FINAL REPORT

Terrain Soils and Land Capability
Gladstone LNG Facility

Prepared for

Santos Ltd

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12 February 2009

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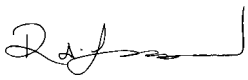

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Final

Date: 12 February 2009

Table of Contents

ES Executive Summary 1

1 Description and Assessment of Environmental Values 2

1.1 Method of Assessment 2

1.1.1 Geomorphological/Facies Modelling Methodology 2

1.1.2 ASS Legislation and Assessment Criteria 3

1.1.3 Data Sources 3

1.2 Program Objectives 3

1.3 Late Quaternary Geology 3

1.4 Field Investigations 4

1.4.1 Sampling and Analysis Program 4

1.4.2 Collection of Sediment Cores 4

1.4.3 Core Locations 5

1.4.4 Core Processing and Logging 5

1.4.5 Acid Sulfate Field **p**H Screening 7

1.5 Laboratory Analysis 7

1.5.1 Methods 7

1.5.2 Data Verification 7

1.5.3 Acid Sulfate Analysis and Threshold Levels 7

1.5.4 Interpretation of Laboratory Results 8

1.6 Results of Assessment 9

1.6.1 Core locations 9

1.6.2 Digital Stratigraphic Logs 12

1.7 Stratigraphy 12

1.7.1 Onshore 12

1.7.2 Offshore 19

1.8 Acid Sulfate Chemistry 20

1.8.1 Field pH data 20

1.8.2 Laboratory Results 21

1.9 Associations between Acid Sulfate Soil distribution and facies 41

1.9.1 Onshore 41

1.9.2 Offshore 42

Table of Contents

2 Potential Impacts and Mitigation Measures 43

2.1 Introduction 43

2.2 Potential Acid Sulfate Soil Impacts 43

2.2.1 Potential Acid Sulfate Soil 43

2.2.2 Actual Acid Sulfate Soil 44

2.3 Mitigation of Acid Sulfate Soil Impacts 44

2.3.1 Potential Acid Sulfate Soil 44

2.3.2 Actual Acid Sulfate Soil 45

3 Glossary 46

4 References 49

Tables, Figures, Drawings, Appendices

Tables

Table 1-1 Action criteria for soils (>1000 tonnes disturbed) by texture categories (from Dear et al., [2002] Soil Management Guidelines). 8

Table 1-2 Site co-ordinates for onshore acid sulfate sampling locations GLNG Project. 9

Table 1-3 Site co-ordinates for offshore acid sulfate cores, GLNG Project 10

Table 1-4 Laboratory results of acid sulfate .analyses for onshore samples. 22

Table 1-5 Laboratory results of acid sulfate .analyses for offshore samples 34

Table 1-6 Summary of laboratory data for offshore ASS cores. 40

Figures

Figure 1-1 Proposed Project Components Gladstone Area 6

Figure 1-2 Acid Sulfate Core Site and Stratigraphic Transect Locations. 11

Figure 1-3 Stratigraphic Transect #1 – Boatshed Point. 13

Figure 1-4 Stratigraphic Transect #2 – Hamilton Point to Boatshed Point. 14

Figure 1-5 Stratigraphic Transect #3. 15

Figure 1-6 Stratigraphic Transect #4 - offshore. 16

Appendices

A Soil Characterisation & Indicative Testing

B Description & Assessment of Terrain Units

C Soil Erosion Potential & Mitigation Measures

D Land Suitability Classes & Limitations

Executive Summary

GeoCoastal (Australia) Pty Ltd was commissioned by URS Australia Pty Ltd on behalf of Santos Pty Ltd to conduct a land and marine environmental survey in an area adjacent to the southwestern end of Curtis Island, Gladstone, where development of an LNG Facility and associated infrastructure / service routes are proposed.

The land program involved acid sulfate soil assessment of several embayment tidal flat areas on Curtis Island, and a coastal strip north of Fisherman's Landing, along a proposed road and pipeline route. The various proposals for development of these coastal corridors and tidal flats all involve filling (i.e. rather than disturbance of *in situ* sediments), which directed the sample analysis strategy toward a minimal 2m depth, although deeper coring was conducted where possible to constrain both facies modelling and the geotechnical understanding of the area. Coring was conducted using the combination of a tracked, all-terrain vibrovacuum rig, and manual piston coring at 84 land sites.

The marine program investigated a linear tract running parallel with the southwestern coast of Curtis Island, where wharf facilities and dredge removal of seabed sediments are proposed to a depth of -14m LAT. The investigation therefore incorporated both contaminant sampling to National Ocean Disposal guidelines and acid sulfate soil assessment. The results of the acid sulfate soils assessment only are presented in this report. Eight offshore sites were cored using GeoCoastal's specialised coring barge.

As may be anticipated from both the geological setting and other studies in the area, investigation of sediments occupying embayments in the area revealed generally high Potential acid sulfate soil potential (PASS), and there is also a widespread occurrence of generally low level Actual acid sulfate soil (AASS). This AASS occurrence is problematic in respect of plans to fill over these areas.

The results from the offshore ASS assessment revealed that while shallow, nearshore accreted silt/clay sediments retained a high potential acid sulfate soil (PASS), the seabed sequence within the main marine passage where dredging is proposed revealed a negative Net Acidity (i.e. has excess buffering capacity).

Description and Assessment of Environmental Values

Section 1

GeoCoastal (Australia) was commissioned by URS Australia Pty Ltd to undertake an Acid Sulfate Soil assessment of areas subject to disturbance by construction of the proposed LNG Facility and the supporting infrastructure in accordance with legislative requirements and to address the Terms of Reference regarding Acid Sulfate Soils in areas subject to excavation or filling below the level of 5 metres AHD.

The proposed LNG Facility is to be located to the north of Hamilton Point at China Bay on Curtis Island (Figure 1-1). This is situated approximately 5 km north-east of the City of Gladstone. Access to the facility will be via a road which runs parallel to the mainland's eastern coastline north of Fishermans Landing Wharf to a proposed bridge to be constructed across The Narrows between Friend Point and Laird Point. An extension of the gas transmission pipeline will be located together with an access road in a common corridor continuing in a south-easterly direction approximately 1.5 km inland from the coast, to link with the LNG facility in the vicinity of China Bay.

1.1 Method of Assessment

1.1.1 Geomorphological/Facies Modelling Methodology

Early recognition of acid sulfate soils in Australia in the late 1960's has been attributed to Walker (1972). However, it has only been in the past decade that their true impact on coastal ecology has been recognised. The study of acid sulfate soils is thus a relatively young scientific discipline in which new advances in both our understanding of the phenomenon and the methods used to research it are occurring rapidly. Not surprisingly, early investigations into acid sulfate soils occurred largely within the domain of soil scientists; however, in recent years a research coalition with the discipline of coastal geomorphology has provided many new insights into the distribution and genesis of these soils. Coastal geomorphology is the branch of geology which deals with the evolution of coasts. GeoCoastal scientists have been at the forefront of this research coalition and have worked closely with QASSIT scientists during the past decade on developing methodologies for ASS mapping which integrate soils and geomorphological concepts.

Geomorphologists unravel coastal sedimentary histories using a stratigraphic interpretation technique known as facies modelling. Definitions of both 'facies' and 'facies modelling' remain somewhat nebulous, even to experienced workers (refer Walker, 1992), however, as a general definition coastal sedimentary facies may be described as 'an areally delimited, mappable sedimentary body associated by either character and/or depositional provenance'. One of the primary difficulties in facies mapping is that the internal physical characteristics of a 'facies' may change substantially without transgressing a facies boundary. Additionally, much of the interpretation of facies relies on its association with surrounding facies, which in turn relies on a sound knowledge of coastal systems and models by the worker.

GeoCoastal have developed a tripartite system for mapping acid sulfate soils based on:

Field methodologies including advanced continuous coring methods, geomorphological logging of sedimentary sequences, and field pH testing

Coastal facies modelling, laboratory analysis and determination of *ASS/Stratigraphic Relationships*

Graphic presentation of subsurface stratigraphy and *ASS distribution* providing for easy assimilation of information by both authorities and site personnel tasked with ASS Management

This approach has consistently demonstrated a superior understanding of ASS distribution from fewer boreholes than recommended in the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in

Queensland -1998 (i.e. the Guidelines represent a minimum number for survey conducted without credible scientific justification for reduction). As such, it has been soundly endorsed and preferred by regulatory authorities during the past decade. Both QASSIT and EPA have commissioned GeoCoastal to conduct surveys on their behalf adopting this geomorphological modelling approach.

1.1.2 ASS Legislation and Assessment Criteria

Developments in Queensland are subject to investigations of Acid Sulfate Soils via triggering the State Planning Policy 2/02: *Planning and Managing Development Involving Acid Sulfate Soils* (SPP 2/02), introduced in November 2002 when excavation of more than 100 m^3 of soil or sediment being '…at or below 5 metres Australian Height Datum (AHD) where the natural ground level is less than 20 metres AHD' is proposed.

The geomorphological approach adopted within this report meets the intent of the State Planning Policy 2/02 by identifying the extent of acid sulfate soils on the site and proposing management strategies to prevent or minimise any potential impacts from the proposed development of the site using Best Practice Environmental Management techniques. The document *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland (1998)* is acknowledged as still containing the current applicable information regarding conducting an ASS investigation, however when the *Queensland Acid Sulfate Soil Technical Manual* is completed, that document should be consulted.

1.1.3 Data Sources

The following data were used and/or referred to in this report:

Project area topographic and bathymetric base maps prepared for Santos Ltd. by URS, with 1 m and 5 m contour intervals;

1:50,000 series Acid Sulfate Soil Map and Acid Sulfate Hazard Map – Ross D.J (2005) Acid Sulfate Soils of the Narrows Area, Central Queensland Coast (and accompanying Report DNRM 05524).

1.2 Program Objectives

The objectives of the sediment investigation were to:

1) Conduct an acid sulfate soil investigation which complies with prevailing state and local government guidelines and policies;
2) Identify and model the stratigraphy of the site to allow the differentiation of acid sulfate soils on the basis of depositional periods and/or events; and
3) Use a combination of the analytical results and stratigraphic modelling to determine the extent, spatial variability and acid generating potential of acid sulfate soils within the site and discuss the potential impacts of relevant disturbance and their mitigation strategies.

1.3 Late Quaternary Geology

The geological sequences of relevance to acid sulfate soil assessment relate primarily to deposition that has occurred in the Holocene-time epoch (last 10,000 years), and in certain circumstances deposits from the penultimate interglacial high sea level period in the late Pleistocene period. (ca. 125,000 years). On southern Curtis Island Holocene-age deposition is characterised mainly by mangrove associated, suspension silt/clay sediments which fill embayments within the bedrock geological template created by the Carboniferous Wandilla Formation. While on the mainland coast to the north of Fisherman's Landing, longshore spit extension has

created a tombolo of mangrove mudflat between the coast and Friend Point, and consequently the development of a broad gusset of shallow, mud dominated nearshore platform.

A more comprehensive description of the regional geology and landscape is provided in the separate EIS soils and terrain report for the LNG facility.

1.4 Field Investigations

1.4.1 Sampling and Analysis Program

Sampling and analysis were conducted with reference to the following documents:

Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998; and

Laboratory Methods Guidelines 2004 - Acid Sulfate Soils. In: Queensland Acid Sulfate Soil Technical Manual – collectively referred to as the 'QASSIT Guidelines'.

1.4.1.1 Sampling Rationale

The sampling strategy in all onshore areas was guided by advice that the proposed activities will involve filling on *in situ* sediments, but no excavation or lowering of existing water tables. Therefore, sample field and laboratory testing was only conducted to the minimal depth required of two metres. Consistent with GeoCoastal's recognised geoscientific approach, coring was continued beyond the acid sulfate soil assessment depth, to the pre-Holocene substrate where feasible; in order to further constrain geomorphological modelling of the site as well as contributing to the geotechnical understanding.

Offshore sampling was conducted along a transect where dredging is proposed to a depth of -16m LAT, and cores were obtained to this depth or to where very stiff pre-Holocene clay substrate prevented restricted penetration. An additional site was located in the bay where the jetty associated with the LNG Facility is proposed to be constructed.

Upon a further requirement to assess the presence of Actual ASS in two additional bays to the north and east of Hamilton Point, additional sites were cored using hand (manual) methods to a depth of one metre.

Samples were taken at 0.25m intervals for field pH screening and per 0.5m for laboratory analyses to the depths described above.

1.4.2 Collection of Sediment Cores

Undisturbed, continuous sediment cores were collected using GeoCoastal's vacuum-vibracoring system mounted on an All Terrain Vehicle (ATV). The vibracoring system obtains cores of 60mm internal diameter, collected within a thin-wall (2 mm) stainless steel barrel which is extruded into plastic sheathing for storage and/or transport to a logging/sampling facility. No surface spoil is produced with the system and there is no cross-contamination. This methodology was also used for the offshore sites with the vacuum-vibracoring system being mounted on a barge.

In locations where access by ATV was restricted due to extremely soft and unstable ground, hand augering was undertaken with the samples extruded into plastic sheathing for storage and/or transport. The hand piston coring system obtains cores of 40mm diameter, collected within a thin wall stainless steel barrel and in lengths of one metre.

Cores were labelled and processed immediately. The core barrel was thoroughly washed by a combination of high pressure water and air combined with vibration between coring runs.

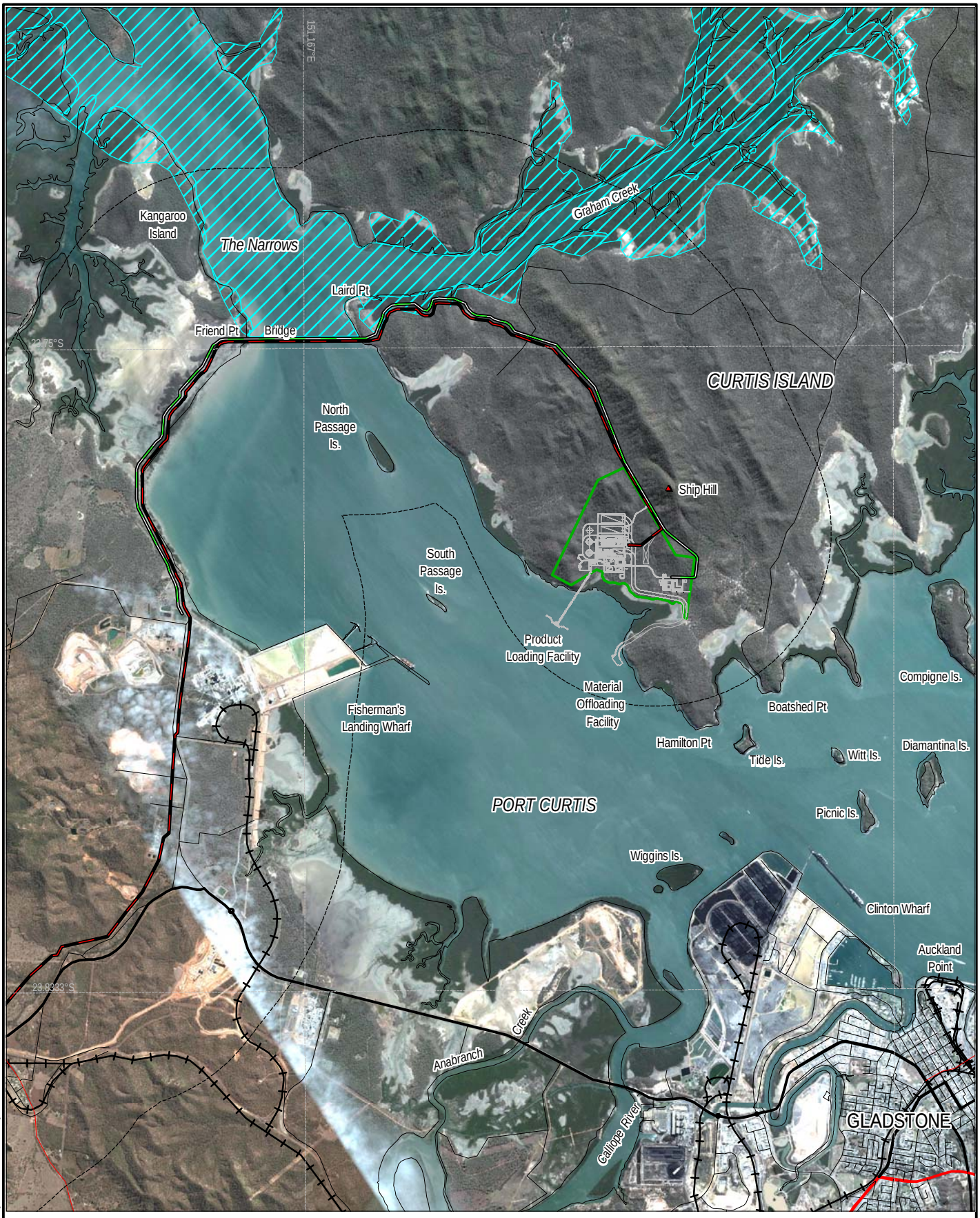
1.4.3 Core Locations

Acid sulfate soil core locations were recorded by hand-held GPS and are detailed in Figure 1-1.

1.4.4 Core Processing and Logging

Each sheathed core was placed onto cleaned PVC half-pipe supports, then the top of the sheath sliced lengthways to expose the core for logging and sub-sampling. The stratigraphic facies encountered were carefully logged, with characteristics including texture, proportional grain size estimations, colour and presence of accessory material (biological matter, jarosite, organic debris, shells etc.) recorded against depth below natural surface.

Samples were collected from the core using decontaminated implements and sealed in zip-lock bags to minimise exposure to oxygen. In order to suppress biological and/or chemical activity, the samples were immediately refrigerated in the field, and stored frozen until delivered to the laboratory for analysis.



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Great Barrier Reef Coast Marine Park
Gas Transmission Pipeline Corridor
Proposed LNG Facility Site
Proposed LNG Facility Access Road
Gas Transmission Pipeline

Source: Google Earth Imagery 2008. This map may contain data which is sourced and Copyright. Refer to Table Of Contents for Ownership and Copyright.

Client: URS	Project: GLADSTONE LNG PROJECT ACID SULFATE SOIL ASSESSMENT		Title: **PROPOSED PROJECT COMPONENTS GLADSTONE AREA**
GEO COASTAL Australia	Drawn: LL	Approved: RL	Date: 26-11-2008
	Job No: **4262 6220**	File No: 42626220-g-656.wor	Figure: **1**
			Rev:A **A4**

1.4.5 Acid Sulfate Field pH Screening

Field pH before and after oxidation with 30% hydrogen peroxide was measured in small samples of soil/sediment taken every 0.25 m down the core, according to the Queensland Sampling Guidelines. A spear point pH electrode and field pH meter were used and peroxide reaction characteristics were noted.

1.5 Laboratory Analysis

1.5.1 Methods

Samples downcore were selected by a senior geomorphologist with consideration of facies boundaries and stratigraphic uniformity vs. variability. These included some samples from the Pre-Holocene age sands and clayey sediments that were generally intersected. Selected samples were submitted to ALS Environmental laboratory, Brisbane, (a NATA accredited laboratory) for Chromium Reducible Sulfur-suite Acid Base Accounting according to the *Acid Sulfate Soils Laboratory Methods Guidelines* chapter (2004) of the Queensland Acid Sulfate Soils Technical Manual. This suite of analyses enables determination of Net Acidity, or acid generating potential, by taking into account inherent acidity and alkalinity of the soil or sediment. The Chromium Reducible Sulfur (CRS) method was selected rather than the Suspension Peroxide Oxidation Combined Acidity & Sulfur method (sPOCAS) test as highly organic sediments were anticipated in the Gladstone region as reported by Ross (2005; 2 to 9% Total Organic Carbon). The CRS method extracts inorganic sulfur only (e.g. pyrite) compared to the Peroxide Oxidisable Sulfur (sPOS) test which includes both organic and inorganic sulfur.

Chain-of-Custody procedures were adhered to for all samples collected. Samples collected but not submitted for laboratory analysis were stored frozen for possible future reference.

1.5.2 Data Verification

The unit of measurement of ASS used in this report is the percent concentration of sulfur in the sample (%S) and all results (Titratable Actual Acidity, Acid reacted Calcium etc) are converted to 'sulfur units' by the laboratory. Net Acidity (N.A) values reported in laboratory certificates are calculated by the laboratory's computers from all results of the sPOCAS suite, thereby incorporating additional analyses including retained acidity, such as that contained in jarosite (measured as sNAS or Net Acid-soluble Sulfur), actual acidity (measured as TAA or Titratable Actual Acidity) and acid neutralizing capacity (ANC) as well as oxidisable sulfur concentrations. They are verified upon receipt using the formulas provided in Ahern et al. (2004). Application of these formulas allows calculation of negative Net Acidity Values, which could be termed Net Alkalinity values. These occur when the amount of Acid Neutralising Capacity exceeds the potential acidity caused by oxidation of sulfides by more than a factor of 150%. These are not reported by the laboratory, which records such results as <0.02%S. Laboratory results received are also checked for errors/anomalies which are then reported to the laboratory for further checking and/or re-analysis.

1.5.3 Acid Sulfate Analysis and Threshold Levels

The term acid sulfate soil generally includes two types of ASS:

1) that which has been already exposed to oxygen and has formed acidic products (including a sulfur mineral known as jarosite) - this is known as an actual acid sulfate soil (AASS), and has a low natural pH, and

2) that which is unoxidised, and contains the potential to form sulfuric acid plus acidic products. This is known as potential acid sulfate soil (PASS). Actual and potential ASSs are often found in the same soil profile, with actual ASS generally overlying potential acid sulfate soil horizons.

The following are descriptions of these, as defined by Queensland State government authorities:

> **Actual acid sulfate soils (AASS):** Soil or sediment containing highly acidic soil horizons or layers affected by the oxidation of soil materials that are rich in iron sulfides, primarily pyrite. This oxidation produces hydrogen ions in excess of the sediment's capacity to neutralize the acidity, resulting in soils of pH 4 or less. These soils can usually be identified by the presence of jarosite (a yellow coloured mineral).
>
> **Potential acid sulfate soils (PASS):** Soils or sediments containing iron sulfides or sulfidic material that have not been exposed to air and oxidized. The field pH of these soils in their undisturbed state is pH 4 or more, and may be neutral or slightly alkaline.

Drops in pH after reaction to hydrogen peroxide (pH_{FOX}) of at least 1 pH unit may indicate a Potential ASS (PASS), with larger drops more indicative. A final pH_{FOX} of <3, after a significant drop from the pH_F value, and in combination with a strong reaction to peroxide is strongly suggestive of PASS.

1.5.4 Interpretation of Laboratory Results

Net Acidity values of soils above which action must be taken to prevent environmental harm due to potential release of acidic leachate are given in the following table.

Table 1-1 Action criteria for soils (>1000 tonnes disturbed) by texture categories (from Dear et al., [2002] Soil Management Guidelines).

Texture Category	Texture Range (McDonald *et al.* 1990)	Approx. Clay Content (<0.002mm)	Action Level Net Acidity (% S)	Action Level Net Acidity (mol H^+/tonne)
Coarse	Sands to loamy sands	<5%	0.03	18
Medium	Sandy loams to light clays	5-40%	0.03	18
Fine	Medium to heavy clays and silty clays	>40%	0.03	18

1.6 Results of Assessment

1.6.1 Core locations

A total of 95 sites were cored throughout the area, with 11 sites located offshore in the passage between Graham Creek and Hamilton Point. The core sites are shown in Figure 1-2 and each different area or group of cores has been denoted a location number. Of the remaining 84 core sites, 61 were located within seven mangrove tidal flats on Curtis Island, with 31 sites to 2 metres depth in Locations 1 to 3 (cores #1 to #31), and 30 sites to 1 metre depth in Locations 5 and 6 (cores #55 to #84). The 23 cores in Location 4 (cores #32 to #54) were undertaken at intervals of approximately 200 m to assess the proposed pipeline route and bridge access road.

Location co-ordinates of the 84 onshore sample sites are provided in Table 1-2, with the 11 offshore locations in Table 1-3.

Table 1-2 Site co-ordinates for onshore acid sulfate sampling locations GLNG Project.

Core Site	Latitude	Longitude	Core Site	Latitude	Longitude
GLNG 01	23.78753	151.22346	GLNG 43	23.76554	151.14349
GLNG 02	23.78878	151.22263	GLNG 44	23.76362	151.14398
GLNG 03	23.79045	151.22383	GLNG 45	23.76219	151.14526
GLNG 04	23.78913	151.22328	GLNG 46	23.76042	151.14590
GLNG 05	23.78703	151.22491	GLNG 47	23.75908	151.14728
GLNG 06	23.78766	151.22513	GLNG 48	23.74898	151.15573
GLNG 07	23.78666	151.22670	GLNG 49	23.75061	151.15462
GLNG 08	23.78562	151.22789	GLNG 50	23.75216	151.15334
GLNG 09	23.78476	151.22853	GLNG 51	23.75344	151.15189
GLNG 10	23.78576	151.22940	GLNG 52	23.75501	151.15086
GLNG 11	23.78652	151.22992	GLNG 53	23.75646	151.14951
GLNG 12	23.78654	151.22830	GLNG 54	23.75787	151.14853
GLNG 13	23.78734	151.22836	GLNG 55	23.78918	151.23386
GLNG 14	23.78990	151.22502	GLNG 56	23.78785	151.23343
GLNG 15	23.78842	151.22615	GLNG 57	23.78695	151.23471
GLNG 16	23.78524	151.21800	GLNG 58	23.78229	151.23625
GLNG 17	23.78499	151.21967	GLNG 59	23.78244	151.23773
GLNG 18	23.78425	151.21848	GLNG 60	23.78374	151.23680
GLNG 19	23.78350	151.21835	GLNG 61	23.78504	151.23691
GLNG 20	23.78283	151.21585	GLNG 62	23.78823	151.23976
GLNG 21	23.78269	151.21378	GLNG 63	23.78729	151.24069
GLNG 22`	23.78137	151.21202	GLNG 64	23.78634	151.23918
GLNG 23	23.78043	151.21007	GLNG 65	23.78543	151.23940
GLNG 24	23.78010	151.20763	GLNG 66	23.78430	151.23875
GLNG 25	23.74576	151.18401	GLNG 67	23.78802	151.23784
GLNG 26	23.74566	151.18437	GLNG 68	23.78691	151.23692

Core Site	Latitude	Longitude		Core Site	Latitude	Longitude
GLNG 27	23.74626	151.19026		GLNG 69	23.78787	151.23524
GLNG 28	23.74467	151.18864		GLNG 70	23.75675	151.18433
GLNG 29	23.74906	151.17490		GLNG 71	23.75601	151.18542
GLNG 30	23.74754	151.17677		GLNG 72	23.75566	151.18668
GLNG 31	23.74635	151.17731		GLNG 73	23.75466	151.18649
GLNG 32	23.78357	151.15021		GLNG 74	23.75320	151.18657
GLNG 33	23.78188	151.14935		GLNG 75	23.75340	151.18788
GLNG 34	23.78017	151.14925		GLNG 76	23.75243	151.18912
GLNG 35	23.77828	151.14906		GLNG 77	23.75107	151.18889
GLNG 36	23.77706	151.14780		GLNG 78	23.75217	151.18730
GLNG 37	23.77476	151.14670		GLNG 79	23.75103	151.18649
GLNG 38	23.77361	151.14565		GLNG 80	23.75213	151.18518
GLNG 39	23.77198	151.14464		GLNG 81	23.75292	151.18399
GLNG 40	23.77107	151.14354		GLNG 82	23.75431	151.18437
GLNG 41	23.76908	151.14326		GLNG 83	23.75396	151.18243
GLNG 42	23.76724	151.14268		GLNG 84	23.75325	151.18024

Cores obtained were often deeper than the depth required for assessment (the maximum depth on this survey was 4.7 metres) to enable additional facies data to be obtained, however, in some locations refusal in rock, pebbles, indurated (cemented) material or pre-Holocene substrate caused the core to be shorter.

Table 1-3 Site co-ordinates for offshore acid sulfate cores, GLNG Project

Core Site	Latitude	Longitude
GLNG Off 1	23.78258	151.19843
GLNG Off 12	23.78335	151.20928
GLNG Off 3	23.78597	151.19857
GLNG Off 5	23.78875	151.20460
GLNG Off 6	23.79075	151.20715
GLNG Off 9	23.79740	151.21468
GLNG Off 10	23.79958	151.21690
GLNG Off 11	23.80112	151.21995

FIGURE 1-2 Acid sulfate core site and stratigraphic transect locations.

1.6.2 Digital Stratigraphic Logs

GeoCoastal (Australia) Pty Ltd. have developed a composite graphic format for the presentation of stratigraphic logs incorporating soil chemistry and other analyses so that the relationship between acid sulfate soil occurrence and progenitive environments can be analysed. These detailed logs are a necessary precursor to 2-dimensional and 3-dimensional modelling of the depositional evolution of the site and its influence on the generation of acid sulfate conditions.

The stratigraphic logs of all cores are presented in Appendix A.

To allow a fuller understanding of how the Net Acidity (N.A) results relate to their soil/sediment profile, the CRS and Titratable Actual Acidity values in addition to N.A values (as %S) were plotted against depth in the logs. This enables demonstration of situations where inherent buffering capacity of the (usually shelly) sediments may override the acid producing potential from reduced sulfides, and also where actual acidity is the greatest component of the overall Net Acidity.

1.7 Stratigraphy

1.7.1 Onshore

1.7.1.1 Location 1: Hamilton Point-Boatshed Point Tidal Flat

This location features a mangrove-rimmed, southeast facing embayment occupied by a tidal flat of the approximate dimension 300m x 900m (area ~27 ha.). Refer Figure 1-2 and Cores #1 to #15. As discussed previously, coring was continued beyond the acid sulfate soil assessment depth, to the pre-Holocene substrate where feasible, in order to further constrain geomorphological modelling of the site as well as contributing to the geotechnical understanding. Facies modelling of this sequence is presented in Figures 1-3 and 1-4.

Assessment criteria: the proposed activity for this site is filling with dredge spoil.

Pre-Holocene facies

The interface of pre-Holocene/Holocene aged sediments within this embayment is generally characterised by a seaward declining continuation of the residual landscape from the back of the tidal flat to a depth exceeding 3.65 m beneath the mangrove fringe.

This substrate is characteristically composed of greenish grey (mottled) to brown/olive grey, clay: stiff to very stiff, plastic, gravelly in places. A shallow zone of discolouration immediately below the surface of these clays was observed in a high proportion of the cores. This phenomenon has been observed commonly in Queensland pre-Holocene clays, and is interpreted by the authors as a zone of infiltration by overlying Holocene-age interstitial water. This observation has significance to later discussion on the distribution of acid sulfate soil conditions.

In some cores (e.g. cores #1, #4 and #6) pebble beds were encountered, which have experienced penetration of the overlying Holocene-age sediments within the pore spaces.

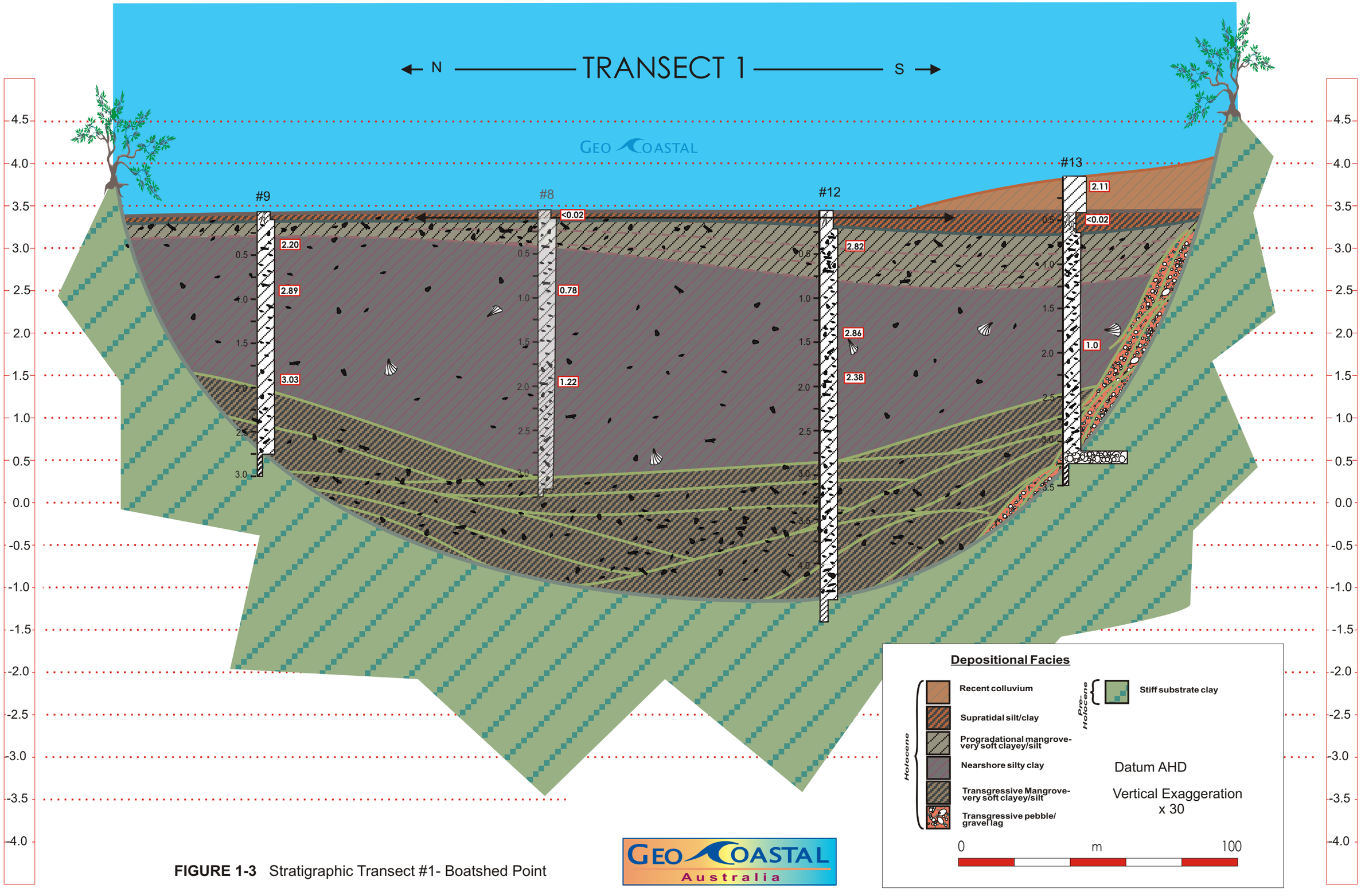


FIGURE 1-3 Stratigraphic Transect #1- Boatshed Point

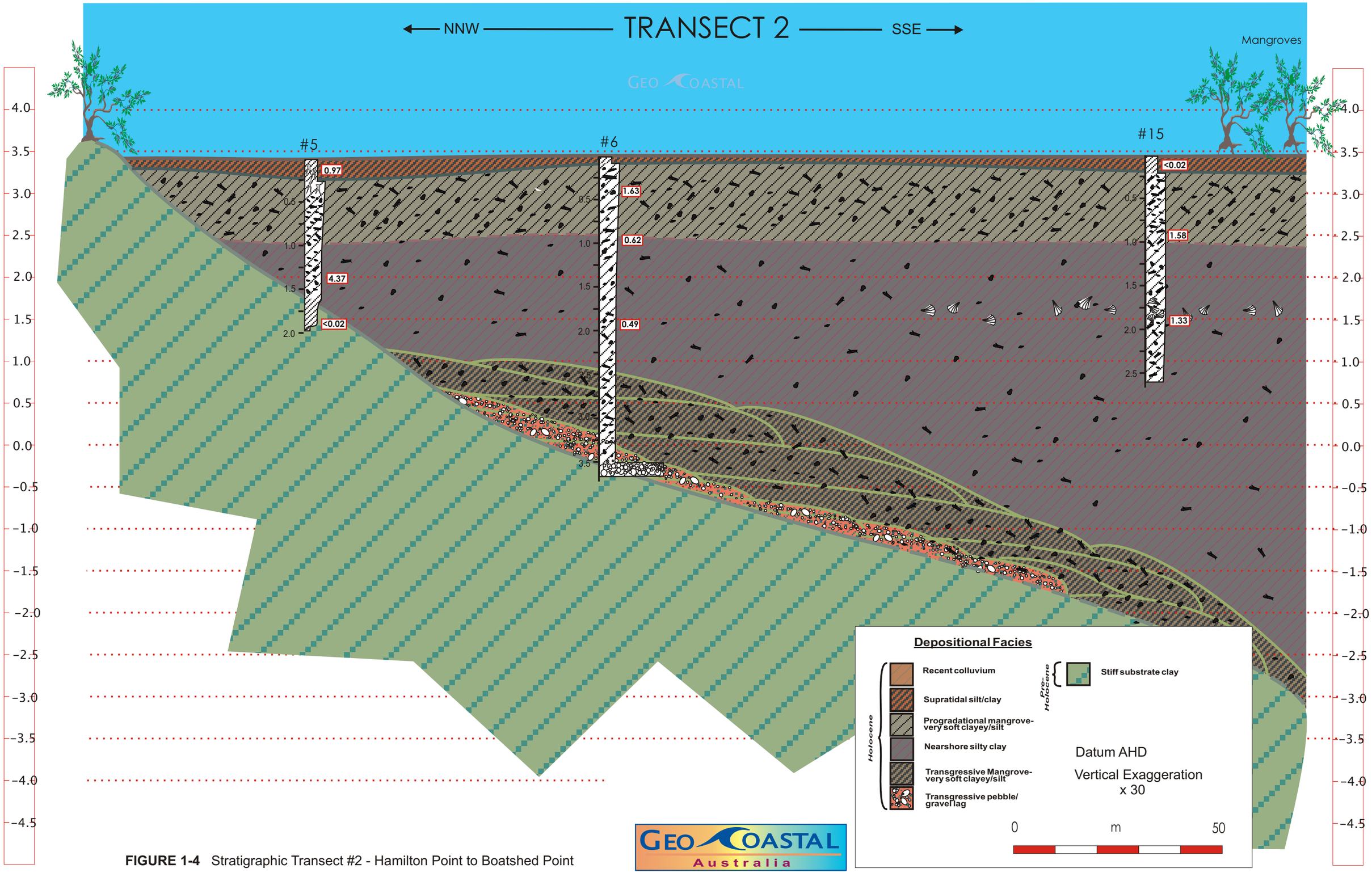


FIGURE 1-4 Stratigraphic Transect #2 - Hamilton Point to Boatshed Point

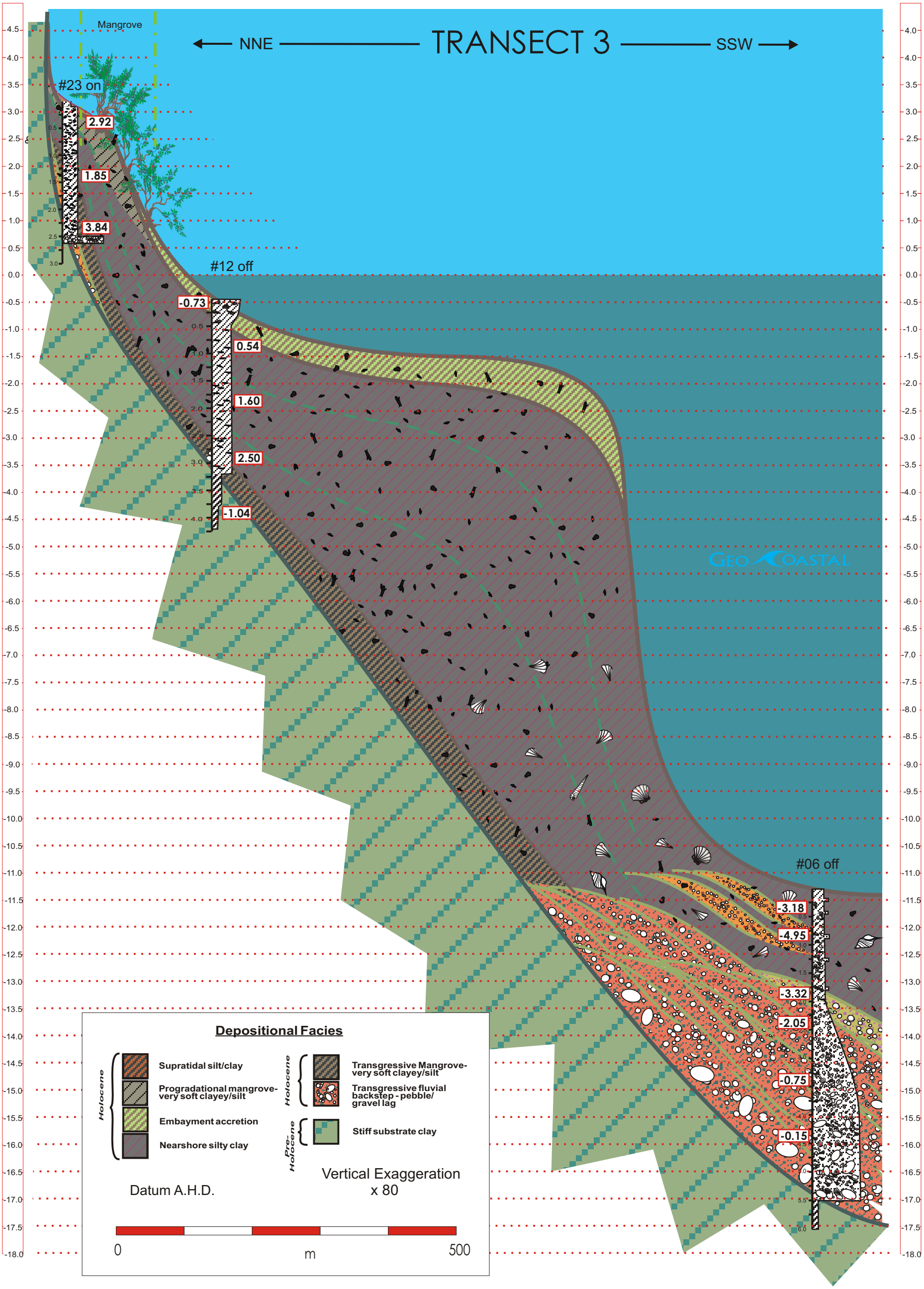


FIGURE 1-5 Stratigraphic Transect #3

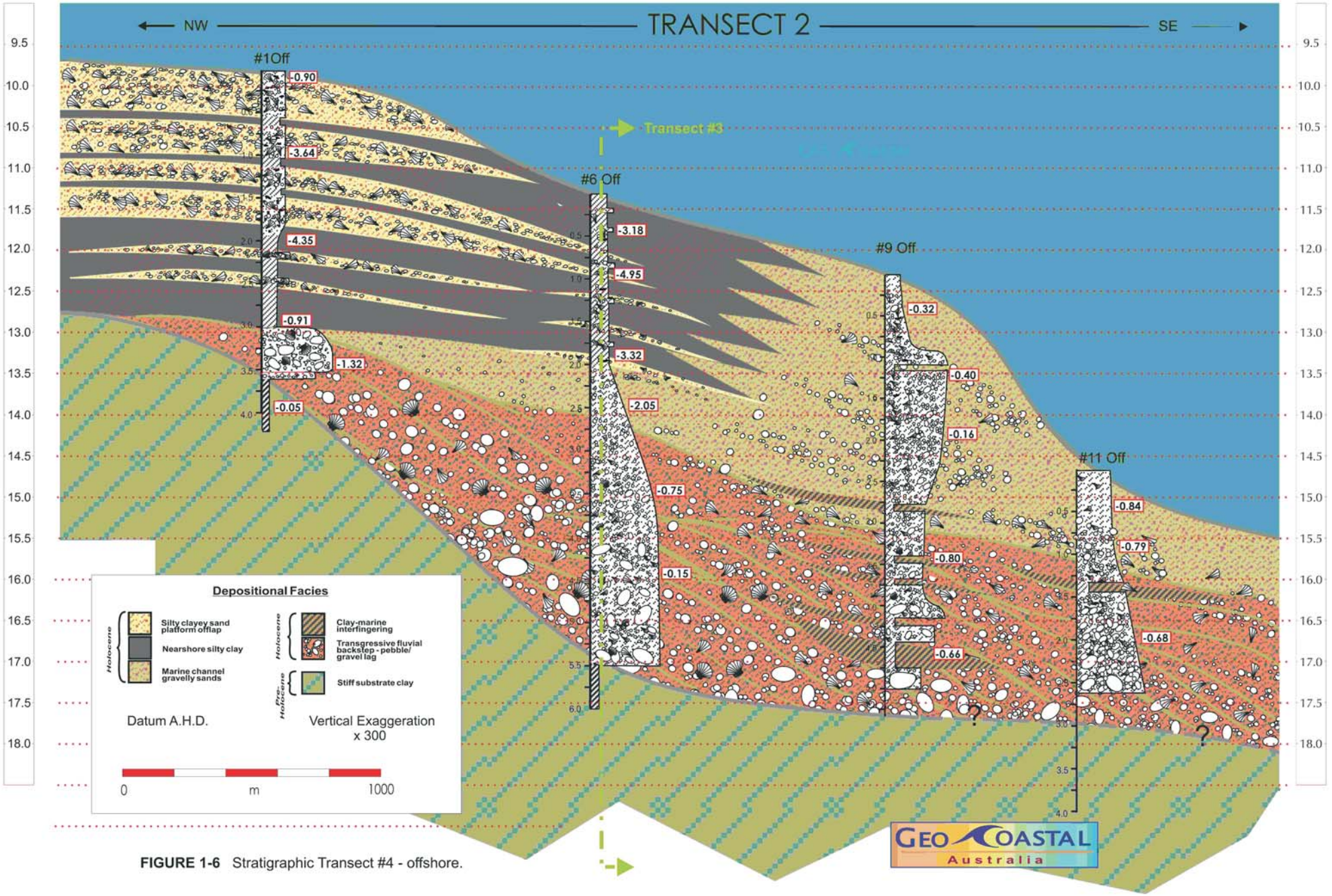


FIGURE 1-6 Stratigraphic Transect #4 - offshore.

Holocene facies

Transgressive - the initial Holocene-age phase of deposition occurs during the transgression of marine conditions over the antecedent landscape. In a low energy, subtropical/tropical setting such as South Curtis Island the transgression is identified by highly organic, silt/clay sediments deposited in the wake of the rising sea. Consistent with this, the basal Holocene sediments across the area generally exhibited a high component of mangrove wood debris, while in some sites old shoreline, pebbly/ gravelly lags are preserved.

Nearshore embayment - as the mangrove shoreline transgressed with the rising sea to a position toward the rear of the present tidal flat, the dominant depositional environment would have been a shallow, nearshore embayment-fill receiving mangrove debris. In abbreviated sequences this intermediate deposition has been wedged out due to lack of accommodation space; however in some of the longer cores (e.g. cores #3, #4, #6 and #12) this phase is identified as a generally amorphous, dark, greenish grey, soft silt/clays with numerous organic fragments present.

Prograding mangrove – in time, sediments infilling the embayment's nearshore would have provided a platform for the mangrove shoreline to prograde seaward to its present position, again providing a highly organic deposit in the upper sequence. This deposit was characterised on site by very dark grey, very soft, clayey silts: moist, weakly cohered, and commonly laminated.

Tidal flat cap – the tidal flat is mantled by a thin (10 to 30 cm) olive brown silty clay: soft to firm. These supratidal sediments, sourced primarily by suspension sediments from the surrounding landscape, are commonly mottled, and feature weak jarosite development in a number of cores.

This thin capping layer presents a relatively fragile seal over the underlying very soft sediments.

Recent accretion – there are localised occurrences of recent accretion, some with an obvious tidal affilitation because they contain acid sulfate potential, while others (e.g. cores #19 and #20) relate to fluvial fan and colluvial overwash deposits.

1.7.1.2 Location 2: Proposed LNG site north of Hamilton Point

This location features a mangrove-rimmed, southwest facing shoreline backed by a relatively narrow, elongated tidal flat of the approximate width range of 30m x 150m. Refer Figure 1-2 and the stratigraphic cross-section illustrated in Figure 1-5 for a representation of the relationship of this shoreline strip of tidal flat with the embayment nearshore/offshore.

Assessment criteria: the proposed activity for this site is filling.

Pre-Holocene facies

Generally the depth of the Holocene-age was relatively shallow beneath this shoreline-tracking tidal flat (typically 0.5-1.5m deep), but deepened at a couple of sites (#18 and #23) coinciding with minor valleys in the palaeo-landscape.

Similar to Area 1, the substrate is characteristically composed of light greenish grey (mottled) to brown/olive grey, clay: stiff to very stiff, plastic, generally gravelly. A shallow zone of infiltration was again identified immediately below the Holocene/Pleistocene boundary (refer earlier discussion in section 1.5.2.1). In core #22 this was particularly pronounced, with penetration by root canal vughs observed.

As in Location 1, the pre-Holocene substrate of some cores (e.g. cores #18 and #23) was characterised by pebble beds.

Holocene facies

Transgressive - consistent with the findings in Area 1, the basal Holocene sediments across the area generally exhibited a high component of mangrove wood debris.

Nearshore embayment – generally the Holocene sequence was quite compressed along this coastal strip, and therefore not providing accommodation for this middle fill facies, however, it features in core #23 which was deeper.

Prograding mangrove – again this deposit was characterised on site by highly organic, very dark grey, very soft, clayey silts: moist, weakly cohered, and commonly laminated.

Tidal flat cap – because of the proximity to the residual landscape backing the narrow tidal plain, the capping layer was generally thicker (10-50cm), and more variable, ranging between silty/clays, sandy silty clays and clayey gravelly sands of fluvial origin.

1.7.1.3 Location 3: Laird Point-Graham Inlet coast

Assessment criteria: the proposed activity for this site is piling for bridge abutments and filling with a road bank in low lying segments of the proposed road corridor. This road bank is proposed to remain entirely on the residual landscape in proximity to Laird point, but will transect the inner portion of the two minor embayments extending east along the Graham Inlet coast. Two sites along the edge of the rearward tidal mud flat adjacent to Laird Point (sites #30 and #31) were investigated as a precaution, and four further sites were investigated in the rear of the two minor embayments to the east (sites #25 to #28). Refer Figure 1-2.

Pre-Holocene facies

Bridge abutment site – this location is a boulder strewn shoreline developed directly onto a steep residual landscape.

Rearward tidal flat east of Laird Point – the two sites tested at this location revealed the pre-Holocene to be residual soils, one site (#30) at 0cm depth and the other #31 at ~30cm depth.

Embayments east of Laird Point – at the four locations tested the pre-Holocene substrate was encountered within a range of depths between 0.4 and 0.95m. In each case it was composed of silty clay (including pebbles), and revealed evidence of Holocene influence by either mixing or infiltration.

Holocene facies

Bridge abutment site – an intertidal shelly mud intercalated among the boulders was sampled.

Rearward tidal flat east of Laird Point – there was no Holocene-age sediments at site #30, while at site #31 an abbreviated 30cm sequence revealed a wedge of mangrove laden gravelly silty clay, with a yellowish brown silty clay capping layer.

Embayments east of Laird Point – the Holocene sequence at all four sites investigated in these embayments was similar, with highly organic silty clays and clayey silts capped by a 10-20cm surface layer of colluvium from the surrounding landscape.

1.7.1.4 Location 4: Fisherman's Landing-Friend Point

Assessment criteria: the proposed activity for this site is filling with a road bank along a proposed road corridor. (sites #32 to #48). Refer Figure 2-1. This includes a stretch of coast north of Fisherman's Landing where a mangrove fringed tidal flat has developed against the residual landscape, and a tombolo joining the mainland coast to Friend Point that has developed by longshore spit development progressively truncating this western branch of the narrows.

Pre-Holocene facies

Along the coastal strip extending north from Fisherman's Landing the pre-Holocene surface rises and falls between 1-2m depth below the central mudflat surface, reflecting the minor palaeo-relief along this residual margin. Generally this substrate is composed of mature stiff clays, commonly incorporating sand and gravel. As the route swings away from the mainland coast this substrate is lost below the investigation depth of 3m (i.e. between sites #42 & #43).

Holocene facies

The Holocene sequence along the mainland coast north of Fisherman's Landing is characterised generally by a highly organic, very dark grey silty clayey sand (gravelly in places) capped variously by coarse, colluvial and minor alluvial fan gravelly sands. There is a distinctive mangrove association with these sediments.

Moving away from the coast (i.e. sites #43/#44) there is a 'Doppler-like' decline in grain size with diminishing transport energy, and silty clay sediments become dominant. From approximately site #45 onward the Holocene sequence adopts a more consistent theme of subtidal, very dark grey, shelly silt/ clay between ~2-3m in the section. These sediments are overlain by very dark grey silty clayey sands with abundant mangrove debris between ~0.4-2m; the sand component testifying to some elevation of energy due to longshore spit development and mangrove stabilisation. This sandy section is not present in core #48 toward Friend Point, which is probably indicating that this was a channel until quite late in the development of the tombolo. This middle sequence is then capped by a dark greyish brown silt/clay which is firmer and more plastic than the underlying soft sediments, demarcating the shift to a supratidal mode of deposition.

1.7.2 Offshore

1.7.2.1 South Passage Island- Hamilton Point

A transect of sites aligned approximately parallel with the southwestern coast of Curtis Island (cores #Off1 to #Off12) was investigated using vibro-vacuum coring from GeoCoastal's specialist coring barge. Bathymetry along the transect declined from ~7.5m LAT in the north to ~12.5m LAT in the south, where the deepened channel meets the Targinie Channel at a confluence adjacent to Hamilton Point. The results of this coring are illustrated in digital logs appended, and summarised in two stratigraphic cross-sections (Figures 1-5 and 1-6).

Assessment criteria: the proposed activity for this area is dredge extraction of material to deepen the existing channel to -14m LAT, which is proposed for land disposal. Other facilities intruding into the marine environment are a trestle connecting the shore with a wharf facility on the edge of the channel, and a secondary wharf facility on the northern flank of Hamilton Point.

Pre-Holocene facies

The pre-Holocene-age substrate is characteristically composed of greenish grey/blue (strongly mottled) clay: very stiff, plastic, sandy in places. A shallow zone of infiltration (as described in section 1.7.1.1 above was observed in the only hole (#Off12) placed within the embayment nearshore subtidal platform.

The interface of pre-Holocene/Holocene aged sediments within this embayment is generally characterised by a southeasterly declining surface from ~10m LAT in core#Off1 to ~15m LAT in proximity to Hamilton Point, with a stronger declination in the northern sector suggesting that the transect may be oblique to the main valley thalweg.

Holocene facies

Transgressive – as illustrated in Figures 1-5 and 1-6, the Holocene marine transgression is marked by a substantial backstepping fluvial delta deposit. This deposit generally fines up-sequence as marine drowning of the valley results in the locus of high energy fluvial deposition to retreat up the valley. This deposit features a generally poorly graded, high energy deposit which coarsens in grain size with greater depth around Hamilton point to include particles to cobble and pebble size. There are shell fragments throughout these sediments testifying to them being deposited at the battle front between fluvial and marine forces.

Estuarine-basin fill phase – as illustrated in Figure 1-6, the greater tidal velocities in the deepened channel confluence in proximity to Hamilton Point have maintained a high deposition energy, resulting in gravelly sands remaining dominant throughout the upper sequence. In contrast, lower velocities across the mouth of the embayment (sites #1 to #6 and #12) have favoured a more suspension sediment dominated mode, with interfingering of sandier layers. Figure 1-5 illustrates that there is a transition from mangrove affected suspension sediments accreting within the embayment to shell dominated suspension deposition in the marine channel.

Embayment fill surface layer – in the single core within the embayment (#Off12) there is a very soft surface silt layer with abundant fine shell that has probably formed as a result of a winnowing event.

1.8 Acid Sulfate Chemistry

1.8.1 Field pH data

The screening data from field pH tests of all onshore and offshore cores obtained are presented in Appendix B.

Field pH values for land cores ranged from 3.3 through to 9.9. The former reflect the sediments with actual acidity which had only minor pH drops after peroxide oxidation and generally nil or small reactions to the peroxide.

In contrast, the highly reactive Holocene silty clays showed large pH drops (up to 7 pH units) from the usual field pH range of 7.8 – 8.2.

The higher pH values were associated with Pleistocene clays and sands/gravels which generally showed low pH drops, but sometimes reacted to the peroxide, as has been found in many past surveys. This is believed to be related to elements such as manganese in the clays (Watling et al., 2004).

Offshore cores #1 - #11 had field pH values from above 7 through ~8.5, and either had low/medium pH drops (up to 3.5 units) or showed increases in pH with peroxide oxidation. Core #12 showed a marked difference with

pH drops of up to 5.98 units down the core before smaller changes were recorded towards the bottom as Pleistocene material was intersected.

1.8.2 Laboratory Results

A total of 221 samples were selected on the basis of sedimentary facies identified and field pH test results and submitted to the laboratory for Chromium Suite analyses.

The relevant laboratory parameters out of the series of tests comprising the CRS suite have been incorporated into Table 1-4 below. Laboratory reports of the full range of CRS analyses, and the Chain of Custody documentation are provided in Appendix C.

Discussion of the data is divided into the six areas identified in previous sections.

Table 1-4 Laboratory results of acid sulfate .analyses for onshore samples.

		Core No.	GLNG ON #1	GLNG ON #1	GLNG ON #1	GLNG ON #2	GLNG ON #2	GLNG ON #2	GLNG ON #2	GLNG ON #3	GLNG ON #3	GLNG ON #3	GLNG ON #4	GLNG ON #4	GLNG ON #4
		Depth (m)	0-0.1	0.3-0.5	1.5-1.7	0-0.1	0.3-0.5	1.3-1.5	1.8-2.0	0-0.1	0.8-1.0	1.8-2.0	0.3-0.5	1.3-1.5	1.8-2.0
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	4.6	4.2	5.4	7.0	4.5	4.5	6.5	7.6	4.8	6.0	4.0	4.3	4.9
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.06	0.18	0.01	<0.02	0.08	0.07	<0.02	<0.02	0.06	<0.02	0.15	0.11	0.06
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	0.15	2.14	1.24	0.21	0.82	2.55	0.21	0.15	4.26	1.21	2.24	2.54	2.84
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01				1.16			0.83	2.07					
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02				0.37			0.26	0.66					
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02		0.03									0.03	<0.02	
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	*0.21*	2.34	1.26	<0.02	0.9	2.62	0.04	<0.02	4.32	1.22	2.43	2.66	2.9
Liming Rate	kg CaCO3/t	1	10	110	59	<1	42	122	2	<1	202	57	114	124	136
Data Verification RL (ASS Lab Methods V2.1, 2004)			0.21	2.35	1.25	-0.04	0.9	*2.62*	*0.04*	*-0.29*	*4.32*	*1.22*	*2.42*	*2.66*	*2.90*

Description and Assessment of Environmental Values

		Core No.	GLNG ON #5	GLNG ON #5	GLNG ON #5	GLNG ON #6	GLNG ON #6	GLNG ON #6	GLNG ON #7	GLNG ON #7	GLNG ON #7	GLNG ON #8	GLNG ON #8	GLNG ON #8	GLNG ON #9
		Depth (m)	0-0.1	1.3-1.5	1.8-1.9	0.3-0.5	0.8-1.0	1.8-2.0	0.3-0.5	1.3-1.5	1.8-2.0	0-0.1	0.8-1.0	1.8-2.0	0.3-0.5
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	4.4	4.4	8.6	4.4	7.4	6.9	5.0	6.0	5.2	7.8	6.8	6.3	4.5
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.09	0.08	<0.02	0.1	<0.02	<0.02	0.05	<0.02	0.06	<0.02	<0.02	<0.02	0.08
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	0.8	4.26	0.62	1.53	0.88	0.71	1.62	1.97	1.83	0.2	0.97	1.21	2.12
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01			13.2		1.25	1.03				1.59	0.88		
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02			4.22		0.4	0.33				0.51	0.28		
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02	0.08	0.02		<0.02									
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	0.97	4.37	<0.02	1.63	0.62	0.49	1.68	1.98	1.89	<0.02	0.78	1.22	2.2
Liming Rate	kg CaCO3/t	1	45	204	<1	76	29	23	78	93	88	<1	37	57	103
Data Verification RL (ASS Lab Methods V2.1, 2004)			*0.97*	*4.36*	*-2.19*	*1.64*	*0.61*	*0.49*	*1.67*	*1.98*	*1.89*	*-0.14*	*0.78*	*1.22*	*2.20*

Description and Assessment of Environmental Values

		Core No.	GLNG ON #9	GLNG ON #9	GLNG ON #10	GLNG ON #10	GLNG ON #10	GLNG ON #11	GLNG #11	GLNG ON #11	GLNG ON #11	GLNG ON #12	GLNG ON #12	GLNG ON #12	GLNG ON #13
		Depth (m)	0.8-1.0	1.8-2.0	0-0.1	0.3-0.5	1.3-1.5	0-0.1	0.3 - 0.5	0.8-1.0	2.0-2.2	0.3-0.5	1.3-1.5	1.8-2.0	0-0.1
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	4.3	4.5	4.4	4.4	4.1	5.0	4.2	4.4	6.6	4.2	5.1	4.7	4.5
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.15	0.05	0.06	0.08	0.13	0.05	0.09	0.11	<0.02	0.12	0.04	0.06	0.08
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	2.72	2.98	0.08	0.89	2.36	0.07	1.26	2.92	0.21	2.7	2.82	2.33	2.04
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01									1.17				
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02									0.37				
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02	<0.02		0.02	0.03	<0.02		0.24	<0.02		<0.02			
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	2.89	3.03	0.16	0.99	2.47	0.12	1.59	3.04	<0.02	2.82	2.86	2.38	2.11
Liming Rate	kg CaCO3/t	1	135	142	7	46	115	6	74	142	<1	132	134	112	99
Data Verification RL (ASS Lab Methods V2.1, 2004)			*2.88*	*3.03*	*0.16*	*1.00*	*2.50*	*0.12*	*1.59*	*3.04*	*-0.04*	*2.83*	*2.86*	*2.39*	*2.12*

		Core No.	GLNG ON #13	GLNG ON #13	GLNG ON #14	GLNG ON #14	GLNG ON #14	GLNG ON #15	GLNG ON #15	GLNG ON #15	GLNG ON #16	GLNG ON #16	GLNG ON #16	GLNG ON #17	GLNG ON #17
		Depth (m)	0.4-0.6	1.8-2.0	0-0.1	0.3-0.5	1.3-1.5	0-0.1	0.8-1.0	1.8-2.0	0-0.1	0.8-1.0	1.3-1.4	0-0.1	0.3-0.5
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	8.4	5.4	8.6	5.9	5.0	7.7	4.5	6.4	8.5	5.2	7.3	7.4	4.1
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	0.07	<0.02	<0.02	0.04	<0.02	<0.02	0.16
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	0.19	0.98	<0.02	3.81	3.68	<0.02	1.51	1.33	0.04	2.75	0.19	0.68	2.6
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01	4.42		4.91			0.96			2.07		0.54	1.56	
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	1.41		1.57			0.31			0.66		0.17	0.5	
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02													<0.02
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	<0.02	1	<0.02	3.82	3.72	<0.02	1.58	1.33	<0.02	2.79	0.07	0.34	2.76
Liming Rate	kg CaCO3/t	1	<1	47	<1	179	174	<1	74	62	<1	131	3	16	129
Data Verification RL (ASS Lab Methods V2.1, 2004)			*-0.75*	*0.99*	*-1.04*	*3.82*	*3.72*	*-0.20*	*1.58*	*1.34*	*-0.40*	*2.79*	*0.08*	*0.35*	*2.77*

Description and Assessment of Environmental Values

		Core No.	GLNG ON #17	GLNG ON #18	GLNG ON #18	GLNG ON #19	GLNG ON #19	GLNG ON #19	GLNG ON #20	GLNG ON #20	GLNG ON #21	GLNG ON #22	GLNG ON #22	GLNG ON #22	GLNG ON #23
		Depth (m)	1.5-1.7	0-0.1	1.3-1.5	0-0.1	0.3-0.5	1.3-1.5	0.3-0.5	0.8-1.0	1.3-1.5	0.8-1.0	1.3-1.5	1.8-2.0	0.3-0.5
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	7.6	8.8	5.4	8.6	5.7	6.9	4.7	8.6	6.9	4.8	7.4	7.7	4.6
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	<0.02	<0.02	0.03	<0.02	0.02	<0.02	0.04	<0.02	<0.02	0.04	<0.02	<0.02	0.08
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	<0.02	<0.02	3.88	<0.02	4.73	1.82	3.55	0.08	0.09	4.4	0.83	0.05	2.84
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01	0.79	1.4		1.35		<0.01		0.6	0.33		0.8	0.5	
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	0.25	0.45		0.43		<0.01		0.19	0.1		0.26	0.16	
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02													
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	<0.02	<0.02	3.91	<0.02	4.75	1.82	3.58	<0.02	0.02	4.44	0.66	<0.02	2.92
Liming Rate	kg CaCO3/t	1	<1	<1	183	<1	222	85	168	<1	1	208	31	<1	136
Data Verification RL (ASS Lab Methods V2.1, 2004)			*-0.16*	*-0.29*	*3.91*	*-0.28*	*4.75*	*1.81*	*3.59*	*-0.05*	*0.02*	*4.44*	*0.66*	*-0.06*	*2.92*

Description and Assessment of Environmental Values

		Core No.	GLNG ON #23	GLNG ON #23	GLNG ON #24	GLNG ON #24	GLNG ON #24	GLNG ON #25	GLNG ON #26	GLNG ON #26	GLNG ON #27	GLNG ON #27	GLNG ON #27	GLNG ON #28	GLNG ON #28	GLNG ON #29
		Depth (m)	1.3-1.5	2.3-2.5	0-0.1	0.8-1.0	1.8-2.0	0.8-0.9	0.3-0.5	0.8-1.0	0.2-0.3	0-0.1	0.4-0.6	0.3-0.5	1.0-1.2	0-0.1
EA033-A: Actual Acidity	Units	LOR														
pH KCL (23A)	pH unit	0.1	4.8	5.2	4.3	7.2	7.0	5.0	5.5	6.4	4.6	8.2	5.5	5.4	6.4	8.9
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.04	0.04	0.1	<0.02	<0.02	0.02	0.04	<0.02	0.07	<0.02	<0.02	0.03	<0.02	<0.02
EA033-B: Potential Acidity																
Chromium Reducible Sulfur	% S	0.02	1.81	3.8	2.62	0.13	<0.02	4.67	2.72	1.9	4.19	0.04	2.94	2.68	0.44	0.32
EA033-C: Acid Neutralising Capacity																
Acid Neutralising Capacity	%CaCO3	0.01				1.37	0.56					2.45				4.33
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02				0.44	0.18					0.78				1.39
EA033-D: Retained Acidity																
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02			<0.02											
EA033-E: Acid Base Accounting																
Net Acidity (sulfur units)	% S	0.02	1.86	3.84	2.72	<0.02	<0.02	4.7	2.75	1.9	4.26	<0.02	2.95	2.71	0.44	<0.02
Liming Rate	kg CaCO3/t	1	87	180	127	<1	<1	220	129	89	200	<1	138	127	20	<1
Data Verification RL (ASS Lab Methods V2.1, 2004)			*1.85*	*3.84*	*2.73*	*-0.16*	*-0.11*	*4.69*	*2.76*	*1.91*	*4.26*	*-0.48*	*2.95*	*2.71*	*0.45*	*-0.61*

		Core No.	GLNG #30	GLNG #31	GLNG #31	GLNG #31	GLNG #32	GLNG #32	GLNG #32	GLNG #33	GLNG #33	GLNG #33	GLNG #34	GLNG #34	GLNG #34	GLNG #35
		Depth (m)	0.25-0.36	0-0.1	0.25-0.35	0.35-0.5	0 - 0.1	0.4 - 0.6	1.7 - 1.9	0.3 - 0.5	0.7 - 0.9	1.5 - 1.7	0 - 0.1	0.3 - 0.45	0.8 - 1.0	0.4 – 0.6
EA033-A: Actual Acidity	Units	LOR														
pH KCL (23A)	pH unit	0.1	6.6	5.5	5.7	6.4	9.8	5.2	7.7	6.5	4.8	7.5	6	4.3	6.7	6.2
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	<0.02	0.04	0.03	<0.02	0.01	0.04	0.01	0.01	0.04	0.01	0.01	0.11	0.01	0.01
EA033-B: Potential Acidity																
Chromium Reducible Sulfur	% S	0.02	<0.02	0.25	1.86	<0.02	0.03	1.2	0.57	0.49	1.59	0.17	0.08	2.11	0.01	0.54
EA033-C: Acid Neutralising Capacity																
Acid Neutralising Capacity	%CaCO3	0.01	0.21				0.66		0.66	0.32		0.64			0.66	
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	0.07				0.21		0.21	0.1		0.21			0.21	
EA033-D: Retained Acidity																
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02												0.27		
EA033-E: Acid Base Accounting																
Net Acidity (sulfur units)	% S	0.02	<0.02	0.28	1.89	<0.02	<0.02	1.23	0.43	0.42	1.63	0.03	0.09	2.49	<0.02	0.54
Liming Rate	kg CaCO3/t	1	<1	13	88	<1	<1	58	20	20	76	1	4	116	<1	26
Data Verification RL (ASS Lab Methods V2.1, 2004)			*-0.04*	*0.29*	*1.89*	*0.02*	*-0.11*	*1.24*	*0.43*	*0.42*	*1.63*	*0.03*	*0.09*	*2.49*	*-0.13*	*0.54*

Description and Assessment of Environmental Values

		Core No.	GLNG #35	GLNG #35	GLNG #36	GLNG #36	GLNG #36	GLNG #37	GLNG #37	GLNG #37	GLNG #38	GLNG #38	GLNG #38	GLNG #39	GLNG #39
		Depth (m)	1.3 - 1.5	2.2 - 2.35	0 - 0.1	0.8 - 1.0	1.3 - 1.5	0 - 0.1	0.3 - 0.5	0.8 - 1.0	0 - 0.1	0.3 - 0.5	1.2 - 1.4	0.3 - 0.5	0.7 - 0.9
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	5.4	7.2	7.6	5	6.6	6.6	4.7	6.8	7.9	4.7	6.7	5.2	4.8
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.02	0.01	0.01	0.04	0.01	0.01	0.07	0.01	0.01	0.07	0.01	0.03	0.06
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	2.22	0.06	0.05	1.97	0.04	0.54	1.52	0.02	0.06	3.95	0.08	1.4	2.22
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01		0.67	0.63		0.24	0.35		0.71	1.06		0.52		
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02		0.21	0.2		0.08	0.11		0.23	0.34		0.17		
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02													
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	2.24	<0.02	<0.02	2.01	<0.02	0.47	1.59	<0.02	<0.02	4.01	<0.02	1.43	2.27
Liming Rate	kg CaCO3/t	1	105	<1	<1	94	<1	22	74	<1	<1	188	<1	67	106
Data Verification RL (ASS Lab Methods V2.1, 2004)			*2.24*	*-0.08*	*-0.08*	*2.01*	*-0.01*	*0.47*	*1.59*	*-0.13*	*-0.17*	*4.02*	*-0.03*	*1.43*	*2.28*

		Core No.	GLNG #39	GLNG #40	GLNG #40	GLNG #40	GLNG #41	GLNG #41	GLNG #41	GLNG #42	GLNG #42	GLNG #42	GLNG #42	GLNG #43	GLNG #43
		Depth (m)	1.3 - 1.5	0 - 0.1	0.3 - 0.5	0.7 - 0.9	0.3 - 0.5	1.8 - 2.0	2.1 - 2.3	0.3 - 0.5	1.8 - 2.0	2.3 - 2.5	2.8 - 3.0	0.3 - 0.5	0.8 - 1.0
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	6.6	6.9	5.2	6.2	5.2	4.8	7.5	4.8	8.6	7.3	8.2	4	4
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.01	0.01	0.04	0.01	0.03	0.04	0.01	0.05	0.01	0.01	0.01	0.09	0.06
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	0.11	0.14	1.87	0.86	1.66	2.42	0.14	1.87	0.35	1	0.39	<0.02	<0.02
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01	0.34	1.55					0.37		4.65	2.98	1.46	0.85	
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	0.11	0.5					0.12		1.49	0.95	0.47		
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02												0.04	0.89
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	0.04	<0.02	1.9	0.87	1.69	2.46	0.07	1.92	<0.02	0.36	0.08	0.12	0.95
Liming Rate	kg CaCO3/t	1	2	<1	89	41	79	115	3	90	<1	17	4	6	44
Data Verification RL (ASS Lab Methods V2.1, 2004)			*0.04*	*-0.19*	*1.91*	*0.87*	*1.69*	*2.46*	*0.06*	*1.92*	*-0.64*	*0.37*	*0.08*	*0.13*	*0.95*

Description and Assessment of Environmental Values

		Core No.	GLNG #43	GLNG #43	GLNG #44	GLNG #44	GLNG #44	GLNG #45	GLNG #45	GLNG #45	GLNG #46	GLNG #46	GLNG #46	GLNG #47	GLNG #47
		Depth (m)	1.8 - 2	2.8 - 3	0.3 - 0.5	1.3 - 1.5	2.8 - 3	0 - 0.1	0.8 - 1	2.3 - 2.5	0.3 - 0.5	1.6 - 2	2.8 - 3	0.4 - 0.6	1.3 - 1.5
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	4.4	7	6.9	8.3	7.3	8.3	8.3	7.2	7.2	6.6	8.5	8	7.1
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.07	0.01	0.01	0.31	0.28	0.31	0.31	0.27	0.27	0.25	0.32	0.3	0.27
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	1.68	0.18	0.56	1.6	0.87	0.03	1.45	0.84	0.86	1.01	1.17	0.98	0.93
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01		4.77	1.19	12.8	0.58	2.17	1.51	1.27	0.56	0.58	4.89	1.34	0.82
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02		1.53	0.38	4.08	0.19	0.69	0.48	0.4	0.18	0.19	1.56	0.43	0.26
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02	0.14												
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	1.9	<0.02	0.3	<0.02	0.74	<0.02	1.13	0.57	0.74	0.88	0.13	0.69	0.76
Liming Rate	kg CaCO3/t	1	89	<1	14	<1	35	<1	53	27	34	41	6	32	35
Data Verification RL (ASS Lab Methods V2.1, 2004)			*1.89*	*-0.84*	*0.31*	*-1.12*	*0.74*	*-0.43*	*1.13*	*0.57*	*0.74*	*0.88*	*0.13*	*0.69*	*0.76*

Description and Assessment of Environmental Values

		Core No.	GLNG #47	GLNG #48	GLNG #48	GLNG #48	GLNG #49	GLNG #49	GLNG #49	GLNG #50	GLNG #50	GLNG #50	GLNG #51	GLNG #51	GLNG #51
		Depth (m)	2.3 - 2.5	0.3 - 0.45	1.8 - 2	2.8 - 3	0.3 - 0.5	0.8 - 1	2.3 - 2.5	0 - 0.1	0.8 - 1	2.3 - 2.5	0.3 - 0.5	1.3 - 1.5	2.8 - 3
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	8	8.2	7.5	8.6	7.6	7.3	6.3	4.5	6.4	6.2	7.2	6.7	8.3
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.3	0.31	0.28	0.32	0.29	0.28	0.24	0.17	0.24	0.23	0.01	0.01	0.01
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	1.76	0.93	1.34	1.03	0.03	0.86	0.51	0.02	0.76	0.92	1.15	1.25	1.29
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01	4.53	2.22	1.34	5.24	1.41	0.71					0.63	0.71	6.08
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	1.45	0.71	0.43	1.68	0.45	0.23					0.2	0.23	1.95
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02													
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	0.8	0.46	1.05	<0.02	<0.02	0.71	0.75	0.19	1	1.15	1.01	1.1	<0.02
Liming Rate	kg CaCO3/t	1	37	22	49	<1	<1	33	35	9	47	54	47	52	<1
Data Verification RL (ASS Lab Methods V2.1, 2004)			*0.79*	*0.46*	*1.05*	*-0.09*	*-0.27*	*0.71*	*0.75*	*0.19*	*1.0*	*1.15*	*1.02*	*1.10*	*-0.01*

Description and Assessment of Environmental Values

		Core No.	GLNG #52	GLNG #52	GLNG #52	GLNG #53	GLNG #53	GLNG #53	GLNG #54	GLNG #54	GLNG #54
		Depth (m)	0.3 - 0.5	0.8 - 1.0	2.3 - 2.5	0 - 0.1	1.3 - 1.5	2.8 - 3.0	0.8 - 1.0	1.8 - 2.0	2.3 - 2.5
EA033-A: Actual Acidity	Units	LOR									
pH KCL (23A)	pH unit	0.1	8.2	6.4	6.9	8.4	7.1	8.2	7.1	7.8	7.8
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.01	<0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01
EA033-B: Potential Acidity											
Chromium Reducible Sulfur	% S	0.02	0.06	1.23	0.76	0.01	0.79	1.29	0.96	0.86	1.25
EA033-C: Acid Neutralising Capacity											
Acid Neutralising Capacity	%CaCO3	0.01	2.46		0.88	2.56	0.78	5.84	0.85	0.92	1
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	0.79		0.28	0.82	0.25	1.87	0.27	0.3	0.32
EA033-D: Retained Acidity											
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02									
EA033-E: Acid Base Accounting											
Net Acidity (sulfur units)	% S	0.02	<0.02	1.23	0.57	<0.02	0.62	0.04	0.77	0.66	1.04
Liming Rate	kg CaCO3/t	1	<1	58	27	<1	29	2	36	31	49
Data Verification RL (ASS Lab Methods V2.1, 2004)			*-0.47*	*1.23*	*0.57*	*-0.54*	*0.62*	*0.04*	*0.78*	*0.66*	*1.04*

Description and Assessment of Environmental Values

Table 1-5 Laboratory results of acid sulfate .analyses for offshore samples

		Core No.	GLNG OFF#1	GLNG OFF#1	GLNG OFF#1	GLNG OFF#1	GLNG OFF#1	GLNG OFF#1	GLNG OFF#3	GLNG OFF#3	GLNG OFF#3	GLNG OFF#3	GLNG OFF#3	GLNG OFF#5	GLNG OFF#5
		Depth (m)	0-0.1	0.8-1.0	1.8-2.0	2.8-3.0	3.3-3.5	3.8-4.0	0.9-1.1	1.8-2.0	2.8-3.0	3.3-3.5	3.8-4.0	0-0.1	1.0-1.2
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	9.0	9.1	8.8	8.7	9.0	8.6	9.4	9.1	8.9	8.7	8.6	9.1	8.7
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	0.19	0.41	0.58	0.49	0.16	0.16	0.08	0.04	0.38	0.52	0.90	0.06	0.62
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01	5.09	19.0	23.1	6.54	6.94	1.01	13.7	9.63	9.47	9.26	6.57	5.60	28.3
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	1.63	6.08	7.40	2.10	2.22	0.32	4.38	3.08	3.03	2.97	2.10	1.79	9.08
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
EA033-E: Acid Base Accounting			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (sulfur units)	% S	0.02	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Liming Rate	kg CaCO3/t	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Data Verification RL (ASS Lab Methods V2.1, 2004)			*-0.90*	*-3.64*	*-4.35*	*-0.91*	*-1.32*	*-0.05*	*-2.84*	*-2.01*	*-1.64*	*-1.46*	*-0.50*	*-1.13*	*-5.43*

		Core No.	GLNG OFF#5	GLNG OFF#5	GLNG OFF#5	GLNG OFF#5	GLNG OFF#5	GLNG OFF#6	GLNG OFF#6	GLNG OFF#6	GLNG OFF#6	GLNG OFF#6	GLNG OFF#6	GLNG OFF#9	GLNG OFF#9
		Depth (m)	1.8-2.0	2.3-2.5	3.3-3.5	4.3-4.5	5.8-6.0	0.3-0.5	0.8-1.0	1.8-2.0	2.3-2.5	3.3-3.5	4.3-4.5	0-0.1	0.3-0.5
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	8.4	8.6	9.0	9.2	8.9	8.6	8.7	8.8	8.9	9.0	8.8	9.3	9.5
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	0.84	0.70	0.17	0.11	0.04	0.71	0.69	0.45	0.32	0.08	0.02	<0.02	<0.02
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01	3.61	14.3	6.51	11.8	28.4	18.2	26.4	17.6	11.1	3.90	0.77	1.76	1.56
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	1.16	4.58	2.09	3.79	9.09	5.83	8.46	5.65	3.55	1.25	0.25	0.56	0.50
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
EA033-E: Acid Base Accounting			0.06	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (sulfur units)	% S	0.02	40	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Liming Rate	kg CaCO3/t	1	3	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Data Verification RL (ASS Lab Methods V2.1, 2004)			*0.07*	*-2.35*	*-1.22*	*-2.42*	*-6.02*	*-3.18*	*-4.95*	*-3.32*	*-2.05*	*-0.75*	*-0.15*	*-0.36*	*-0.32*

Description and Assessment of Environmental Values

		Core No.	GLNG OFF#9	GLNG OFF#9	GLNG OFF#9	GLNG OFF#9	GLNG OFF#10	GLNG OFF#10	GLNG OFF#10	GLNG OFF#10	GLNG OFF#11	GLNG OFF#11	GLNG OFF#11
		Depth (m)	1.1-1.3	1.8-2.0	3.3-3.5	4.5-4.7	0-0.1	0.4-0.6	1.3-1.5	2.4-2.6	0.3-0.5	0.8-1.0	1.8-2.0
EA033-A: Actual Acidity	Units	LOR											
pH KCL (23A)	pH unit	0.1	9.1	9.4	9.3	8.4	9.4	9.1	9.4	8.7	9.5	9.5	9.4
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
EA033-B: Potential Acidity													
Chromium Reducible Sulfur	% S	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-C: Acid Neutralising Capacity													
Acid Neutralising Capacity	%CaCO3	0.01	1.95	0.77	3.78	3.11	3.71	7.43	7.44	6.88	3.97	3.76	3.25
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	0.62	0.25	1.21	1.00	1.19	2.38	2.38	2.20	1.27	1.20	1.04
EA033-D: Retained Acidity													
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
EA033-E: Acid Base Accounting			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (sulfur units)	% S	0.02	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Liming Rate	kg CaCO3/t	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Data Verification RL (ASS Lab Methods V2.1, 2004)			*-0.40*	*-0.16*	*-0.80*	*-0.66*	*-0.78*	*-1.58*	*-1.58*	*-1.46*	*-0.84*	*-0.79*	*-0.68*

Description and Assessment of Environmental Values

		Core No.	GLNG OFF#12	GLNG OFF#12	GLNG OFF#12	GLNG OFF#12	GLNG OFF#12
		Depth (m)	0-0.1	0.8-1.0	1.8-2.0	2.8-3.0	3.8-4.0
EA033-A: Actual Acidity	Units	LOR					
pH KCL (23A)	pH unit	0.1	8.5	8.1	7.3	6.8	8.5
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	<2	<2	<2	<2	<2
EA033-B: Potential Acidity							
Chromium Reducible Sulfur	% S	0.02	1.03	0.84	1.82	2.71	<0.02
EA033-C: Acid Neutralising Capacity							
Acid Neutralising Capacity	%CaCO3	0.01	8.23	1.41	1.04	1.01	4.93
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	2.64	0.45	0.33	0.32	1.58
EA033-D: Retained Acidity							
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02	1.5	1.5	1.5	1.5	1.5
EA033-E: Acid Base Accounting			<0.02	0.54	1.60	2.50	<0.02
Net Acidity (sulfur units)	% S	0.02	<10	335	995	1560	<10
Liming Rate	kg CaCO3/t	1	<1	25	75	117	<1
Data Verification RL (ASS Lab Methods V2.1, 2004)			*-0.73*	*0.54*	*1.60*	*2.50*	*-1.04*

1.8.2.1 Location 1: Hamilton Point-Boatshed Point Tidal Flat, Cores # 1 – 15

There was some variability across the cores within this area; however the following points can be made regarding the ASS chemistry.

Actual and Retained Acidity

Actual acidity (as measured by TAA) was commonly present to depths below ground level of ~ 1 to 1.5 m, but at low levels (≤ 0.15%S or 93 mol H^+/t) with a maximum of 0.18%S in one sample.

In some locations actual acidity occurred at the surface (#1, #5, #10, #11, and #13) with jarosite noted at often abundant concentrations. In two of these cores there was measurable retained acidity also (Net Acid Soluble sulfur analysis or sNAS): #5 at the surface (0.08 %S) and #11 at 0.3-0.5m below surface (0.24%S). Retained acidity is the acidity stored in largely insoluble compounds such as jarosite and other iron and aluminium sulfate minerals. These are not generally measured by the TAA method.

In other samples where pH_{KCL} was less than 4.5 and sNAS analysis undertaken, concentrations were 0.03%S or less.

In a number of sites (#2, #3, #4, #9, #12, #13), the presence of jarosite did not necessarily equate with the sediment being an AASS, as there was nil TAA measured which corresponded with the field and laboratory pH values recorded (e.g. 7.6, 7.0, 7.1, 7.01, 6.79). Laboratory samples (from cores #2, #3 and #13) also had elevated levels of Acid Neutralising Capacity (range 0.37 – 1.41 %S equivalent) which resulted in overall Net Alkalinity values (-0.04 to -0.75 %S using a fineness factor of 1.5).

In some of these cores (#4, #9 and #12) there was AASS present at 2.0m BGL, however, the concentrations were very low (TAA values 0.05-0.06%S)

Potential Acidity

CRS concentrations ranged from <0.02%S to 4.26%S, with the low levels (e.g. up to 0.21%S) measured in surface clay samples (0 – 0.1m) and also in the pre-Holocene substrate (cores #2 and #11 at 2 m and 2.2 m BGL respectively).

High level PASS occurred across the area within 0.5m of the surface, with CRS values recorded between 0.82 and 3.81 %S.

This PASS facies of highly organic mangrove clayey silt sediments continued down the cores to the target sampling depth with CRS concentrations ranging to 4.26%S.

1.8.2.2 Location 2: Proposed LNG site north of Hamilton Point, Cores # 16 – 24

Actual and Retained Acidity

TAA values were generally lower in this area, with four samples having concentrations between 0.08 and 0.16%S (94 mol H^+/t) and all others ≤ 0.04%S (28 mol H^+/t).

Retained acidity was only present in one of these samples (#22) but at a moderate level (0.3%S).

Potential Acidity

S_{CR} values ranged from <0.02%S to 4.73%S, with again low or nil levels present in the thin (less than 0.3 m) surface cap material and in the pre-Holocene substrate when it was intersected.

Acid Neutralising Capacity (ANC) was measured at moderate levels in the surface material (0.43 to 0.66 %S equivalent) with lower concentrations in the pre-Holocene clays and gravelly clays (0.16 to 0.25 %S equivalent).

The Holocene silt clays contained very high concentrations of Net Acidity as in Site 1 with values between 1.86 and 4.75 %S.

Some ASS potential was noted to be present in infiltration zones below the Holocene silt clays and into the top of the pre-Holocene material, e.g. core #18 at 1.3-1.5 m BGL.

1.8.2.3 Location 3: Laird Point-Graham Inlet coast, Cores # 25 – 31

Actual and Retained Acidity

TAA values were either nil or almost negligible in the samples obtained from this area, with a maximum of 0.07 %S (46 mol H^+/t) in core #27 and the remainder ≤ 0.04%S (28 mol H^+/t).

Analysis of retained acidity was not required for any of the samples.

Potential Acidity

In locations at cores #25, #26, #27 and #28 S_{CR} values in the Holocene mangrove facies were again very high, from 2.71 – 4.7 %S, but negligible values (0.04 %S) with some ANC (0.78 %S equivalent) in the surface clayey gravelly sand.

Locations #29 and #30 were found to have nil Net Acidities, although low level PASS was measured in the muddy sand sampled at #29 which was more than compensated by an ANC of 1.39 %S equivalent.

Location #31 had a high level of PASS (1.89 %S) recorded in a very thin layer (0.1m) of mangrove influenced clayey silt sandwiched by terrestrial based clayey materials with nil ASS.

1.8.2.4 Location 4: Fisherman's Landing-Friend Point, Cores # 32 – 54

Cores #32 to #43

This linear series of cores had low level TAA (0.01 to 0.11 %S or up to 70 mol H^+/t) within generally the top 0.5 metre, with low to moderate levels of retained acidity in two samples.

ANC was present in the colluvial surface sediments and Pleistocene clays at low levels (~0.21 %S equivalent) with levels up to 1.53 %S equivalent in the deeper sediments in the northern locations.

S_{CR} values were moderate to very high (1.2 – 3.95 %S) in the Holocene material and overall Net Acidities ranged up to 4.01%S.

Cores #44 to #50

Cores #44 to #50 had TAA values of 0.17 – 0.32 %S (200 mol H^+/t) right through the Holocene mangrove and subtidal facies, which continued to the core depth of 3 metres in these locations. However, no jarosite was

present and the pH_{KCl} (and field pH) values were both above 6.5, in fact generally from 7 to 8.5. The sediments contained moderate to high levels of CRS (~0.8 – 1.6 %S) and also moderate to high amounts of ANC (maximum of 4.08%S equivalent) such that resultant Net Acidities ranged to ~1.15 %S.

These results were discussed with QASSIT (Indooroopilly) and it was concluded that the soils should not be considered to be actually acidic (i.e. not AASS). This is because the acidity present (whether from current organic material or previous exposure to aerobic conditions where some oxidation of pyrite had occurred) is clearly buffered by the excess ANC resulting in soils of neutral or slightly alkaline pH. The soils are classed as moderate PASS.

Cores #51 to #54

This group of cores had nil TAA and retained acidity, and variable, moderate to high levels of ANC (0.2 – 1.95 %S equivalent). S_{CR} values were moderate (to 1.29 %S) with overall Net Acidities ranging from <0.02%S to 1.23%S.

1.8.2.5 Offshore Acid Sulfate Cores

The field and laboratory ASS chemistry are shown against the stratigraphy of the offshore sediment cores in logs #Off1 to #Off12. Relevant results from laboratory reports are summarised in the table below.

Table 1-6 Summary of laboratory data for offshore ASS cores.

	Unit	LOR	Min	Max	Mean	n
pH KCl	pH unit	0.1	6.8	9.5	8.86	43
Titratable Actual Acidity	% pyrite S	0.02	<0.02	<0.02	0	0
Chromium Reducible Sulfur	% S	0.02	0.02	2.71	0.53	29
Acid Neutralising Capacity	% pyrite S	0.01	0.25	9.09	2.72	43
Net Acid Soluble Sulfur	% pyrite S	0.02	<0.02	<0.02	0	0
Net Acidity	% S	0.02	0.06	2.5	1.18	4

These data show that the marine sediments within the channel are also comprised of Holocene silty clays and silty clayey sands that contain PASS but also contain high levels of shell (calcium carbonate) that have effectively acted as a neutralising agent, resulting in no overall net acidity. No Actual ASS was present.

Core #12 that was obtained in the sheltered bay, however, was closer in character to the land strata and contained significant Net Acidity in the absence of shell.

1.9 Associations between Acid Sulfate Soil distribution and facies

1.9.1 Onshore

1.9.1.1 Pre-Holocene facies

The pre-Holocene-aged sequence encountered at all sites relates to residual soils of substantial antiquity, and therefore do not present an inherent acid sulfate soil forming condition. This is borne out by consistent zero Net Acidity results in most of these sediments tested.

An important exception to this generalisation is the phenomenon described in section 1.7.1.1 above. in a relatively confined zone of usually less than 0.5m occurring immediately below the Holocene/Pleistocene boundary, where a discolouration indicates influence from the overlying sequence. This phenomenon has been reported by the authors and other workers at a number of locations, and is believed to relate to the infiltration of interstitial waters from above. These zones have been consistently found to have inherited acid sulfate potential from overlying sediments, and generally appear devoid of any carbonate buffering capacity to neutralise this effect. Where these zones were tested in this study, they were found to have a moderate acid sulfate potential. An exception here was the pre-Holocene clay in core #5 which appears to have a buffering capacity, indicating perhaps a previous marine depositionalorigin.

With the exception of core #32 all of the pre-Holocene substrate samples tested along the mainland coast showed no Net Acidity.

1.9.1.2 Holocene facies

Transgressive – as described previously, this facies is characterised by a strong mangrove affiliation within this setting, which provides the ideal conditions for the development and maturation of acid sulfate soil conditions. Accordingly, these sediments consistently revealed a high to very high Potential Acid Sulfate Soil (PASS) condition.

Subtidal – this facies is identified in Area 4 between the mainland coast and Friend Point, and is distinctive because of its high shell content (and suspected fine carbonate presence) giving these sediments a substantial buffering capacity that reduces generally high PASS to a moderate category.

Nearshore embayment – these nearshore sediments accrete as suspension sediments just seaward of the mangrove shoreline, and are therefore less tidally restricted. However, the combination of this low energy subtropical/tropical setting and high organic supply still provides conditions conducive to PASS formation. What generally defines this middle sequence deposition from the transgressive mangrove beneath and prograding mangrove overlying is its access to a rain of microscopic carbonate (foraminifera tests) within the suspension load. This can in some tropical locations provide a very significant (sometimes complete) buffering capacity. Generally the results within this middle sequence revealed a less intense (i.e. but still high) and more variable PASS condition, perhaps reflecting something of this influence at work.

Prograding mangrove – consistent with prediction these muds, which deposited in highly organic, anaerobic conditions ideal for acid sulfate formation, consistently revealed a high to very high Potential Acid Sulfate Soil (PASS) condition.

Tidal capping layer – this facies regularly displayed weak jarosite development, and laboratory results showed variability in the ASS with usually nil or negligible potential acidity but low-level AASS in some locations.

Actual Acid Sulfate Soils (AASS) - a high proportion of the cores within the study revealed a low level Actual Acid Sulfate Soil condition. This is discussed in section 1.8.2 above. The widespread occurrence of AASS around South Curtis Island is obviously a naturally occurring phenomenon, as there has been no substantive anthropogenic intervention that can be invoked to explain their presence. A possible natural mechanism for producing AASS in the upper sequence is hydroisostatic uplift of the coast since deposition, but it is difficult to invoke this as a mechanism for the occurrence of AASS at 1.8-2.0m below the surface. Another mechanism observed elsewhere is the switch on of oxidised conditions with stream switching but there is no evidence to support this higher energy within this setting. Ross (2005) has observed AASS to similar depths in the Narrows area.

1.9.2 Offshore

1.9.2.1 Pre-Holocene facies

As with onshore pre-Holocene soils, where tested the offshore substrate consistently showed zero Net Acidity results.

However, the single site within the embayment (#Off12) showed evidence of Holocene infiltration, and the substrate in this area may have a zone of PASS immediately below the interface. The inherent buffering capacity of the sample at 3.8-4.0m in the preHolocene of this core suggests that the antecedent substrate immediately beneath the embayment may be of Pleistocene marine origin rather than residual.

1.9.2.2 Holocene facies

Consistent with its location and high organic input, the results of testing for the single site investigated within the embayment (#off12) revealed a positive net PASS in the high range, and this is likely to be representative of these embayment sediments.

By contrast, along the main marine transect where dredging is proposed, all Holocene-aged sediments provided a negative Net Acidity indicating that they have excess buffering capacity. An approximate inverse relationship can be observed, where decreased grain size equates to increased buffering capacity. This is probably indicating that, as has been observed at other locations by the authors, the main carbonate contribution that provides effective buffering is in the microscopic range (i.e. such as foraminiferal tests) rather than visual shell.

Potential Impacts and Mitigation Measures

Section 2

2.1 Introduction

If inappropriately managed, acid sulfate soils can have a substantial environmental impact. These impacts are now well documented and range from more direct impacts such as mass mortality of marine organisms and flora, to more insidious effects such as the impact on organisms requiring carbonate for shell development, removal of the mucus layer that protects fish from viruses, and the release of high levels of iron and aluminium into receiving waters. These impacts can be further enhanced in tropical climates where both the initial conditions for the development of pyritic soils have led to elevated concentrations, and the conversion of pyrite to acid sulfate products, a bacterially catalysed process, are accelerated by temperature/moisture conditions.

2.2 Potential Acid Sulfate Soil Impacts

The potential environmental impacts of acid sulfate soils are generally considered in terms of either:

1) Potential Acid Sulfate Soil (PASS), which may result in a range of impacts if disturbed and incorrectly managed; and

2) existing or Actual Acid Sulfate Soils which may present a current low level impact that the receiving environment is adjusted to, but can create an enhanced environmental impact through activity.

2.2.1 Potential Acid Sulfate Soil

Onshore

With the general exception of a thin capping layer, the complete Holocene-aged sedimentary sequence tested in onshore locations revealed a moderate to very high acid sulfate soil potential (PASS).

As discussed in the preceding text, the pre-Holocene-aged substrate was consistently demonstrated to have no inherent acid sulfate soil potential, however a zone of ~0.5m immediately below the Holocene/Pleistocene boundary commonly revealed an inheritance of moderate acid sulfate soil potential from the overlying sequence by infiltration of interstitial waters.

The assessment criteria provided by the client at the time of this study provides for no activities that will either disturb these in situ PASS soils or lower the local water table, and therefore, no environmental hazard is identified from these activities. However, an identifiable risk with surcharging these immature silt clay sediments is the production of bulges adjacent to the filled area which elevates PASS sediments above the water table (i.e. thereby elevating them into oxidising conditions leading to activation), or in more uncontrolled surcharge conditions surface blowouts of this PASS material (as has occurred at a number of locations in the past decade).

Offshore

As observed previously, the single site within the embayment north of Hamilton Point (#off12) showed evidence of Holocene infiltration into the upper Pleistocene clays, and therefore the substrate in this area may have a zone of PASS immediately below the interface. This sediment may have the potential for environmental harm if disturbed, or oxidised.

2.2.2 Actual Acid Sulfate Soil

Onshore

The distribution of Actual Acid Sulfate Soils (AASS) was widespread laterally throughout the area and continued down-sequence to the general 2m depth of testing at a number of locations. As discussed in the preceding text, this AASS was generally at a low level but is widely present.

The potential for this acidity to provide an enhanced impact on receiving environments is recognised in legislation (Qld State Planning Policy 2/02; Dear et al., [2002]), and presents a considerable hurdle to all proposed development activities because it does not allow for any other strategy other than neutralisation (i.e. *in situ* burial by overburden or reinterment are not options allowed). The restriction on filling over AASS presents a substantial limitation on the proposal to fill existing embayment tidal sediments with dredge spoil.

The philosophy behind the legislation preventing filling over Actual Acid Sulfate Soils may be summarised as:

1) Surcharging these sediments will result in a sudden enhanced lateral expulsion of acid sulfate leachate into receiving environments; and

2) Burial of contaminated soils is generally not considered a sound environmental ethos.

Debate over the positive benefit of surcharging in reducing the porosity of these sediments and thereby both restricting further oxidation and transmission of leachate have failed to impact upon legislation at this time.

Offshore

As may be anticipated, there were no AASS sediments identified in the offshore sequences.

2.3 Mitigation of Acid Sulfate Soil Impacts

2.3.1 Potential Acid Sulfate Soil

Onshore

As discussed in the above section, uncontrolled surcharging with dredge overburden could lead to activation of PASS by creating bulges around the boundary of the fill, or in extreme cases blowouts. Obviously this bulge effect would not occur in the residual soils fringing the tidal flat on the landward side, and fill/surcharge strategies should account for this by:

1) filling at a rate that controls the development of bulging; and

2) filling in a direction that would allow any minor bulging to occur on the seaward foreslope allowing the sediment to be displaced below an existing level of continuous saturation.

As discussed in the preceding section, at the time of this study no activities that will either directly disturb these *in situ* PASS soils or lower the local water table are planned, and therefore, no environmental hazard is identified from these activities at this time.

Should activities be planned that may result in the direct disturbance of these soils they would require considerable management as the potential for impacts is high, and because of the nature of these sediments (i.e. moist, poorly cohered silt/clay with a high organic content) conventional management strategies such as reinterment and neutralisation with lime would be challenging if required.

Offshore

The results of testing for the single site investigated within the embayment (#Off12) revealed a positive net PASS in the high range, and this is likely to be representative of these embayment sediments.

The current proposal does not plan to disturb this area other than by driving piles. However, while this plan should not lead to intentional disturbance, the logistics of controlling sediment disturbance while placing piling barges in the bay and driving piles for the trestle structure will need to be considered.

Along the main marine transect where dredging is proposed, all Holocene-aged sediments provided a negative Net Acidity indicating that they have excess buffering capacity. Dredging this sediment will provide no acid sulfate soils risk to the environment.

2.3.2 Actual Acid Sulfate Soil

Onshore

As noted above, the restriction on filling over AASS presents a substantial limitation on the proposal to fill existing embayment tidal sediments with dredge spoil.

Some aspects of this particular area and the filling strategy proposed may provide a basis for examining a strategy whereby filling may occur in a controlled fashion with no harmful environmental impacts. The factors to be considered include:

i. the level of AASS is generally low;

ii. the sediments proposed for filling have an excess of buffering capacity;

iii. the receiving environment is both geared to an existing level of acid export, and is a dynamic marine environment capable of rapid mixing and dilution; and

iv. placement of dredge spoil would be providing runoff of alkaline water into the receiving environment at the time when any enhanced export of products may occur

Based on a consideration of these factors it is proposed that, with a regimen of testing of dredge spoil for buffering capacity, that filling could occur on these tidal flats without creating an environmental impact. Such a strategy would involve a far more minimal risk to the environment than the alternative strategy of disturbing such a high volume of volatile sediments to achieve neutralisation.

Glossary Section 2

AASS – Actual Acid Sulfate Soil

A.H.D. – Australian Height Datum – this datum has been adopted by the National Mapping Council as the datum to which all vertical control for mapping is to be referred. Generally approximates mean sea level

Aerobic – said of conditions that can exist only in the presence of free oxygen. ***Cf. Anaerobic***

Antecedent – preceding in time or order

Colluvium - a general term applied to any loose, heterogeneous and incoherent mass of soil material and/or rock fragments deposited by rainwash, sheetwash, or slow continuous downhill creep (Bates &Jackson, 1987)

Facies - an areally delimited, mappable sedimentary body associated by either character or depositional provenance

Foraminifer - a microscopic, primarily marine organism (protozoan of the subclass Sarcoina, order Foraminifera) characterised by the presence of a test of one or more chambers composed of secreted calcite

Geomorphology – 'the science that treats the general configuration of the Earth's surface; specif. the study of the classification, description, nature, origin, and development of present landforms and their relationship to underlying structures, and of the history of geologic changes as recorded by these surface features' (Bates and Jackson, 1987; p.272).

Holocene – *Holocene* is the name of a geological time *epoch* commencing ~10,000 years ago and extending to present. Pre-Holocene is the lime preceding this epoch. The Immediate time epoch preceding is the Pleistocene time epoch, however, sediments immediately underlying those of Holocene-age may have been deposited much earlier than the Pleistocene, and are therefore referred generally as pre-Holocene in age.

Hydroisostatic - as sea level rises over broad continental shelves the additional weight of the water creates subsidence on the outer shelf which is compensated for by a rise of the inner shelf and coastal plain.

Incipient – beginning, coming into, or in an early (or initial) stage of existence

Intercalated – said of layered material that exists or is introduced between other layers of a different character (Bates &Jackson, 1987)

Intersticed - an intervening space of time; an interval between actions

Interstitial water- subsurface water in the voids of a rock or pores of a sediment (i.e. or porewater)

Interfluve – area between rivers; esp. the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction (Bates &Jackson, 1987)

Laterite – **a** highly weathered red subsoil or material rich in secondary oxides of iron, aluminium, or both (Bates &Jackson, 1987)

Microtidal – spring tide range <2m

Mesotidal – spring tide range of 2-4m

Mol H^+/t - a unit of measurement of acidity determined through laboratory testing: moles of hydrogen ions per tonne of soil.

Glossary Section 2

Palaeo - denoting great age or remoteness in regard to time – ancient conditions

PASS – Potential Acid Sulfate Soil

Piedmont – lying or formed at the base of a mountain or mountain range; e.g. a *piedmont* terrace or *pediment.* (Bates & Jackson, 1987)

pH_{KCl} – the pH (measure of acidity or alkalinity) of a suspension prepared in the laboratory involving 1:40 (weight/volume) soil in a solution of 1 M potassium chloride

Pisolitic – the texture of rock made up of *pisoliths* or pea-like grains (Bates & Jackson, 1987)

Pleistocene – a time *epoch* of the Quaternary *period*. It began ~2-3 million years ago and extended to the commencement of the Holocene epoch ~10,000 years ago.

Prodelta – extension of the delta influence beyond the delta front as a wedge of fine sediment gently sloping to the floor of the basin

Progradation – the building forward or outward toward the sea of a shoreline or coastline

Proto – first in time, earliest, original, primitive

Quaternary – a time *period* beginning ~2-3 million years ago and extending to present. This time period encompasses the Pleistocene and Holocene time *epochs*

Stillstand – a term that describes the stabilisation of sea level at around its present level (c.a.6,500 years ago, Thom and Roy, 1985) following a rapid rise in the early Holocene epoch.

Subaerial – conditions and processes that exist or operate in the open air (Bates & Jackson, 1987)

Supratidal – just above high tide level

Swale – a long, narrow, generally shallow, trough-like depression between two beach ridges

Thalweg - the line connecting the lowest or deepest points along a stream bed or valley; the line of maximum depth

Transgression - the progressive marine incursion of the land surface as sea level rises

Winnowing – selective sorting or removal of fine particles by wind or water

Vadose- upper soil water zone which is aerated by water table fluctuations

Vugh- a relatively large and usually irregular void [*often infilled by different material or sediment*] in a soil, but not normally connected to other voids of comparable size (Bates & Jackson, 1987)

References

Section 3

Ahern CR, Ahern MR and Powell, B. (1998). Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998. QASSIT, Department of Natural Resources, Indooroopilly, DNRQ980124.

Ahern CR, McElnea AE and Sullivan LA. (2004). *Acid Sulfate Soils Laboratory Methods Guidelines*, Version 2.1 June 2004. In: Queensland Acid Sulfate Soil Manual. Dept. Natural Resources, Mines & Energy, Indooroopilly, Queensland, Australia.

Geological Survey of Queensland (GSQ – 2005). Geoscience Data, Queensland Regional Geological Mapping Data – Gladstone 1:100,000 Sheet Area.

Dear S.E, Moore N.G, Dobos S.K, Watling K.M and Ahern C.R. (2002). Soil Management Guidelines. In: *Queensland Acid Sulfate Soil Technical Manual.* Dept. Natural Resources & Mines, Indooroopilly, QLD.

Graham T.L. & Larsen R.M. (2002) *Maroochy/Caloundra Acid Sulfate Soil and Stratigraphic Investigation.* GC Report 2002-11-IX27 In association with QASSIT (DNR), to Natural Heritage Trust, Commonwealth Govt, Canberra; Maroochy Landcare Inc.; Caloundra City Council and Maroochy Shire Council.

Graham T.L. & Larsen R.M. (2003) *Acid Sulfate Soil and Stratigraphic Investigation: East Trinity, Cairns, Queensland.* GC Report 2003-2-III31 for Department of Natural Resources & Mines, Queensland.

State Planning Policy 2/02: *Planning and Managing Development Involving Acid Sulfate Soils* (SPP 2/02) introduced in November 2002. Qld Government, Department of Local Government and Planning, Department of Natural Resources and Mines.

KM Watling, CR Ahern and KM Hey (2004). *Acid Sulfate Soil pH Tests.* In Acid Sulfate Soils Laboratory *Methods Guidelines.* (Eds CR Ahern, AE McElnea, LA Sullivan). Department of Natural Resources, Mines and Energy, Indooroopilly, Queensland, Australia.

Stratigraphic Logs with Acid Sulfate Chemistry | Appendix A

A.1 Logs of onshore cores #1 to #54

SITE: GC/ GLNG# 11

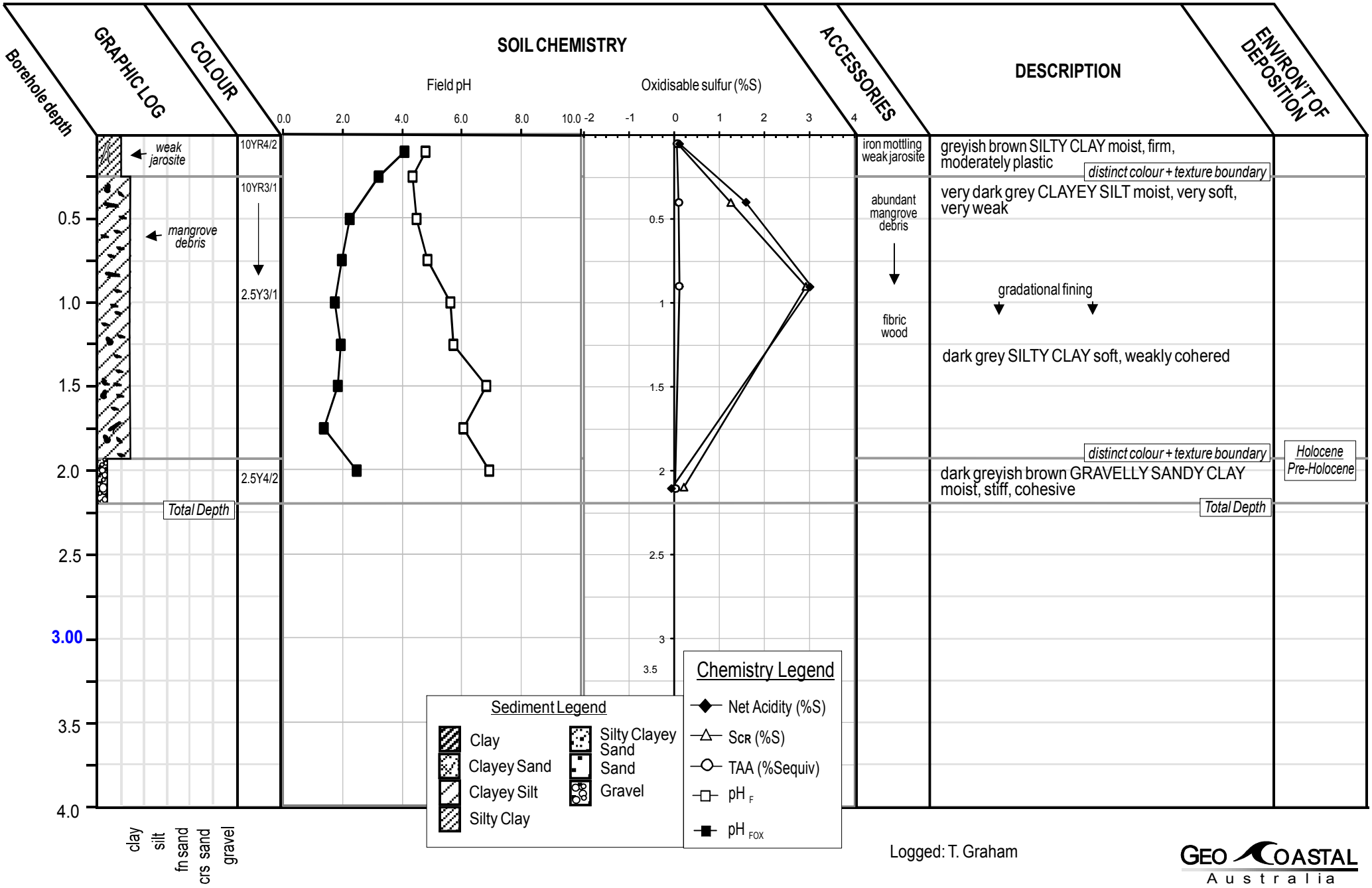
FEATURE: Mangrove fringed tidal flat

DATE: 7/ 8/ 08

Borehole #11

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78652°**S** 151.22992°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 12

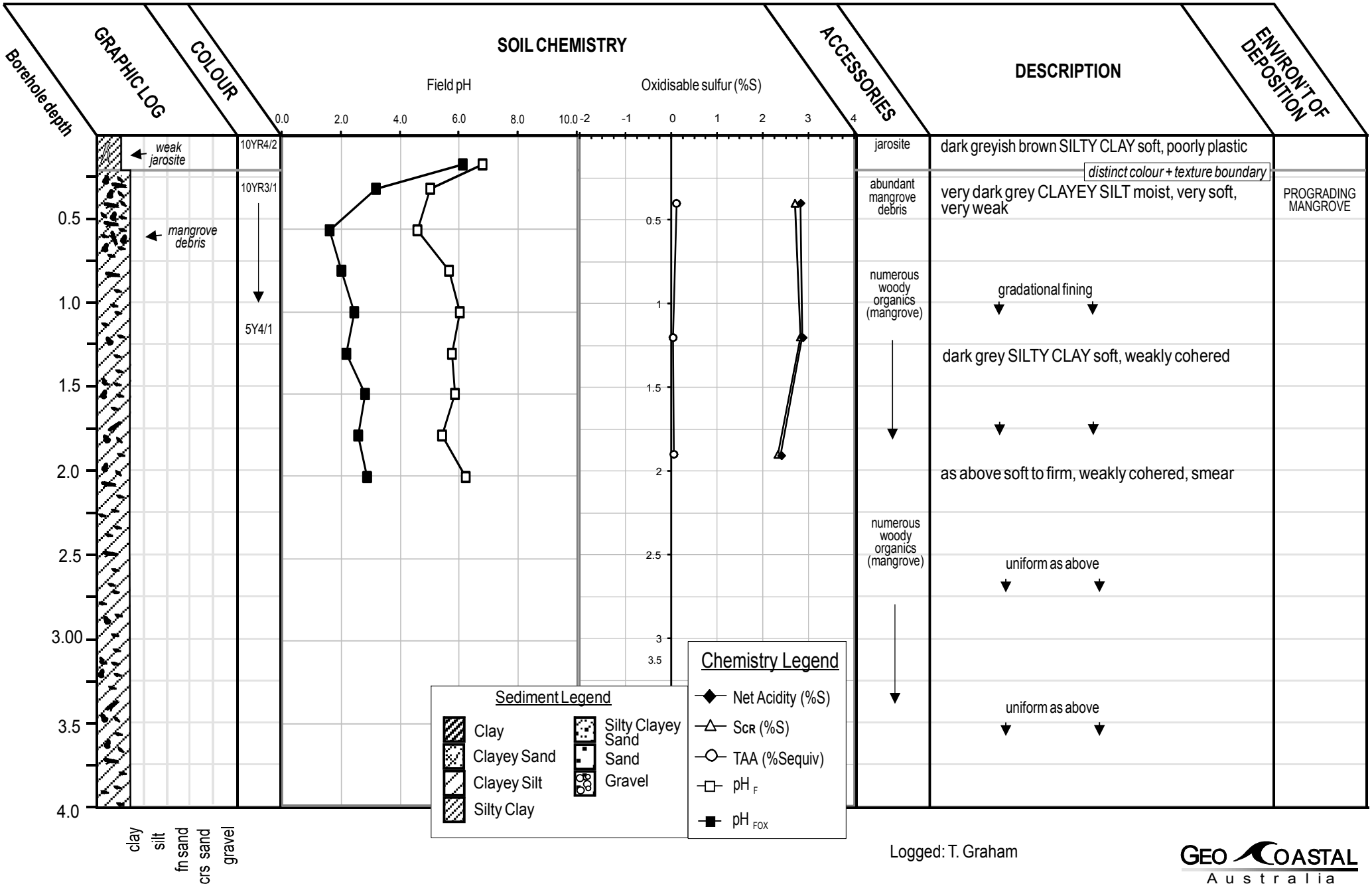
FEATURE: Mangrove fringed tidal flat

DATE: 7/ 8/ 08

Borehole #12

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78654°**S** 151.22830°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 12 continued

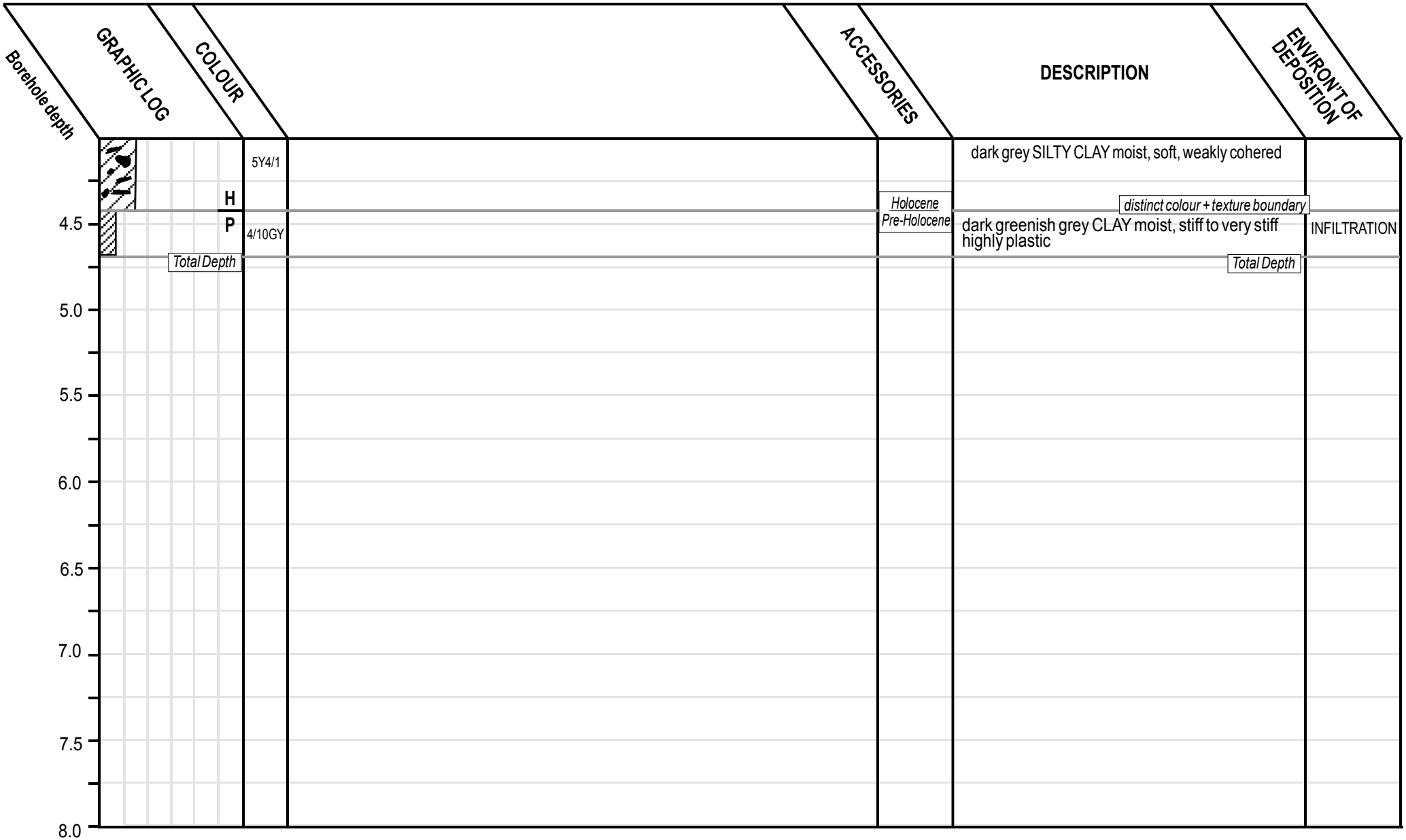
FEATURE: Mangrove fringed tidal flat

DATE: 7/ 8/ 08

Borehole #12

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78654°**S** 151.22830°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 13

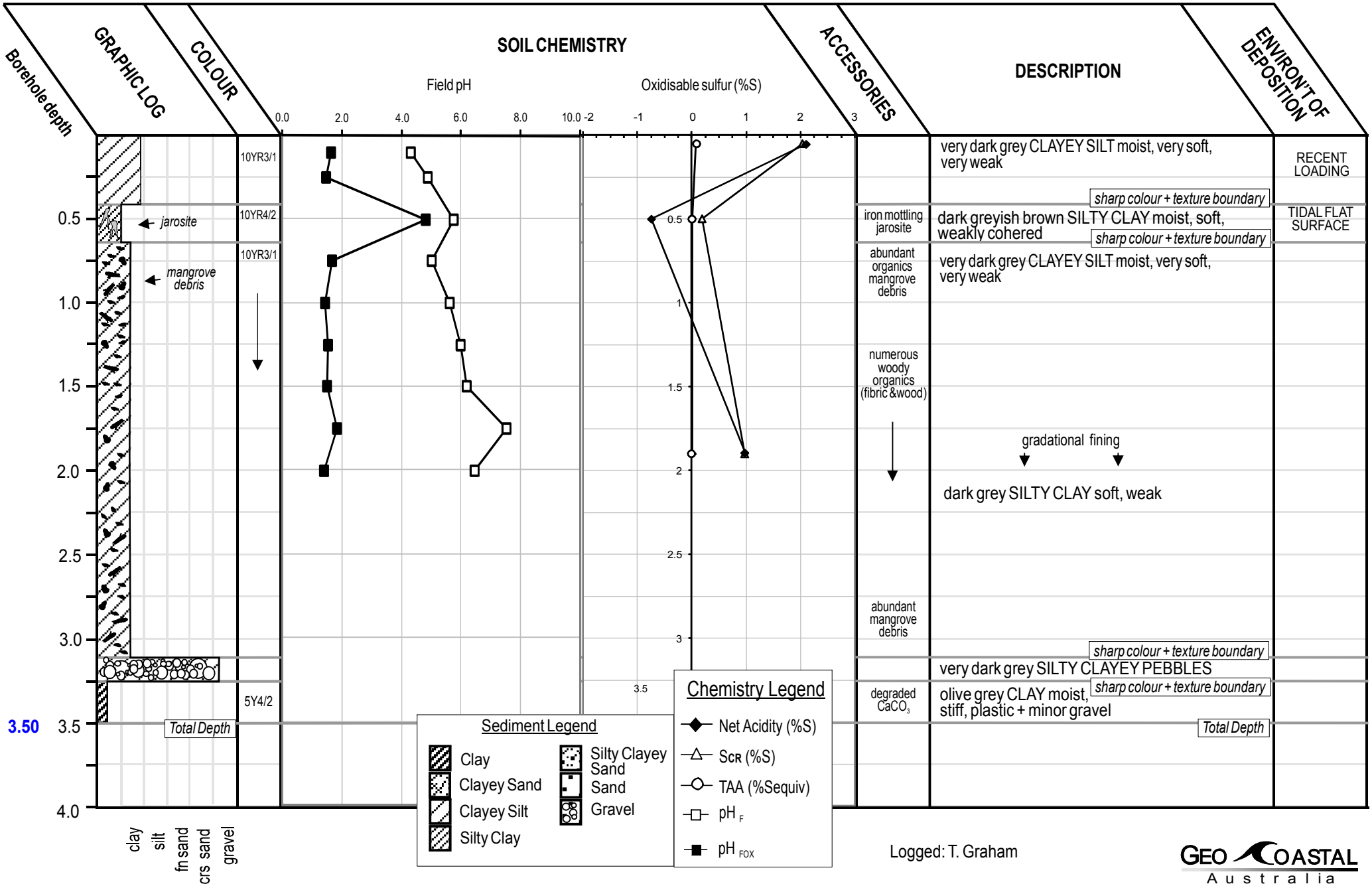
FEATURE: Mangrove fringed tidal flat

DATE: 7/ 8/ 08

Borehole #13

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78734°**S** 151.22836°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 14

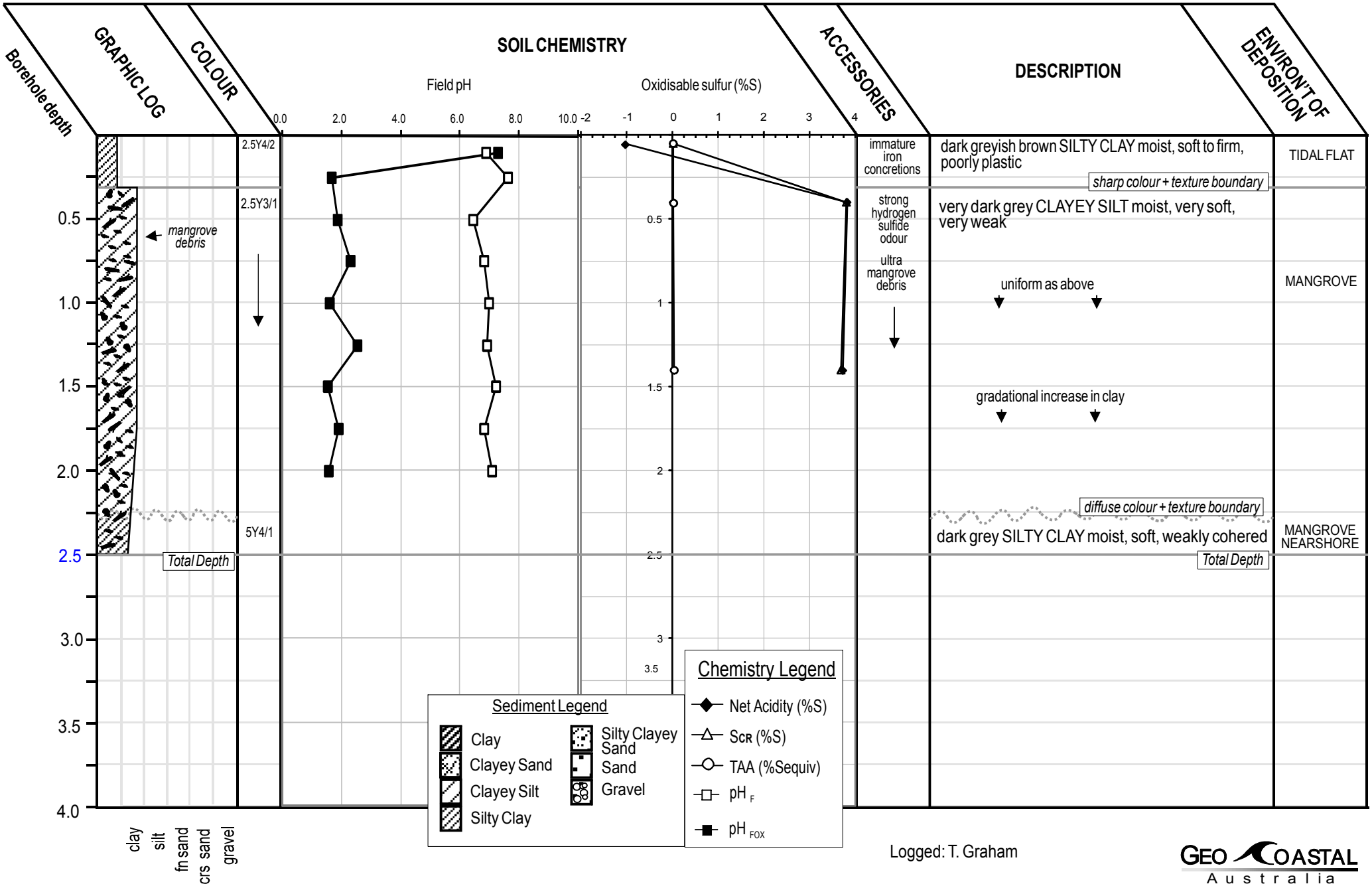
FEATURE: Mangrove fringed tidal flat

DATE: 8/ 8/ 08

Borehole #14

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78990°**S** 151.22502°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 15

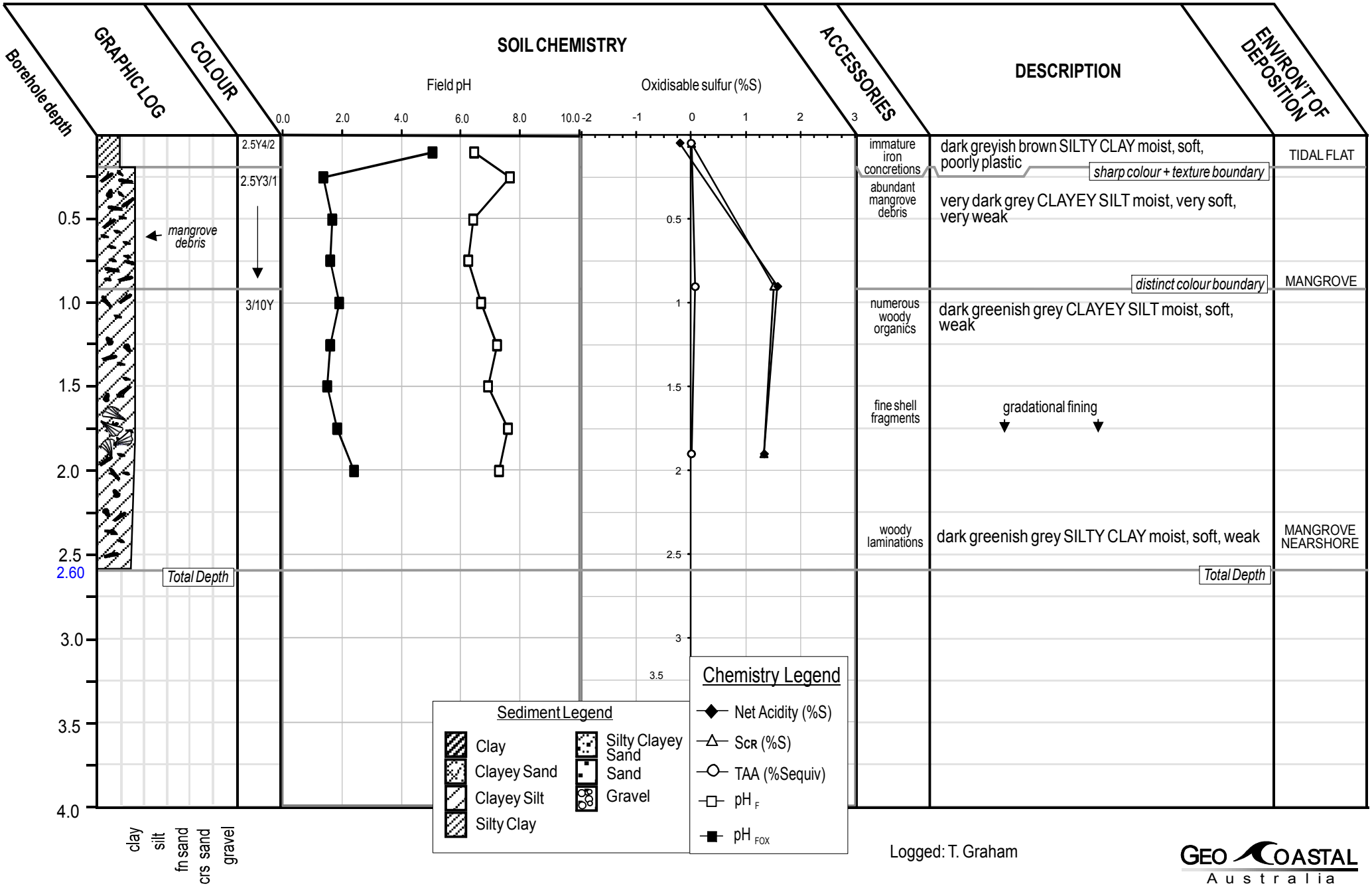
FEATURE: Mangrove fringed tidal flat

DATE: 8/ 8/ 08

Borehole #15

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78842°**S** 151.22615°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 16

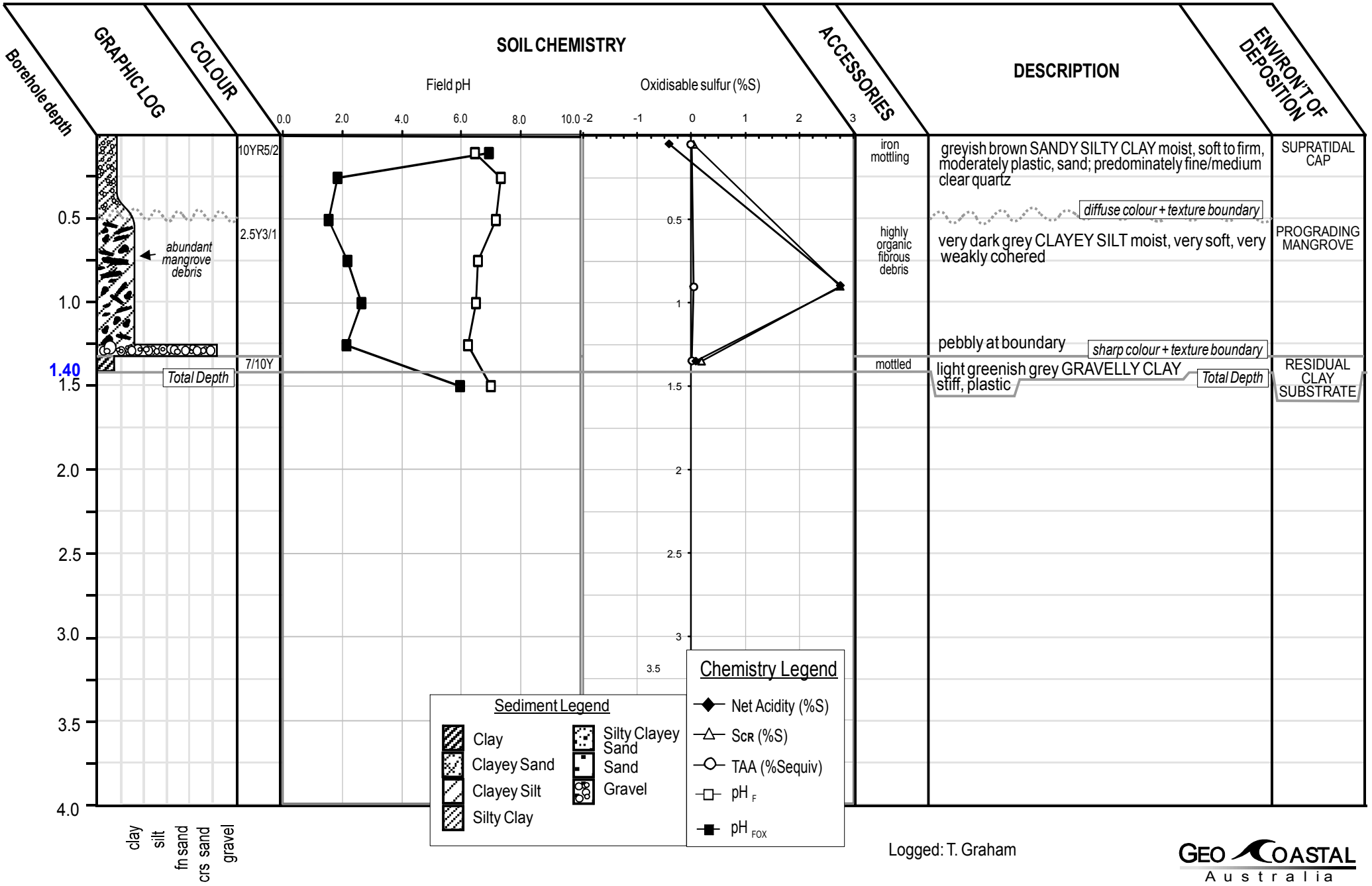
FEATURE: Mangrove fringed tidal flat

DATE: 8/ 8/ 08

Borehole #16

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78524°**S** 151.21800°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 17

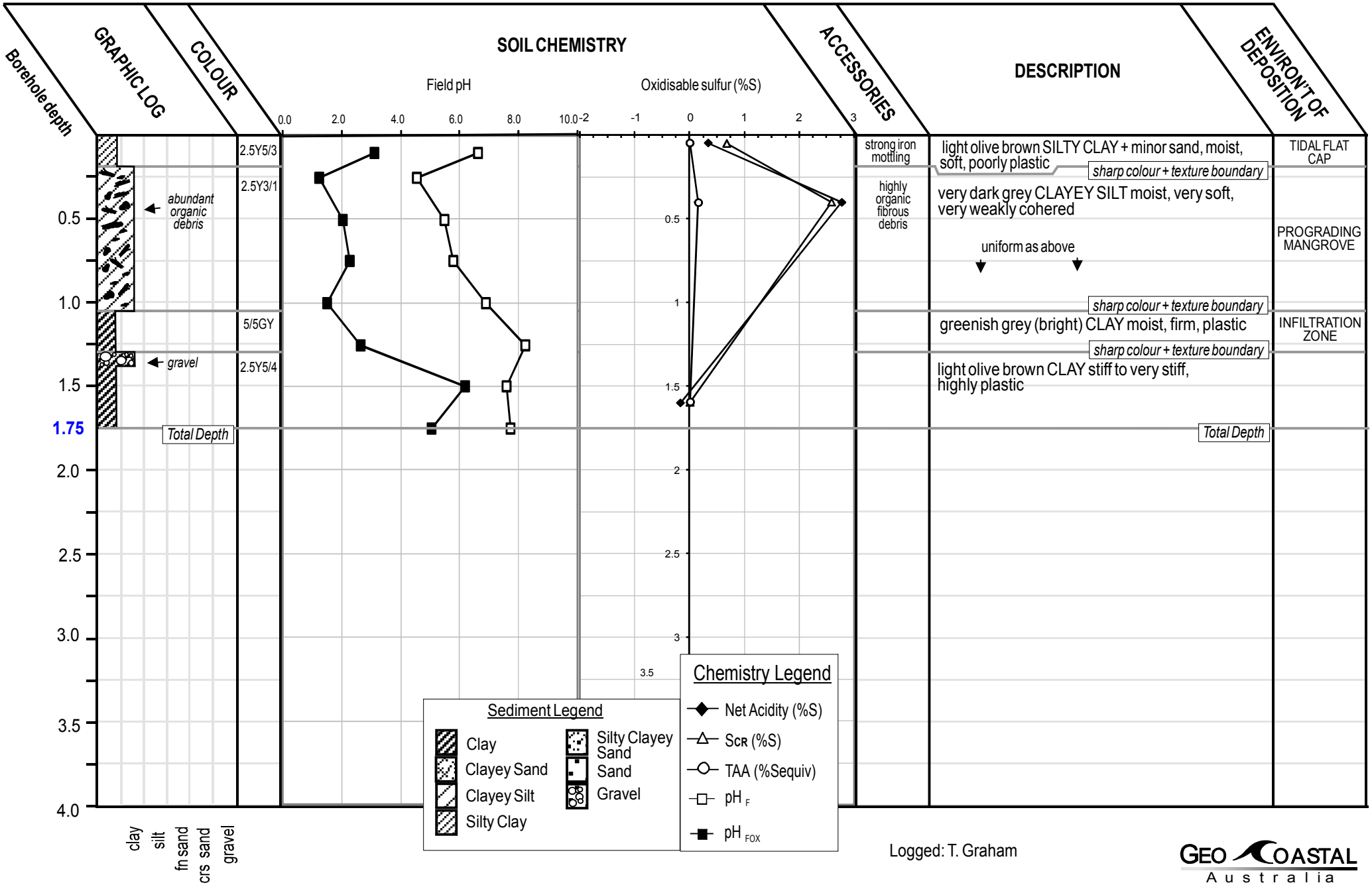
FEATURE: Mangrove fringed tidal flat

DATE: 8/ 8/ 08

Borehole #17

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78499°**S** 151.21967°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 18

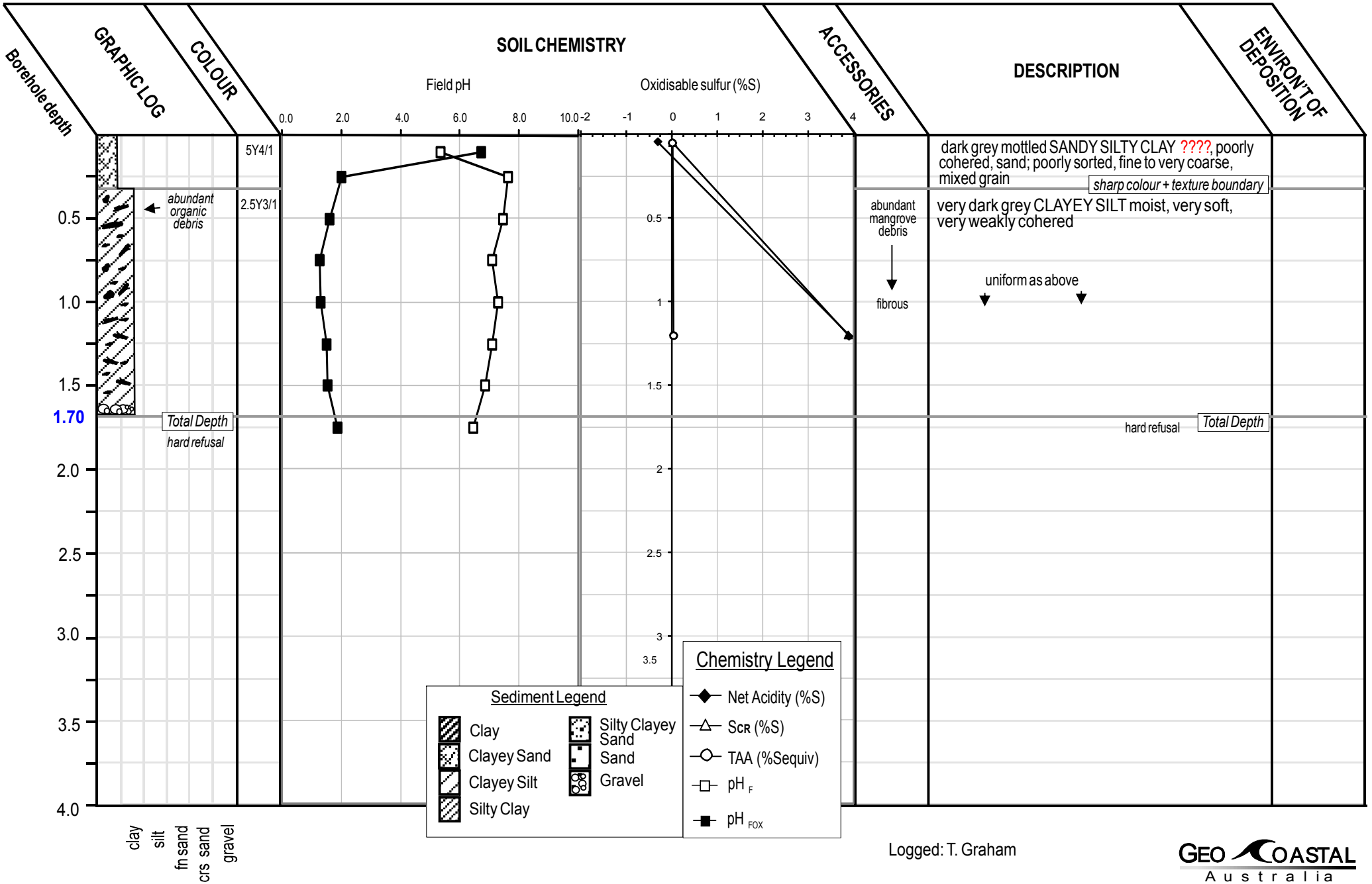
FEATURE: Mangrove fringed tidal flat

DATE: 8/ 8/ 08

Borehole #18

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78425°**S** 151.21848°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 19

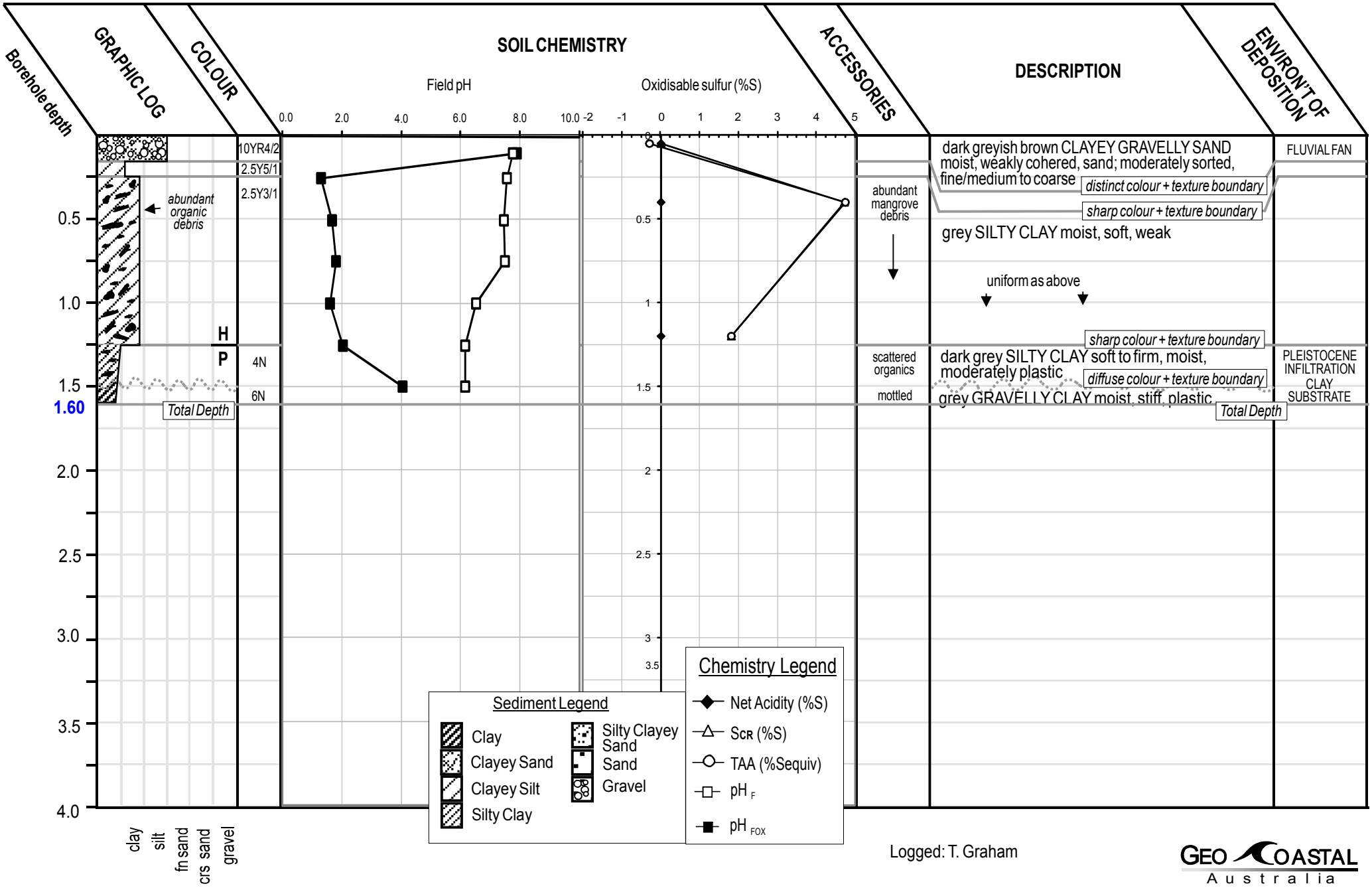
FEATURE: Mangrove fringed tidal flat

DATE: 9/ 8/ 08

Borehole #19

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78350°**S** 151.21835°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 20

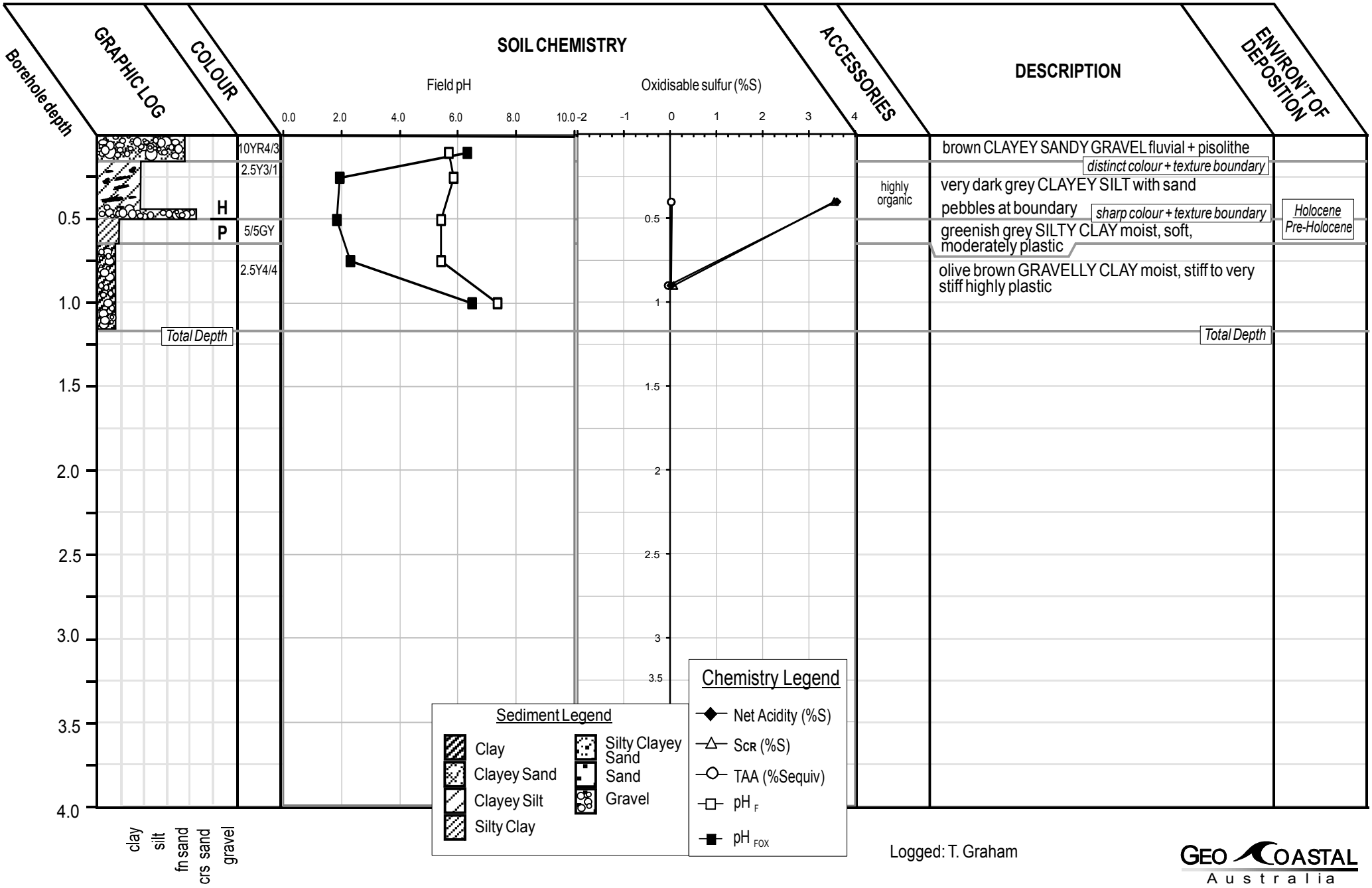
FEATURE: Mangrove fringed tidal flat

DATE: 9/ 8/ 08

Borehole #20

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78283°**S** 151.21585°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 31

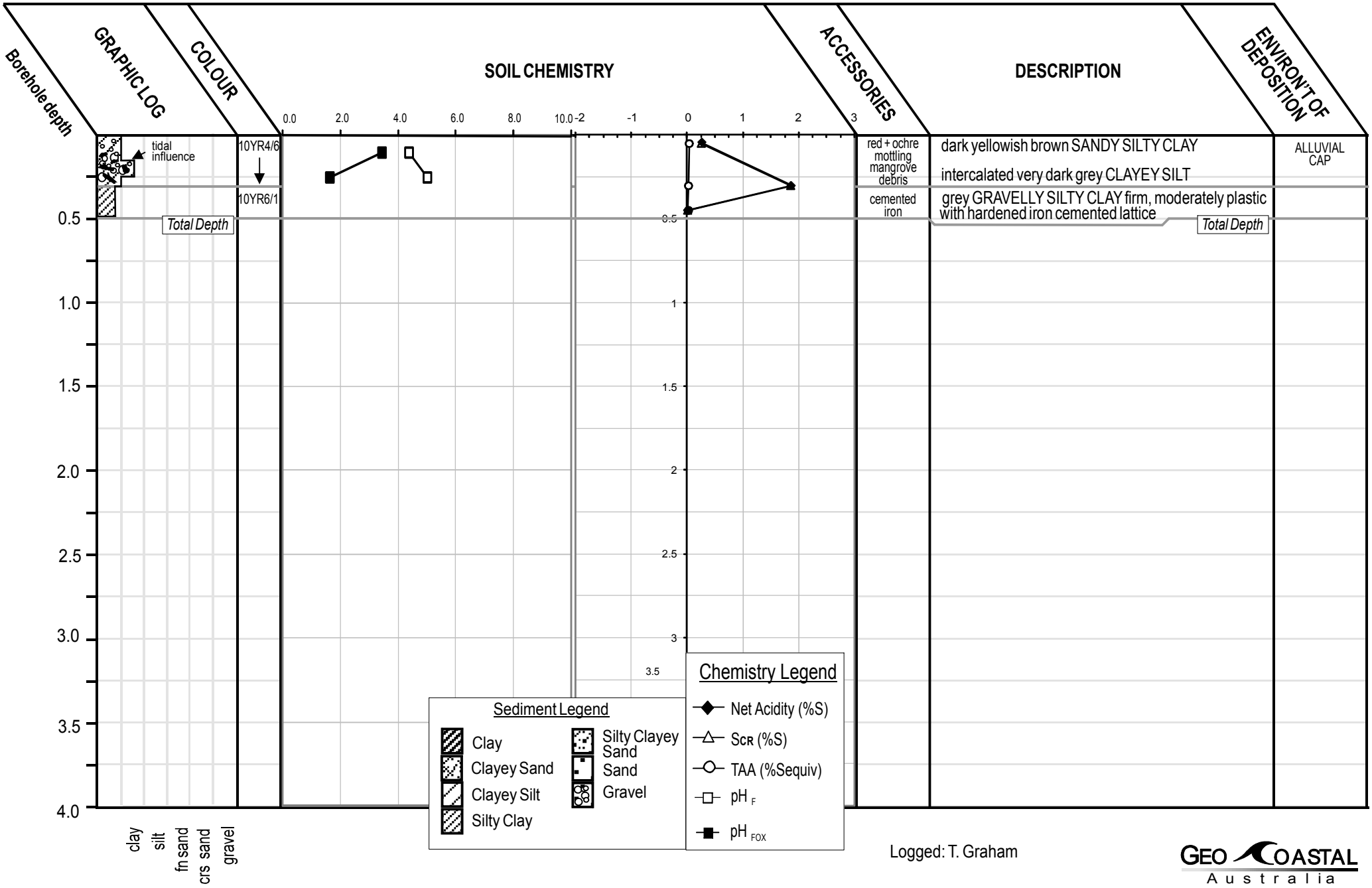
FEATURE: Mangrove fringed tidal flat

DATE: 11/ 8/ 08

Borehole #31

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.74635°**S** 151.17731°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG # 32

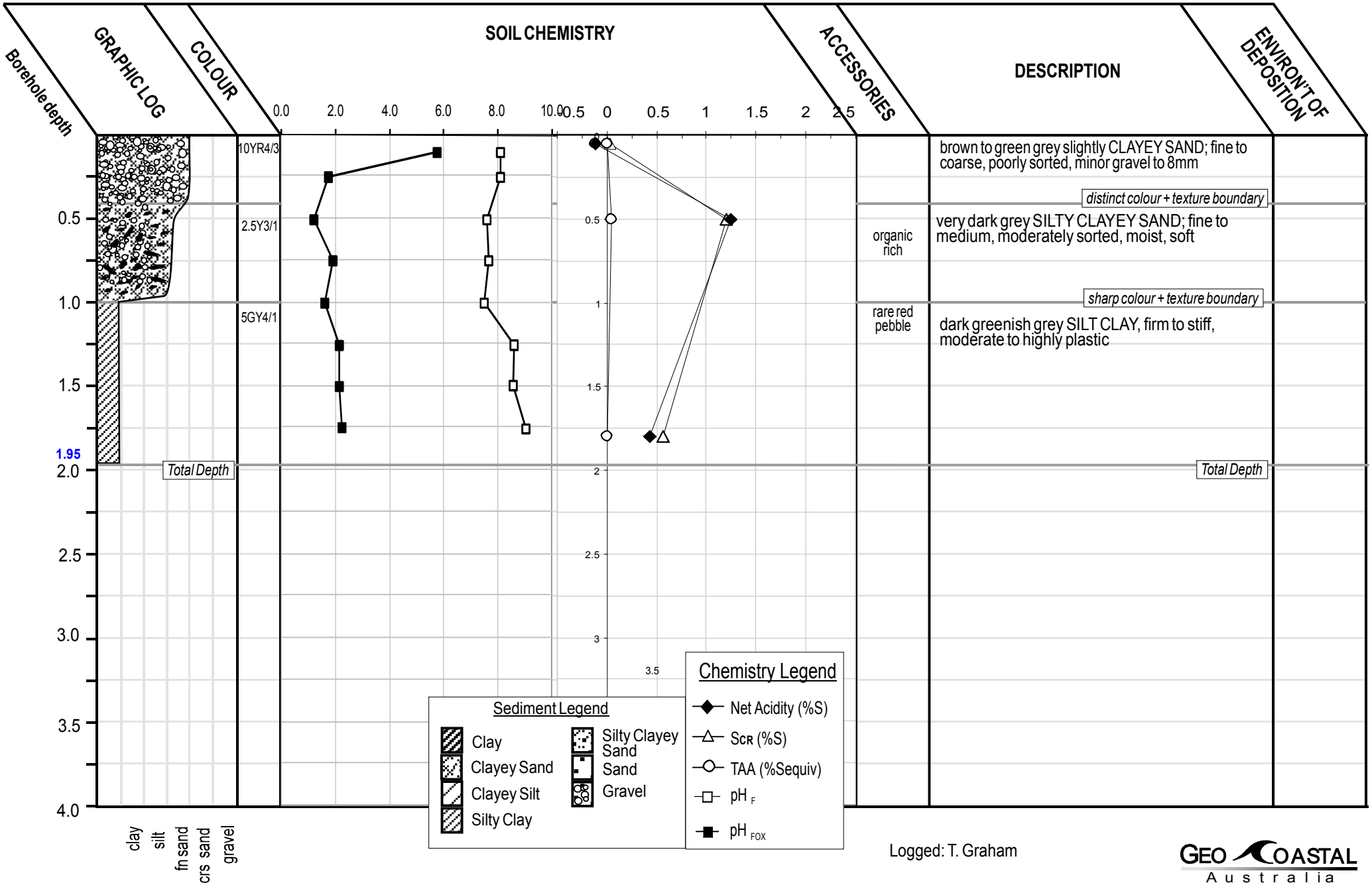
FEATURE: Mangrove fringed tidal flat

DATE: 16/ 8/ 08

Borehole #32

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78357°**S** 151.15021°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracorer



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 33

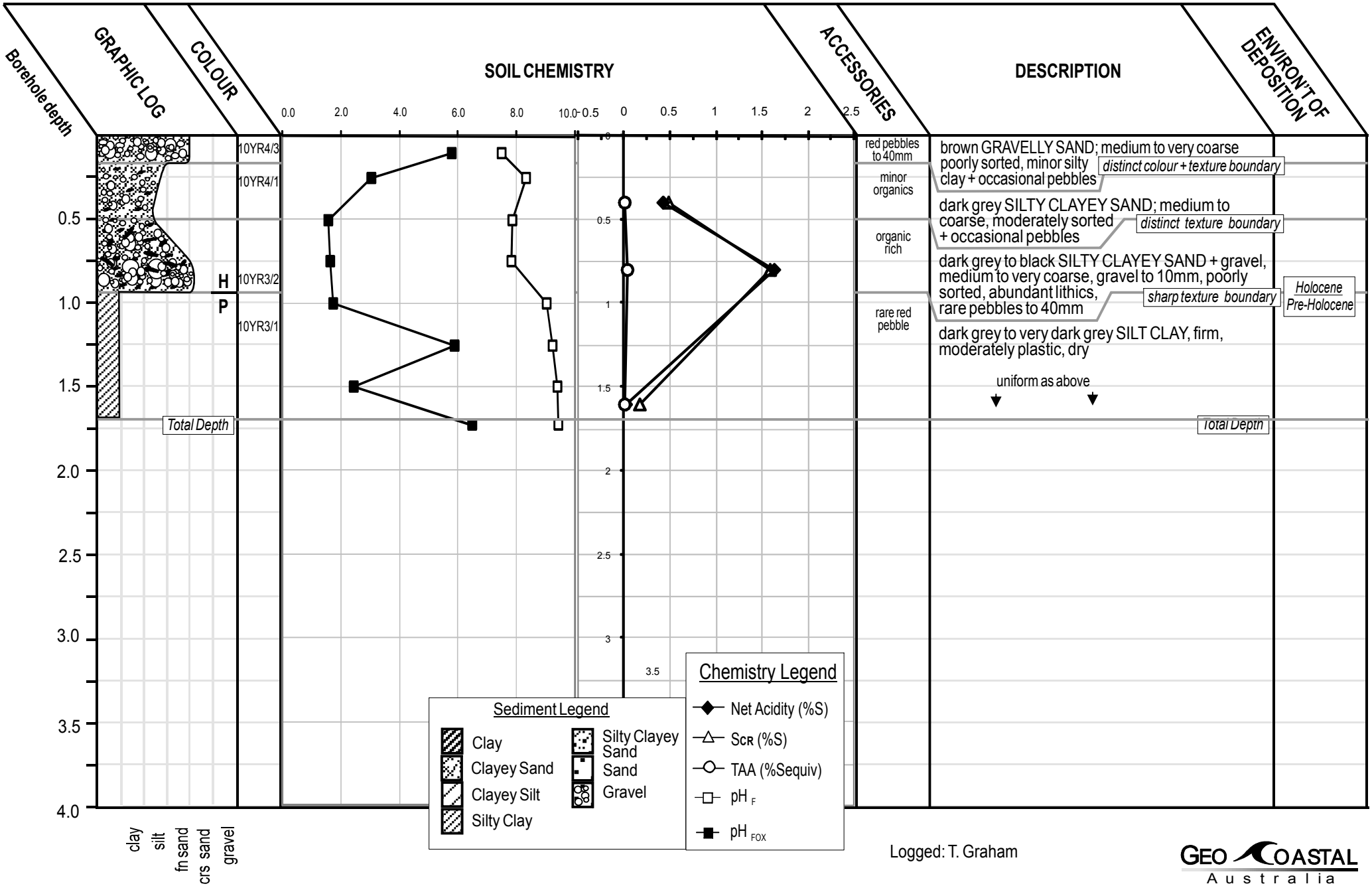
FEATURE: Mangrove fringed tidal flat

DATE: 16/ 8/ 08

Borehole #33

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.781885°**S** 151.14935°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 34

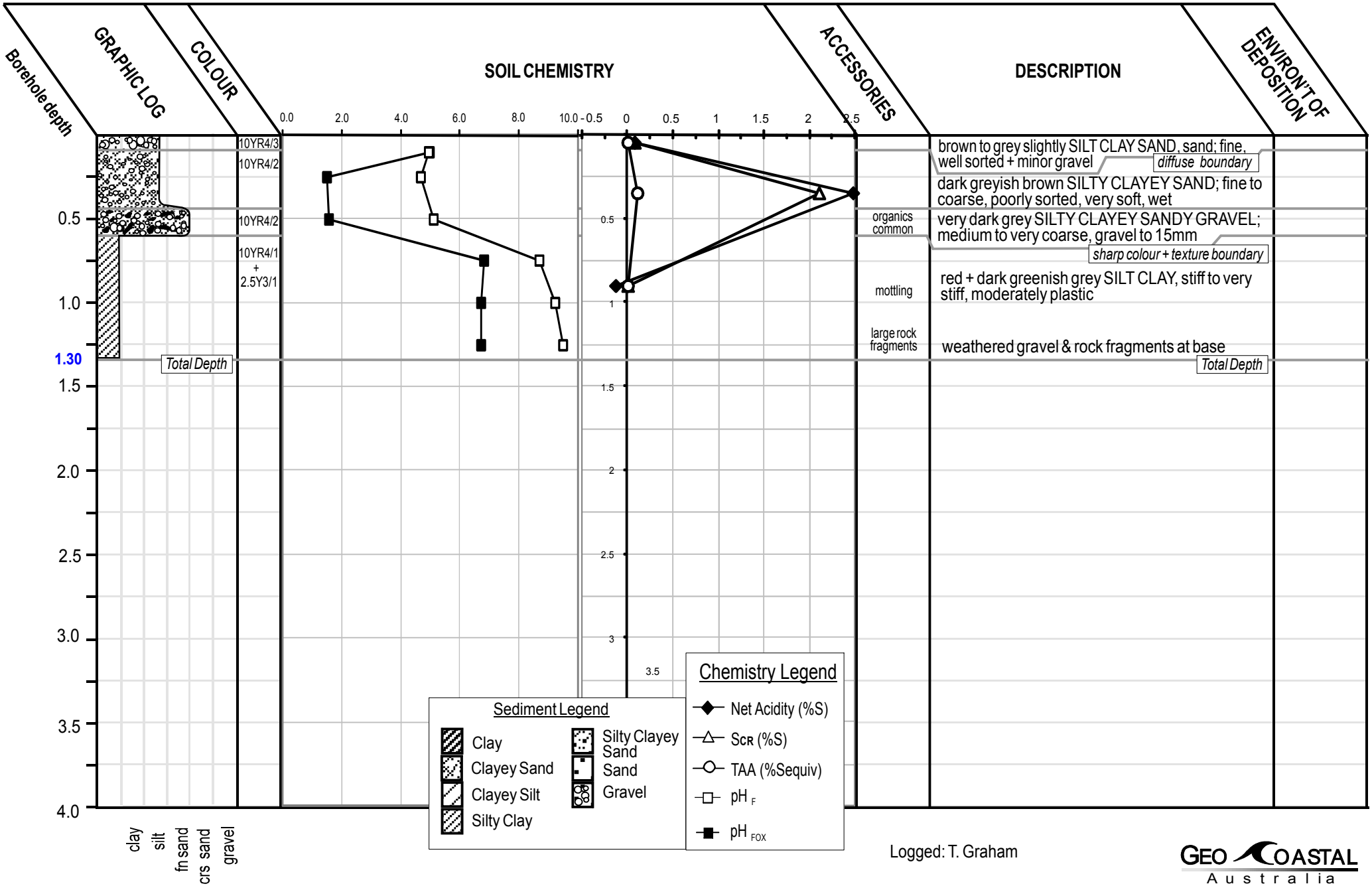
FEATURE: Mangrove fringed tidal flat

DATE: 16/ 8/ 08

Borehole #34

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78015°**S** 151.14925°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 35

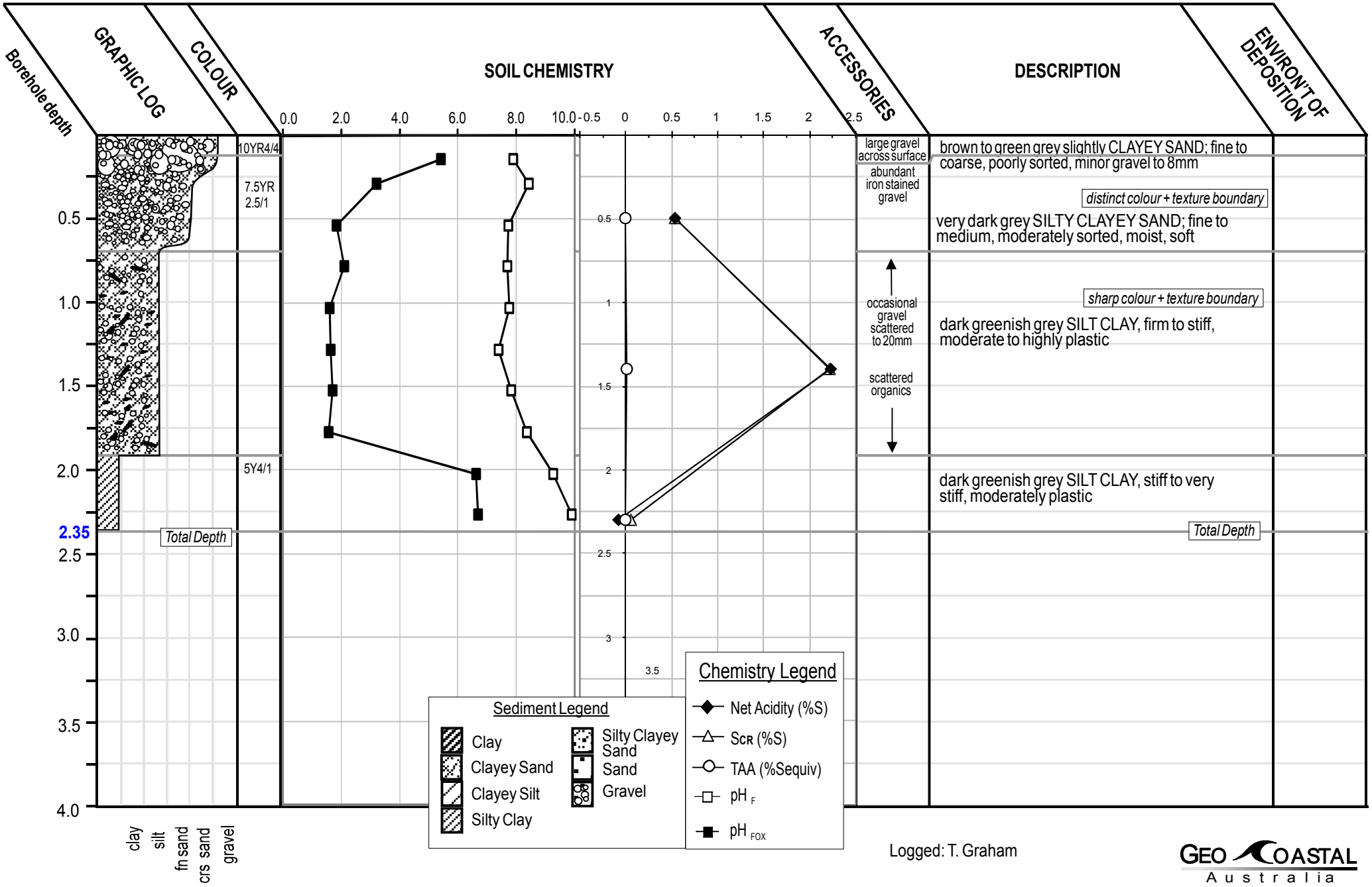
FEATURE: Mangrove fringed tidal flat

DATE: 16/ 8/ 08

Borehole #35

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.77828°**S** 151.14906°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 36

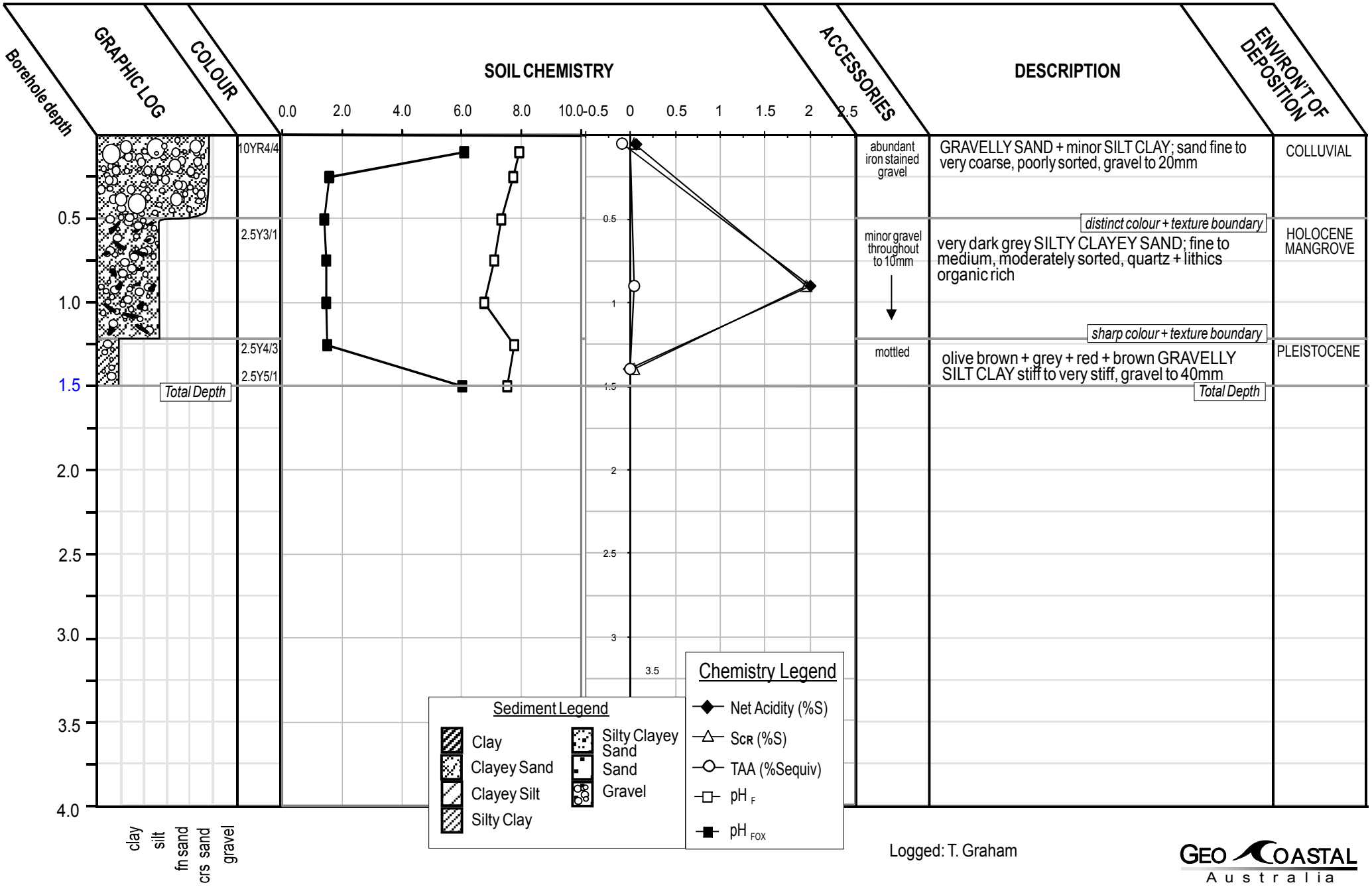
FEATURE: Mangrove fringed tidal flat

DATE: 16/ 8/ 08

Borehole #36

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.77706°**S** 151.14780°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 37

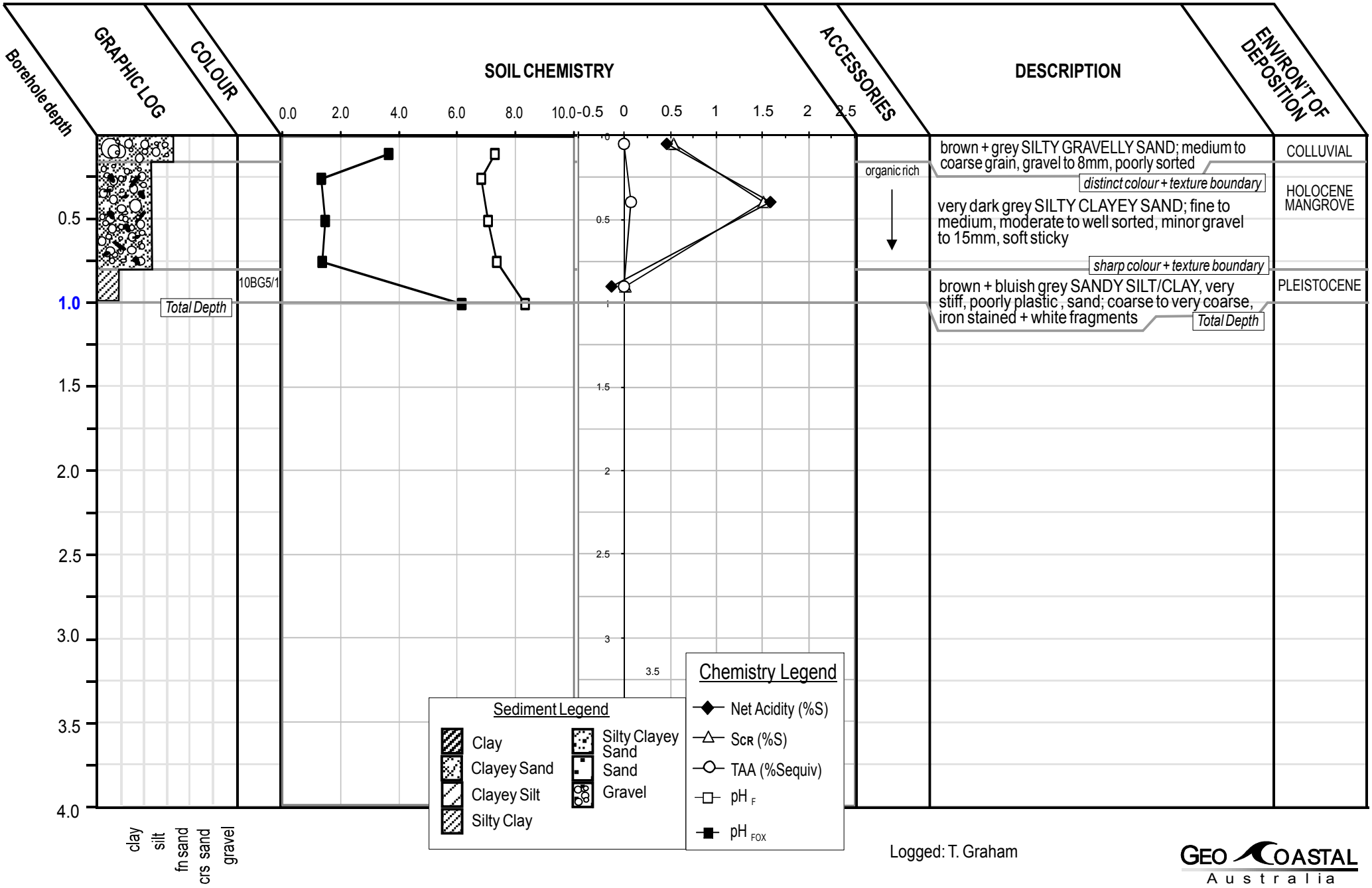
FEATURE: Mangrove fringed tidal flat

DATE: 16/ 8/ 08

Borehole #37

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.77476°**S** 151.14670°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 38

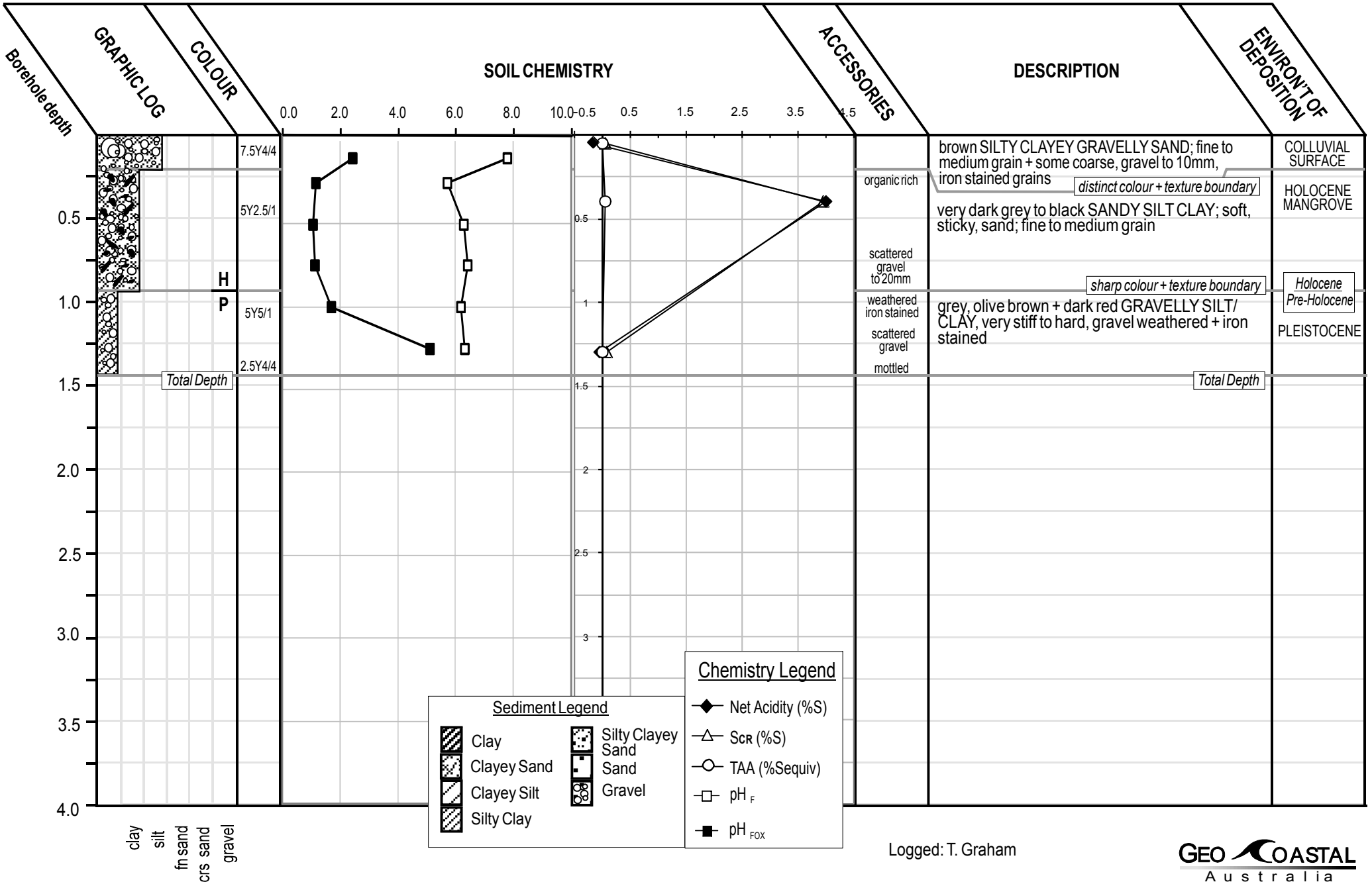
FEATURE: Mangrove fringed tidal flat

DATE: 16/ 8/ 08

Borehole #38

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.77361°**S** 151.14565°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 39

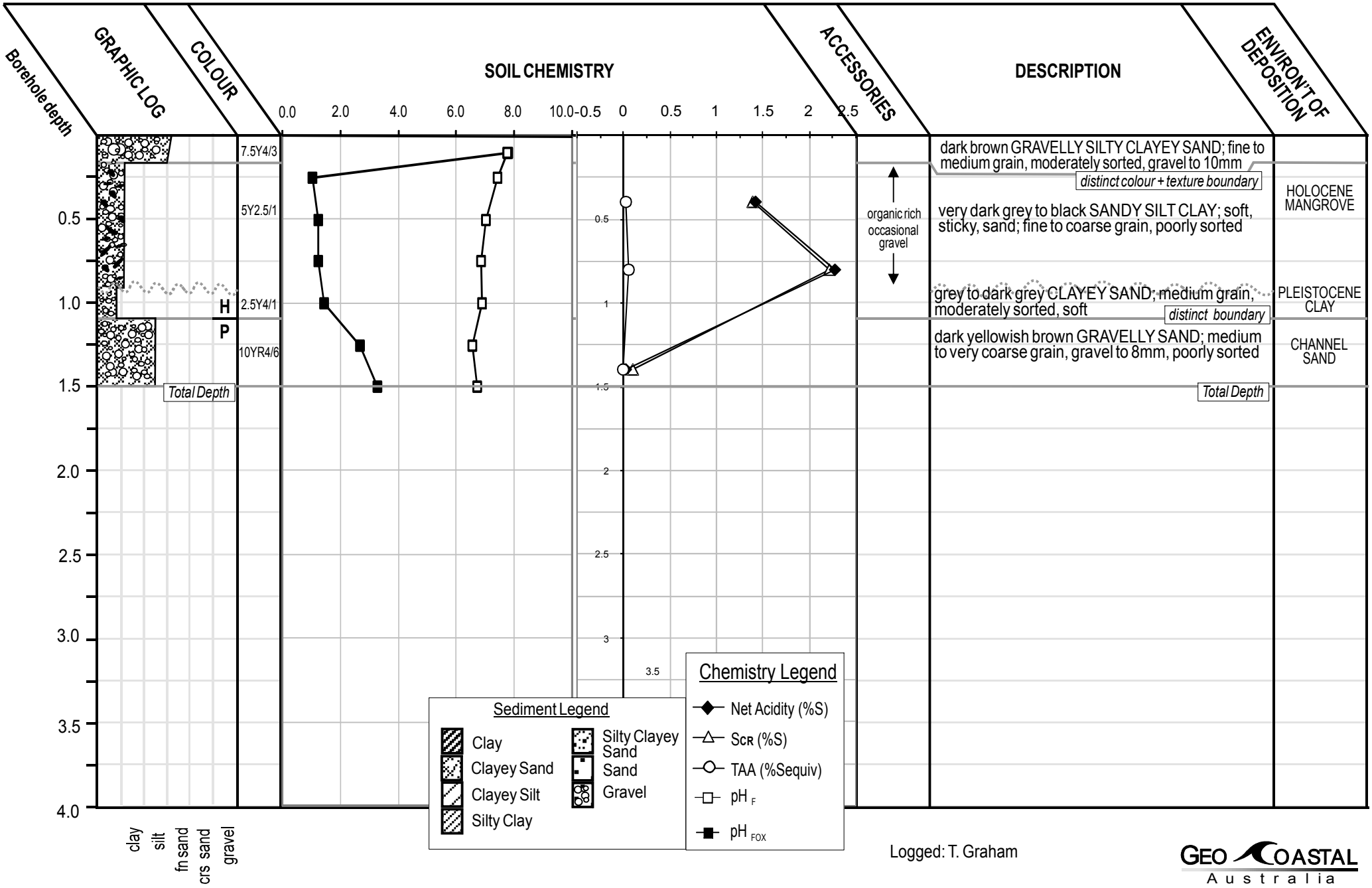
FEATURE: Mangrove fringed tidal flat

DATE: 16/ 8/ 08

Borehole #39

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.77107°**S** 151.14354°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

SITE: GC/ GLNG# 40

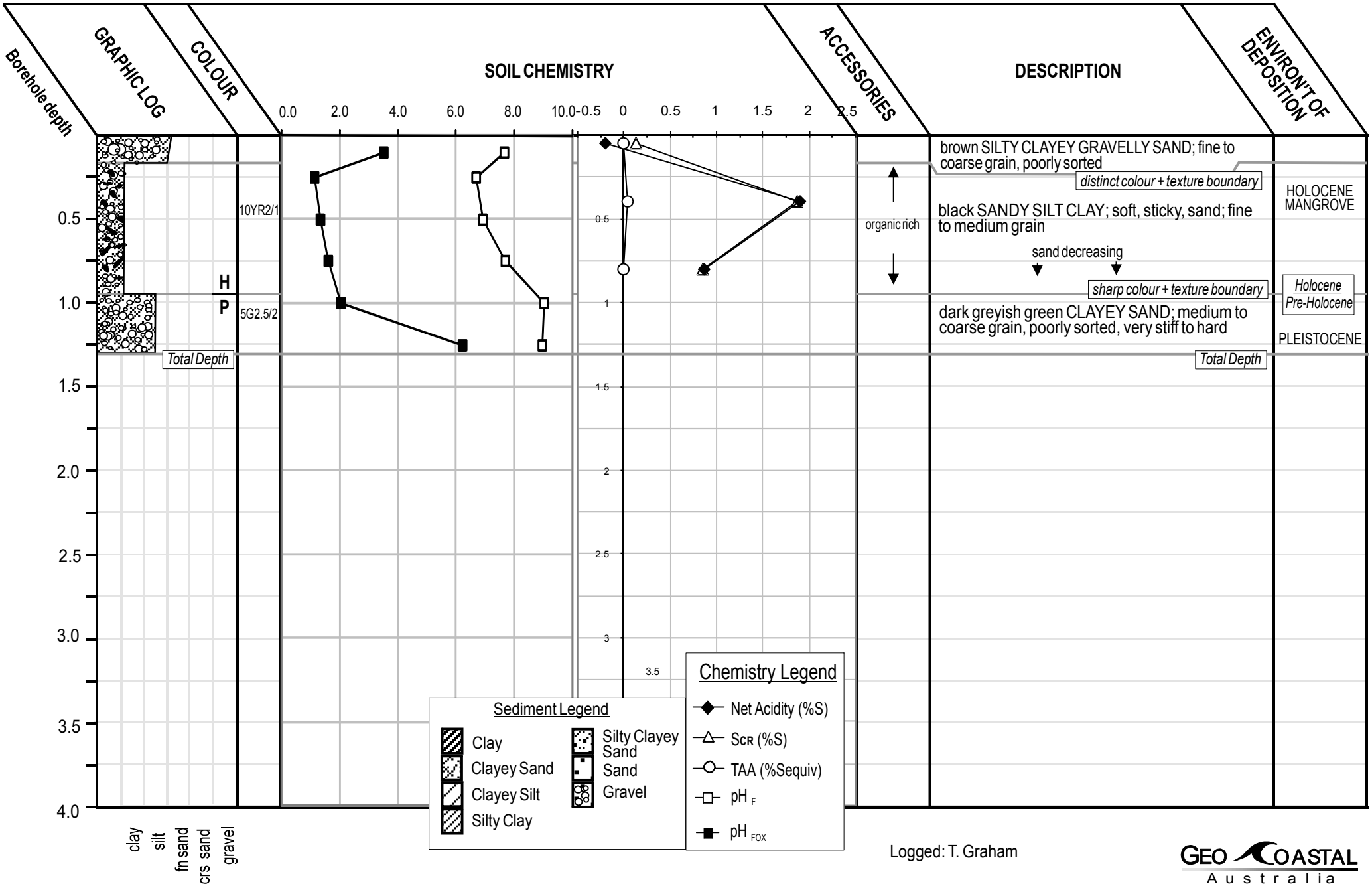
FEATURE: Mangrove fringed tidal flat

DATE: 16/ 8/ 08

Borehole #40

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.77107°**S** 151.14354°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore



Logged: T. Graham

GEO COASTAL Australia

Stratigraphic Logs with Acid Sulfate Chemistry | Appendix A

A.2 Logs of offshore cores #1 to #12

SITE: GC/GLNG OFF#01

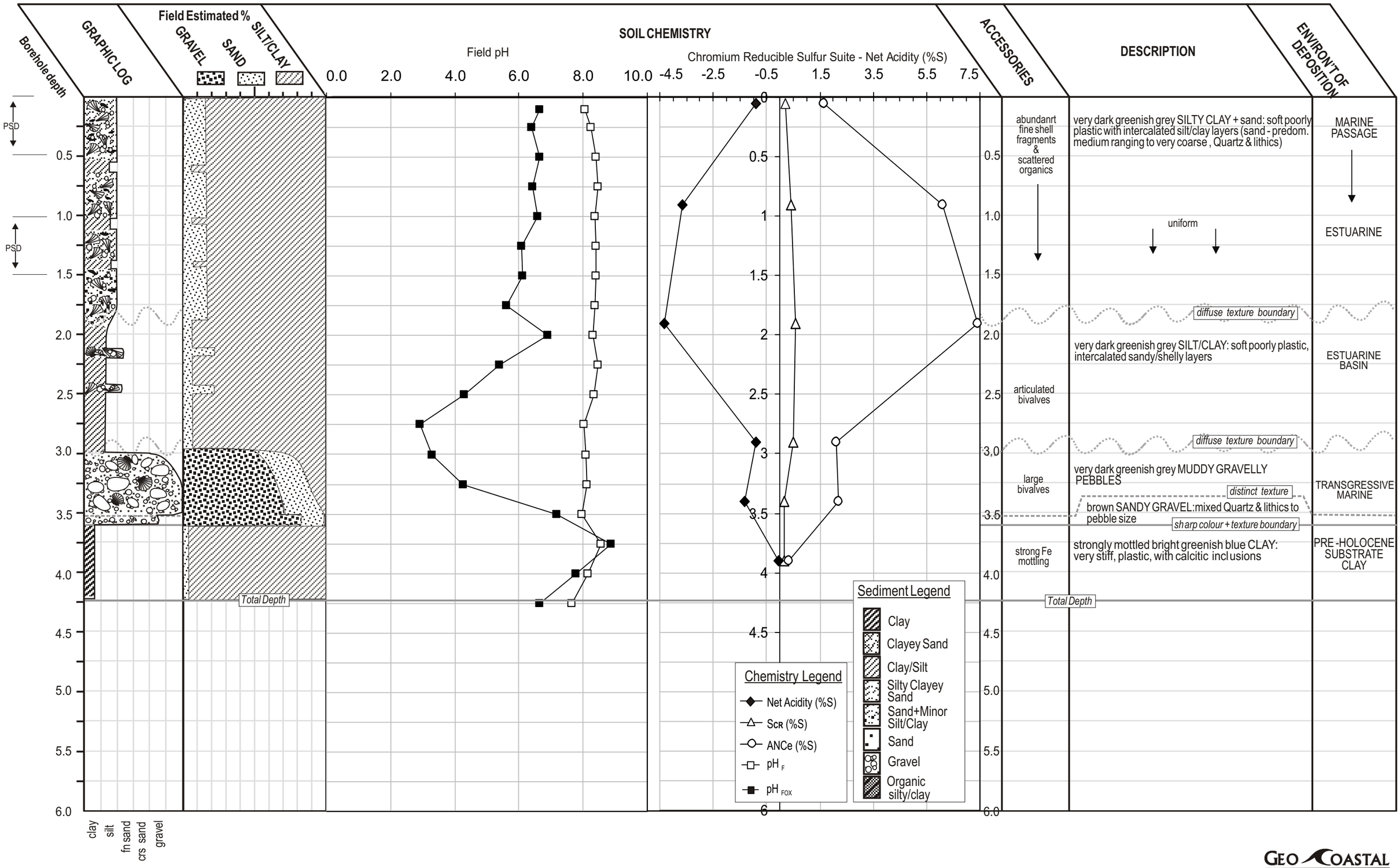
FEATURE: Marine Channel

DATE: 7/6/08

Seabed Core #01

LOCATION: Offshore Sthn Curtis Island, Qld
WGS 84 23° 46.955' Lat. 151° 11.906' Long. **Depth below LAT:** -7.15m

SAMPLING METHOD: GeoCoastal Pneumatic/Hydraulic Vibracorer



GEO COASTAL Australia

SITE: GC/GLNG OFF#03

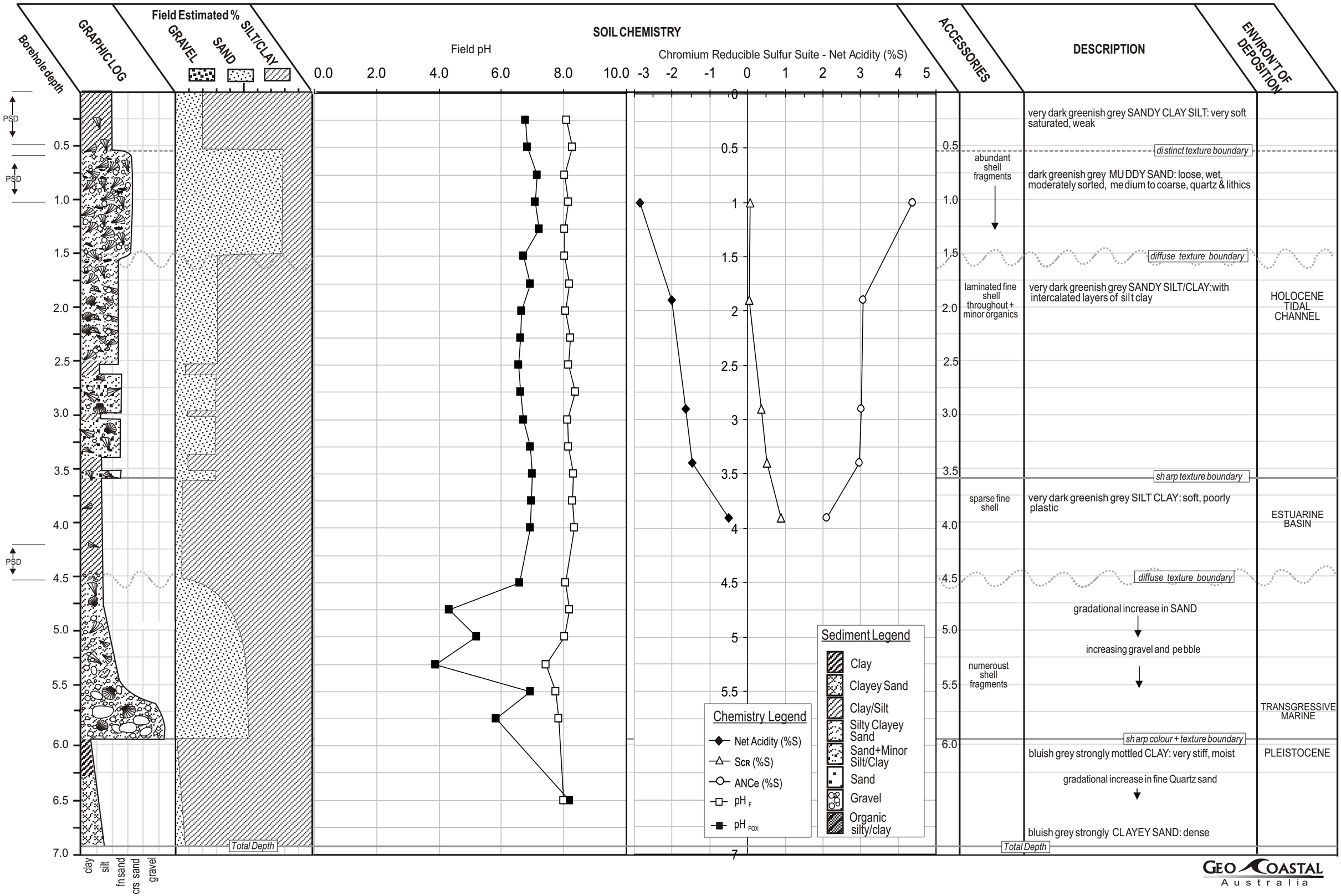
FEATURE: Marine Channel

DATE: 8/6/08

Seabed Core #03

LOCATION: Offshore Sthn Curtis Island, Qld
WGS 84 23° 47.158' Lat. 151° 11.914' Long. **Depth below LAT:** -6.52m

SAMPLING METHOD: GeoCoastal Pneumatic/Hydraulic Vibracorer



GEO COASTAL Australia

SITE: GC/GLNG OFF#05

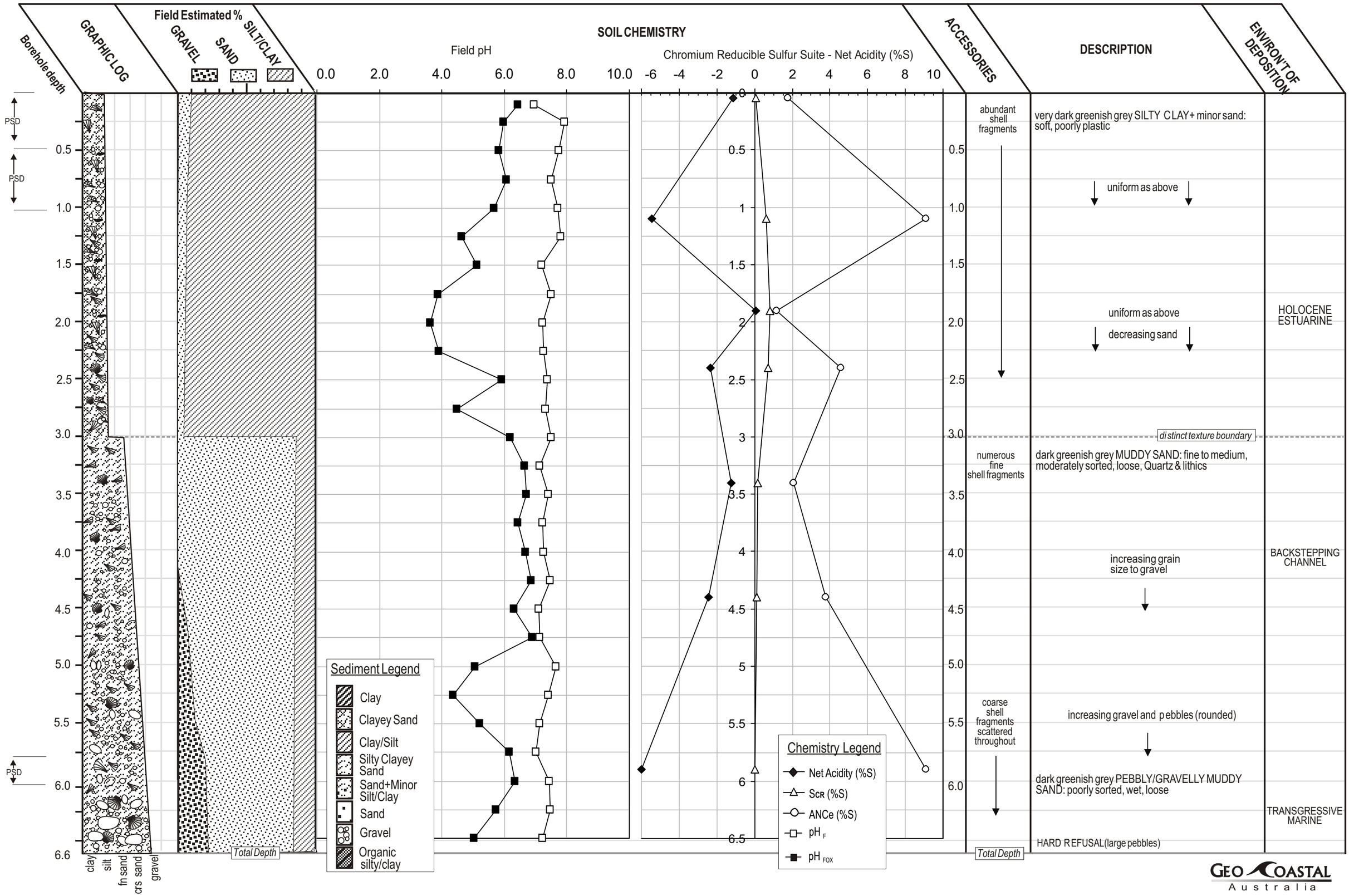
FEATURE: Marine Channel

DATE: 9/6/08

Seabed Core #05

LOCATION: Offshore Sthn Curtis Island, Qld
WGS 84 23° 47.325' Lat. 151° 12.276' Long. **Depth below LAT:** -7.86m

SAMPLING METHOD: GeoCoastal Pneumatic/Hydraulic Vibracorer



GEO COASTAL Australia

SITE: GC/GLNG OFF#06

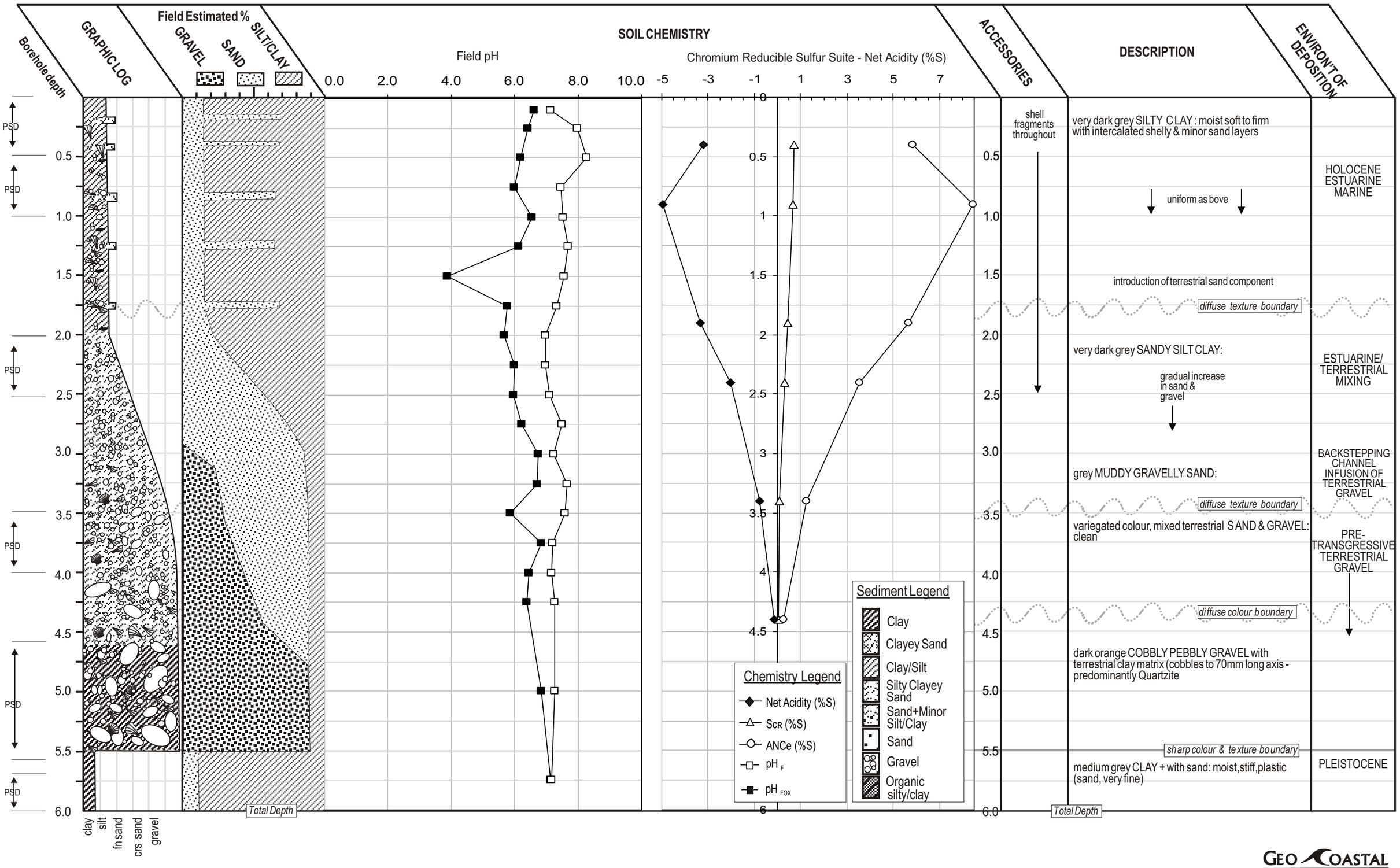
FEATURE: Marine Channel

DATE: 6/6/08

Seabed Core #06

LOCATION: Offshore Sthn Curtis Island, Qld
WGS 84 23° 47.455' Lat. 151° 12.429' Long. **Depth below LAT:** -9.40m

SAMPLING METHOD: GeoCoastal Pneumatic/Hydraulic Vibracorer



GEO COASTAL Australia

SITE: GC/GLNG OFF#09

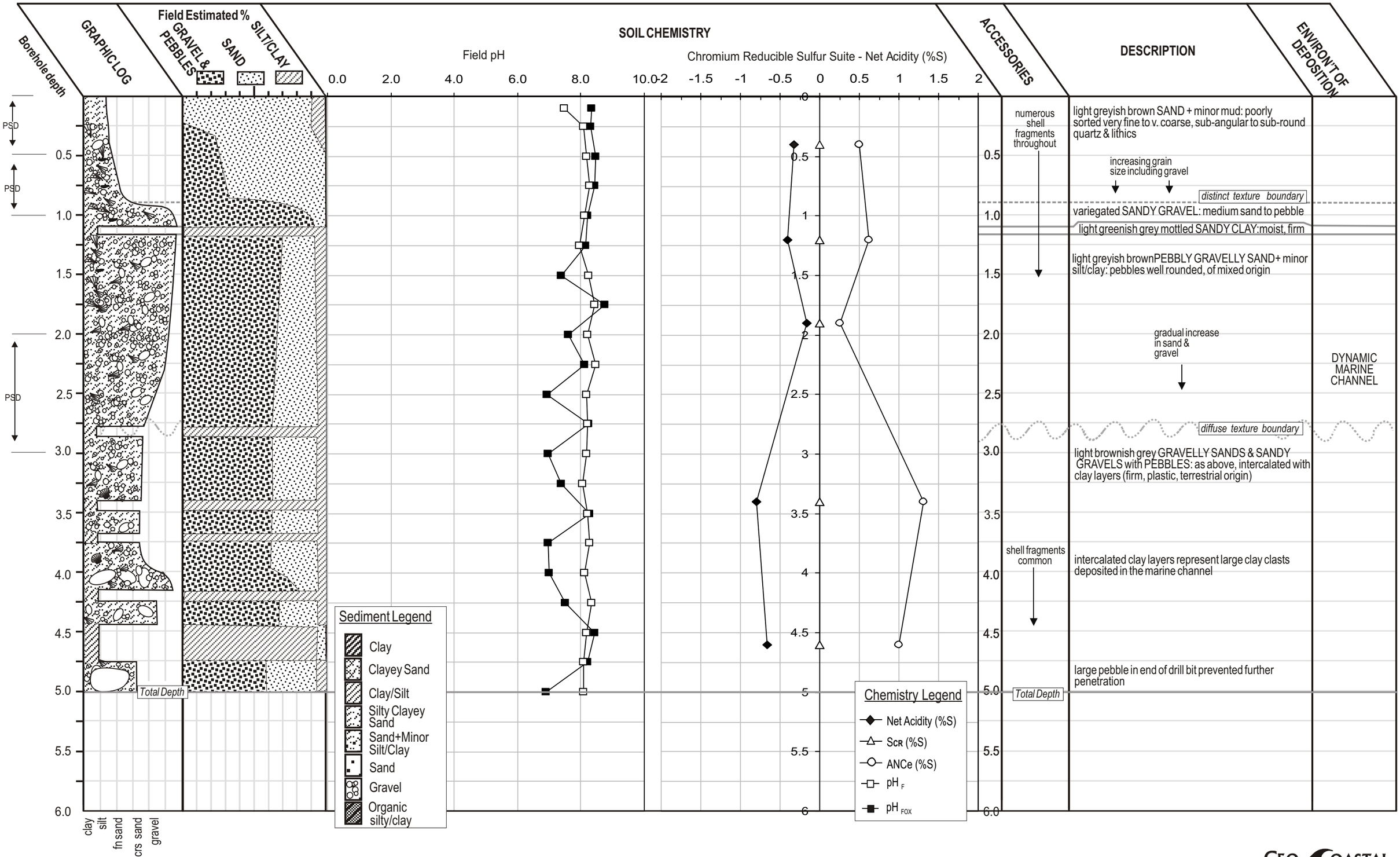
FEATURE: Marine Channel

DATE: 7/6/08

Seabed Core #09

LOCATION: Offshore Sthn Curtis Island, Qld
WGS 84 23° 47.844' Lat. 151° 12.881' Long. **Depth below LAT:** -10.17m

SAMPLING METHOD: GeoCoastal Pneumatic/Hydraulic Vibracorer



GEO COASTAL Australia

SITE: GC/GLNG OFF#10

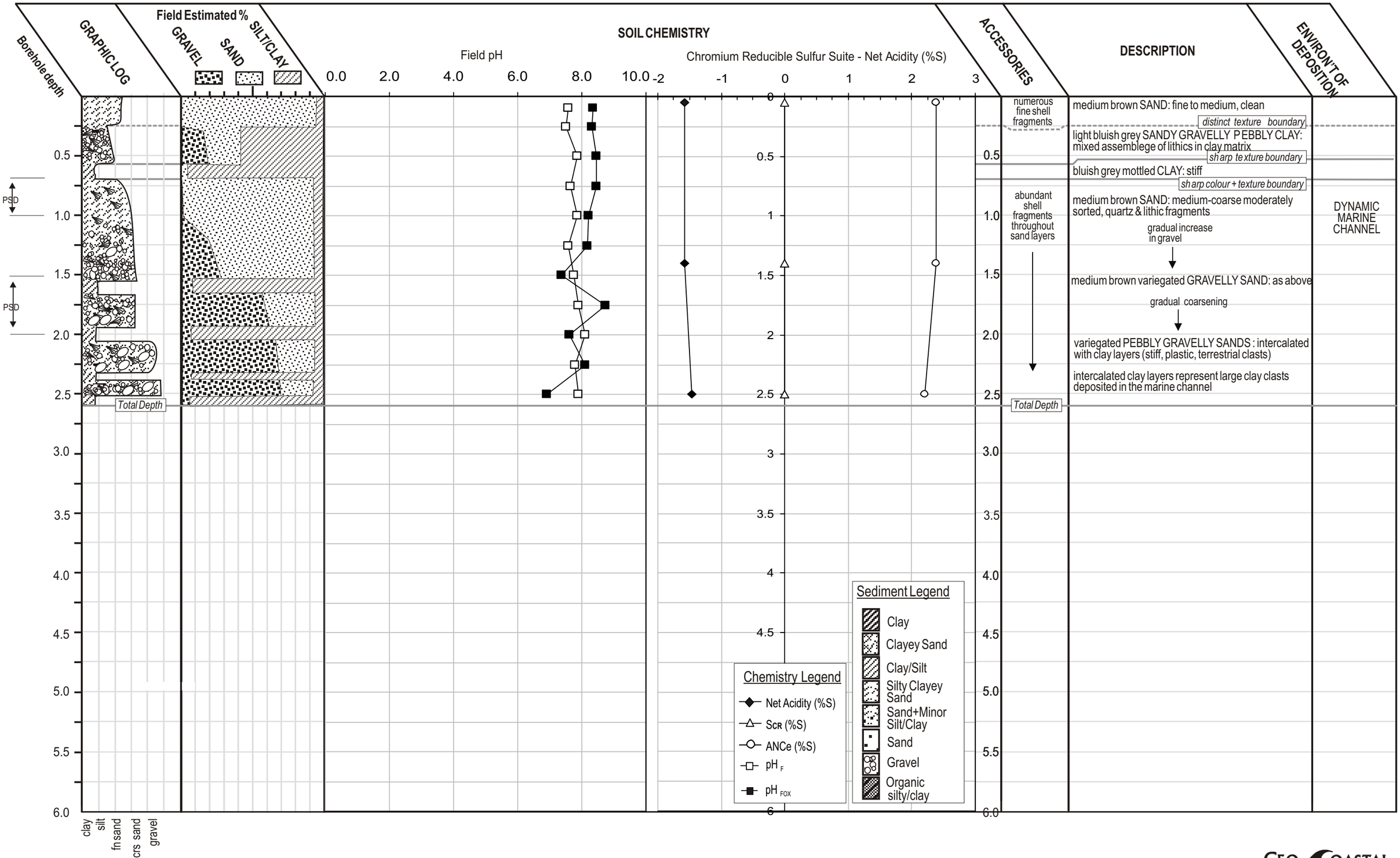
FEATURE: Marine Channel

DATE: 8/6/08

Seabed Core #10

LOCATION: Offshore Sthn Curtis Island, Qld
WGS 84 23° 47.975' Lat. 151° 13.014' Long. **Depth below LAT:** -12.57m

SAMPLING METHOD: GeoCoastal Pneumatic/Hydraulic Vibracorer



GEO COASTAL Australia

SITE: GC/GLNG OFF#11

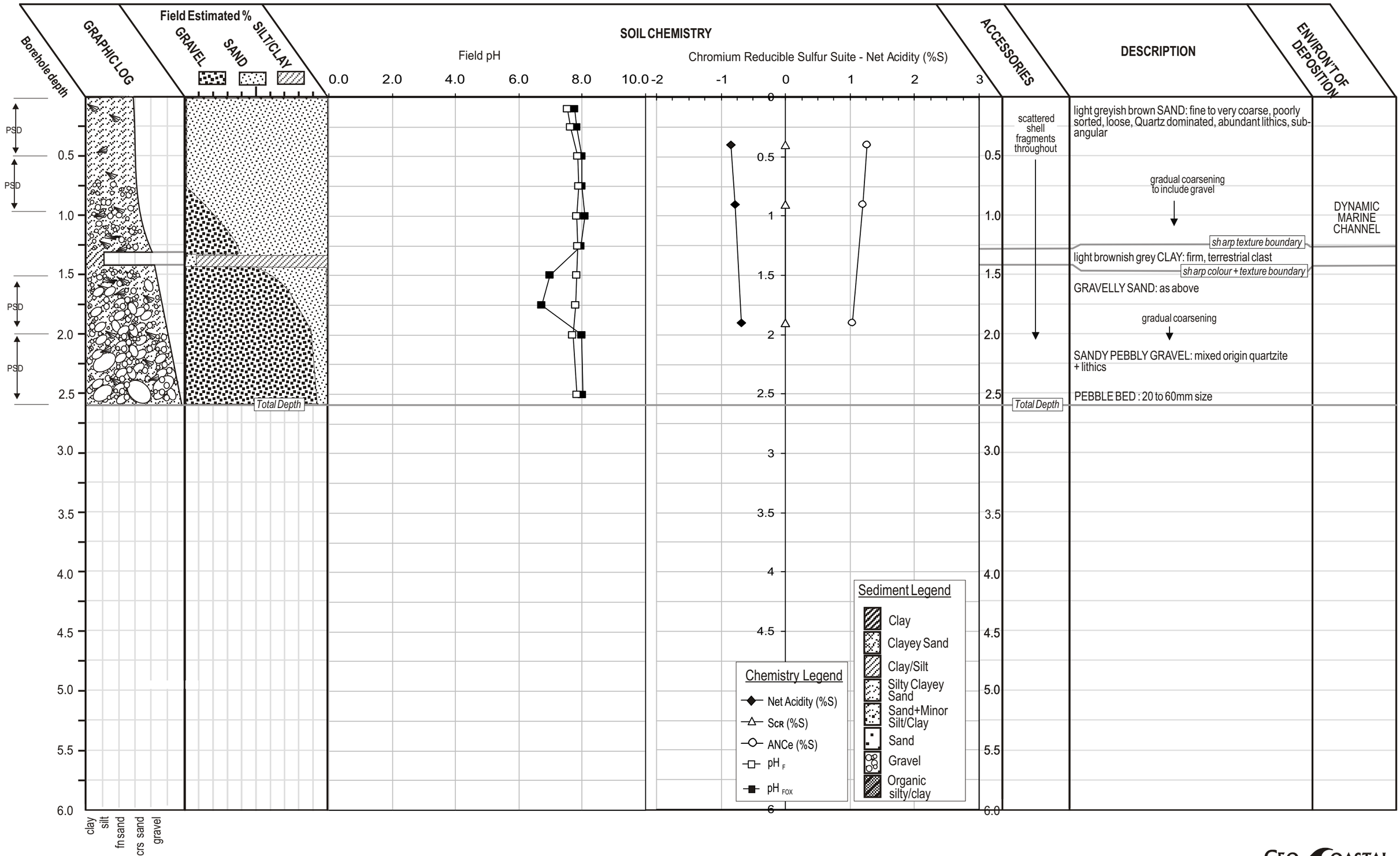
FEATURE: Marine Channel

DATE: 7/6/08

Seabed Core #11

LOCATION: Offshore Sthn Curtis Island, Qld
WGS 84 23° 48.067' Lat. 151° 13.197' Long. **Depth below LAT:** -12.45m

SAMPLING METHOD: GeoCoastal Pneumatic/Hydraulic Vibracorer



GEO COASTAL Australia

SITE: GC/GLNG OFF#12

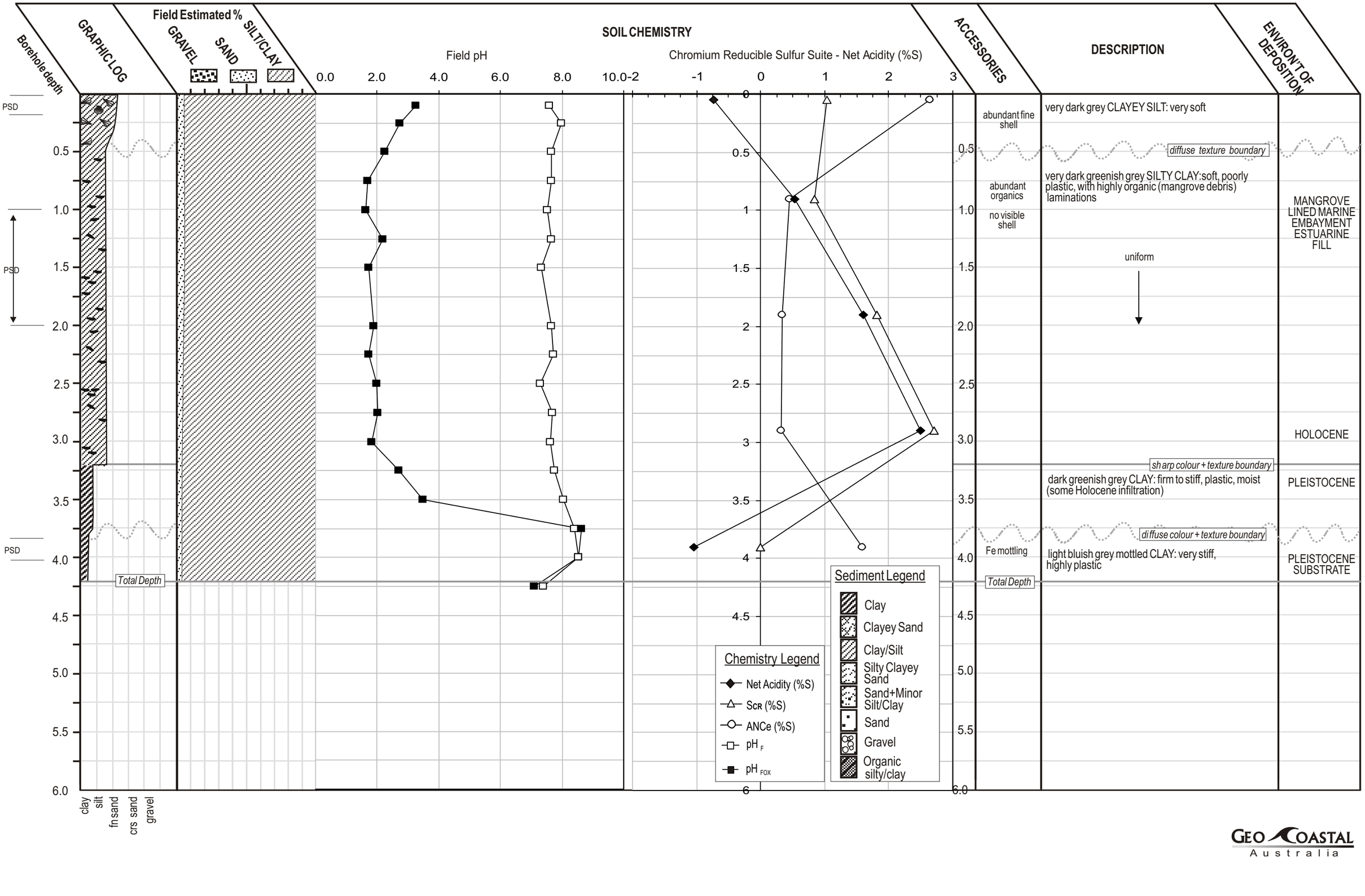
FEATURE: Shallow embayment

DATE: 8/6/08

Seabed Core #12

LOCATION: Offshore Sthn Curtis Island, Qld
WGS 84 23° 47.001' Lat. 151° 12.557' Long. **Depth below LAT:** 0m

SAMPLING METHOD: GeoCoastal Pneumatic/Hydraulic Vibracorer



GEO COASTAL Australia

Field pH Screening Data | Appendix B

Appendix B-1 Field pH tests of onshore cores (#1 to #84)

Note: The number of X's denotes the strength of the reaction to peroxide. 'X" is low (minor bubbling) and "XXXX" is violent with frothing and heat produced. An "!" denotes production of sulfurous gas as well.

BH01

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.15	7.41	XXXX!	0.1	0.7
7.93	8.01	XXXX!	0.25	-0.1
7.99	8.03	XXXX!	0.5	0.0
7.76	1.08	XXXX!	0.75	6.7
7.96	0.96	XX	1.0	7.0
7.71	1.15	XXXX!	1.25	6.6
7.76	1.22	XXXX!	1.5	6.5
7.86	1.31	XXXX!	1.75	6.6
7.83	1.55	XXXX!	2.0	6.3
7.68	1.44	XXXX!	2.25	6.2
7.76	1.83	XXXX!	2.5	5.9
7.84	2.04	XXXX!	2.8	5.8
8.08	3.33	XX	3	4.8

BH02

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.56	6.26	XX	0.1	1.3
4.45	1.41	XX	0.25	3.0
3.73	1.38	XXXX!	0.5	2.4
3.72	1.30	XXXX!	0.75	2.4
4.35	1.49	XXXX!	1.0	2.9
4.45	1.48	XXXX!	1.25	3.0
5.01	2.02	XX	1.5	3.0
6.43	5.26	XX	1.75	1.2
7.02	2.37	XX	2.0	4.7

BH03

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.33	4.15	XX!	0.1	3.2
7.12	1.38	XXXX!	0.25	5.7
6.69	1.42	XXXX!	0.5	5.3
6.51	1.28	XXXX!	0.75	5.2
6.90	1.46	XXXX!	1.0	5.4
6.70	1.48	XXXX!	1.25	5.2
7.15	1.65	XXXX!	1.5	5.5
7.23	1.52	XXXX!	1.75	5.7
7.50	1.55	XX	2.0	6.0

BH04

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.09	6.41	X	0.1	0.7
6.07	2.30	XXXX!	0.25	3.8
5.40	2.22	XXXX!	0.5	3.2
5.70	2.35	XXXX!	0.75	3.4
6.60	2.60	XXXX!	1.0	4.0
7.45	3.15	XXXX!	1.25	4.3
7.02	2.60	XXXX!	1.5	4.4
7.06	2.30	XXXX!	1.75	4.8
7.02	2.16	XXX	2.0	4.9

BH05

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
5.20	4.61	X	0.1	0.6
4.72	1.92	XX	0.25	2.8
5.27	2.17	XXXX!	0.5	3.1
5.29	2.38	XXXX!	0.75	2.9
6.55	2.29	XXXX!	1.0	4.3
7.27	2.35	XXXX!	1.25	4.9
7.26	2.75	XXXX!	1.5	4.5
7.60	4.35	XXXX!	1.75	3.3

BH06

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
6.74	6.92	X	0.1	-0.2
5.40	1.95	XXXX!	0.25	3.5
5.36	1.90	XXXX!	0.5	3.5
5.21	1.76	XXXX!	0.75	3.5
6.23	1.69	XXXX!	1.0	4.5
7.67	3.25	XXXX!	1.25	4.4
7.51	2.35	XXXX!	1.5	5.2
7.32	2.54	XXXX!	1.75	4.8
5.54	3.07	XXXX!	2.0	2.5

Field pH Screening Data | Appendix B

BH07

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
6.49	4.55	X	0.1	1.9
5.37	1.35	XXXX!	0.25	4.0
7.62	2.07	XXXX!	0.5	5.6
8.07	2.08	XXXX!	0.75	6.0
8.09	1.94	XXXX!	1.0	6.2
7.32	2.01	XXXX!	1.25	5.3
7.43	2.64	XXXX!	1.5	4.8
7.17	2.36	XXXX!	1.75	4.8
7.72	1.68	XXX!	2.0	6.0

BH08

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
6.85	6.40	XX	0.1	0.4
5.22	3.32	XX	0.25	1.9
5.62	2.34	XXXX!	0.5	3.3
6.77	3.75	XX	0.75	3.0
7.43	2.74	XX	1.0	4.7
7.50	1.88	XX	1.25	5.6
7.08	1.50	XX	1.5	5.6
7.60	2.95	XX	1.75	4.7
7.03	1.86	XXXX!	2.0	5.2

BH09

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.01	7.61	XXXX!	0.1	-0.6
5.20	1.55	XXXX!	0.25	3.7
5.00	1.85	XXXX!	0.5	3.2
5.78	1.64	XX	0.75	4.1
6.87	1.54	XXX	1.0	5.3
6.73	1.78	XXXX!	1.25	5.0
7.35	1.48	XXX	1.5	5.9
7.05	1.35	XXX	1.75	5.7
7.29	1.95	XXXX!	2.0	5.3

BH10

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
4.48	2.95	X	0.1	1.5
4.01	2.73	X	0.25	1.3
4.51	2.68	X	0.5	1.8
4.62	1.78	XXXX!	0.75	2.8
5.02	2.46	XXXX!	1.0	2.6
4.93	1.93	XXXX!	1.25	3.0
7.41	2.06	XXXX!	1.5	5.4
7.40	1.27	XXXX!	1.75	6.1
6.17	1.27	XXXX!	2.0	4.9

BH11

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
4.81	4.09	X	0.1	0.7
4.35	3.23	X	0.25	1.1
4.48	2.24	XXXX!	0.5	2.2
4.87	1.98	XXXX!	0.75	2.9
5.62	1.75	XXXX!	1.0	3.9
5.72	1.95	XXXX!	1.25	3.8
6.83	1.86	XXXX!	1.5	5.0
6.05	1.39	XXXX!	1.75	4.7
6.93	2.48	XXXX!	2.0	4.5

BH12

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
6.79	6.13	XX	0.1	0.7
5.04	3.20	X	0.25	1.8
4.61	1.61	XXXX!	0.5	3.0
5.67	2.03	XXXX!	0.75	3.6
6.03	2.46	XXXX!	1.0	3.6
5.76	2.19	XXXX!	1.25	3.6
5.85	2.81	XXXX!	1.5	3.0
5.42	2.58	XXXX!	1.75	2.8
6.25	2.88	XXXX!	2.0	3.4

BH13

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
4.33	1.64	X	0.1	2.7
4.91	1.48	XXXX!	0.25	3.4
5.76	4.84	XXX	0.5	0.9
5.02	1.69	XXXX!	0.75	3.3
5.62	1.46	XXXX!	1.0	4.2
6.01	1.56	XXXX!	1.25	4.5
6.19	1.52	XXXX!	1.5	4.7
7.55	1.84	XXXX!	1.75	5.7
6.47	1.41	XXX	2.0	5.1

BH14

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
6.91	7.30	XXXX!	0.1	-0.4
7.63	1.69	XXX	0.25	5.9
6.48	1.87	XXX	0.5	4.6
6.83	2.31	XXXX!	0.75	4.5
7.02	1.62	XXXX!	1.0	5.4
6.93	2.54	XXXX!	1.25	4.4
7.23	1.55	XXXX!	1.5	5.7
6.84	1.92	XXXX!	1.75	4.9
7.12	1.57	XXX	2.0	5.6

Field pH Screening Data | Appendix B

BH15

pH F	pH FOX	Reaction	Sample depth	pH drop
6.47	5.06	XXXX!	0.1	1.4
7.66	1.37	XXXX!	0.25	6.3
6.44	1.69	XXXX!	0.5	4.8
6.28	1.63	XXXX!	0.75	4.7
6.70	1.91	XXXX!	1.0	4.8
7.24	1.61	XXXX!	1.25	5.6
6.94	1.51	XXX	1.5	5.4
7.59	1.84	XXXX!	1.75	5.8
7.30	2.42	XXX	2.0	4.9

BH16

pH F	pH FOX	Reaction	Sample depth	pH drop
6.46	6.93	XXXX!	0.1	-0.5
7.34	1.86	XXXX!	0.25	5.5
7.18	1.55	XXXX!	0.5	5.6
6.57	2.18	XXXX!	0.75	4.4
6.49	2.65	XXXX!	1.0	3.8
6.22	2.14	XXXX!	1.25	4.1
7.02	5.98	XXX	1.5	1.0

BH17

pH F	pH FOX	Reaction	Sample depth	pH drop
6.63	3.12	XXXX!	0.1	3.5
4.56	1.26	XXXX!	0.25	3.3
5.51	2.06	XXXX!	0.5	3.5
5.81	2.27	XXXX!	0.75	3.5
6.91	1.51	XXXX!	1.0	5.4
8.23	2.64	XXXX!	1.25	5.6
7.61	6.20	X	1.5	1.4
7.73	5.07	X	1.75	2.6

BH18

pH F	pH FOX	Reaction	Sample depth	pH drop
5.35	6.74	XXXX!	0.1	-1.4
7.63	2.03	XXXX!	0.25	5.6
7.47	1.63	XXXX!	0.5	5.8
7.11	1.29	XXX	0.75	5.8
7.29	1.31	XXXX!	1.0	6.0
7.12	1.50	XXXX!	1.25	5.6
6.86	1.56	XXXX!	1.5	5.3
6.47	1.88	XXXX!	1.75	4.6

BH19

pH F	pH FOX	Reaction	Sample depth	pH drop
7.78	7.92	XXXX!	0.1	-0.1
7.56	1.32	XXXX!	0.25	6.2
7.46	1.67	XXXX!	0.5	5.8
7.49	1.83	XXXX!	0.75	5.7
6.54	1.60	XXXX!	1.0	4.9
6.16	2.06	XXXX!	1.25	4.1
6.15	4.07	XXX	1.5	2.1

BH20

pH F	pH FOX	Reaction	Sample depth	pH drop
5.71	6.35	XXXX!	0.1	-0.6
5.88	1.96	XXXX!	0.25	3.9
5.42	1.84	XXXX!	0.5	3.6
5.44	2.32	XXXX!	0.75	3.1
7.37	6.50	X	1.0	0.9

BH21

pH F	pH FOX	Reaction	Sample depth	pH drop
5.14	6.52	XXXX!	0.1	-1.4
5.98	1.60	XXXX!	0.25	4.4
6.31	1.88	XXXX!	0.5	4.4
5.40	1.63	XXXX!	0.75	3.8
5.07	2.54	XXXX!	1.0	2.5
4.94	4.71	XX	1.25	0.2
6.01	3.78	X	1.5	2.2

BH22

pH F	pH FOX	Reaction	Sample depth	pH drop
4.61	5.34	-	0.1	-0.7
5.70	1.75	XXXX!	0.25	4.0
4.27	1.55	XXXX!	0.5	2.7
3.29	1.68	XXXX!	0.75	1.6
5.88	1.67	XXXX!	1.0	4.2
5.85	1.58	XXX	1.25	4.3
5.60	4.65	X	1.5	0.9
6.43	6.03	X	1.75	0.4
6.65	5.51	X	2.0	1.1

Field pH Screening Data | Appendix B

BH23

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
5.50	6.23	XXX	0.1	-0.7
7.50	1.71	XXXX!	0.25	5.8
6.92	1.84	XXXX!	0.5	5.1
6.96	2.29	XXXX!	0.75	4.7
6.76	1.93	XXXX!	1.0	4.8
6.33	1.45	XXXX!	1.25	4.9
6.92	2.32	XXXX!	1.5	4.6
6.08	2.76	XXXX!	1.75	3.3
5.81	2.91	XXXX!	2.0	2.9

BH24

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
5.38	6.96	XXXX!	0.1	-1.6
6.01	1.62	XXXX!	0.25	4.4
5.86	1.76	XXXX!	0.5	4.1
6.18	1.53	XXXX!	0.75	4.7
6.21	1.72	XXXX!	1.0	4.5
6.24	1.84	XXXX!	1.25	4.4
5.73	1.95	XXXX!	1.5	3.8
5.88	4.72	XXXX!	1.75	1.2
6.24	6.70	XXXX!	2.0	-0.5

BH25

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
5.50	6.05	XXXX!	0.1	-0.6
7.06	1.65	XXXX!	0.25	5.4
6.25	1.44	XXXX!	0.5	4.8
5.70	1.58	XXXX!	0.75	4.1

BH26

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
6.43	6.23	XXXX!	0.1	0.2
6.47	1.53	XXXX!	0.25	4.9
6.24	1.84	XXXX!	0.5	4.4
6.37	1.96	XXXX!	0.75	4.4
6.04	1.95	XXXX!	1.0	4.1

BH27

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
5.96	6.33	XXXX!	0.1	-0.4
5.91	1.72	XXXX!	0.25	4.2
5.42	1.73	XXXX!	0.5	3.7

BH28

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
4.03	2.40	X	0.1	1.6
6.54	1.78	XXXX!	0.25	4.8
5.50	1.40	XXXX!	0.5	4.1
5.01	1.85	XXXX!	0.75	3.2
5.70	2.15	XXXX!	1.0	3.6

BH30

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
5.49	5.42	XX	0.1	0.1
6.68	5.13	XXXX!	0.25	1.6

BH31

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
4.40	3.46	X	0.1	0.9
5.03	1.64	XXXX	0.25	3.4

BH32

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
8.10	5.78	X	0.1	2.3
8.11	1.75	XX	0.25	6.4
7.59	1.22	XXX	0.5	6.4
7.67	1.90	XXXX!	0.75	5.8
7.49	1.62	XXXX!	1.0	5.9
8.61	2.14	XXXX!	1.25	6.5
8.56	2.16	XXXX!	1.5	6.4
9.06	2.25	XXXX!	1.75	6.8

BH33

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.50	5.79	XX	0.1	1.7
8.35	3.04	XX	0.25	5.3
7.87	1.59	XXXX!	0.5	6.3
7.84	1.64	XXXX!	0.75	6.2
9.06	1.75	XXXX!	1.0	7.3
9.26	5.91	XX	1.25	3.4
9.42	2.45	XX	1.5	7.0
9.46	6.50	XX	1.75	3.0

Field pH Screening Data | Appendix B

BH34

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
4.95	5.01	X	0.1	-0.1
4.69	1.51	XXXX!	0.25	3.2
5.12	1.58	XXXX!	0.5	3.5
8.71	6.82	XX	0.75	1.9
9.26	6.73	XX	1.0	2.5
9.52	6.74	XX	1.25	2.8

BH35

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.91	5.43	X	0.1	2.5
8.43	3.22	XX	0.25	5.2
7.74	1.86	XXXX!	0.5	5.9
7.69	2.11	XXXX!	0.75	5.6
7.79	1.62	XXXX!	1.0	6.2
7.40	1.65	XXXX!	1.25	5.8
7.85	1.71	XXXX!	1.5	6.1
8.36	1.59	XXXX!	1.75	6.8
9.28	6.65	X	2.0	2.6
9.90	6.69	X	2.25	3.2

BH36

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.94	6.11	XX	0.1	1.8
7.75	1.59	XXX!	0.25	6.2
7.35	1.43	XXXX!	0.5	5.9
7.11	1.49	XXXX!	0.75	5.6
6.77	1.47	XXXX!	1.0	5.3
7.79	1.52	XXXX!	1.25	6.3
7.53	6.02	X	1.5	1.5
7.77	7.81	XXXX!	0.1	0.0
7.43	1.06	XXXX!	0.25	6.4
7.03	1.26	XXXX!	0.5	5.8
6.88	1.23	XXXX!	0.75	5.7
6.91	1.45	XXXX!	1.0	5.5
6.56	2.70	X	1.25	3.9
6.74	3.28	X	1.5	3.5

BH37

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.31	3.65	XX	0.1	3.7
6.85	1.33	XXXX!	0.25	5.5
7.06	1.49	XXXX!	0.5	5.6
7.38	1.37	XXXX!	0.75	6.0
8.33	6.15	X	1.0	2.2

BH38

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.80	2.44	XXX	0.1	5.4
5.73	1.19	XXXX!	0.25	4.5
6.29	1.09	XXXX!	0.5	5.2
6.43	1.15	XXXX!	0.75	5.3
6.21	1.71	X	1.0	4.5
6.32	5.13	X	1.25	1.2

BH39

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.77	7.81	XXXX!	0.1	0.0
7.43	1.06	XXXX!	0.25	6.4
7.03	1.26	XXXX!	0.5	5.8
6.88	1.23	XXXX!	0.75	5.7
6.91	1.45	XXXX!	1.0	5.5
6.56	2.70	X	1.25	3.9
6.74	3.28	X	1.5	3.4

BH40

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.67	3.53	XX	0.1	4.1
6.69	1.13	XXXX!	0.25	5.6
6.94	1.35	XXXX!	0.5	5.6
7.72	1.63	XXXX!	0.75	6.1
9.03	2.04	X	1.0	7.0
8.97	6.23	X	1.25	2.7

BH41

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.34	1.62	X	0.1	5.7
6.84	1.27	X	0.25	5.6
6.89	1.43	X	0.5	5.5
6.60	1.17	XXXX!	0.75	5.4
6.86	1.76	XXXX!	1.0	5.1
6.92	1.52	XX	1.25	5.4
6.85	1.01	XXXX!	1.5	5.8
6.77	1.91	XXXX!	1.75	4.9
7.22	1.83	XXXX!	2.0	5.4
6.91	5.06	X	2.25	1.8

Field pH Screening Data | Appendix B

BH42

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.26	6.06	XXX	0.1	1.2
7.58	1.41	XXXX!	0.25	6.2
6.91	1.79	XXXX!	0.5	5.1
7.13	1.61	XXXX!	0.75	5.5
6.94	1.80	XXXX!	1.0	5.1
7.34	2.19	XX	1.25	5.2
7.44	2.18	XX	1.5	5.3
7.58	2.36	XX	1.75	5.2
7.41	2.03	XXXX	2.0	5.4
6.93	1.68	XX	2.25	5.2
6.80	1.69	XXXX	2.5	5.1
6.89	1.47	X	2.8	5.4
6.77	4.27	X	3	2.5

BH43

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
4.72	3.80	X	0.1	0.9
5.16	4.06	X	0.25	1.1
4.65	1.92	X	0.5	2.7
4.34	3.18	X	0.75	1.2
4.26	3.67	X	1.0	0.6
4.38	2.73	X	1.25	1.7
4.80	1.42	XXXX!	1.5	3.4
4.20	1.54	XXXX!	1.75	2.7
4.63	1.44	XXXX!	2.0	3.2
6.14	1.28	XX	2.25	5.2
8.29	6.37	XX	2.5	5.1
8.73	2.61	XX	2.8	5.4
8.53	2.42	XXX	3	2.5

BH44

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.49	6.99	XXX!	0.1	1.5
8.63	2.81	XX	0.25	5.8
8.51	1.61	XX	0.5	6.9
8.32	1.68	XXXX!	0.75	6.6
7.86	1.30	XX	1.0	6.6
8.74	1.99	XXXX!	1.25	6.8
7.72	1.67	XXXX!	1.5	6.1
8.52	1.74	XX	1.75	6.8
8.71	2.06	XXXX!	2.0	6.7
8.26	1.84	XX	2.25	5.2
8.48	2.25	XXXX!	2.5	5.1
8.75	1.91	XXXX!	2.8	5.4
7.82	1.44	XXXX!	3	2.5

BH45

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.37	8.07	XXXX!	0.1	0.3
8.61	5.29	XXX!	0.25	3.3
7.94	1.44	XXXX!	0.5	6.5
8.14	1.10	XXX	0.75	7.0
8.20	1.28	XX	1.0	6.9
8.15	1.16	XXX	1.25	7.0
7.98	1.24	XX	1.5	6.7
8.27	1.17	XX	1.75	7.1
8.06	1.77	XXXX!	2.0	6.3
8.47	2.11	XXXX!	2.25	5.2
8.28	2.32	XXXX!	2.5	5.1
8.36	2.02	XXXX!	2.8	5.4
8.08	1.19	XX	3	2.5

BH46

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.36	8.53	XXX!	0.1	-0.2
8.97	1.68	XXXX!	0.25	7.3
8.14	1.65	XXXX!	0.5	6.5
8.07	1.22	XXX	0.75	6.9
8.28	1.15	XX!	1.0	7.1
8.15	1.20	XX	1.25	7.0
8.14	1.21	XX	1.5	6.9
5.91	1.61	XXXX!	1.75	4.3
8.14	1.41	XXXX!	2.0	6.7
8.09	1.92	XXXX!	2.25	5.2
8.19	2.22	XXXX!	2.5	5.1
8.08	5.62	XX	2.8	5.4
7.77	1.62	XXXX!	3	2.5

BH47

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.42	6.32	XXX!	XXX!	2.1
8.12	6.36	XX!	XX!	1.8
9.22	4.27	XX	XX	5.0
8.37	1.13	XX	XX	7.2
8.04	1.34	XXXX!	XXXX!	6.7
8.09	1.53	XXXX!	XXXX!	6.6
8.04	1.58	XXXX!	XXXX!	6.5
7.94	1.73	XXXX!	XXXX!	6.2
7.88	1.54	XXXX!	XXXX!	6.3
7.93	1.70	XXXX!	XXXX!	5.2
8.22	1.91	XXXX!	XXXX!	5.1
8.15	1.64	XX	XX	5.4
8.07	1.99	XX	XX	2.5

Field pH Screening Data | Appendix B

BH48

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.87	6.17	XX	0.1	1.7
8.61	3.49	XX	0.25	5.1
8.33	1.12	XX	0.5	7.2
8.30	1.04	XX	0.75	7.3
8.02	0.95	XX	1.0	7.1
8.13	1.18	XX	1.25	7.0
8.21	1.39	XXX!	1.5	6.8
8.07	1.54	XXXX!	1.75	6.5
7.70	1.39	XXXX!	2.0	6.3
7.87	1.31	XXXX!	2.25	5.2
7.80	1.23	XXXX!	2.5	5.1
7.49	1.22	XXXX!	2.8	5.4
7.69	1.63	XXXX!	3	2.5

BH49

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
6.94	6.07	XXXX!	0.1	0.9
7.58	0.95	XX	0.25	6.6
8.05	1.21	XX	0.5	6.8
7.97	0.97	XX	0.75	7.0
8.10	0.96	XXX	1.0	7.1
8.03	1.57	XXXX!	1.25	6.5
7.94	1.39	XXXX!	1.5	6.6
8.09	1.58	XXXX!	1.75	6.5
7.88	1.59	XXXX!	2.0	6.3
7.80	1.42	XXXX!	2.25	5.2
7.96	2.05	XXXX!	2.5	5.1
7.82	1.44	XXXX!	2.8	5.4
7.98	2.61	XXXX!	3	2.5

BH50

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
4.04	2.72	X	0.1	1.3
7.89	1.36	XXXX!	0.25	6.5
7.61	1.35	XXXX!	0.5	6.3
7.74	1.19	XXXX!	0.75	6.6
7.77	1.35	XXXX!	1.0	6.4
7.76	1.39	XXXX!	1.25	6.4
7.92	1.27	XXXX!	1.5	6.7
7.82	1.62	XXXX!	1.75	6.2
7.64	1.53	XXXX!	2.0	6.1
7.52	1.36	XXXX!	2.25	5.2
7.71	1.48	XXXX!	2.5	5.1
7.88	1.95	XXXX!	2.8	5.4
7.74	1.74	XXXX!	3	2.5

BH51

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
5.09	2.44	XX	0.1	2.7
7.73	1.26	XXXX!	0.25	6.5
7.90	1.34	XXXX!	0.5	6.6
7.88	1.46	XXXX!	0.75	6.4
7.94	1.34	XXXX!	1.0	6.6
7.89	1.32	XXXX!	1.25	6.6
7.96	1.52	XXXX!	1.5	6.4
7.75	1.39	XXXX!	1.75	6.4
7.77	1.38	XXXX!	2.0	6.4
7.65	1.00	XX	2.25	5.2
7.64	1.43	XXXX!	2.5	5.1
7.83	2.10	XXXX!	2.8	5.4
7.88	1.74	XXXX!	3	2.5

BH52

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
8.04	7.33	XXXX!	0.1	0.7
7.54	1.05	XXXX!	0.25	6.5
8.62	5.74	XX	0.5	2.9
8.17	0.83	XXX	0.75	7.3
7.69	7.49	XX	1.0	0.2
7.66	1.02	XX	1.25	6.6
7.81	1.16	XXXX!	1.5	6.7
7.62	1.28	XXXX!	1.75	6.3
7.86	1.17	XXXX!	2.0	6.7
7.89	1.04	XX	2.25	5.2
7.85	1.51	XXXX!	2.5	5.1
7.97	1.93	XXXX!	2.8	5.4
7.71	1.70	XXXX!	3	2.5

BH53

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
8.09	6.73	XXX!	0.1	1.4
7.61	5.98	XX!	0.25	1.6
8.47	1.38	XXXX!	0.5	7.1
8.02	1.41	XXXX!	0.75	6.6
7.61	1.42	XXXX!	1.0	6.2
7.79	1.02	XXX!	1.25	6.8
7.94	1.46	XXXX!	1.5	6.5
7.67	1.34	XXXX!	1.75	6.3
7.90	1.29	XXXX!	2.0	6.6
7.72	1.26	XXXX!	2.25	5.2
7.79	1.25	XXXX!	2.5	5.1
7.83	2.61	XXXX!	2.8	5.4
7.82	1.84	XXXX!	3	2.5

Field pH Screening Data | Appendix B

BH54

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.15	7.41	XXXX!	0.1	0.7
7.93	8.01	XXXX!	0.25	-0.1
7.99	8.03	XXXX!	0.5	0.0
7.76	1.08	XXXX!	0.75	6.7
7.96	0.96	XX	1.0	7.0
7.71	1.15	XXXX!	1.25	6.6
7.76	1.22	XXXX!	1.5	6.5
7.86	1.31	XXXX!	1.75	6.6
7.83	1.55	XXXX!	2.0	6.3
7.68	1.44	XXXX!	2.25	5.2
7.76	1.83	XXXX!	2.5	5.1
7.84	2.04	XXXX!	2.8	5.4
8.08	3.33	XX	3	2.5

Field pH Screening Data | Appendix B

Appendix B-2 Field pH tests of offshore cores (#Off1 to #Off12)

Off #1

pH_F	pH_{FOX}	Sample depth	Reaction	pH drop
8.07	6.64	0.1	xx	1.43
8.26	6.41	0.25	xxx	1.85
8.41	6.64	0.5	xxxx!	1.77
8.45	6.43	0.75	xxxx!	2.02
8.37	6.57	1.0	xxxx!	1.80
8.40	6.08	1.25	xxxx!	2.32
8.39	6.11	1.5	xxxx!	2.28
8.36	5.60	1.75	xx	2.76
8.32	6.90	2.0	xx	1.42
8.45	5.40	2.25	xxx!	3.05
8.33	4.30	2.5	-	4.03
8.02	2.93	2.75	xxxx!	5.09
8.09	3.30	3.0	-	4.79
8.11	4.26	3.25	xxx!	3.85
7.95	7.17	3.5	x	0.78
8.55	8.87	3.75	x	-0.32
8.15	7.76	4.0	x	0.39
7.66	6.66	4.25	-	1.00

Off #5

pH_F	pH_{FOX}	Sample depth	Reaction	pH drop
6.94	6.43	0.1	xxx	0.51
7.92	5.97	0.25	xxx	1.95
7.74	5.82	0.5	xxx	1.92
7.50	6.08	0.75	xxxx	1.42
7.71	5.66	1.0	xxxx	2.05
7.81	4.64	1.25	xxxx	3.17
7.19	5.13	1.5	xxxx!	2.06
7.50	3.88	1.75	xxxx!	3.62
7.24	3.62	2.0	xxx	3.62
7.25	3.90	2.25	xxx	3.35
7.38	5.91	2.5	xxx	1.47
7.32	4.49	2.75	xxx	2.83
7.49	6.18	3.0	x	1.31
7.14	6.65	3.25	x	0.49
7.42	6.72	3.5	x	0.70
7.22	6.43	3.75	x	0.79
7.27	6.68	4.0	x	0.59
7.46	6.87	4.3	x	0.59
7.11	6.32	4.5	xx	0.79
7.14	6.89	4.75	x	0.25
7.64	5.06	5.0	x	2.58
7.41	4.37	5.25	x	3.04
7.13	5.22	5.5	x	1.91
7.02	6.15	5.75	-	0.87
7.43	6.34	6	-	1.09
7.47	5.72	6.25	-	1.75
7.23	5.03	6.5	-	2.20

Off #3

pH_F	pH_{FOX}	Sample depth	Reaction	pH drop
8.10	6.78	0.25	XXX	1.32
8.27	6.84	0.5	XXX	1.43
8.04	7.15	0.75	XX	0.89
8.16	7.09	1.0	XX	1.07
8.03	7.22	1.25	XX	0.81
8.03	6.71	1.5	XXX	1.32
8.19	6.92	1.75	XXX	1.27
8.06	6.64	2.0	XXX	1.42
8.20	6.60	2.25	XXX	1.60
8.16	6.54	2.5	XXX	1.62
8.38	6.61	2.75	XXX	1.77
8.12	6.71	3.0	XXX	1.41
8.16	6.92	3.25	XXX	1.24
8.31	6.98	3.5	XXX	1.33
8.29	6.97	3.75	XXX	1.32
8.35	6.92	4.0	XXX	1.43
8.05	6.59	4.5		1.46
8.17	4.32	4.75	XXX	3.85
8.01	5.20	5.0	XXX	2.81
7.44	3.90	5.25	XXX	3.54
7.73	6.92	5.5	XXX	0.81
7.84	5.83	5.75	XX	2.01
7.99	8.18	6.5	XX	-0.19

Off #6

pH_F	pH_{FOX}	Sample depth	Reaction	pH drop
7.13	6.61	0.1	xxxx	0.52
7.98	6.41	0.25	xxxx	1.57
8.28	6.19	0.5	x	2.09
7.46	5.99	0.75	xxxx	1.47
7.54	6.56	1	xx	0.98
7.68	6.12	1.25	xxxx	1.56
7.56	3.86	1.5	xx	3.70
7.34	5.77	1.75	xxxx	1.57
6.97	5.68	2	xxxx	1.29
6.97	6.0	2.25	xxxx	0.99
7.11	5.97	2.5	xxxx	1.14
7.48	6.21	2.75	xxxx	1.27
7.23	6.73	3	xx	0.50
7.65	6.7	3.25	xx	0.93
7.58	5.86	3.5	xxx	1.72
7.20	6.85	3.75	xx	0.35
7.15	6.45	4	-	0.70
7.25	6.38	4.25	-	0.87
7.26	6.85	5.00	-	0.41
7.16	7.14	5.75	-	0.02

Field pH Screening Data | Appendix B

Off #9

pH $_F$	pH $_{FOX}$	Sample depth	Reaction	pH drop
7.49	8.35	0.1	xxx!	-0.86
8.09	8.31	0.25	xxx!	-0.22
8.17	8.47	0.5	xxx!	-0.30
8.26	8.44	0.75	xxx!	-0.18
8.10	8.22	1	xxx!	-0.12
7.97	8.16	1.25	x	-0.19
8.23	7.38	1.5	x	0.85
8.44	8.74	1.75	xxx!	-0.30
8.21	7.6	2	x!	0.61
8.46	8.1	2.25	xx!	0.35
8.19	6.92	2.5	-	1.27
8.22	8.25	2.75	xxx!	-0.03
8.19	6.97	3	-	1.22
8.04	7.4	3.25	-	0.66
8.21	8.28	3.5	xx!	-0.07
8.26	6.98	3.75	-	1.28
8.11	6.99	4	-	1.12
8.35	7.51	4.25	-	0.84
8.17	8.44	4.5	xxx!	-0.27
8.09	8.20	4.75	xxx!	-0.11
8.09	6.89	5	-	1.20

Off #11

pH $_F$	pH $_{FOX}$	Sample depth	Reaction	pH drop
7.52	7.75	0.1	xxx!	-0.23
7.62	7.84	0.25	xxx!	-0.22
7.85	7.98	0.5	xx!	-0.13
7.89	8.00	0.75	xxx	-0.11
7.84	8.08	1	x	-0.24
7.85	7.97	1.25	xx!	-0.12
7.83	6.97	1.5	-	0.86
7.78	6.72	1.75	-	1.06
7.69	7.99	2	xxx!	-0.30
7.82	8.01	2.5	-	-0.19

Off #10

pH $_F$	pH $_{FOX}$	Sample depth	Reaction	pH drop
7.57	8.35	0.1	xx!	-0.78
7.52	8.31	0.25	xx!	-0.79
7.85	8.47	0.5	xx	-0.62
7.64	8.44	0.75	x	-0.80
7.86	8.22	1	xx!	-0.36
7.57	8.16	1.25	x	-0.59
7.75	7.38	1.5	xxx!	0.37
7.91	8.74	1.75	xxx!	-0.83
8.12	7.60	2	x	0.52
7.79	8.11	2.25	xxx	-0.32
7.88	6.92	2.5	-	0.96

Off #12

pH $_F$	pH $_{FOX}$	Sample depth	Reaction	pH drop
7.58	3.27	0.1	xxx!	4.31
7.98	2.74	0.25	xxx!	5.24
7.65	2.24	0.5	xx	5.41
7.65	1.70	0.75	xxxx!	5.95
7.52	1.62	1	xxxx!	5.90
7.64	2.18	1.25	xxxx!	5.46
7.34	1.72	1.5	xxxx!	5.62
7.66	1.9	2	xxx!	5.76
7.71	1.7	2.25	xxxx!	5.98
7.29	1.98	2.5	xxxx!	5.31
7.68	2.01	2.75	xx	5.67
7.62	1.82	3	xxxx!	5.80
7.75	2.7	3.25	xxx!	5.04
8.05	3.48	3.5	x	4.57
8.40	8.63	3.75	xx	-0.23
8.53	8.52	4	xxx!	0.01
7.39	7.10	4.25	-	0.29

Laboratory Certificates and Chain of Custody Documentation

Appendix C

C.1 Laboratory Certificates of Analyses

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0810932**	Page	: 1 of 19
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG ONAUG08	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: 08/08GLNG/onASS	Date Samples Received	: 14-AUG-2008
Sampler	: ----	Issue Date	: 26-AUG-2008
Site	: ----		
		No. of samples received	: 81
Quote number	: BN/248/07	No. of samples analysed	: 81

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jessica Janson	Supervisor - Acid Sulphate Soils	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #1 0-0.1m	GC/GLNG ON #1 0.3-0.5m	GC/GLNG ON #1 1.5-1.7m	GC/GLNG ON #2 0-0.1m	GC/GLNG ON #2 0.3-0.5m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-001	EB0810932-002	EB0810932-003	EB0810932-004	EB0810932-005
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.6	4.2	5.4	7.0	4.5
Titratable Actual Acidity (23F)	----	2	mole H+ / t	36	110	8	<2	47
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.06	0.18	<0.02	<0.02	0.08
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	0.15	2.14	1.24	0.21	0.82
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	93	1340	774	133	512
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	----	----	1.16	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	----	----	233	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	----	----	0.37	----
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	0.03	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	16	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	0.03	----	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	0.31	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.35	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.21	2.34	1.26	<0.02	0.90
Net Acidity (acidity units)	----	10	mole H+ / t	130	1460	783	<10	559
Liming Rate	----	1	kg CaCO3/t	10	110	59	<1	42

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #2 1.3-1.5m	GC/GLNG ON #2 1.8-2.0m	GC/GLNG ON #3 0-0.1m	GC/GLNG ON #3 0.8-1.0m	GC/GLNG ON #3 1.8-2.0m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-006	EB0810932-007	EB0810932-008	EB0810932-009	EB0810932-010
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.5**	**6.5**	**7.6**	**4.8**	**6.0**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**44**	<2	<2	**39**	**6**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.07**	<0.02	<0.02	**0.06**	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**2.55**	**0.21**	**0.15**	**4.26**	**1.21**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**1590**	**133**	**92**	**2660**	**756**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	**0.83**	**2.07**	----	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	**165**	**414**	----	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	**0.26**	**0.66**	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**2.62**	**0.04**	<0.02	**4.32**	**1.22**
Net Acidity (acidity units)	----	10	mole H+ / t	**1630**	**23**	<10	**2690**	**762**
Liming Rate	----	1	kg CaCO3/t	**122**	**2**	<1	**202**	**57**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #4 0.3-0.5m	GC/GLNG ON #4 1.3-1.5m	GC/GLNG ON #4 1.8-2.0m	GC/GLNG ON #5 0-0.1m	GC/GLNG ON #5 1.3-1.5m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-011	EB0810932-012	EB0810932-013	EB0810932-014	EB0810932-015
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.0	4.3	4.9	4.4	4.4
Titratable Actual Acidity (23F)	----	2	mole H+ / t	96	71	36	59	52
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.15	0.11	0.06	0.09	0.08
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	2.24	2.54	2.84	0.80	4.26
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1400	1590	1770	497	2660
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	0.04	<0.02	----	0.10	0.03
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	21	<10	----	50	14
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	0.03	<0.02	----	0.08	0.02
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.47	0.51	----	0.28	0.52
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.52	0.51	----	0.38	0.54
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	2.43	2.66	2.90	0.97	4.37
Net Acidity (acidity units)	----	10	mole H+ / t	1510	1660	1810	606	2720
Liming Rate	----	1	kg CaCO3/t	114	124	136	45	204

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #5 1.8-1.9m	GC/GLNG ON #6 0.3-0.5m	GC/GLNG ON #6 0.8-1.0m	GC/GLNG ON #6 1.8-2.0m	GC/GLNG ON #7 0.3-0.5m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-016	EB0810932-017	EB0810932-018	EB0810932-019	EB0810932-020
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**8.6**	**4.4**	**7.4**	**6.9**	**5.0**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	**62**	<2	<2	**34**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	**0.10**	<0.02	<0.02	**0.05**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.62**	**1.53**	**0.88**	**0.71**	**1.62**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**390**	**957**	**552**	**443**	**1010**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**13.2**	----	**1.25**	**1.03**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**2630**	----	**250**	**206**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**4.22**	----	**0.40**	**0.33**	----
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	<0.02	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	<10	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	<0.02	----	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	**0.38**	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	**0.38**	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	**1.63**	**0.62**	**0.49**	**1.68**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	**1020**	**386**	**306**	**1040**
Liming Rate	----	1	kg CaCO3/t	<1	**76**	**29**	**23**	**78**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #7 1.3-1.5m	GC/GLNG ON #7 1.8-2.0m	GC/GLNG ON #8 0-0.1m	GC/GLNG ON #8 0.8-1.0m	GC/GLNG ON #8 1.8-2.0m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-021	EB0810932-022	EB0810932-023	EB0810932-024	EB0810932-025
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.0**	**5.2**	**7.8**	**6.8**	**6.3**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**8**	**38**	<2	<2	**6**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	**0.06**	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**1.97**	**1.83**	**0.20**	**0.97**	**1.21**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**1230**	**1140**	**125**	**607**	**754**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	----	**1.59**	**0.88**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	----	**317**	**175**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	----	**0.51**	**0.28**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**1.98**	**1.89**	<0.02	**0.78**	**1.22**
Net Acidity (acidity units)	----	10	mole H+ / t	**1240**	**1180**	<10	**490**	**760**
Liming Rate	----	1	kg CaCO3/t	**93**	**88**	<1	**37**	**57**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #9 0.3-0.5m	GC/GLNG ON #9 0.8-1.0m	GC/GLNG ON #9 1.8-2.0m	GC/GLNG ON #10 0-0.1m	GC/GLNG ON #10 0.3-0.5m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-026	EB0810932-027	EB0810932-028	EB0810932-029	EB0810932-030
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	4.5	4.3	4.5	4.4	4.4
Titratable Actual Acidity (23F)	----	2	mole H+ / t	52	96	33	35	47
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.08	0.15	0.05	0.06	0.08
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	2.12	2.72	2.98	0.08	0.89
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1320	1700	1860	48	554
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	0.02	----	0.03	0.04
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	12	----	15	18
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	<0.02	----	0.02	0.03
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	0.59	----	0.29	0.40
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.61	----	0.32	0.44
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	2.20	2.89	3.03	0.16	0.99
Net Acidity (acidity units)	----	10	mole H+ / t	1380	1800	1890	99	619
Liming Rate	----	1	kg CaCO3/t	103	135	142	7	46

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #10 1.3-1.5m	GC/GLNG ON #11 0-0.1m	GC/GLNG ON #11 0.8-1.0m	GC/GLNG ON #11 2.0-2.2m	GC/GLNG ON #12 0.3-0.5m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-031	EB0810932-032	EB0810932-033	EB0810932-034	EB0810932-035
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.1**	**5.0**	**4.4**	**6.6**	**4.2**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**79**	**30**	**71**	<2	**78**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.13**	**0.05**	**0.11**	<0.02	**0.12**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**2.36**	**0.07**	**2.92**	**0.21**	**2.70**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**1470**	**46**	**1820**	**130**	**1680**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	----	----	**1.17**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	----	----	**234**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	----	----	**0.37**	----
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	<0.02	----	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	<10	----	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	<0.02	----	<0.02
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.56**	----	**0.54**	----	**0.41**
HCl Extractable Sulfur (20Be)	----	0.02	% S	**0.54**	----	**0.56**	----	**0.41**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**2.47**	**0.12**	**3.04**	<0.02	**2.82**
Net Acidity (acidity units)	----	10	mole H+ / t	**1540**	**76**	**1900**	<10	**1760**
Liming Rate	----	1	kg CaCO3/t	**115**	**6**	**142**	<1	**132**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #12 1.3-1.5m	GC/GLNG ON #12 1.8-2.0m	GC/GLNG ON #13 0-0.1m	GC/GLNG ON #13 0.4-0.6m	GC/GLNG ON #13 1.8-2.0m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-036	EB0810932-037	EB0810932-038	EB0810932-039	EB0810932-040
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**5.1**	**4.7**	**4.5**	**8.4**	**5.4**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**25**	**36**	**47**	<2	**11**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.04**	**0.06**	**0.08**	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**2.82**	**2.33**	**2.04**	**0.19**	**0.98**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**1760**	**1450**	**1270**	**121**	**610**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	----	----	**4.42**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	----	----	**882**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	----	----	**1.41**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**2.86**	**2.38**	**2.11**	<0.02	**1.00**
Net Acidity (acidity units)	----	10	mole H+ / t	**1780**	**1490**	**1320**	<10	**621**
Liming Rate	----	1	kg CaCO3/t	**134**	**112**	**99**	<1	**47**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #14 0-0.1m	GC/GLNG ON #14 0.3-0.5m	GC/GLNG ON #14 1.3-1.5m	GC/GLNG ON #15 0-0.1m	GC/GLNG ON #15 0.8-1.0m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-041	EB0810932-042	EB0810932-043	EB0810932-044	EB0810932-045
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**8.6**	**5.9**	**5.0**	**7.7**	**4.5**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	**8**	**28**	<2	**46**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	**0.04**	<0.02	**0.07**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	**3.81**	**3.68**	<0.02	**1.51**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	**2370**	**2290**	<10	**942**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**4.91**	----	----	**0.96**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**982**	----	----	**191**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**1.57**	----	----	**0.31**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	**3.82**	**3.72**	<0.02	**1.58**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	**2380**	**2320**	<10	**988**
Liming Rate	----	1	kg CaCO3/t	<1	**179**	**174**	<1	**74**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #15 1.8-2.0m	GC/GLNG ON #16 0-0.1m	GC/GLNG ON #16 0.8-1.0m	GC/GLNG ON #16 1.3-1.4m	GC/GLNG ON #17 0-0.1m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-046	EB0810932-047	EB0810932-048	EB0810932-049	EB0810932-050
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.4**	**8.5**	**5.2**	**7.3**	**7.4**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	**23**	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	**0.04**	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**1.33**	**0.04**	**2.75**	**0.19**	**0.68**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**831**	**24**	**1720**	**116**	**421**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	**2.07**	----	**0.54**	**1.56**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	**413**	----	**107**	**312**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	**0.66**	----	**0.17**	**0.50**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**1.33**	<0.02	**2.79**	**0.07**	**0.34**
Net Acidity (acidity units)	----	10	mole H+ / t	**831**	<10	**1740**	**44**	**214**
Liming Rate	----	1	kg CaCO3/t	**62**	<1	**131**	**3**	**16**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #17 0.3-0.5m	GC/GLNG ON #17 1.5-1.7m	GC/GLNG ON #18 0-0.1m	GC/GLNG ON #18 1.3-1.5m	GC/GLNG ON #19 0-0.1m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-051	EB0810932-052	EB0810932-053	EB0810932-054	EB0810932-055
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.1**	**7.6**	**8.8**	**5.4**	**8.6**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**97**	<2	<2	**22**	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.16**	<0.02	<0.02	**0.03**	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**2.60**	<0.02	<0.02	**3.88**	<0.02
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**1620**	<10	<10	**2420**	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	**0.79**	**1.40**	----	**1.35**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	**157**	**280**	----	**270**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	**0.25**	**0.45**	----	**0.43**
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.37**	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	**0.38**	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**2.76**	<0.02	<0.02	**3.91**	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	**1720**	<10	<10	**2440**	<10
Liming Rate	----	1	kg CaCO3/t	**129**	<1	<1	**183**	<1

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #19 0.3-0.5m	GC/GLNG ON #19 1.3-1.5m	GC/GLNG ON #20 0.3-0.5m	GC/GLNG ON #20 0.8-1.0m	GC/GLNG ON #21 1.3-1.5m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-056	EB0810932-057	EB0810932-058	EB0810932-059	EB0810932-060
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**5.7**	**6.9**	**4.7**	**8.6**	**6.9**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**13**	<2	**23**	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.02**	<0.02	**0.04**	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**4.73**	**1.82**	**3.55**	**0.08**	**0.09**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**2950**	**1140**	**2210**	**48**	**58**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	<0.01	----	**0.60**	**0.33**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	<10	----	**120**	**65**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	<0.01	----	**0.19**	**0.10**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**4.75**	**1.82**	**3.58**	<0.02	**0.02**
Net Acidity (acidity units)	----	10	mole H+ / t	**2960**	**1140**	**2240**	<10	**14**
Liming Rate	----	1	kg CaCO3/t	**222**	**85**	**168**	<1	**1**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #22 0-0.1m	GC/GLNG ON #22 0.8-1.0m	GC/GLNG ON #22 1.3-1.5m	GC/GLNG ON #22 1.8-2.0m	GC/GLNG ON #23 0.3-0.5m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-061	EB0810932-062	EB0810932-063	EB0810932-064	EB0810932-065
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**5.8**	**4.8**	**7.4**	**7.7**	**4.6**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**13**	**25**	<2	<2	**47**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.02**	**0.04**	<0.02	<0.02	**0.08**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.03**	**4.40**	**0.83**	**0.05**	**2.84**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**22**	**2750**	**516**	**34**	**1770**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	----	**0.80**	**0.50**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	----	**159**	**99**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	----	**0.26**	**0.16**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.06**	**4.44**	**0.66**	<0.02	**2.92**
Net Acidity (acidity units)	----	10	mole H+ / t	**35**	**2770**	**409**	<10	**1820**
Liming Rate	----	1	kg CaCO3/t	**3**	**208**	**31**	<1	**136**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #23 1.3-1.5m	GC/GLNG ON #23 2.3-2.5m	GC/GLNG ON #24 0-0.1m	GC/GLNG ON #24 0.8-1.0m	GC/GLNG ON #24 1.8-2.0m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-066	EB0810932-067	EB0810932-068	EB0810932-069	EB0810932-070
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.8**	**5.2**	**4.3**	**7.2**	**7.0**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**28**	**23**	**62**	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.04**	**0.04**	**0.10**	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**1.81**	**3.80**	**2.62**	**0.13**	<0.02
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**1130**	**2370**	**1640**	**82**	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	----	----	**1.37**	**0.56**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	----	----	**273**	**113**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	----	----	**0.44**	**0.18**
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	<0.02	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	<10	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	<0.02	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	**0.50**	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	**0.49**	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**1.86**	**3.84**	**2.72**	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	**1160**	**2390**	**1690**	<10	<10
Liming Rate	----	1	kg CaCO3/t	**87**	**180**	**127**	<1	<1

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #25 0.8-0.9m	GC/GLNG ON #26 0.3-0.5m	GC/GLNG ON #26 0.8-1.0m	GC/GLNG ON #27 0.2-0.3m	GC/GLNG ON #27 0.4-0.6m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-071	EB0810932-072	EB0810932-073	EB0810932-074	EB0810932-075
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**5.0**	**5.5**	**6.4**	**4.6**	**5.5**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**16**	**23**	<2	**46**	**8**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.02**	**0.04**	<0.02	**0.07**	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**4.67**	**2.72**	**1.90**	**4.19**	**2.94**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**2920**	**1690**	**1180**	**2610**	**1830**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**4.70**	**2.75**	**1.90**	**4.26**	**2.95**
Net Acidity (acidity units)	----	10	mole H+ / t	**2930**	**1720**	**1180**	**2660**	**1840**
Liming Rate	----	1	kg CaCO3/t	**220**	**129**	**89**	**200**	**138**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #28 0.3-0.5m	GC/GLNG ON #28 1.0-1.2m	GC/GLNG ON #29 0-0.1m	GC/GLNG ON #30 0.25-0.36m	GC/GLNG ON #31 0.25-0.35m
			Client sampling date / time	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]	[11-AUG-2008]
				EB0810932-076	EB0810932-077	EB0810932-078	EB0810932-079	EB0810932-080
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**5.4**	**6.4**	**8.9**	**6.6**	**5.7**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**18**	<2	<2	<2	**17**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.03**	<0.02	<0.02	<0.02	**0.03**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**2.68**	**0.44**	**0.32**	<0.02	**1.86**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**1670**	**272**	**202**	<10	**1160**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	----	**4.33**	**0.21**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	----	**865**	**42**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	----	**1.39**	**0.07**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**2.71**	**0.44**	<0.02	<0.02	**1.89**
Net Acidity (acidity units)	----	10	mole H+ / t	**1690**	**272**	<10	<10	**1180**
Liming Rate	----	1	kg CaCO3/t	**127**	**20**	<1	<1	**88**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG ON #31 0.35-0.5m	----	----	----	----
			Client sampling date / time	[11-AUG-2008]	----	----	----	----
				EB0810932-081	**----**	**----**	**----**	**----**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.4**	----	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0811434**	Page	: 1 of 18
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG 08	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: 08/08 GLNG/08 ASS-2	Date Samples Received	: 25-AUG-2008
Sampler	: ----	Issue Date	: 05-SEP-2008
Site	: ----		
		No. of samples received	: 76
Quote number	: BN/248/07	No. of samples analysed	: 76

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Cass Sealby	Senior Chemist - Acid Sulphate Soils	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #32 0 - 0.1m	GC/GLNG #32 0.4 - 0.6m	GC/GLNG #32 1.7 - 1.9m	GC/GLNG #33 0.3 - 0.5m	GC/GLNG #33 0.7 - 0.9m
Client sampling date / time				20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
				EB0811434-001	EB0811434-002	EB0811434-003	EB0811434-004	EB0811434-005
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.8	5.2	7.7	6.5	4.8
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	24	<2	<2	25
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.04	<0.02	<0.02	0.04
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	0.03	1.20	0.57	0.49	1.59
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	20	746	356	306	993
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	0.66	----	0.66	0.32	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	131	----	131	64	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	0.21	----	0.21	0.10	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	1.23	0.43	0.42	1.63
Net Acidity (acidity units)	----	10	mole H+ / t	<10	769	269	263	1020
Liming Rate	----	1	kg CaCO3/t	<1	58	20	20	76

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #33 1.5 - 1.7m	GC/GLNG #34 0 - 0.1m	GC/GLNG #34 0.3 - 0.45m	GC/GLNG #34 0.8 - 1.0m	GC/GLNG #35 0.4 - 0.6m
				Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
					EB0811434-006	EB0811434-007	EB0811434-008	EB0811434-009	EB0811434-010
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		7.5	6.0	4.3	6.7	6.2
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	4	70	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	0.11	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		0.17	0.08	2.11	<0.02	0.54
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		105	52	1320	11	339
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		0.64	----	----	0.66	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		129	----	----	131	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		0.21	----	----	0.21	----
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	----	0.36	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	----	166	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		----	----	0.27	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	----	0.11	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	----	0.46	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S		0.03	0.09	2.49	<0.02	0.54
Net Acidity (acidity units)	----	10	mole H+ / t		19	55	1550	<10	340
Liming Rate	----	1	kg CaCO3/t		1	4	116	<1	26

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #35 1.3 - 1.5m	GC/GLNG #35 2.2 - 2.35m	GC/GLNG #36 0 - 0.1m	GC/GLNG #36 0.8 - 1.0m	GC/GLNG #36 1.3 - 1.5m
				Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
					EB0811434-011	EB0811434-012	EB0811434-013	EB0811434-014	EB0811434-015
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**5.4**	**7.2**	**7.6**	**5.0**	**6.6**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**14**	<2	<2	**22**	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.02**	<0.02	<0.02	**0.04**	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**2.22**	**0.06**	**0.05**	**1.97**	**0.04**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**1380**	**34**	**30**	**1230**	**28**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		----	**0.67**	**0.63**	----	**0.24**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		----	**134**	**126**	----	**49**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		----	**0.21**	**0.20**	----	**0.08**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**2.24**	<0.02	<0.02	**2.01**	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		**1400**	<10	<10	**1250**	<10
Liming Rate	----	1	kg CaCO3/t		**105**	<1	<1	**94**	<1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #37 0 - 0.1m	GC/GLNG #37 0.3 - 0.5m	GC/GLNG #37 0.8 - 1.0m	GC/GLNG #38 0 - 0.1m	GC/GLNG #38 0.3 - 0.5m
			Client sampling date / time:	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
				EB0811434-016	EB0811434-017	EB0811434-018	EB0811434-019	EB0811434-020
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.6**	**4.7**	**6.8**	**7.9**	**4.7**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	**41**	<2	<2	**41**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	**0.07**	<0.02	<0.02	**0.07**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.54**	**1.52**	**0.02**	**0.06**	**3.95**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**339**	**950**	**15**	**39**	**2460**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**0.35**	----	**0.71**	**1.06**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**71**	----	**141**	**212**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**0.11**	----	**0.23**	**0.34**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.47**	**1.59**	<0.02	<0.02	**4.01**
Net Acidity (acidity units)	----	10	mole H+ / t	**292**	**992**	<10	<10	**2500**
Liming Rate	----	1	kg CaCO3/t	**22**	**74**	<1	<1	**188**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #38 1.2 - 1.4m	GC/GLNG #39 0.3 - 0.5m	GC/GLNG #39 0.7 - 0.9m	GC/GLNG #39 1.3 - 1.5m	GC/GLNG #40 0 - 0.1m
			Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
				EB0811434-021	EB0811434-022	EB0811434-023	EB0811434-024	EB0811434-025
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.7**	**5.2**	**4.8**	**6.6**	**6.9**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	**18**	**34**	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	**0.03**	**0.06**	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.08**	**1.40**	**2.22**	**0.11**	**0.14**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**48**	**877**	**1380**	**69**	**86**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**0.52**	----	----	**0.34**	**1.55**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**105**	----	----	**68**	**310**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**0.17**	----	----	**0.11**	**0.50**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	**1.43**	**2.27**	**0.04**	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	**894**	**1420**	**24**	<10
Liming Rate	----	1	kg CaCO3/t	<1	**67**	**106**	**2**	<1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #40 0.3 - 0.5m	GC/GLNG #40 0.7 - 0.9m	GC/GLNG #41 0.3 - 0.5m	GC/GLNG #41 1.8 - 2.0.m	GC/GLNG #41 2.1 - 2.3m
			Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
				EB0811434-026	EB0811434-027	EB0811434-028	EB0811434-029	EB0811434-030
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**5.2**	**6.2**	**5.2**	**4.8**	**7.5**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**22**	**4**	**18**	**25**	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.04**	<0.02	**0.03**	**0.04**	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**1.87**	**0.86**	**1.66**	**2.42**	**0.14**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**1170**	**540**	**1040**	**1510**	**91**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	----	----	----	**0.37**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	----	----	----	**74**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	----	----	----	**0.12**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**1.90**	**0.87**	**1.69**	**2.46**	**0.07**
Net Acidity (acidity units)	----	10	mole H+ / t	**1190**	**543**	**1050**	**1540**	**41**
Liming Rate	----	1	kg CaCO3/t	**89**	**41**	**79**	**115**	**3**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #42 0.3 - 0.5m	GC/GLNG #42 1.8 - 2.0m	GC/GLNG #42 2.3 - 2.5m	GC/GLNG #42 2.8 - 3.0m	GC/GLNG #82 1.3 - 1.5m
			Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
				EB0811434-031	EB0811434-032	EB0811434-033	EB0811434-034	EB0811434-035
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.8**	**8.6**	**7.3**	**8.2**	**8.2**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**33**	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.05**	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**1.87**	**0.35**	**1.00**	**0.39**	**0.81**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**1170**	**216**	**622**	**244**	**507**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	**4.65**	**2.98**	**1.46**	**0.85**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	**929**	**595**	**292**	**170**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	**1.49**	**0.95**	**0.47**	**0.27**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**1.92**	<0.02	**0.36**	**0.08**	**0.63**
Net Acidity (acidity units)	----	10	mole H+ / t	**1200**	<10	**225**	**49**	**394**
Liming Rate	----	1	kg CaCO3/t	**90**	<1	**17**	**4**	**30**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #43 0.3 - 0.5m	GC/GLNG #43 0.8 - 1.0m	GC/GLNG #43 1.8 - 2.0m	GC/GLNG #43 2.8 - 3.0m	GC/GLNG #44 0.3 - 0.5m
			Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
				EB0811434-036	EB0811434-037	EB0811434-038	EB0811434-039	EB0811434-040
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.0**	**4.0**	**4.4**	**7.0**	**6.9**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**56**	**38**	**46**	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.09**	**0.06**	**0.07**	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	<0.02	**1.68**	**0.18**	**0.56**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	**1050**	**114**	**348**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	----	----	**4.77**	**1.19**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	----	----	**952**	**238**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	----	----	**1.53**	**0.38**
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	**0.05**	**1.18**	**0.19**	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	**22**	**553**	**90**	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	**0.04**	**0.89**	**0.14**	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.02**	<0.02	**0.05**	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	**0.07**	**1.18**	**0.25**	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.12**	**0.95**	**1.90**	<0.02	**0.30**
Net Acidity (acidity units)	----	10	mole H+ / t	**78**	**591**	**1180**	<10	**189**
Liming Rate	----	1	kg CaCO3/t	**6**	**44**	**89**	<1	**14**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #44 1.3 - 1.5m	GC/GLNG #44 2.8 - 3.0m	GC/GLNG #45 0 - 0.1m	GC/GLNG #45 0.8 - 1.0m	GC/GLNG #45 2.3 - 2.5m
Client sampling date / time				20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
				EB0811434-041	EB0811434-042	EB0811434-043	EB0811434-044	EB0811434-045
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**8.3**	**7.3**	**8.3**	**8.3**	**7.2**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**196**	**172**	**196**	**196**	**169**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.31**	**0.28**	**0.31**	**0.31**	**0.27**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**1.60**	**0.87**	**0.03**	**1.45**	**0.84**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**998**	**542**	**19**	**907**	**527**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**12.8**	**0.58**	**2.17**	**1.51**	**1.27**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**2550**	**117**	**433**	**302**	**253**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**4.08**	**0.19**	**0.69**	**0.48**	**0.40**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	**0.74**	<0.02	**1.13**	**0.57**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	**464**	<10	**706**	**358**
Liming Rate	----	1	kg CaCO3/t	<1	**35**	<1	**53**	**27**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #46 0.3 - 0.5m	GC/GLNG #46 1.6 - 2.0m	GC/GLNG #46 2.8 - 3.0m	GC/GLNG #47 0.4 - 0.6m	GC/GLNG #47 1.3 - 1.5m
				Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
					EB0811434-046	EB0811434-047	EB0811434-048	EB0811434-049	EB0811434-050
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		7.2	6.6	8.5	8.0	7.1
Titratable Actual Acidity (23F)	----	2	mole H+ / t		169	155	200	188	167
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		0.27	0.25	0.32	0.30	0.27
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		0.86	1.01	1.17	0.98	0.93
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		533	628	730	609	581
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		0.56	0.58	4.89	1.34	0.82
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		112	117	976	268	163
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		0.18	0.19	1.56	0.43	0.26
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S		0.74	0.88	0.13	0.69	0.76
Net Acidity (acidity units)	----	10	mole H+ / t		459	550	79	431	472
Liming Rate	----	1	kg CaCO3/t		34	41	6	32	35

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #47 2.3 - 2.5m	GC/GLNG #48 0.3 - 0.45m	GC/GLNG #48 1.8 - 2.0m	GC/GLNG #48 2.8 - 3.0m	GC/GLNG #49 0.3 - 0.5m
				Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
					EB0811434-051	EB0811434-052	EB0811434-053	EB0811434-054	EB0811434-055
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**8.0**	**8.2**	**7.5**	**8.6**	**7.6**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**188**	**193**	**176**	**203**	**179**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.30**	**0.31**	**0.28**	**0.32**	**0.29**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**1.76**	**0.93**	**1.34**	**1.03**	**0.03**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**1100**	**583**	**834**	**644**	**17**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		**4.53**	**2.22**	**1.34**	**5.24**	**1.41**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		**905**	**443**	**268**	**1050**	**282**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		**1.45**	**0.71**	**0.43**	**1.68**	**0.45**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**0.80**	**0.46**	**1.05**	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		**498**	**288**	**655**	<10	<10
Liming Rate	----	1	kg CaCO3/t		**37**	**22**	**49**	<1	<1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #49 0.8 - 1.0m	GC/GLNG #49 2.3 - 2.5m	GC/GLNG #50 0 - 0.1m	GC/GLNG #50 0.8 - 1.0m	GC/GLNG #50 2.3 - 2.5m
				Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
					EB0811434-056	EB0811434-057	EB0811434-058	EB0811434-059	EB0811434-060
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**7.3**	**6.3**	**4.5**	**6.4**	**6.2**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**172**	**148**	**105**	**150**	**146**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.28**	**0.24**	**0.17**	**0.24**	**0.23**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**0.86**	**0.51**	**0.02**	**0.76**	**0.92**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**536**	**320**	**13**	**475**	**574**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		**0.71**	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		**141**	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		**0.23**	----	----	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**0.71**	**0.75**	**0.19**	**1.00**	**1.15**
Net Acidity (acidity units)	----	10	mole H+ / t		**441**	**468**	**118**	**626**	**720**
Liming Rate	----	1	kg CaCO3/t		**33**	**35**	**9**	**47**	**54**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #51 0.3 - 0.5m	GC/GLNG #51 1.3 - 1.5m	GC/GLNG #51 2.8 - 3.0 m	GC/GLNG #52 0.3 - 0.5m	GC/GLNG #52 0.8 - 1.0m
			Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
				EB0811434-061	EB0811434-062	EB0811434-063	EB0811434-064	EB0811434-065
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**7.2**	**6.7**	**8.3**	**8.2**	**6.4**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**1.15**	**1.25**	**1.29**	**0.06**	**1.23**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**717**	**782**	**803**	**39**	**769**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**0.63**	**0.71**	**6.08**	**2.46**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**126**	**141**	**1210**	**491**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**0.20**	**0.23**	**1.95**	**0.79**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**1.01**	**1.10**	<0.02	<0.02	**1.23**
Net Acidity (acidity units)	----	10	mole H+ / t	**633**	**688**	<10	<10	**770**
Liming Rate	----	1	kg CaCO3/t	**47**	**52**	<1	<1	**58**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #52 2.3 - 2.5m	GC/GLNG #53 0 - 0.1m	GC/GLNG #53 1.3 - 1.5m	GC/GLNG #53 2.8 - 3.0m	GC/GLNG #54 0.8 - 1.0m
				Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
					EB0811434-066	EB0811434-067	EB0811434-068	EB0811434-069	EB0811434-070
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**6.9**	**8.4**	**7.1**	**8.2**	**7.1**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**0.76**	<0.02	**0.79**	**1.29**	**0.96**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**473**	<10	**492**	**803**	**596**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		**0.88**	**2.56**	**0.78**	**5.84**	**0.85**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		**175**	**511**	**156**	**1170**	**170**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		**0.28**	**0.82**	**0.25**	**1.87**	**0.27**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**0.57**	<0.02	**0.62**	**0.04**	**0.77**
Net Acidity (acidity units)	----	10	mole H+ / t		**356**	<10	**388**	**26**	**482**
Liming Rate	----	1	kg CaCO3/t		**27**	<1	**29**	**2**	**36**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #54 1.8 - 2.0m	GC/GLNG #54 2.3 - 2.5m	GC/GLNG #11 0.3 - 0.5m	GC/GLNG #22 0.3 - 0.5m	GC/GLNG #27 0 - 0.1m
				Client sampling date / time	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00	20-AUG-2008 12:00
					EB0811434-071	EB0811434-072	EB0811434-073	EB0811434-074	EB0811434-075
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		7.8	7.8	4.2	4.2	8.2
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	56	70	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	0.09	0.11	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		0.86	1.25	1.26	1.87	0.04
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		538	782	786	1170	28
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		0.92	1.00	----	----	2.45
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		185	199	----	----	489
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		0.30	0.32	----	----	0.78
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	----	0.32	0.40	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	----	152	188	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		----	----	0.24	0.30	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	----	0.19	0.18	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	----	0.51	0.58	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S		0.66	1.04	1.59	2.28	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		414	649	994	1420	<10
Liming Rate	----	1	kg CaCO3/t		31	49	74	107	<1

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/GLNG #31 0 - 0.1m	----	----	----	----
			Client sampling date / time	20-AUG-2008 12:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB0811434-076	----	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**5.5**	----	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**22**	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.04**	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.25**	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**155**	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	**0.28**	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	**178**	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	**13**	----	----	----	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0812008**	Page	: 1 of 15
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG 08	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: 08/09 GLNG/on/ASS-4	Date Samples Received	: 04-SEP-2008
Sampler	: ----	Issue Date	: 16-SEP-2008
Site	: ----		
		No. of samples received	: 64
Quote number	: BN/248/07	No. of samples analysed	: 64

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Cass Sealby	Senior Chemist - Acid Sulphate Soils	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #55 0.3-0.5m	GC/GLNG #55 0.8-1.0m	GC/GLNG #56 0.3-0.5m	GC/GLNG #56 0.8-1.0m	GC/GLNG #57 0-0.1m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-001	EB0812008-002	EB0812008-003	EB0812008-004	EB0812008-005
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**3.7**	**4.5**	**4.2**	**3.5**	**4.9**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**82**	**31**	**50**	**81**	**20**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.13**	**0.05**	**0.08**	**0.13**	**0.03**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**1.50**	**1.30**	**1.56**	**2.23**	**0.23**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**936**	**813**	**970**	**1390**	**142**
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	----	<0.02	<0.02	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	----	<10	<10	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	----	<0.02	<0.02	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.75**	----	**0.80**	**0.92**	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		**0.63**	----	**0.69**	**0.80**	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**1.63**	**1.35**	**1.64**	**2.36**	**0.26**
Net Acidity (acidity units)	----	10	mole H+ / t		**1020**	**844**	**1020**	**1470**	**162**
Liming Rate	----	1	kg CaCO3/t		**76**	**63**	**77**	**110**	**12**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #57 0.3-0.5m	GC/GLNG #57 0.8-1.0m	GC/GLNG #58 0.3-0.5m	GC/GLNG #58 0.8-1.0m	GC/GLNG #59 0-0.1m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-006	EB0812008-007	EB0812008-008	EB0812008-009	EB0812008-010
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**3.3**	**3.5**	**3.5**	**3.5**	**4.6**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**74**	**76**	**88**	**100**	**45**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.12**	**0.12**	**0.14**	**0.16**	**0.07**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**2.35**	**2.19**	**2.50**	**2.66**	**0.18**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**1460**	**1370**	**1560**	**1660**	**115**
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	<10	<10	<10	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.69**	**0.83**	**0.93**	**0.94**	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		**0.56**	**0.70**	**0.83**	**0.77**	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**2.47**	**2.31**	**2.64**	**2.82**	**0.26**
Net Acidity (acidity units)	----	10	mole H+ / t		**1540**	**1440**	**1650**	**1760**	**160**
Liming Rate	----	1	kg CaCO3/t		**115**	**108**	**124**	**132**	**12**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #59 0.3-0.5m	GC/GLNG #59 0.8-1.0m	GC/GLNG #60 0.3-0.5m	GC/GLNG #60 0.8-1.0m	GC/GLNG #61 0.3-0.5m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-011	EB0812008-012	EB0812008-013	EB0812008-014	EB0812008-015
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**3.3**	**3.4**	**5.0**	**6.1**	**4.9**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**99**	**117**	**25**	**7**	**17**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.16**	**0.19**	**0.04**	<0.02	**0.03**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**2.54**	**4.48**	**2.17**	**1.88**	**1.18**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**1580**	**2790**	**1350**	**1170**	**738**
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		**0.12**	<0.02	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		**57**	<10	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		**0.09**	<0.02	----	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.62**	**0.94**	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		**0.74**	**0.84**	----	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**2.79**	**4.67**	**2.21**	**1.89**	**1.21**
Net Acidity (acidity units)	----	10	mole H+ / t		**1740**	**2910**	**1380**	**1180**	**755**
Liming Rate	----	1	kg CaCO3/t		**131**	**218**	**104**	**89**	**57**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #61 0.8-1.0m	GC/GLNG #62 0.3-0.5m	GC/GLNG #62 0.8-1.0m	GC/GLNG #63 0-0.1m	GC/GLNG #63 0.3-0.5m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-016	EB0812008-017	EB0812008-018	EB0812008-019	EB0812008-020
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**3.8**	**3.9**	**4.0**	**8.0**	**4.1**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**60**	**41**	**39**	<2	**43**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.10**	**0.06**	**0.06**	<0.02	**0.07**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**1.88**	**0.68**	**0.95**	<0.02	**1.57**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**1170**	**423**	**593**	<10	**980**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		----	----	----	**2.90**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		----	----	----	**579**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		----	----	----	**0.93**	----
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	<0.02	<0.02	----	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	<10	<10	----	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	----	<0.02
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.97**	**0.56**	**0.53**	----	**0.64**
HCl Extractable Sulfur (20Be)	----	0.02	% S		**0.80**	**0.48**	**0.44**	----	**0.64**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**1.98**	**0.74**	**1.01**	<0.02	**1.64**
Net Acidity (acidity units)	----	10	mole H+ / t		**1230**	**464**	**632**	<10	**1020**
Liming Rate	----	1	kg CaCO3/t		**93**	**35**	**47**	<1	**77**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #63 0.8-1.0m	GC/GLNG #64 0.3-0.5m	GC/GLNG #64 0.8-1.0m	GC/GLNG #65 0.3-0.5m	GC/GLNG #65 0.8-1.0m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-021	EB0812008-022	EB0812008-023	EB0812008-024	EB0812008-025
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**4.2**	**4.6**	**5.4**	**4.0**	**4.3**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**42**	**44**	**16**	**52**	**37**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.07**	**0.07**	**0.02**	**0.08**	**0.06**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**1.49**	**2.42**	**1.65**	**3.04**	**2.31**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**932**	**1510**	**1030**	**1900**	**1440**
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	----	----	<0.02	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	----	----	<10	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	----	----	<0.02	<0.02
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.57**	----	----	**0.86**	**0.88**
HCl Extractable Sulfur (20Be)	----	0.02	% S		**0.56**	----	----	**0.76**	**0.72**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**1.56**	**2.50**	**1.67**	**3.13**	**2.37**
Net Acidity (acidity units)	----	10	mole H+ / t		**971**	**1560**	**1040**	**1950**	**1480**
Liming Rate	----	1	kg CaCO3/t		**73**	**117**	**78**	**146**	**111**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #66 0.3-0.5m	GC/GLNG #66 0.8-1.0m	GC/GLNG #67 0.3-0.5m	GC/GLNG #67 0.8-1.0m	GC/GLNG #68 0.3-0.5m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-026	EB0812008-027	EB0812008-028	EB0812008-029	EB0812008-030
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**4.2**	**5.1**	**4.2**	**4.0**	**3.8**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**42**	**16**	**52**	**47**	**91**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.07**	**0.02**	**0.08**	**0.07**	**0.14**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**1.80**	**1.96**	**1.65**	**2.15**	**1.80**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**1120**	**1220**	**1030**	**1340**	**1120**
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	----	<0.02	<0.02	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	----	<10	<10	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	----	<0.02	<0.02	<0.02
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.95**	----	**0.78**	**0.65**	**0.81**
HCl Extractable Sulfur (20Be)	----	0.02	% S		**0.82**	----	**0.66**	**0.55**	**0.68**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**1.87**	**1.98**	**1.73**	**2.23**	**1.95**
Net Acidity (acidity units)	----	10	mole H+ / t		**1170**	**1240**	**1080**	**1390**	**1220**
Liming Rate	----	1	kg CaCO3/t		**88**	**93**	**81**	**104**	**91**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #68 0.8-1.0m	GC/GLNG #69 0.3-0.5m	GC/GLNG #69 0.8-1.0m	GC/GLNG #70 0.3-0.5m	GC/GLNG #70 0.8-1.0m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-031	EB0812008-032	EB0812008-033	EB0812008-034	EB0812008-035
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**3.6**	**4.2**	**4.0**	**3.7**	**3.8**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**106**	**56**	**92**	**90**	**88**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.17**	**0.09**	**0.15**	**0.14**	**0.14**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**1.38**	**2.62**	**2.66**	**1.92**	**3.32**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**859**	**1630**	**1660**	**1200**	**2070**
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	<10	<10	<10	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.61**	**0.70**	**0.76**	**0.64**	**0.66**
HCl Extractable Sulfur (20Be)	----	0.02	% S		**0.51**	**0.58**	**0.67**	**0.52**	**0.59**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**1.55**	**2.71**	**2.80**	**2.06**	**3.46**
Net Acidity (acidity units)	----	10	mole H+ / t		**965**	**1690**	**1750**	**1290**	**2160**
Liming Rate	----	1	kg CaCO3/t		**72**	**127**	**131**	**97**	**162**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #71 0.3-0.5m	GC/GLNG #71 0.8-1.0m	GC/GLNG #72 0.3-0.5m	GC/GLNG #72 0.8-1.0m	GC/GLNG #73 0-0.1m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-036	EB0812008-037	EB0812008-038	EB0812008-039	EB0812008-040
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**3.5**	**3.4**	**4.6**	**5.6**	**7.8**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**116**	**112**	**29**	**6**	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		**0.18**	**0.18**	**0.04**	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**5.22**	**3.20**	**1.30**	**1.30**	**0.05**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**3250**	**2000**	**810**	**810**	**30**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		----	----	----	----	**0.76**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		----	----	----	----	**153**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		----	----	----	----	**0.24**
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	<0.02	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	<10	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	<0.02	----	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S		**0.60**	**0.67**	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		**0.53**	**0.61**	----	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**5.40**	**3.38**	**1.34**	**1.31**	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		**3370**	**2110**	**839**	**816**	<10
Liming Rate	----	1	kg CaCO3/t		**253**	**158**	**63**	**61**	<1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #73 0.3-0.5m	GC/GLNG #73 0.8-1.0m	GC/GLNG #74 0.3-0.5m	GC/GLNG #74 0.8-1.0m	GC/GLNG #75 0.3-0.5m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-041	EB0812008-042	EB0812008-043	EB0812008-044	EB0812008-045
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**6.0**	**4.3**	**4.2**	**4.1**	**4.2**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	**41**	**41**	**47**	**48**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	**0.06**	**0.06**	**0.07**	**0.08**
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**0.58**	**1.44**	**1.59**	**2.48**	**3.18**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**363**	**895**	**992**	**1550**	**1980**
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	<0.02	<0.02	<0.02	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	<10	<10	<10	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		----	<0.02	<0.02	<0.02	<0.02
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	**0.15**	**0.42**	**0.50**	**0.43**
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	**0.14**	**0.40**	**0.42**	**0.39**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**0.58**	**1.50**	**1.66**	**2.56**	**3.26**
Net Acidity (acidity units)	----	10	mole H+ / t		**364**	**936**	**1030**	**1600**	**2030**
Liming Rate	----	1	kg CaCO3/t		**27**	**70**	**77**	**120**	**152**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG #76 0.3-0.5m	GC/GLNG #77 0.3-0.5m	GC/GLNG #77 0.8-1.0m	GC/GLNG #78 0-0.1m	GC/GLNG #78 0.3-0.5m
				Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
					EB0812008-046	EB0812008-047	EB0812008-048	EB0812008-049	EB0812008-050
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**4.7**	**3.9**	**4.3**	**7.4**	**5.6**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		**8**	**74**	**43**	<2	**7**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	**0.12**	**0.07**	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**0.70**	**2.56**	**1.44**	**0.04**	**0.58**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**436**	**1600**	**895**	**27**	**363**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		----	----	----	**1.38**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		----	----	----	**276**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		----	----	----	**0.44**	----
EA033-D: Retained Acidity									
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	<0.02	<0.02	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	<10	<10	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		----	<0.02	<0.02	----	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	**0.55**	**0.48**	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	**0.47**	**0.40**	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**0.71**	**2.68**	**1.50**	<0.02	**0.59**
Net Acidity (acidity units)	----	10	mole H+ / t		**444**	**1670**	**938**	<10	**370**
Liming Rate	----	1	kg CaCO3/t		**33**	**125**	**70**	<1	**28**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #78 0.8-1.0m	GC/GLNG #79 0.3-0.5m	GC/GLNG #79 0.8-1.0m	GC/GLNG #80 0.3-0.5m	GC/GLNG #80 0.8-1.0m
			Client sampling date / time	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
				EB0812008-051	EB0812008-052	EB0812008-053	EB0812008-054	EB0812008-055
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.5**	**4.5**	**5.3**	**5.0**	**6.3**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	**29**	**11**	**14**	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	**0.04**	<0.02	**0.02**	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.78**	**0.62**	**1.51**	**0.58**	**0.54**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**484**	**387**	**944**	**363**	**339**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**0.35**	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**69**	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**0.11**	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.70**	**0.67**	**1.53**	**0.60**	**0.54**
Net Acidity (acidity units)	----	10	mole H+ / t	**438**	**416**	**954**	**377**	**340**
Liming Rate	----	1	kg CaCO3/t	**33**	**31**	**72**	**28**	**26**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #81 0.3-0.5m	GC/GLNG #81 0.8-1.0m	GC/GLNG #82 0.3-0.5m	GC/GLNG #82 0.8-1.0m	GC/GLNG #83 0-0.1m
Client sampling date / time				02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00
				EB0812008-056	EB0812008-057	EB0812008-058	EB0812008-059	EB0812008-060
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**5.4**	**6.7**	**6.5**	**6.6**	**3.8**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**10**	<2	<2	<2	**69**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	**0.11**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.81**	**0.70**	**1.47**	**1.07**	**3.41**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**508**	**436**	**919**	**665**	**2130**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	----	**0.65**	**0.79**	**0.82**	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	----	**130**	**158**	**164**	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	----	**0.21**	**0.25**	**0.26**	----
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	----	----	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	----	----	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	----	----	<0.02
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	----	----	**0.68**
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	----	**0.58**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.83**	**0.56**	**1.31**	**0.89**	**3.52**
Net Acidity (acidity units)	----	10	mole H+ / t	**518**	**349**	**814**	**556**	**2200**
Liming Rate	----	1	kg CaCO3/t	**39**	**26**	**61**	**42**	**165**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG #83 0.3-0.5m	GC/GLNG #83 0.8-1.0m	GC/GLNG #84 0.3-0.5m	GC/GLNG #84 0.8-1.0m	----
			Client sampling date / time:	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	02-SEP-2008 15:00	----
				EB0812008-061	EB0812008-062	EB0812008-063	EB0812008-064	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**6.7**	**4.4**	**4.1**	**3.9**	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	**42**	**35**	**66**	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	**0.07**	**0.06**	**0.10**	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.49**	**1.71**	**1.82**	**2.87**	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**307**	**1060**	**1140**	**1790**	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**1.91**	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**383**	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**0.61**	----	----	----	----
EA033-D: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	<0.02	<0.02	<0.02	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	<10	<10	<10	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	<0.02	<0.02	<0.02	----
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	**0.48**	**0.34**	**0.64**	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	**0.46**	**0.32**	**0.56**	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	----
Net Acidity (sulfur units)	----	0.02	% S	**0.08**	**1.77**	**1.88**	**2.98**	----
Net Acidity (acidity units)	----	10	mole H+ / t	**52**	**1110**	**1170**	**1860**	----
Liming Rate	----	1	kg CaCO3/t	**4**	**83**	**88**	**139**	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0807957**	Page	: 1 of 11
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG OFF	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: 08/06 GLNG/ASS	Date Samples Received	: 17-JUN-2008
Sampler	: ----	Issue Date	: 25-JUN-2008
Site	: ----		
		No. of samples received	: 43
Quote number	: BN/248/07	No. of samples analysed	: 43

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jessica Janson	Supervisor - Acid Sulphate Soils	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing purposes. If the sampling time is displayed as 0:00 the information was not provided by client.

Key : CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.**
- **Retained Acidity not required because pH KCl greater than or equal to 4.5**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG OFF#1 0-0.1m	GC/GLNG OFF#1 1.8-2.0m	GC/GLNG OFF#1 2.8-3.0m	GC/GLNG OFF#1 3.3-3.5m	GC/GLNG OFF#1 3.8-4.0m
			Client sampling date / time	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00
				EB0807957-001	EB0807957-002	EB0807957-003	EB0807957-004	EB0807957-005
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**9.0**	**8.8**	**8.7**	**9.0**	**8.6**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.19**	**0.58**	**0.49**	**0.16**	**0.16**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**120**	**362**	**306**	**101**	**98**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**5.09**	**23.1**	**6.54**	**6.94**	**1.01**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**1020**	**4620**	**1310**	**1390**	**202**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**1.63**	**7.40**	**2.10**	**2.22**	**0.32**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG OFF#3 1.8-2.0m	GC/GLNG OFF#3 3.3-3.5m	GC/GLNG OFF#5 0-0.1m	GC/GLNG OFF#5 1.0-1.2m	GC/GLNG OFF#5 1.8-2.0m
			Client sampling date / time	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00
				EB0807957-006	EB0807957-007	EB0807957-008	EB0807957-009	EB0807957-010
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**9.1**	**8.7**	**9.1**	**8.7**	**8.4**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	**0.04**	**0.52**	**0.06**	**0.62**	**0.84**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**23**	**323**	**40**	**384**	**521**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**9.63**	**9.26**	**5.60**	**28.3**	**3.61**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**1920**	**1850**	**1120**	**5660**	**722**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**3.08**	**2.97**	**1.79**	**9.08**	**1.16**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	**0.06**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	**40**
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	**3**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG OFF#5 2.3-2.5m	GC/GLNG OFF#5 3.3-3.5m	GC/GLNG OFF#5 4.3-4.5m	GC/GLNG OFF#5 5.8-6.0m	GC/GLNG OFF#6 0.3-0.5m
				Client sampling date / time	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00
					EB0807957-011	EB0807957-012	EB0807957-013	EB0807957-014	EB0807957-015
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**8.6**	**9.0**	**9.2**	**8.9**	**8.6**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**0.70**	**0.17**	**0.11**	**0.04**	**0.71**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**438**	**108**	**70**	**23**	**446**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		**14.3**	**6.51**	**11.8**	**28.4**	**18.2**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		**2860**	**1300**	**2360**	**5670**	**3640**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		**4.58**	**2.09**	**3.79**	**9.09**	**5.83**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t		<1	<1	<1	<1	<1

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG OFF#6 0.8-1.0m	GC/GLNG OFF#6 1.8-2.0m	GC/GLNG OFF#6 2.3-2.5m	GC/GLNG OFF#6 3.3-3.5m	GC/GLNG OFF#6 4.3-4.5m
				Client sampling date / time	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00
					EB0807957-016	EB0807957-017	EB0807957-018	EB0807957-019	EB0807957-020
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**8.7**	**8.8**	**8.9**	**9.0**	**8.8**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**0.69**	**0.45**	**0.32**	**0.08**	**0.02**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**433**	**282**	**201**	**53**	**15**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		**26.4**	**17.6**	**11.1**	**3.90**	**0.77**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		**5280**	**3520**	**2210**	**779**	**154**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		**8.46**	**5.65**	**3.55**	**1.25**	**0.25**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t		<1	<1	<1	<1	<1

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID: GC/GLNG OFF#9 0-0.1m	GC/GLNG OFF#9 0.3-0.5m	GC/GLNG OFF#9 1.1-1.3m	GC/GLNG OFF#9 1.8-2.0m	GC/GLNG OFF#9 3.3-3.5m
			Client sampling date / time	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00
				EB0807957-021	EB0807957-022	EB0807957-023	EB0807957-024	EB0807957-025
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**9.3**	**9.5**	**9.1**	**9.4**	**9.3**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	**10**	<10	<10	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	**1.76**	**1.56**	**1.95**	**0.77**	**3.78**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	**351**	**312**	**389**	**154**	**755**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	**0.56**	**0.50**	**0.62**	**0.25**	**1.21**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG OFF#10 0-0.1m	GC/GLNG OFF#10 0.4-0.6m	GC/GLNG OFF#10 1.3-1.5m	GC/GLNG OFF#10 2.4-2.6m	GC/GLNG OFF#11 0.3-0.5m
				Client sampling date / time	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00
					EB0807957-026	EB0807957-027	EB0807957-028	EB0807957-029	EB0807957-030
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**9.4**	**9.1**	**9.4**	**8.7**	**9.5**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		<10	<10	<10	<10	<10
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		**3.71**	**7.43**	**7.44**	**6.88**	**3.97**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		**741**	**1480**	**1480**	**1380**	**793**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		**1.19**	**2.38**	**2.38**	**2.20**	**1.27**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t		<1	<1	<1	<1	<1

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG OFF#11 0.8-1.0m	GC/GLNG OFF#11 1.8-2.0m	GC/GLNG OFF#12 0-0.1m	GC/GLNG OFF#12 0.8-1.0m	GC/GLNG OFF#12 1.8-2.0m
				Client sampling date / time	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00
					EB0807957-031	EB0807957-032	EB0807957-033	EB0807957-034	EB0807957-035
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**9.5**	**9.4**	**8.5**	**8.1**	**7.3**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		<0.02	<0.02	**1.03**	**0.84**	**1.82**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		<10	<10	**645**	**523**	**1130**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		**3.76**	**3.25**	**8.23**	**1.41**	**1.04**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		**752**	**649**	**1640**	**282**	**207**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		**1.20**	**1.04**	**2.64**	**0.45**	**0.33**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		<0.02	<0.02	<0.02	**0.54**	**1.60**
Net Acidity (acidity units)	----	10	mole H+ / t		<10	<10	<10	**335**	**995**
Liming Rate	----	1	kg CaCO3/t		<1	<1	<1	**25**	**75**

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG OFF#12 2.8-3.0m	GC/GLNG OFF#12 3.8-4.0m	GC/GLNG OFF#1 0.8-1.0m	GC/GLNG OFF#2 2.8-3.0m	GC/GLNG OFF#2 3.8-4.0m
				Client sampling date / time	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00
					EB0807957-036	EB0807957-037	EB0807957-038	EB0807957-039	EB0807957-040
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**6.8**	**8.5**	**9.1**	**8.9**	**8.6**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**2.71**	<0.02	**0.41**	**0.38**	**0.90**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**1690**	<10	**255**	**238**	**560**
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		**1.01**	**4.93**	**19.0**	**9.47**	**6.57**
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		**201**	**984**	**3800**	**1890**	**1310**
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		**0.32**	**1.58**	**6.08**	**3.03**	**2.10**
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S		**2.50**	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t		**1560**	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t		**117**	<1	<1	<1	<1

Analytical Results

Sub-Matrix: **SEDIMENT**

Compound	CAS Number	LOR	Unit	Client sample ID	GC/GLNG OFF#3 0.9-1.1m	GC/GLNG OFF#13 0-0.1m	GC/GLNG OFF#9 4.5-4.7m	----	----
				Client sampling date / time	06-JUN-2008 15:00	06-JUN-2008 15:00	06-JUN-2008 15:00	----	----
					EB0807957-041	EB0807957-042	EB0807957-043	----	----
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		**9.4**	**9.0**	**8.4**	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t		<2	<2	<2	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	----	----
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.02	% S		**0.08**	**0.10**	<0.02	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		**51**	**59**	<10	----	----
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3		**13.7**	**12.2**	**3.11**	----	----
acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t		**2730**	**2440**	**622**	----	----
sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S		**4.38**	**3.92**	**1.00**	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		**1.5**	**1.5**	**1.5**	----	----
Net Acidity (sulfur units)	----	0.02	% S		<0.02	<0.02	<0.02	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		<10	<10	<10	----	----
Liming Rate	----	1	kg CaCO3/t		<1	<1	<1	----	----

Laboratory Certificates and Chain of Custody Documentation

Appendix C

C.2 Chain of Custody Documentation

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EB0810932**		
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG ONAUG08	Page	: 1 of 4
Order number	: ----		
C-O-C number	: 08/08GLNG/onASS	Quote number	: EB20070176 (BN/248/07)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 14-AUG-2008	Issue Date	: 15-AUG-2008 16:15
Client Requested Due Date	: 21-AUG-2008	Scheduled Reporting Date	: **21-AUG-2008**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: -0.8 C, 2.0 C - Ice bricks present
No. of coolers/boxes	: 1 LARGE, 1 MEDIUM	No. of samples received	: 81
Sercurity Seal	: Intact.	No. of samples analysed	: 81

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0810932-001	[11-AUG-2008]	GC/GLNG ON #1 0-0.1m	✓
EB0810932-002	[11-AUG-2008]	GC/GLNG ON #1 0.3-0..	✓
EB0810932-003	[11-AUG-2008]	GC/GLNG ON #1 1.5-1..	✓
EB0810932-004	[11-AUG-2008]	GC/GLNG ON #2 0-0.1m	✓
EB0810932-005	[11-AUG-2008]	GC/GLNG ON #2 0.3-0..	✓
EB0810932-006	[11-AUG-2008]	GC/GLNG ON #2 1.3-1..	✓
EB0810932-007	[11-AUG-2008]	GC/GLNG ON #2 1.8-2..	✓
EB0810932-008	[11-AUG-2008]	GC/GLNG ON #3 0-0.1m	✓
EB0810932-009	[11-AUG-2008]	GC/GLNG ON #3 0.8-1..	✓
EB0810932-010	[11-AUG-2008]	GC/GLNG ON #3 1.8-2..	✓
EB0810932-011	[11-AUG-2008]	GC/GLNG ON #4 0.3-0..	✓
EB0810932-012	[11-AUG-2008]	GC/GLNG ON #4 1.3-1..	✓
EB0810932-013	[11-AUG-2008]	GC/GLNG ON #4 1.8-2..	✓
EB0810932-014	[11-AUG-2008]	GC/GLNG ON #5 0-0.1m	✓
EB0810932-015	[11-AUG-2008]	GC/GLNG ON #5 1.3-1..	✓
EB0810932-016	[11-AUG-2008]	GC/GLNG ON #5 1.8-1..	✓
EB0810932-017	[11-AUG-2008]	GC/GLNG ON #6 0.3-0..	✓
EB0810932-018	[11-AUG-2008]	GC/GLNG ON #6 0.8-1..	✓
EB0810932-019	[11-AUG-2008]	GC/GLNG ON #6 1.8-2..	✓
EB0810932-020	[11-AUG-2008]	GC/GLNG ON #7 0.3-0..	✓
EB0810932-021	[11-AUG-2008]	GC/GLNG ON #7 1.3-1..	✓
EB0810932-022	[11-AUG-2008]	GC/GLNG ON #7 1.8-2..	✓
EB0810932-023	[11-AUG-2008]	GC/GLNG ON #8 0-0.1m	✓
EB0810932-024	[11-AUG-2008]	GC/GLNG ON #8 0.8-1..	✓
EB0810932-025	[11-AUG-2008]	GC/GLNG ON #8 1.8-2..	✓
EB0810932-026	[11-AUG-2008]	GC/GLNG ON #9 0.3-0..	✓
EB0810932-027	[11-AUG-2008]	GC/GLNG ON #9 0.8-1..	✓
EB0810932-028	[11-AUG-2008]	GC/GLNG ON #9 1.8-2..	✓
EB0810932-029	[11-AUG-2008]	GC/GLNG ON #10 0-0...	✓
EB0810932-030	[11-AUG-2008]	GC/GLNG ON #10 0.3-..	✓
EB0810932-031	[11-AUG-2008]	GC/GLNG ON #10 1.3-..	✓
EB0810932-032	[11-AUG-2008]	GC/GLNG ON #11 0-0...	✓
EB0810932-033	[11-AUG-2008]	GC/GLNG ON #11 0.8-..	✓
EB0810932-034	[11-AUG-2008]	GC/GLNG ON #11 2.0-..	✓
EB0810932-035	[11-AUG-2008]	GC/GLNG ON #12 0.3-..	✓

			SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0810932-036	[11-AUG-2008]	GC/GLNG ON #12 1.3-..	✓
EB0810932-037	[11-AUG-2008]	GC/GLNG ON #12 1.8-..	✓
EB0810932-038	[11-AUG-2008]	GC/GLNG ON #13 0-0...	✓
EB0810932-039	[11-AUG-2008]	GC/GLNG ON #13 0.4-..	✓
EB0810932-040	[11-AUG-2008]	GC/GLNG ON #13 1.8-..	✓
EB0810932-041	[11-AUG-2008]	GC/GLNG ON #14 0-0...	✓
EB0810932-042	[11-AUG-2008]	GC/GLNG ON #14 0.3-..	✓
EB0810932-043	[11-AUG-2008]	GC/GLNG ON #14 1.3-..	✓
EB0810932-044	[11-AUG-2008]	GC/GLNG ON #15 0-0...	✓
EB0810932-045	[11-AUG-2008]	GC/GLNG ON #15 0.8-..	✓
EB0810932-046	[11-AUG-2008]	GC/GLNG ON #15 1.8-..	✓
EB0810932-047	[11-AUG-2008]	GC/GLNG ON #16 0-0...	✓
EB0810932-048	[11-AUG-2008]	GC/GLNG ON #16 0.8-..	✓
EB0810932-049	[11-AUG-2008]	GC/GLNG ON #16 1.3-..	✓
EB0810932-050	[11-AUG-2008]	GC/GLNG ON #17 0-0...	✓
EB0810932-051	[11-AUG-2008]	GC/GLNG ON #17 0.3-..	✓
EB0810932-052	[11-AUG-2008]	GC/GLNG ON #17 1.5-..	✓
EB0810932-053	[11-AUG-2008]	GC/GLNG ON #18 0-0...	✓
EB0810932-054	[11-AUG-2008]	GC/GLNG ON #18 1.3-..	✓
EB0810932-055	[11-AUG-2008]	GC/GLNG ON #19 0-0...	✓
EB0810932-056	[11-AUG-2008]	GC/GLNG ON #19 0.3-..	✓
EB0810932-057	[11-AUG-2008]	GC/GLNG ON #19 1.3-..	✓
EB0810932-058	[11-AUG-2008]	GC/GLNG ON #20 0.3-..	✓
EB0810932-059	[11-AUG-2008]	GC/GLNG ON #20 0.8-..	✓
EB0810932-060	[11-AUG-2008]	GC/GLNG ON #21 1.3-..	✓
EB0810932-061	[11-AUG-2008]	GC/GLNG ON #22 0-0...	✓
EB0810932-062	[11-AUG-2008]	GC/GLNG ON #22 0.8-..	✓
EB0810932-063	[11-AUG-2008]	GC/GLNG ON #22 1.3-..	✓
EB0810932-064	[11-AUG-2008]	GC/GLNG ON #22 1.8-..	✓
EB0810932-065	[11-AUG-2008]	GC/GLNG ON #23 0.3-..	✓
EB0810932-066	[11-AUG-2008]	GC/GLNG ON #23 1.3-..	✓
EB0810932-067	[11-AUG-2008]	GC/GLNG ON #23 2.3-..	✓
EB0810932-068	[11-AUG-2008]	GC/GLNG ON #24 0-0...	✓
EB0810932-069	[11-AUG-2008]	GC/GLNG ON #24 0.8-..	✓
EB0810932-070	[11-AUG-2008]	GC/GLNG ON #24 1.8-..	✓
EB0810932-071	[11-AUG-2008]	GC/GLNG ON #25 0.8-..	✓
EB0810932-072	[11-AUG-2008]	GC/GLNG ON #26 0.3-..	✓
EB0810932-073	[11-AUG-2008]	GC/GLNG ON #26 0.8-..	✓
EB0810932-074	[11-AUG-2008]	GC/GLNG ON #27 0.2-..	✓
EB0810932-075	[11-AUG-2008]	GC/GLNG ON #27 0.4-..	✓
EB0810932-076	[11-AUG-2008]	GC/GLNG ON #28 0.3-..	✓

			SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0810932-077	[11-AUG-2008]	GC/GLNG ON #28 1.0-..	✓
EB0810932-078	[11-AUG-2008]	GC/GLNG ON #29 0-0...	✓
EB0810932-079	[11-AUG-2008]	GC/GLNG ON #30 0.25..	✓
EB0810932-080	[11-AUG-2008]	GC/GLNG ON #31 0.25..	✓
EB0810932-081	[11-AUG-2008]	GC/GLNG ON #31 0.35..	✓

Requested Deliverables

DR RUNDI LARSEN

- *AU Certificate of Analysis - NATA	Email	rlarsen@geocoastal.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep)	Email	rlarsen@geocoastal.com.au
- *AU QC Report ¿ DEFAULT (Anon QC Rep) - NATA	Email	rlarsen@geocoastal.com.au
- A4 - AU Sample Receipt Notification - Environmental	Email	rlarsen@geocoastal.com.au
- A4 - AU Tax Invoice	Email	rlarsen@geocoastal.com.au
- Default - Chain of Custody	Email	rlarsen@geocoastal.com.au
- EDI Format - ENMRG	Email	rlarsen@geocoastal.com.au
- EDI Format - XTab	Email	rlarsen@geocoastal.com.au

GEO COASTAL
Australia
PO Box 4051, 111 Stanbrough Rd, Gumdale QLD 4154. Tel: (07) 3890 7392 Fax: (07) 3890 7599

CHAIN OF CUSTODY/SAMPLE LIST SHEET

PROJECT I.D:	GC/GLNG/ONAUG08
COC No:	**08/08GLNG/onASS**
DATES SAMPLED:	4-11 Aug 2008
CONTACT PERSON:	Dr Rundi Larsen
LABORATORY:	Aust Laboratory Services P/L, 32 Shand Street, Stafford, QLD
SAMPLE TYPE:	SILT/CLAY & SANDY SILT CLAY SEDIMENT
COLLECTION METHOD:	Vibro-vacuum coring
SAMPLES:	- Kept chilled in esky & frozen within 6 hrs of collection
	- **81** samples for **COMPLETE CHROMIUM SUITE**

ALS QUOTE No. EN/248/07

RELINQUISHED BY	RECEIVED BY	DATE/TIME	DOCUMENTATION/ COMMENTS
	TNT DEPOT GLADSTONE	12/8/08	HAND DELIVERED TO TNT
LYNDON			DEPOT GLADSTONE

	CORE NUMBER	DEPTH (m)
1	GC/GLNG ON #1	0 – 0.1
2	GC/GLNG ON #1	0.3 – 0.5
3	GC/GLNG ON #1	1.5 – 1.7
4	GC/GLNG ON #2	0 – 0.1
5	GC/GLNG ON #2	0.3 – 0.5
6	GC/GLNG ON #2	1.3 – 1.5
7	GC/GLNG ON #2	1.8 – 2.0
8	GC/GLNG ON #3	0 – 0.1
9	GC/GLNG ON #3	0.8 – 1.0
10	GC/GLNG ON #3	1.8 – 2.0
11	GC/GLNG ON #4	0.3 – 0.5
12	GC/GLNG ON #4	1.3 – 1.5

Environmental Division
Brisbane
Work Order
EB0810932

Telephone : +61-7-3243 7222

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Australia
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	CORE NUMBER	DEPTH (m)
13	GC/GLNG ON #4	1.8 – 2.0
14	GC/GLNG ON #5	0 – 0.1
15	GC/GLNG ON #5	1.3 – 1.5 → LABELLED 0.8 – 1.0
16	GC/GLNG ON #5	1.8 – 1.9
17	GC/GLNG ON #6	0.3 – 0.5
18	GC/GLNG ON #6	0.8 – 1.0
19	GC/GLNG ON #6	1.8 – 2.0
20	GC/GLNG ON #7	0.3 – 0.5
21	GC/GLNG ON #7	1.3 – 1.5
22	GC/GLNG ON #7	1.8 – 2.0
23	GC/GLNG ON #8	0 – 0.1
24	GC/GLNG ON #8	0.8 – 1.0
25	GC/GLNG ON #8	1.8 – 2.0
26	GC/GLNG ON #9	0.3 – 0.5
27	GC/GLNG ON #9	0.8 – 1.0
28	GC/GLNG ON #9	1.8– 2.0
29	GC/GLNG ON #10	0 – 0.1
30	GC/GLNG ON #10	0.3 – 0.5
31	GC/GLNG ON #10	1.3 – 1.5
32	GC/GLNG ON #11	0 - 0.1
33	GC/GLNG ON #11	0.8 – 1.0
34	GC/GLNG ON #11	2.0 – 2.2
35	GC/GLNG ON #12	0.3 – 0.5
36	GC/GLNG ON #12	1.3 – 1.5
37	GC/GLNG ON #12	1.8 – 2.0
38	GC/GLNG ON #13	0 – 0.1
39	GC/GLNG ON #13	0.4 – 0.6
40	GC/GLNG ON #13	1.8 – 2.0
41	GC/GLNG ON #14	0 – 0.1
42	GC/GLNG ON #14	0.3 – 0.5
43	GC/GLNG ON #14	1.3 – 1.5

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CORE NUMBER	DEPTH (m)
GC/GLNG ON #15	0 – 0.1
GC/GLNG ON #15	0.8 – 1.0
GC/GLNG ON #15	1.8 – 2.0
GC/GLNG ON #16	0 – 0.1
GC/GLNG ON #16	0.8 – 1.0
GC/GLNG ON #16	1.3 – 1.4
GC/GLNG ON #17	0 – 0.1
CORE NUMBER	**DEPTH (m)**
~~GC/GLNG ON #15~~	~~0 – 0.1~~
~~GC/GLNG ON #15~~	~~0.8 – 1.0~~
~~GC/GLNG ON #15~~	~~1.8 – 2.0~~
~~GC/GLNG ON #16~~	~~0 – 0.1~~
~~GC/GLNG ON #16~~	~~0.8 – 1.0~~
~~GC/GLNG ON #16~~	~~1.3 – 1.4~~
~~GC/GLNG ON #17~~	~~0 – 0.1~~
GC/GLNG ON #17	0.3 – 0.5
GC/GLNG ON #17	1.5 – 1.7
GC/GLNG ON #18	0 – 0.1
GC/GLNG ON #18	1.3 – 1.5
GC/GLNG ON #19	0 – 0.1
GC/GLNG ON #19	0.3 – 0.5
GC/GLNG ON #19	1.3 – 1.5
GC/GLNG ON #20	0.3 – 0.5
GC/GLNG ON #20	0.8 – 1.0
GC/GLNG ON #21	1.3 – 1.5
GC/GLNG ON #22	0 – 0.1
GC/GLNG ON #22	0.8 – 1.0
GC/GLNG ON #22	1.3 – 1.5
GC/GLNG ON #22	1.8 – 2.0
GC/GLNG ON #23	0.3 – 0.5
GC/GLNG ON #23	1.3 – 1.5
GC/GLNG ON #23	2.3 – 2.5
GC/GLNG ON #24	0 – 0.1
GC/GLNG ON #24	0.8 – 1.0
GC/GLNG ON #24	1.8 – 2.0

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71	GC/GLNG ON #25	0.8 – 0.9
72	GC/GLNG ON #26	0.3 – 0.5
73	GC/GLNG ON #26	0.8 – 1.0
74	GC/GLNG ON #27	0.2 – 0.3
75	GC/GLNG ON #27	0.4 – 0.6
76	GC/GLNG ON #28	0.3 – 0.5
77	GC/GLNG ON #28	1.0 – 1.2
78	GC/GLNG ON #29	0 – 0.1
79	GC/GLNG ON #30	0.25 – 0.36
80	GC/GLNG ON #31	0.25 – 0.35
81	GC/GLNG ON #31	0.35 – 0.5

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0810932**	Page	: 1 of 8
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG ONAUG08	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: 08/08GLNG/onASS	Date Samples Received	: 14-AUG-2008
Sampler	: ----	Issue Date	: 26-AUG-2008
Order number	: ----		
		No. of samples received	: 81
Quote number	: BN/248/07	No. of samples analysed	: 81

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jessica Janson	Supervisor - Acid Sulphate Soils	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-A: Actual Acidity (QC Lot: 735841)									
EB0810932-001	GC/GLNG ON #1 0-0.1m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.06		0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	36		6.8	0% - 50%
		EA033: pH KCl (23A)	----	0.1	pH Unit	4.6		0.0	0% - 20%
EB0810932-011	GC/GLNG ON #4 0.3-0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.15	0.16	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	96	100	4.9	0% - 20%
		EA033: pH KCl (23A)	----	0.1	pH Unit	4.0	4.1	2.5	0% - 20%
EA033-A: Actual Acidity (QC Lot: 735842)									
EB0810932-021	GC/GLNG ON #7 1.3-1.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	8		13.2	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.0		0.0	0% - 20%
EB0810932-031	GC/GLNG ON #10 1.3-1.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.13		0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	79	74	6.3	0% - 20%
		EA033: pH KCl (23A)	----	0.1	pH Unit	4.1	4.1	0.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 735843)									
EB0810932-041	GC/GLNG ON #14 0-0.1m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02		0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	8.6	8.6	0.0	0% - 20%
EB0810932-051	GC/GLNG ON #17 0.3-0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.16	0.15	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	97		1.4	0% - 20%
		EA033: pH KCl (23A)	----	0.1	pH Unit	4.1		0.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 735844)									
EB0810932-061	GC/GLNG ON #22 0-0.1m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02		0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	13	11	19.9	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	5.8	5.9	1.7	0% - 20%
EB0810932-071	GC/GLNG ON #25 0.8-0.9m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02		0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	16		26.1	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	5.0		2.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 735845)									
EB0810932-081	GC/GLNG ON #31 0.35-0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2		0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.4		0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 735841)									
EB0810932-001	GC/GLNG ON #1 0-0.1m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.15		0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-B: Potential Acidity (QC Lot: 735841) - continued									
EB0810932-001	GC/GLNG ON #1 0-0.1m	EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	93		1.1	No Limit
EB0810932-011	GC/GLNG ON #4 0.3-0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	2.24	2.35	4.9	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1400	1470	4.9	0% - 20%
EA033-B: Potential Acidity (QC Lot: 735842)									
EB0810932-021	GC/GLNG ON #7 1.3-1.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.97		0.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1230	1230	0.1	0% - 20%
EB0810932-031	GC/GLNG ON #10 1.3-1.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	2.36	2.57	8.7	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1470		8.7	0% - 20%
EA033-B: Potential Acidity (QC Lot: 735843)									
EB0810932-041	GC/GLNG ON #14 0-0.1m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0810932-051	GC/GLNG ON #17 0.3-0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	2.60		8.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1620		8.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 735844)									
EB0810932-061	GC/GLNG ON #22 0-0.1m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.03	0.04	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	22		0.0	No Limit
EB0810932-071	GC/GLNG ON #25 0.8-0.9m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	4.67		6.1	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	2920	3100	6.1	0% - 20%
EA033-B: Potential Acidity (QC Lot: 735845)									
EB0810932-081	GC/GLNG ON #31 0.35-0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02		0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10		0.0	No Limit
EA033-C: Acid Neutralising Capacity (QC Lot: 735843)									
EB0810932-041	GC/GLNG ON #14 0-0.1m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	4.91	4.91	0.0	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	1.57		0.0	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	982		0.0	0% - 20%
EA033-D: Retained Acidity (QC Lot: 735841)									
EB0810932-011	GC/GLNG ON #4 0.3-0.5m	EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	0.03	0.03	0.0	No Limit
		EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	0.04		0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-D: Retained Acidity (QC Lot: 735841) - continued									
EB0810932-011	GC/GLNG ON #4 0.3-0.5m	EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.47	0.48	0.0	0% - 20%
		EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.52	0.52	0.0	0% - 20%
		EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	21	17	21.4	No Limit
EA033-D: Retained Acidity (QC Lot: 735842)									
EB0810932-031	GC/GLNG ON #10 1.3-1.5m	EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02		0.0	No Limit
		EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.56		4.8	0% - 20%
		EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.54	0.55	2.4	0% - 20%
		EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10		0.0	No Limit
EA033-D: Retained Acidity (QC Lot: 735843)									
EB0810932-051	GC/GLNG ON #17 0.3-0.5m	EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.37	0.38	0.0	0% - 50%
		EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.38		0.0	0% - 50%
		EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10		0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA033-A: Actual Acidity (QCLot: 735841)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 735842)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 735843)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 735844)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 735845)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 735841)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 735842)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 735843)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 735844)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 735845)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 735841)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EA033-D: Retained Acidity (QCLot: 735841)								
EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) Results are required to be reported.**

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0810932**	Page	: 1 of 24
Client	: GEOCOASTAL (AUSTRALIA) PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG ONAUG08	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: 08/08GLNG/onASS	Date Samples Received	: 14-AUG-2008
Sampler	: ----	Issue Date	: 26-AUG-2008
Order number	: ----		
		No. of samples received	: 81
Quote number	: BN/248/07	No. of samples analysed	: 81

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity - Continued							
Snap Lock Bag - frozen							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity - Continued							
GC/GLNG ON #1 - 0-0.1m, GC/GLNG ON #1 - 0.3-0.5m, GC/GLNG ON #1 - 1.5-1.7m, GC/GLNG ON #2 - 0-0.1m, GC/GLNG ON #2 - 0.3-0.5m, GC/GLNG ON #2 - 1.3-1.5m, GC/GLNG ON #2 - 1.8-2.0m, GC/GLNG ON #3 - 0-0.1m, GC/GLNG ON #3 - 0.8-1.0m, GC/GLNG ON #5 - 0-0.1m, GC/GLNG ON #3 - 1.8-2.0m, GC/GLNG ON #4 - 0.3-0.5m, GC/GLNG ON #4 - 1.3-1.5m, GC/GLNG ON #4 - 1.8-2.0m, GC/GLNG ON #5 - 1.3-1.5m, GC/GLNG ON #5 - 1.8-1.9m, GC/GLNG ON #6 - 0.3-0.5m, GC/GLNG ON #6 - 0.8-1.0m, GC/GLNG ON #6 - 1.8-2.0m, GC/GLNG ON #7 - 0.3-0.5m, GC/GLNG ON #7 - 1.3-1.5m, GC/GLNG ON #7 - 1.8-2.0m, GC/GLNG ON #8 - 0-0.1m, GC/GLNG ON #8 - 0.8-1.0m, GC/GLNG ON #8 - 1.8-2.0m, GC/GLNG ON #9 - 0.3-0.5m, GC/GLNG ON #9 - 0.8-1.0m, GC/GLNG ON #9 - 1.8-2.0m, GC/GLNG ON #10 - 0-0.1m, GC/GLNG ON #10 - 0.3-0.5m, GC/GLNG ON #10 - 1.3-1.5m, GC/GLNG ON #11 - 0-0.1m, GC/GLNG ON #11 - 0.8-1.0m, GC/GLNG ON #11 - 2.0-2.2m, GC/GLNG ON #12 - 0.3-0.5m, GC/GLNG ON #12 - 1.3-1.5m, GC/GLNG ON #12 - 1.8-2.0m, GC/GLNG ON #13 - 0-0.1m, GC/GLNG ON #13 - 0.4-0.6m, GC/GLNG ON #13 - 1.8-2.0m, GC/GLNG ON #14 - 0-0.1m, GC/GLNG ON #14 - 0.3-0.5m, GC/GLNG ON #14 - 1.3-1.5m, GC/GLNG ON #15 - 0-0.1m, GC/GLNG ON #15 - 0.8-1.0m, GC/GLNG ON #15 - 1.8-2.0m, GC/GLNG ON #16 - 0-0.1m, GC/GLNG ON #16 - 0.8-1.0m, GC/GLNG ON #16 - 1.3-1.4m, GC/GLNG ON #17 - 0-0.1m, GC/GLNG ON #17 - 0.3-0.5m, GC/GLNG ON #17 - 1.5-1.7m, GC/GLNG ON #18 - 0-0.1m, GC/GLNG ON #18 - 1.3-1.5m, GC/GLNG ON #19 - 0-0.1m, GC/GLNG ON #19 - 0.3-0.5m, GC/GLNG ON #19 - 1.3-1.5m, GC/GLNG ON #20 - 0.3-0.5m, GC/GLNG ON #20 - 0.8-1.0m, GC/GLNG ON #21 - 1.3-1.5m, GC/GLNG ON #22 - 0-0.1m, GC/GLNG ON #22 - 0.8-1.0m, GC/GLNG ON #22 - 1.3-1.5m, GC/GLNG ON #22 - 1.8-2.0m, GC/GLNG ON #23 - 0.3-0.5m, GC/GLNG ON #23 - 1.3-1.5m, GC/GLNG ON #23 - 2.3-2.5m, GC/GLNG ON #24 - 0-0.1m, GC/GLNG ON #24 - 0.8-1.0m, GC/GLNG ON #24 - 1.8-2.0m, GC/GLNG ON #25 - 0.8-0.9m, GC/GLNG ON #26 - 0.3-0.5m, GC/GLNG ON #26 - 0.8-1.0m, GC/GLNG ON #27 - 0.2-0.3m, GC/GLNG ON #27 - 0.4-0.6m, GC/GLNG ON #28 - 0.3-0.5m, GC/GLNG ON #28 - 1.0-1.2m, GC/GLNG ON #29 - 0-0.1m, GC/GLNG ON #30 - 0.25-0.36m, GC/GLNG ON #31 - 0.25-0.35m,	**11-AUG-2008**	**14-AUG-2008**	11-AUG-2009	✓	**21-AUG-2008**	19-NOV-2008	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity - Continued							
GC/GLNG ON #31 - 0.35-0.5m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-B: Potential Acidity							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-B: Potential Acidity - Continued							
Snap Lock Bag - frozen							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-B: Potential Acidity - Continued							
GC/GLNG ON #1 - 0-0.1m, GC/GLNG ON #1 - 0.3-0.5m, GC/GLNG ON #1 - 1.5-1.7m, GC/GLNG ON #2 - 0-0.1m, GC/GLNG ON #2 - 0.3-0.5m, GC/GLNG ON #2 - 1.3-1.5m, GC/GLNG ON #2 - 1.8-2.0m, GC/GLNG ON #3 - 0-0.1m, GC/GLNG ON #3 - 0.8-1.0m, GC/GLNG ON #5 - 0-0.1m, GC/GLNG ON #3 - 1.8-2.0m, GC/GLNG ON #4 - 0.3-0.5m, GC/GLNG ON #4 - 1.3-1.5m, GC/GLNG ON #4 - 1.8-2.0m, GC/GLNG ON #5 - 1.3-1.5m, GC/GLNG ON #5 - 1.8-1.9m, GC/GLNG ON #6 - 0.3-0.5m, GC/GLNG ON #6 - 0.8-1.0m, GC/GLNG ON #6 - 1.8-2.0m, GC/GLNG ON #7 - 0.3-0.5m, GC/GLNG ON #7 - 1.3-1.5m, GC/GLNG ON #7 - 1.8-2.0m, GC/GLNG ON #8 - 0-0.1m, GC/GLNG ON #8 - 0.8-1.0m, GC/GLNG ON #8 - 1.8-2.0m, GC/GLNG ON #9 - 0.3-0.5m, GC/GLNG ON #9 - 0.8-1.0m, GC/GLNG ON #9 - 1.8-2.0m, GC/GLNG ON #10 - 0-0.1m, GC/GLNG ON #10 - 0.3-0.5m, GC/GLNG ON #10 - 1.3-1.5m, GC/GLNG ON #11 - 0-0.1m, GC/GLNG ON #11 - 0.8-1.0m, GC/GLNG ON #11 - 2.0-2.2m, GC/GLNG ON #12 - 0.3-0.5m, GC/GLNG ON #12 - 1.3-1.5m, GC/GLNG ON #12 - 1.8-2.0m, GC/GLNG ON #13 - 0-0.1m, GC/GLNG ON #13 - 0.4-0.6m, GC/GLNG ON #13 - 1.8-2.0m, GC/GLNG ON #14 - 0-0.1m, GC/GLNG ON #14 - 0.3-0.5m, GC/GLNG ON #14 - 1.3-1.5m, GC/GLNG ON #15 - 0-0.1m, GC/GLNG ON #15 - 0.8-1.0m, GC/GLNG ON #15 - 1.8-2.0m, GC/GLNG ON #16 - 0-0.1m, GC/GLNG ON #16 - 0.8-1.0m, GC/GLNG ON #16 - 1.3-1.4m, GC/GLNG ON #17 - 0-0.1m, GC/GLNG ON #17 - 0.3-0.5m, GC/GLNG ON #17 - 1.5-1.7m, GC/GLNG ON #18 - 0-0.1m, GC/GLNG ON #18 - 1.3-1.5m, GC/GLNG ON #19 - 0-0.1m, GC/GLNG ON #19 - 0.3-0.5m, GC/GLNG ON #19 - 1.3-1.5m, GC/GLNG ON #20 - 0.3-0.5m, GC/GLNG ON #20 - 0.8-1.0m, GC/GLNG ON #21 - 1.3-1.5m, GC/GLNG ON #22 - 0-0.1m, GC/GLNG ON #22 - 0.8-1.0m, GC/GLNG ON #22 - 1.3-1.5m, GC/GLNG ON #22 - 1.8-2.0m, GC/GLNG ON #23 - 0.3-0.5m, GC/GLNG ON #23 - 1.3-1.5m, GC/GLNG ON #23 - 2.3-2.5m, GC/GLNG ON #24 - 0-0.1m, GC/GLNG ON #24 - 0.8-1.0m, GC/GLNG ON #24 - 1.8-2.0m, GC/GLNG ON #25 - 0.8-0.9m, GC/GLNG ON #26 - 0.3-0.5m, GC/GLNG ON #26 - 0.8-1.0m, GC/GLNG ON #27 - 0.2-0.3m, GC/GLNG ON #27 - 0.4-0.6m, GC/GLNG ON #28 - 0.3-0.5m, GC/GLNG ON #28 - 1.0-1.2m, GC/GLNG ON #29 - 0-0.1m, GC/GLNG ON #30 - 0.25-0.36m, GC/GLNG ON #31 - 0.25-0.35m,	**11-AUG-2008**	**14-AUG-2008**	11-AUG-2009	✓	**21-AUG-2008**	19-NOV-2008	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-B: Potential Acidity - Continued							
GC/GLNG ON #31 - 0.35-0.5m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-C: Acid Neutralising Capacity							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-C: Acid Neutralising Capacity - Continued							
Snap Lock Bag - frozen							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-C: Acid Neutralising Capacity - Continued							
GC/GLNG ON #1 - 0-0.1m, GC/GLNG ON #1 - 0.3-0.5m, GC/GLNG ON #1 - 1.5-1.7m, GC/GLNG ON #2 - 0-0.1m, GC/GLNG ON #2 - 0.3-0.5m, GC/GLNG ON #2 - 1.3-1.5m, GC/GLNG ON #2 - 1.8-2.0m, GC/GLNG ON #3 - 0-0.1m, GC/GLNG ON #3 - 0.8-1.0m, GC/GLNG ON #5 - 0-0.1m, GC/GLNG ON #3 - 1.8-2.0m, GC/GLNG ON #4 - 0.3-0.5m, GC/GLNG ON #4 - 1.3-1.5m, GC/GLNG ON #4 - 1.8-2.0m, GC/GLNG ON #5 - 1.3-1.5m, GC/GLNG ON #5 - 1.8-1.9m, GC/GLNG ON #6 - 0.3-0.5m, GC/GLNG ON #6 - 0.8-1.0m, GC/GLNG ON #6 - 1.8-2.0m, GC/GLNG ON #7 - 0.3-0.5m, GC/GLNG ON #7 - 1.3-1.5m, GC/GLNG ON #7 - 1.8-2.0m, GC/GLNG ON #8 - 0-0.1m, GC/GLNG ON #8 - 0.8-1.0m, GC/GLNG ON #8 - 1.8-2.0m, GC/GLNG ON #9 - 0.3-0.5m, GC/GLNG ON #9 - 0.8-1.0m, GC/GLNG ON #9 - 1.8-2.0m, GC/GLNG ON #10 - 0-0.1m, GC/GLNG ON #10 - 0.3-0.5m, GC/GLNG ON #10 - 1.3-1.5m, GC/GLNG ON #11 - 0-0.1m, GC/GLNG ON #11 - 0.8-1.0m, GC/GLNG ON #11 - 2.0-2.2m, GC/GLNG ON #12 - 0.3-0.5m, GC/GLNG ON #12 - 1.3-1.5m, GC/GLNG ON #12 - 1.8-2.0m, GC/GLNG ON #13 - 0-0.1m, GC/GLNG ON #13 - 0.4-0.6m, GC/GLNG ON #13 - 1.8-2.0m, GC/GLNG ON #14 - 0-0.1m, GC/GLNG ON #14 - 0.3-0.5m, GC/GLNG ON #14 - 1.3-1.5m, GC/GLNG ON #15 - 0-0.1m, GC/GLNG ON #15 - 0.8-1.0m, GC/GLNG ON #15 - 1.8-2.0m, GC/GLNG ON #16 - 0-0.1m, GC/GLNG ON #16 - 0.8-1.0m, GC/GLNG ON #16 - 1.3-1.4m, GC/GLNG ON #17 - 0-0.1m, GC/GLNG ON #17 - 0.3-0.5m, GC/GLNG ON #17 - 1.5-1.7m, GC/GLNG ON #18 - 0-0.1m, GC/GLNG ON #18 - 1.3-1.5m, GC/GLNG ON #19 - 0-0.1m, GC/GLNG ON #19 - 0.3-0.5m, GC/GLNG ON #19 - 1.3-1.5m, GC/GLNG ON #20 - 0.3-0.5m, GC/GLNG ON #20 - 0.8-1.0m, GC/GLNG ON #21 - 1.3-1.5m, GC/GLNG ON #22 - 0-0.1m, GC/GLNG ON #22 - 0.8-1.0m, GC/GLNG ON #22 - 1.3-1.5m, GC/GLNG ON #22 - 1.8-2.0m, GC/GLNG ON #23 - 0.3-0.5m, GC/GLNG ON #23 - 1.3-1.5m, GC/GLNG ON #23 - 2.3-2.5m, GC/GLNG ON #24 - 0-0.1m, GC/GLNG ON #24 - 0.8-1.0m, GC/GLNG ON #24 - 1.8-2.0m, GC/GLNG ON #25 - 0.8-0.9m, GC/GLNG ON #26 - 0.3-0.5m, GC/GLNG ON #26 - 0.8-1.0m, GC/GLNG ON #27 - 0.2-0.3m, GC/GLNG ON #27 - 0.4-0.6m, GC/GLNG ON #28 - 0.3-0.5m, GC/GLNG ON #28 - 1.0-1.2m, GC/GLNG ON #29 - 0-0.1m, GC/GLNG ON #30 - 0.25-0.36m, GC/GLNG ON #31 - 0.25-0.35m,	**11-AUG-2008**	**14-AUG-2008**	11-AUG-2009	✓	**21-AUG-2008**	19-NOV-2008	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-C: Acid Neutralising Capacity - Continued							
GC/GLNG ON #31 - 0.35-0.5m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-D: Retained Acidity							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-D: Retained Acidity - Continued							
Snap Lock Bag - frozen							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-D: Retained Acidity - Continued							
GC/GLNG ON #1 - 0-0.1m, GC/GLNG ON #1 - 0.3-0.5m, GC/GLNG ON #1 - 1.5-1.7m, GC/GLNG ON #2 - 0-0.1m, GC/GLNG ON #2 - 0.3-0.5m, GC/GLNG ON #2 - 1.3-1.5m, GC/GLNG ON #2 - 1.8-2.0m, GC/GLNG ON #3 - 0-0.1m, GC/GLNG ON #3 - 0.8-1.0m, GC/GLNG ON #5 - 0-0.1m, GC/GLNG ON #3 - 1.8-2.0m, GC/GLNG ON #4 - 0.3-0.5m, GC/GLNG ON #4 - 1.3-1.5m, GC/GLNG ON #4 - 1.8-2.0m, GC/GLNG ON #5 - 1.3-1.5m, GC/GLNG ON #5 - 1.8-1.9m, GC/GLNG ON #6 - 0.3-0.5m, GC/GLNG ON #6 - 0.8-1.0m, GC/GLNG ON #6 - 1.8-2.0m, GC/GLNG ON #7 - 0.3-0.5m, GC/GLNG ON #7 - 1.3-1.5m, GC/GLNG ON #7 - 1.8-2.0m, GC/GLNG ON #8 - 0-0.1m, GC/GLNG ON #8 - 0.8-1.0m, GC/GLNG ON #8 - 1.8-2.0m, GC/GLNG ON #9 - 0.3-0.5m, GC/GLNG ON #9 - 0.8-1.0m, GC/GLNG ON #9 - 1.8-2.0m, GC/GLNG ON #10 - 0-0.1m, GC/GLNG ON #10 - 0.3-0.5m, GC/GLNG ON #10 - 1.3-1.5m, GC/GLNG ON #11 - 0-0.1m, GC/GLNG ON #11 - 0.8-1.0m, GC/GLNG ON #11 - 2.0-2.2m, GC/GLNG ON #12 - 0.3-0.5m, GC/GLNG ON #12 - 1.3-1.5m, GC/GLNG ON #12 - 1.8-2.0m, GC/GLNG ON #13 - 0-0.1m, GC/GLNG ON #13 - 0.4-0.6m, GC/GLNG ON #13 - 1.8-2.0m, GC/GLNG ON #14 - 0-0.1m, GC/GLNG ON #14 - 0.3-0.5m, GC/GLNG ON #14 - 1.3-1.5m, GC/GLNG ON #15 - 0-0.1m, GC/GLNG ON #15 - 0.8-1.0m, GC/GLNG ON #15 - 1.8-2.0m, GC/GLNG ON #16 - 0-0.1m, GC/GLNG ON #16 - 0.8-1.0m, GC/GLNG ON #16 - 1.3-1.4m, GC/GLNG ON #17 - 0-0.1m, GC/GLNG ON #17 - 0.3-0.5m, GC/GLNG ON #17 - 1.5-1.7m, GC/GLNG ON #18 - 0-0.1m, GC/GLNG ON #18 - 1.3-1.5m, GC/GLNG ON #19 - 0-0.1m, GC/GLNG ON #19 - 0.3-0.5m, GC/GLNG ON #19 - 1.3-1.5m, GC/GLNG ON #20 - 0.3-0.5m, GC/GLNG ON #20 - 0.8-1.0m, GC/GLNG ON #21 - 1.3-1.5m, GC/GLNG ON #22 - 0-0.1m, GC/GLNG ON #22 - 0.8-1.0m, GC/GLNG ON #22 - 1.3-1.5m, GC/GLNG ON #22 - 1.8-2.0m, GC/GLNG ON #23 - 0.3-0.5m, GC/GLNG ON #23 - 1.3-1.5m, GC/GLNG ON #23 - 2.3-2.5m, GC/GLNG ON #24 - 0-0.1m, GC/GLNG ON #24 - 0.8-1.0m, GC/GLNG ON #24 - 1.8-2.0m, GC/GLNG ON #25 - 0.8-0.9m, GC/GLNG ON #26 - 0.3-0.5m, GC/GLNG ON #26 - 0.8-1.0m, GC/GLNG ON #27 - 0.2-0.3m, GC/GLNG ON #27 - 0.4-0.6m, GC/GLNG ON #28 - 0.3-0.5m, GC/GLNG ON #28 - 1.0-1.2m, GC/GLNG ON #29 - 0-0.1m, GC/GLNG ON #30 - 0.25-0.36m, GC/GLNG ON #31 - 0.25-0.35m,	**11-AUG-2008**	**14-AUG-2008**	11-AUG-2009	✓	**21-AUG-2008**	19-NOV-2008	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-D: Retained Acidity - Continued							
GC/GLNG ON #31 - 0.35-0.5m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-E: Acid Base Accounting							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-E: Acid Base Accounting - Continued							
Snap Lock Bag - frozen							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-E: Acid Base Accounting - Continued							
GC/GLNG ON #1 - 0-0.1m, GC/GLNG ON #1 - 0.3-0.5m, GC/GLNG ON #1 - 1.5-1.7m, GC/GLNG ON #2 - 0-0.1m, GC/GLNG ON #2 - 0.3-0.5m, GC/GLNG ON #2 - 1.3-1.5m, GC/GLNG ON #2 - 1.8-2.0m, GC/GLNG ON #3 - 0-0.1m, GC/GLNG ON #3 - 0.8-1.0m, GC/GLNG ON #5 - 0-0.1m, GC/GLNG ON #3 - 1.8-2.0m, GC/GLNG ON #4 - 0.3-0.5m, GC/GLNG ON #4 - 1.3-1.5m, GC/GLNG ON #4 - 1.8-2.0m, GC/GLNG ON #5 - 1.3-1.5m, GC/GLNG ON #5 - 1.8-1.9m, GC/GLNG ON #6 - 0.3-0.5m, GC/GLNG ON #6 - 0.8-1.0m, GC/GLNG ON #6 - 1.8-2.0m, GC/GLNG ON #7 - 0.3-0.5m, GC/GLNG ON #7 - 1.3-1.5m, GC/GLNG ON #7 - 1.8-2.0m, GC/GLNG ON #8 - 0-0.1m, GC/GLNG ON #8 - 0.8-1.0m, GC/GLNG ON #8 - 1.8-2.0m, GC/GLNG ON #9 - 0.3-0.5m, GC/GLNG ON #9 - 0.8-1.0m, GC/GLNG ON #9 - 1.8-2.0m, GC/GLNG ON #10 - 0-0.1m, GC/GLNG ON #10 - 0.3-0.5m, GC/GLNG ON #10 - 1.3-1.5m, GC/GLNG ON #11 - 0-0.1m, GC/GLNG ON #11 - 0.8-1.0m, GC/GLNG ON #11 - 2.0-2.2m, GC/GLNG ON #12 - 0.3-0.5m, GC/GLNG ON #12 - 1.3-1.5m, GC/GLNG ON #12 - 1.8-2.0m, GC/GLNG ON #13 - 0-0.1m, GC/GLNG ON #13 - 0.4-0.6m, GC/GLNG ON #13 - 1.8-2.0m, GC/GLNG ON #14 - 0-0.1m, GC/GLNG ON #14 - 0.3-0.5m, GC/GLNG ON #14 - 1.3-1.5m, GC/GLNG ON #15 - 0-0.1m, GC/GLNG ON #15 - 0.8-1.0m, GC/GLNG ON #15 - 1.8-2.0m, GC/GLNG ON #16 - 0-0.1m, GC/GLNG ON #16 - 0.8-1.0m, GC/GLNG ON #16 - 1.3-1.4m, GC/GLNG ON #17 - 0-0.1m, GC/GLNG ON #17 - 0.3-0.5m, GC/GLNG ON #17 - 1.5-1.7m, GC/GLNG ON #18 - 0-0.1m, GC/GLNG ON #18 - 1.3-1.5m, GC/GLNG ON #19 - 0-0.1m, GC/GLNG ON #19 - 0.3-0.5m, GC/GLNG ON #19 - 1.3-1.5m, GC/GLNG ON #20 - 0.3-0.5m, GC/GLNG ON #20 - 0.8-1.0m, GC/GLNG ON #21 - 1.3-1.5m, GC/GLNG ON #22 - 0-0.1m, GC/GLNG ON #22 - 0.8-1.0m, GC/GLNG ON #22 - 1.3-1.5m, GC/GLNG ON #22 - 1.8-2.0m, GC/GLNG ON #23 - 0.3-0.5m, GC/GLNG ON #23 - 1.3-1.5m, GC/GLNG ON #23 - 2.3-2.5m, GC/GLNG ON #24 - 0-0.1m, GC/GLNG ON #24 - 0.8-1.0m, GC/GLNG ON #24 - 1.8-2.0m, GC/GLNG ON #25 - 0.8-0.9m, GC/GLNG ON #26 - 0.3-0.5m, GC/GLNG ON #26 - 0.8-1.0m, GC/GLNG ON #27 - 0.2-0.3m, GC/GLNG ON #27 - 0.4-0.6m, GC/GLNG ON #28 - 0.3-0.5m, GC/GLNG ON #28 - 1.0-1.2m, GC/GLNG ON #29 - 0-0.1m, GC/GLNG ON #30 - 0.25-0.36m, GC/GLNG ON #31 - 0.25-0.35m,	**11-AUG-2008**	**14-AUG-2008**	11-AUG-2009	✓	**21-AUG-2008**	19-NOV-2008	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-E: Acid Base Accounting - Continued							
GC/GLNG ON #31 - 0.35-0.5m							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	9	81	**11.1**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	5	81	**6.2**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EB0811434**		
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG 08	Page	: 1 of 4
Order number	: ----		
C-O-C number	: 08/08 GLNG/08 ASS-2	Quote number	: EB20070176 (BN/248/07)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 25-AUG-2008	Issue Date	: 26-AUG-2008 11:40
Client Requested Due Date	: 03-SEP-2008	Scheduled Reporting Date	: **01-SEP-2008**

Delivery Details

Mode of Delivery	: Client Drop off	Temperature	: -5.2 C, -2.4 C - Ice bricks present
No. of coolers/boxes	: 1 LARGE, 1 LARGE FOAM	No. of samples received	: 76
Sercurity Seal	: Intact.	No. of samples analysed	: 76

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0811434-001	20-AUG-2008 12:00	GC/GLNG #32 0 - 0.1m	✓
EB0811434-002	20-AUG-2008 12:00	GC/GLNG #32 0.4 - 0...	✓
EB0811434-003	20-AUG-2008 12:00	GC/GLNG #32 1.7 - 1...	✓
EB0811434-004	20-AUG-2008 12:00	GC/GLNG #33 0.3 - 0...	✓
EB0811434-005	20-AUG-2008 12:00	GC/GLNG #33 0.7 - 0...	✓
EB0811434-006	20-AUG-2008 12:00	GC/GLNG #33 1.5 - 1...	✓
EB0811434-007	20-AUG-2008 12:00	GC/GLNG #34 0 - 0.1m	✓
EB0811434-008	20-AUG-2008 12:00	GC/GLNG #34 0.3 - 0...	✓
EB0811434-009	20-AUG-2008 12:00	GC/GLNG #34 0.8 - 1...	✓
EB0811434-010	20-AUG-2008 12:00	GC/GLNG #35 0.4 - 0...	✓
EB0811434-011	20-AUG-2008 12:00	GC/GLNG #35 1.3 - 1...	✓
EB0811434-012	20-AUG-2008 12:00	GC/GLNG #35 2.2 - 2...	✓
EB0811434-013	20-AUG-2008 12:00	GC/GLNG #36 0 - 0.1m	✓
EB0811434-014	20-AUG-2008 12:00	GC/GLNG #36 0.8 - 1...	✓
EB0811434-015	20-AUG-2008 12:00	GC/GLNG #36 1.3 - 1...	✓
EB0811434-016	20-AUG-2008 12:00	GC/GLNG #37 0 - 0.1m	✓
EB0811434-017	20-AUG-2008 12:00	GC/GLNG #37 0.3 - 0...	✓
EB0811434-018	20-AUG-2008 12:00	GC/GLNG #37 0.8 - 1...	✓
EB0811434-019	20-AUG-2008 12:00	GC/GLNG #38 0 - 0.1m	✓
EB0811434-020	20-AUG-2008 12:00	GC/GLNG #38 0.3 - 0...	✓
EB0811434-021	20-AUG-2008 12:00	GC/GLNG #38 1.2 - 1...	✓
EB0811434-022	20-AUG-2008 12:00	GC/GLNG #39 0.3 - 0...	✓
EB0811434-023	20-AUG-2008 12:00	GC/GLNG #39 0.7 - 0...	✓
EB0811434-024	20-AUG-2008 12:00	GC/GLNG #39 1.3 - 1...	✓
EB0811434-025	20-AUG-2008 12:00	GC/GLNG #40 0 - 0.1m	✓
EB0811434-026	20-AUG-2008 12:00	GC/GLNG #40 0.3 - 0...	✓
EB0811434-027	20-AUG-2008 12:00	GC/GLNG #40 0.7 - 0...	✓
EB0811434-028	20-AUG-2008 12:00	GC/GLNG #41 0.3 - 0...	✓
EB0811434-029	20-AUG-2008 12:00	GC/GLNG #41 1.8 - 2...	✓
EB0811434-030	20-AUG-2008 12:00	GC/GLNG #41 2.1 - 2...	✓
EB0811434-031	20-AUG-2008 12:00	GC/GLNG #42 0.3 - 0...	✓
EB0811434-032	20-AUG-2008 12:00	GC/GLNG #42 1.8 - 2...	✓
EB0811434-033	20-AUG-2008 12:00	GC/GLNG #42 2.3 - 2...	✓
EB0811434-034	20-AUG-2008 12:00	GC/GLNG #42 2.8 - 3...	✓
EB0811434-035	20-AUG-2008 12:00	GC/GLNG #82 1.3 - 1...	✓

			SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0811434-036	20-AUG-2008 12:00	GC/GLNG #43 0.3 - 0...	✓
EB0811434-037	20-AUG-2008 12:00	GC/GLNG #43 0.8 - 1...	✓
EB0811434-038	20-AUG-2008 12:00	GC/GLNG #43 1.8 - 2...	✓
EB0811434-039	20-AUG-2008 12:00	GC/GLNG #43 2.8 - 3...	✓
EB0811434-040	20-AUG-2008 12:00	GC/GLNG #44 0.3 - 0...	✓
EB0811434-041	20-AUG-2008 12:00	GC/GLNG #44 1.3 - 1...	✓
EB0811434-042	20-AUG-2008 12:00	GC/GLNG #44 2.8 - 3...	✓
EB0811434-043	20-AUG-2008 12:00	GC/GLNG #45 0 - 0.1m	✓
EB0811434-044	20-AUG-2008 12:00	GC/GLNG #45 0.8 - 1...	✓
EB0811434-045	20-AUG-2008 12:00	GC/GLNG #45 2.3 - 2...	✓
EB0811434-046	20-AUG-2008 12:00	GC/GLNG #46 0.3 - 0...	✓
EB0811434-047	20-AUG-2008 12:00	GC/GLNG #46 1.6 - 2...	✓
EB0811434-048	20-AUG-2008 12:00	GC/GLNG #46 2.8 - 3...	✓
EB0811434-049	20-AUG-2008 12:00	GC/GLNG #47 0.4 - 0...	✓
EB0811434-050	20-AUG-2008 12:00	GC/GLNG #47 1.3 - 1...	✓
EB0811434-051	20-AUG-2008 12:00	GC/GLNG #47 2.3 - 2...	✓
EB0811434-052	20-AUG-2008 12:00	GC/GLNG #48 0.3 - 0...	✓
EB0811434-053	20-AUG-2008 12:00	GC/GLNG #48 1.8 - 2...	✓
EB0811434-054	20-AUG-2008 12:00	GC/GLNG #48 2.8 - 3...	✓
EB0811434-055	20-AUG-2008 12:00	GC/GLNG #49 0.3 - 0...	✓
EB0811434-056	20-AUG-2008 12:00	GC/GLNG #49 0.8 - 1...	✓
EB0811434-057	20-AUG-2008 12:00	GC/GLNG #49 2.3 - 2...	✓
EB0811434-058	20-AUG-2008 12:00	GC/GLNG #50 0 - 0.1m	✓
EB0811434-059	20-AUG-2008 12:00	GC/GLNG #50 0.8 - 1...	✓
EB0811434-060	20-AUG-2008 12:00	GC/GLNG #50 2.3 - 2...	✓
EB0811434-061	20-AUG-2008 12:00	GC/GLNG #51 0.3 - 0...	✓
EB0811434-062	20-AUG-2008 12:00	GC/GLNG #51 1.3 - 1...	✓
EB0811434-063	20-AUG-2008 12:00	GC/GLNG #51 2.8 - 3...	✓
EB0811434-064	20-AUG-2008 12:00	GC/GLNG #52 0.3 - 0...	✓
EB0811434-065	20-AUG-2008 12:00	GC/GLNG #52 0.8 - 1...	✓
EB0811434-066	20-AUG-2008 12:00	GC/GLNG #52 2.3 - 2...	✓
EB0811434-067	20-AUG-2008 12:00	GC/GLNG #53 0 - 0.1m	✓
EB0811434-068	20-AUG-2008 12:00	GC/GLNG #53 1.3 - 1...	✓
EB0811434-069	20-AUG-2008 12:00	GC/GLNG #53 2.8 - 3...	✓
EB0811434-070	20-AUG-2008 12:00	GC/GLNG #54 0.8 - 1...	✓
EB0811434-071	20-AUG-2008 12:00	GC/GLNG #54 1.8 - 2...	✓
EB0811434-072	20-AUG-2008 12:00	GC/GLNG #54 2.3 - 2...	✓
EB0811434-073	20-AUG-2008 12:00	GC/GLNG #11 0.3 - 0...	✓
EB0811434-074	20-AUG-2008 12:00	GC/GLNG #22 0.3 - 0...	✓
EB0811434-075	20-AUG-2008 12:00	GC/GLNG #27 0 - 0.1m	✓
EB0811434-076	20-AUG-2008 12:00	GC/GLNG #31 0 - 0.1m	✓

Requested Deliverables

DR RUNDI LARSEN

- *AU Certificate of Analysis - NATA	Email	rlarsen@geocoastal.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep)	Email	rlarsen@geocoastal.com.au
- *AU QC Report ¿ DEFAULT (Anon QC Rep) - NATA	Email	rlarsen@geocoastal.com.au
- A4 - AU Sample Receipt Notification - Environmental	Email	rlarsen@geocoastal.com.au
- A4 - AU Tax Invoice	Email	rlarsen@geocoastal.com.au
- Default - Chain of Custody	Email	rlarsen@geocoastal.com.au
- EDI Format - ENMRG	Email	rlarsen@geocoastal.com.au
- EDI Format - XTab	Email	rlarsen@geocoastal.com.au

GEO COASTAL
Australia
PO Box 4051, 111 Stanbrough Rd, Gumdale QLD 4154. Tel: (07) 3890 7392 Fax: (07) 3890 7599

CHAIN OF CUSTODY/SAMPLE LIST SHEET

PROJECT I.D: GC/GLNG
COC No: ASS-2
DATES SAMPLED: 15-
CONTACT PERSON: Dr
LABORATORY: Aust Laboratory Services P/L, 32 Shand Street, Stafford, QLD
SAMPLE TYPE: SANDY/MUDDY SEDIMENT
COLLECTION METHOD: Vibro-vaccum coring
SAMPLES: - Kept chilled in esky & frozen within 6 hrs of collection
- 76 samples for COMPLETE CHROMIUM SUITE

ALS QUOTE No. EN/248/07

RELINQUISHED BY	RECEIVED BY	DATE/TIME	DOCUMENTATION/ COMMENTS
MDorman		25.8.08	
	ALS	17-20.	

	CORE NUMBER	DEPTH (m)
1	GC/GLNG #32	0 – 0.1
2	GC/GLNG #32	0.4 – 0.6
3	GC/GLNG #32	1.7 – 1.9
4	[illegible]	[illegible]
5	[illegible]	[illegible]
6	[illegible]	[illegible]
7	GC/GLNG #34	0 – 0.1
8	GC/GLNG #34	0.3 – 0.45
9	GC/GLNG #34	0.8 – 1.0
10	GC/GLNG #35	0.4 – 0.6
11	GC/GLNG #35	1.3 – 1.5
12	GC/GLNG #35	2.2 – 2.35
13	GC/GLNG #36	0 – 0.1
14	GC/GLNG #36	0.8 – 1.0
15	GC/GLNG #36	1.3 – 1.5

Environmental Division
Brisbane
Work Order
EB0811434

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GEO COASTAL
Australia
PO Box 4051, 111 Stanbrough Rd, Gumdale QLD 4154. Tel: (07) 3890 7392 Fax: (07) 3890 7599

	CORE NUMBER	DEPTH (m)
16	GC/GLNG #37	0 – 0.1
17	GC/GLNG #37	0.3 – 0.5
18	GC/GLNG #37	0.8 – 1.0
19	GC/GLNG #38	0 – 0.1
20	GC/GLNG #38	0.3 – 0.5
21	GC/GLNG #38	1.2 – 1.4
22	GC/GLNG #39	0.3 – 0.5
23	GC/GLNG #39	0.7 – 0.9
24	GC/GLNG #39	1.3 – 1.5
25	[redacted]	0 – 0.1
26	[redacted]	[redacted]
27	[redacted]	[redacted]
28	GC/GLNG #41	0.3 – 0.5
29	GC/GLNG #41	1.8 – 2.0
30	GC/GLNG #41	2.1 – 2.3
31	[redacted]	[redacted]
32	[redacted]	[redacted]
33	[redacted]	[redacted]
34	[redacted]	[redacted]
35	[redacted]	[redacted]
36	GC/GLNG #43	0.3 – 0.5
37	GC/GLNG #43	0.8 – 1.0
38	GC/GLNG #43	1.8 – 2.0
39	GC/GLNG #43	2.8 – 3.0
40	[redacted]	[redacted]
41	[redacted]	[redacted]
42	[redacted]	[redacted]
43	GC/GLNG #45	0 – 0.1
44	GC/GLNG #45	0.8 – 1.0
45	GC/GLNG #45	2.3 – 2.5
46	[redacted]	[redacted]
47	[redacted]	[redacted]
48	GC/GLNG #46	[redacted]

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CORE NUMBER	DEPTH (m)
49 GC/GLNG #47	0.4 – 0.6
50 GC/GLNG #47	1.3 – 1.5
51 GC/GLNG #47	2.3 – 2.5
52 GC/GLNG #48	0.3 – 0.45
53 GC/GLNG #48	1.8 – 2.0
54 GC/GLNG #48	2.8 – 3.0
55 GC/GLNG #49	0.3 – 0.5
56 GC/GLNG $49	0.8 – 1.0
57 GC/GLNG #49	2.3 – 2.5
58 GC/GLNG #50	0 – 0.1
59 GC/GLNG #50	0.8 – 1.0
60 GC/GLNG #50	2.3 – 2.5
61 GC/GLNG #51	0.3 – 0.5
62 GC/GLNG #51	1.3 – 1.5
63 GC/GLNG #51	2.8 – 3.0
64 GC/GLNG #52	0.3 – 0.5
65 GC/GLNG #52	0.8 – 1.0
66 GC/GLNG #52	2.3 – 2.5
67 GC/GLNG #53	0 – 0.1
68 GC/GLNG #53	1.3 – 1.5
69 GC/GLNG #53	2.8 – 3.0
70 GC/GLNG #54	0.8 – 1.0
71 GC/GLNG #54	1.8 – 2.0
72 GC/GLNG #54	2.8 – 2.5
73 GC/GLNG #11	0.3 – 0.5
74 GC/GLNG #22	0.3 – 0.5
75 GC/GLNG #27	0 – 0.1
76 GC/GLNG #31	0 – 0.1

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0811434**	Page	: 1 of 8
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG 08	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: 08/08 GLNG/08 ASS-2	Date Samples Received	: 25-AUG-2008
Sampler	: ----	Issue Date	: 05-SEP-2008
Order number	: ----		
		No. of samples received	: 76
Quote number	: BN/248/07	No. of samples analysed	: 76

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Cass Sealby	Senior Chemist - Acid Sulphate Soils	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-A: Actual Acidity (QC Lot: 742108)									
EB0811434-001	GC/GLNG #32 0 - 0.1m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.8	9.8	0.0	0% - 20%
EB0811434-011	GC/GLNG #35 1.3 - 1.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02	0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	14	13	8.7	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	5.4	5.4	0.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 742109)									
EB0811434-021	GC/GLNG #38 1.2 - 1.4m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.7	6.6	1.5	0% - 20%
EB0811434-031	GC/GLNG #42 0.3 - 0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.05	0.05	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	33	30	11.3	0% - 50%
		EA033: pH KCl (23A)	----	0.1	pH Unit	4.8	4.8	0.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 742110)									
EB0811434-041	GC/GLNG #44 1.3 - 1.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.31	0.31	0.0	0% - 50%
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	196	196	0.0	0% - 20%
		EA033: pH KCl (23A)	----	0.1	pH Unit	8.3	8.3	0.0	0% - 20%
EB0811434-051	GC/GLNG #47 2.3 - 2.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.30	0.30	0.0	0% - 50%
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	188	191	1.2	0% - 20%
		EA033: pH KCl (23A)	----	0.1	pH Unit	8.0	8.1	1.2	0% - 20%
EA033-A: Actual Acidity (QC Lot: 742111)									
EB0811434-061	GC/GLNG #51 0.3 - 0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	7.2	7.0	2.8	0% - 20%
EB0811434-071	GC/GLNG #54 1.8 - 2.0m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	7.8	7.9	1.3	0% - 20%
EA033-B: Potential Acidity (QC Lot: 742108)									
EB0811434-001	GC/GLNG #32 0 - 0.1m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.03	0.03	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	20	22	5.6	No Limit
EB0811434-011	GC/GLNG #35 1.3 - 1.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	2.22	2.22	0.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1380	1380	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 742109)									

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-B: Potential Acidity (QC Lot: 742109) - continued									
EB0811434-021	GC/GLNG #38 1.2 - 1.4m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.08	0.08	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	48	52	8.7	No Limit
EB0811434-031	GC/GLNG #42 0.3 - 0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.87	1.87	0.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1170	1170	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 742110)									
EB0811434-041	GC/GLNG #44 1.3 - 1.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.60	1.61	0.9	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	998	1010	0.9	0% - 20%
EB0811434-051	GC/GLNG #47 2.3 - 2.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.76	1.76	0.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1100	1100	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 742111)									
EB0811434-061	GC/GLNG #51 0.3 - 0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.15	1.08	6.2	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	717	674	6.2	0% - 20%
EB0811434-071	GC/GLNG #54 1.8 - 2.0m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.86	0.86	0.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	538	536	0.4	0% - 20%
EA033-C: Acid Neutralising Capacity (QC Lot: 742108)									
EB0811434-001	GC/GLNG #32 0 - 0.1m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	0.66	0.56	16.0	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	0.21	0.18	16.0	0% - 50%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	131	112	16.0	0% - 50%
EA033-C: Acid Neutralising Capacity (QC Lot: 742109)									
EB0811434-021	GC/GLNG #38 1.2 - 1.4m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	0.52	0.52	0.0	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	0.17	0.17	0.0	0% - 50%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	105	105	0.0	0% - 50%
EA033-C: Acid Neutralising Capacity (QC Lot: 742110)									
EB0811434-041	GC/GLNG #44 1.3 - 1.5m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	12.8	12.9	0.9	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	4.08	4.12	0.9	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	2550	2570	0.9	0% - 20%
EB0811434-051	GC/GLNG #47 2.3 - 2.5m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	4.53	4.65	2.6	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-C: Acid Neutralising Capacity (QC Lot: 742110) - continued									
EB0811434-051	GC/GLNG #47 2.3 - 2.5m	EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	1.45	1.49	2.6	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	905	929	2.6	0% - 20%
EA033-C: Acid Neutralising Capacity (QC Lot: 742111)									
EB0811434-061	GC/GLNG #51 0.3 - 0.5m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	0.63	0.71	10.9	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	0.20	0.23	10.9	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	126	141	10.9	0% - 50%
EB0811434-071	GC/GLNG #54 1.8 - 2.0m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	0.92	0.95	2.6	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	0.30	0.30	0.0	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	185	190	2.6	0% - 50%

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA033-A: Actual Acidity (QCLot: 742108)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 742109)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 742110)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 742111)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 742108)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 742109)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 742110)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 742111)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 742108)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 742109)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 742110)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EA033-C: Acid Neutralising Capacity (QCLot: 742110) - continued								
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 742111)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-D: Retained Acidity (QCLot: 742108)								
EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----
EA033-D: Retained Acidity (QCLot: 742109)								
EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----
EA033-D: Retained Acidity (QCLot: 742111)								
EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) Results are required to be reported.**

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0811434**	Page	: 1 of 10
Client	: GEOCOASTAL (AUSTRALIA) PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG 08	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: 08/08 GLNG/08 ASS-2	Date Samples Received	: 25-AUG-2008
Sampler	: ----	Issue Date	: 05-SEP-2008
Order number	: ----		
		No. of samples received	: 76
Quote number	: BN/248/07	No. of samples analysed	: 76

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity - Continued								
Snap Lock Bag - frozen								
GC/GLNG #32 - 0 - 0.1m,	GC/GLNG #32 - 0.4 - 0.6m,	**20-AUG-2008**	**25-AUG-2008**	20-AUG-2009	✓	**28-AUG-2008**	26-NOV-2008	✓
GC/GLNG #32 - 1.7 - 1.9m,	GC/GLNG #33 - 0.3 - 0.5m,							
GC/GLNG #33 - 0.7 - 0.9m,	GC/GLNG #33 - 1.5 - 1.7m,							
GC/GLNG #34 - 0 - 0.1m,	GC/GLNG #34 - 0.3 - 0.45m,							
GC/GLNG #34 - 0.8 - 1.0m,	GC/GLNG #35 - 0.4 - 0.6m,							
GC/GLNG #35 - 1.3 - 1.5m,	GC/GLNG #35 - 2.2 - 2.35m,							
GC/GLNG #36 - 0 - 0.1m,	GC/GLNG #36 - 0.8 - 1.0m,							
GC/GLNG #36 - 1.3 - 1.5m,	GC/GLNG #37 - 0 - 0.1m,							
GC/GLNG #37 - 0.3 - 0.5m,	GC/GLNG #37 - 0.8 - 1.0m,							
GC/GLNG #38 - 0 - 0.1m,	GC/GLNG #38 - 0.3 - 0.5m,							
GC/GLNG #38 - 1.2 - 1.4m,	GC/GLNG #39 - 0.3 - 0.5m,							
GC/GLNG #39 - 0.7 - 0.9m,	GC/GLNG #39 - 1.3 - 1.5m,							
GC/GLNG #40 - 0 - 0.1m,	GC/GLNG #40 - 0.3 - 0.5m,							
GC/GLNG #40 - 0.7 - 0.9m,	GC/GLNG #41 - 0.3 - 0.5m,							
GC/GLNG #41 - 1.8 - 2.0.m,	GC/GLNG #41 - 2.1 - 2.3m,							
GC/GLNG #42 - 0.3 - 0.5m,	GC/GLNG #42 - 1.8 - 2.0m,							
GC/GLNG #42 - 2.3 - 2.5m,	GC/GLNG #42 - 2.8 - 3.0m,							
GC/GLNG #82 - 1.3 - 1.5m,	GC/GLNG #43 - 0.3 - 0.5m,							
GC/GLNG #43 - 0.8 - 1.0m,	GC/GLNG #43 - 1.8 - 2.0m,							
GC/GLNG #43 - 2.8 - 3.0m,	GC/GLNG #44 - 0.3 - 0.5m,							
GC/GLNG #44 - 1.3 - 1.5m,	GC/GLNG #44 - 2.8 - 3.0m,							
GC/GLNG #45 - 0 - 0.1m,	GC/GLNG #45 - 0.8 - 1.0m,							
GC/GLNG #45 - 2.3 - 2.5m,	GC/GLNG #46 - 0.3 - 0.5m,							
GC/GLNG #46 - 1.6 - 2.0m,	GC/GLNG #46 - 2.8 - 3.0m,							
GC/GLNG #47 - 0.4 - 0.6m,	GC/GLNG #47 - 1.3 - 1.5m,							
GC/GLNG #47 - 2.3 - 2.5m,	GC/GLNG #48 - 0.3 - 0.45m,							
GC/GLNG #48 - 1.8 - 2.0m,	GC/GLNG #48 - 2.8 - 3.0m,							
GC/GLNG #49 - 0.3 - 0.5m,	GC/GLNG #49 - 0.8 - 1.0m,							
GC/GLNG #49 - 2.3 - 2.5m,	GC/GLNG #50 - 0 - 0.1m,							
GC/GLNG #50 - 0.8 - 1.0m,	GC/GLNG #50 - 2.3 - 2.5m,							
GC/GLNG #51 - 0.3 - 0.5m,	GC/GLNG #51 - 1.3 - 1.5m,							
GC/GLNG #51 - 2.8 - 3.0 m,	GC/GLNG #52 - 0.3 - 0.5m,							
GC/GLNG #52 - 0.8 - 1.0m,	GC/GLNG #52 - 2.3 - 2.5m,							
GC/GLNG #53 - 0 - 0.1m,	GC/GLNG #53 - 1.3 - 1.5m,							
GC/GLNG #53 - 2.8 - 3.0m,	GC/GLNG #54 - 0.8 - 1.0m,							
GC/GLNG #54 - 1.8 - 2.0m,	GC/GLNG #54 - 2.3 - 2.5m,							
GC/GLNG #11 - 0.3 - 0.5m,	GC/GLNG #22 - 0.3 - 0.5m,							
GC/GLNG #27 - 0 - 0.1m,	GC/GLNG #31 - 0 - 0.1m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-B: Potential Acidity								
Snap Lock Bag - frozen								
GC/GLNG #32 - 0 - 0.1m,	GC/GLNG #32 - 0.4 - 0.6m,	**20-AUG-2008**	**25-AUG-2008**	20-AUG-2009	✓	**28-AUG-2008**	26-NOV-2008	✓
GC/GLNG #32 - 1.7 - 1.9m,	GC/GLNG #33 - 0.3 - 0.5m,							
GC/GLNG #33 - 0.7 - 0.9m,	GC/GLNG #33 - 1.5 - 1.7m,							
GC/GLNG #34 - 0 - 0.1m,	GC/GLNG #34 - 0.3 - 0.45m,							
GC/GLNG #34 - 0.8 - 1.0m,	GC/GLNG #35 - 0.4 - 0.6m,							
GC/GLNG #35 - 1.3 - 1.5m,	GC/GLNG #35 - 2.2 - 2.35m,							
GC/GLNG #36 - 0 - 0.1m,	GC/GLNG #36 - 0.8 - 1.0m,							
GC/GLNG #36 - 1.3 - 1.5m,	GC/GLNG #37 - 0 - 0.1m,							
GC/GLNG #37 - 0.3 - 0.5m,	GC/GLNG #37 - 0.8 - 1.0m,							
GC/GLNG #38 - 0 - 0.1m,	GC/GLNG #38 - 0.3 - 0.5m,							
GC/GLNG #38 - 1.2 - 1.4m,	GC/GLNG #39 - 0.3 - 0.5m,							
GC/GLNG #39 - 0.7 - 0.9m,	GC/GLNG #39 - 1.3 - 1.5m,							
GC/GLNG #40 - 0 - 0.1m,	GC/GLNG #40 - 0.3 - 0.5m,							
GC/GLNG #40 - 0.7 - 0.9m,	GC/GLNG #41 - 0.3 - 0.5m,							
GC/GLNG #41 - 1.8 - 2.0.m,	GC/GLNG #41 - 2.1 - 2.3m,							
GC/GLNG #42 - 0.3 - 0.5m,	GC/GLNG #42 - 1.8 - 2.0m,							
GC/GLNG #42 - 2.3 - 2.5m,	GC/GLNG #42 - 2.8 - 3.0m,							
GC/GLNG #82 - 1.3 - 1.5m,	GC/GLNG #43 - 0.3 - 0.5m,							
GC/GLNG #43 - 0.8 - 1.0m,	GC/GLNG #43 - 1.8 - 2.0m,							
GC/GLNG #43 - 2.8 - 3.0m,	GC/GLNG #44 - 0.3 - 0.5m,							
GC/GLNG #44 - 1.3 - 1.5m,	GC/GLNG #44 - 2.8 - 3.0m,							
GC/GLNG #45 - 0 - 0.1m,	GC/GLNG #45 - 0.8 - 1.0m,							
GC/GLNG #45 - 2.3 - 2.5m,	GC/GLNG #46 - 0.3 - 0.5m,							
GC/GLNG #46 - 1.6 - 2.0m,	GC/GLNG #46 - 2.8 - 3.0m,							
GC/GLNG #47 - 0.4 - 0.6m,	GC/GLNG #47 - 1.3 - 1.5m,							
GC/GLNG #47 - 2.3 - 2.5m,	GC/GLNG #48 - 0.3 - 0.45m,							
GC/GLNG #48 - 1.8 - 2.0m,	GC/GLNG #48 - 2.8 - 3.0m,							
GC/GLNG #49 - 0.3 - 0.5m,	GC/GLNG #49 - 0.8 - 1.0m,							
GC/GLNG #49 - 2.3 - 2.5m,	GC/GLNG #50 - 0 - 0.1m,							
GC/GLNG #50 - 0.8 - 1.0m,	GC/GLNG #50 - 2.3 - 2.5m,							
GC/GLNG #51 - 0.3 - 0.5m,	GC/GLNG #51 - 1.3 - 1.5m,							
GC/GLNG #51 - 2.8 - 3.0 m,	GC/GLNG #52 - 0.3 - 0.5m,							
GC/GLNG #52 - 0.8 - 1.0m,	GC/GLNG #52 - 2.3 - 2.5m,							
GC/GLNG #53 - 0 - 0.1m,	GC/GLNG #53 - 1.3 - 1.5m,							
GC/GLNG #53 - 2.8 - 3.0m,	GC/GLNG #54 - 0.8 - 1.0m,							
GC/GLNG #54 - 1.8 - 2.0m,	GC/GLNG #54 - 2.3 - 2.5m,							
GC/GLNG #11 - 0.3 - 0.5m,	GC/GLNG #22 - 0.3 - 0.5m,							
GC/GLNG #27 - 0 - 0.1m,	GC/GLNG #31 - 0 - 0.1m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-C: Acid Neutralising Capacity								
Snap Lock Bag - frozen								
GC/GLNG #32 - 0 - 0.1m,	GC/GLNG #32 - 0.4 - 0.6m,	**20-AUG-2008**	**25-AUG-2008**	20-AUG-2009	✓	**28-AUG-2008**	26-NOV-2008	✓
GC/GLNG #32 - 1.7 - 1.9m,	GC/GLNG #33 - 0.3 - 0.5m,							
GC/GLNG #33 - 0.7 - 0.9m,	GC/GLNG #33 - 1.5 - 1.7m,							
GC/GLNG #34 - 0 - 0.1m,	GC/GLNG #34 - 0.3 - 0.45m,							
GC/GLNG #34 - 0.8 - 1.0m,	GC/GLNG #35 - 0.4 - 0.6m,							
GC/GLNG #35 - 1.3 - 1.5m,	GC/GLNG #35 - 2.2 - 2.35m,							
GC/GLNG #36 - 0 - 0.1m,	GC/GLNG #36 - 0.8 - 1.0m,							
GC/GLNG #36 - 1.3 - 1.5m,	GC/GLNG #37 - 0 - 0.1m,							
GC/GLNG #37 - 0.3 - 0.5m,	GC/GLNG #37 - 0.8 - 1.0m,							
GC/GLNG #38 - 0 - 0.1m,	GC/GLNG #38 - 0.3 - 0.5m,							
GC/GLNG #38 - 1.2 - 1.4m,	GC/GLNG #39 - 0.3 - 0.5m,							
GC/GLNG #39 - 0.7 - 0.9m,	GC/GLNG #39 - 1.3 - 1.5m,							
GC/GLNG #40 - 0 - 0.1m,	GC/GLNG #40 - 0.3 - 0.5m,							
GC/GLNG #40 - 0.7 - 0.9m,	GC/GLNG #41 - 0.3 - 0.5m,							
GC/GLNG #41 - 1.8 - 2.0.m,	GC/GLNG #41 - 2.1 - 2.3m,							
GC/GLNG #42 - 0.3 - 0.5m,	GC/GLNG #42 - 1.8 - 2.0m,							
GC/GLNG #42 - 2.3 - 2.5m,	GC/GLNG #42 - 2.8 - 3.0m,							
GC/GLNG #82 - 1.3 - 1.5m,	GC/GLNG #43 - 0.3 - 0.5m,							
GC/GLNG #43 - 0.8 - 1.0m,	GC/GLNG #43 - 1.8 - 2.0m,							
GC/GLNG #43 - 2.8 - 3.0m,	GC/GLNG #44 - 0.3 - 0.5m,							
GC/GLNG #44 - 1.3 - 1.5m,	GC/GLNG #44 - 2.8 - 3.0m,							
GC/GLNG #45 - 0 - 0.1m,	GC/GLNG #45 - 0.8 - 1.0m,							
GC/GLNG #45 - 2.3 - 2.5m,	GC/GLNG #46 - 0.3 - 0.5m,							
GC/GLNG #46 - 1.6 - 2.0m,	GC/GLNG #46 - 2.8 - 3.0m,							
GC/GLNG #47 - 0.4 - 0.6m,	GC/GLNG #47 - 1.3 - 1.5m,							
GC/GLNG #47 - 2.3 - 2.5m,	GC/GLNG #48 - 0.3 - 0.45m,							
GC/GLNG #48 - 1.8 - 2.0m,	GC/GLNG #48 - 2.8 - 3.0m,							
GC/GLNG #49 - 0.3 - 0.5m,	GC/GLNG #49 - 0.8 - 1.0m,							
GC/GLNG #49 - 2.3 - 2.5m,	GC/GLNG #50 - 0 - 0.1m,							
GC/GLNG #50 - 0.8 - 1.0m,	GC/GLNG #50 - 2.3 - 2.5m,							
GC/GLNG #51 - 0.3 - 0.5m,	GC/GLNG #51 - 1.3 - 1.5m,							
GC/GLNG #51 - 2.8 - 3.0 m,	GC/GLNG #52 - 0.3 - 0.5m,							
GC/GLNG #52 - 0.8 - 1.0m,	GC/GLNG #52 - 2.3 - 2.5m,							
GC/GLNG #53 - 0 - 0.1m,	GC/GLNG #53 - 1.3 - 1.5m,							
GC/GLNG #53 - 2.8 - 3.0m,	GC/GLNG #54 - 0.8 - 1.0m,							
GC/GLNG #54 - 1.8 - 2.0m,	GC/GLNG #54 - 2.3 - 2.5m,							
GC/GLNG #11 - 0.3 - 0.5m,	GC/GLNG #22 - 0.3 - 0.5m,							
GC/GLNG #27 - 0 - 0.1m,	GC/GLNG #31 - 0 - 0.1m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-D: Retained Acidity								
Snap Lock Bag - frozen								
GC/GLNG #32 - 0 - 0.1m,	GC/GLNG #32 - 0.4 - 0.6m,	**20-AUG-2008**	**25-AUG-2008**	20-AUG-2009	✓	**28-AUG-2008**	26-NOV-2008	✓
GC/GLNG #32 - 1.7 - 1.9m,	GC/GLNG #33 - 0.3 - 0.5m,							
GC/GLNG #33 - 0.7 - 0.9m,	GC/GLNG #33 - 1.5 - 1.7m,							
GC/GLNG #34 - 0 - 0.1m,	GC/GLNG #34 - 0.3 - 0.45m,							
GC/GLNG #34 - 0.8 - 1.0m,	GC/GLNG #35 - 0.4 - 0.6m,							
GC/GLNG #35 - 1.3 - 1.5m,	GC/GLNG #35 - 2.2 - 2.35m,							
GC/GLNG #36 - 0 - 0.1m,	GC/GLNG #36 - 0.8 - 1.0m,							
GC/GLNG #36 - 1.3 - 1.5m,	GC/GLNG #37 - 0 - 0.1m,							
GC/GLNG #37 - 0.3 - 0.5m,	GC/GLNG #37 - 0.8 - 1.0m,							
GC/GLNG #38 - 0 - 0.1m,	GC/GLNG #38 - 0.3 - 0.5m,							
GC/GLNG #38 - 1.2 - 1.4m,	GC/GLNG #39 - 0.3 - 0.5m,							
GC/GLNG #39 - 0.7 - 0.9m,	GC/GLNG #39 - 1.3 - 1.5m,							
GC/GLNG #40 - 0 - 0.1m,	GC/GLNG #40 - 0.3 - 0.5m,							
GC/GLNG #40 - 0.7 - 0.9m,	GC/GLNG #41 - 0.3 - 0.5m,							
GC/GLNG #41 - 1.8 - 2.0.m,	GC/GLNG #41 - 2.1 - 2.3m,							
GC/GLNG #42 - 0.3 - 0.5m,	GC/GLNG #42 - 1.8 - 2.0m,							
GC/GLNG #42 - 2.3 - 2.5m,	GC/GLNG #42 - 2.8 - 3.0m,							
GC/GLNG #82 - 1.3 - 1.5m,	GC/GLNG #43 - 0.3 - 0.5m,							
GC/GLNG #43 - 0.8 - 1.0m,	GC/GLNG #43 - 1.8 - 2.0m,							
GC/GLNG #43 - 2.8 - 3.0m,	GC/GLNG #44 - 0.3 - 0.5m,							
GC/GLNG #44 - 1.3 - 1.5m,	GC/GLNG #44 - 2.8 - 3.0m,							
GC/GLNG #45 - 0 - 0.1m,	GC/GLNG #45 - 0.8 - 1.0m,							
GC/GLNG #45 - 2.3 - 2.5m,	GC/GLNG #46 - 0.3 - 0.5m,							
GC/GLNG #46 - 1.6 - 2.0m,	GC/GLNG #46 - 2.8 - 3.0m,							
GC/GLNG #47 - 0.4 - 0.6m,	GC/GLNG #47 - 1.3 - 1.5m,							
GC/GLNG #47 - 2.3 - 2.5m,	GC/GLNG #48 - 0.3 - 0.45m,							
GC/GLNG #48 - 1.8 - 2.0m,	GC/GLNG #48 - 2.8 - 3.0m,							
GC/GLNG #49 - 0.3 - 0.5m,	GC/GLNG #49 - 0.8 - 1.0m,							
GC/GLNG #49 - 2.3 - 2.5m,	GC/GLNG #50 - 0 - 0.1m,							
GC/GLNG #50 - 0.8 - 1.0m,	GC/GLNG #50 - 2.3 - 2.5m,							
GC/GLNG #51 - 0.3 - 0.5m,	GC/GLNG #51 - 1.3 - 1.5m,							
GC/GLNG #51 - 2.8 - 3.0 m,	GC/GLNG #52 - 0.3 - 0.5m,							
GC/GLNG #52 - 0.8 - 1.0m,	GC/GLNG #52 - 2.3 - 2.5m,							
GC/GLNG #53 - 0 - 0.1m,	GC/GLNG #53 - 1.3 - 1.5m,							
GC/GLNG #53 - 2.8 - 3.0m,	GC/GLNG #54 - 0.8 - 1.0m,							
GC/GLNG #54 - 1.8 - 2.0m,	GC/GLNG #54 - 2.3 - 2.5m,							
GC/GLNG #11 - 0.3 - 0.5m,	GC/GLNG #22 - 0.3 - 0.5m,							
GC/GLNG #27 - 0 - 0.1m,	GC/GLNG #31 - 0 - 0.1m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-E: Acid Base Accounting								
Snap Lock Bag - frozen								
GC/GLNG #32 - 0 - 0.1m,	GC/GLNG #32 - 0.4 - 0.6m,	**20-AUG-2008**	**25-AUG-2008**	20-AUG-2009	✓	**28-AUG-2008**	26-NOV-2008	✓
GC/GLNG #32 - 1.7 - 1.9m,	GC/GLNG #33 - 0.3 - 0.5m,							
GC/GLNG #33 - 0.7 - 0.9m,	GC/GLNG #33 - 1.5 - 1.7m,							
GC/GLNG #34 - 0 - 0.1m,	GC/GLNG #34 - 0.3 - 0.45m,							
GC/GLNG #34 - 0.8 - 1.0m,	GC/GLNG #35 - 0.4 - 0.6m,							
GC/GLNG #35 - 1.3 - 1.5m,	GC/GLNG #35 - 2.2 - 2.35m,							
GC/GLNG #36 - 0 - 0.1m,	GC/GLNG #36 - 0.8 - 1.0m,							
GC/GLNG #36 - 1.3 - 1.5m,	GC/GLNG #37 - 0 - 0.1m,							
GC/GLNG #37 - 0.3 - 0.5m,	GC/GLNG #37 - 0.8 - 1.0m,							
GC/GLNG #38 - 0 - 0.1m,	GC/GLNG #38 - 0.3 - 0.5m,							
GC/GLNG #38 - 1.2 - 1.4m,	GC/GLNG #39 - 0.3 - 0.5m,							
GC/GLNG #39 - 0.7 - 0.9m,	GC/GLNG #39 - 1.3 - 1.5m,							
GC/GLNG #40 - 0 - 0.1m,	GC/GLNG #40 - 0.3 - 0.5m,							
GC/GLNG #40 - 0.7 - 0.9m,	GC/GLNG #41 - 0.3 - 0.5m,							
GC/GLNG #41 - 1.8 - 2.0.m,	GC/GLNG #41 - 2.1 - 2.3m,							
GC/GLNG #42 - 0.3 - 0.5m,	GC/GLNG #42 - 1.8 - 2.0m,							
GC/GLNG #42 - 2.3 - 2.5m,	GC/GLNG #42 - 2.8 - 3.0m,							
GC/GLNG #82 - 1.3 - 1.5m,	GC/GLNG #43 - 0.3 - 0.5m,							
GC/GLNG #43 - 0.8 - 1.0m,	GC/GLNG #43 - 1.8 - 2.0m,							
GC/GLNG #43 - 2.8 - 3.0m,	GC/GLNG #44 - 0.3 - 0.5m,							
GC/GLNG #44 - 1.3 - 1.5m,	GC/GLNG #44 - 2.8 - 3.0m,							
GC/GLNG #45 - 0 - 0.1m,	GC/GLNG #45 - 0.8 - 1.0m,							
GC/GLNG #45 - 2.3 - 2.5m,	GC/GLNG #46 - 0.3 - 0.5m,							
GC/GLNG #46 - 1.6 - 2.0m,	GC/GLNG #46 - 2.8 - 3.0m,							
GC/GLNG #47 - 0.4 - 0.6m,	GC/GLNG #47 - 1.3 - 1.5m,							
GC/GLNG #47 - 2.3 - 2.5m,	GC/GLNG #48 - 0.3 - 0.45m,							
GC/GLNG #48 - 1.8 - 2.0m,	GC/GLNG #48 - 2.8 - 3.0m,							
GC/GLNG #49 - 0.3 - 0.5m,	GC/GLNG #49 - 0.8 - 1.0m,							
GC/GLNG #49 - 2.3 - 2.5m,	GC/GLNG #50 - 0 - 0.1m,							
GC/GLNG #50 - 0.8 - 1.0m,	GC/GLNG #50 - 2.3 - 2.5m,							
GC/GLNG #51 - 0.3 - 0.5m,	GC/GLNG #51 - 1.3 - 1.5m,							
GC/GLNG #51 - 2.8 - 3.0 m,	GC/GLNG #52 - 0.3 - 0.5m,							
GC/GLNG #52 - 0.8 - 1.0m,	GC/GLNG #52 - 2.3 - 2.5m,							
GC/GLNG #53 - 0 - 0.1m,	GC/GLNG #53 - 1.3 - 1.5m,							
GC/GLNG #53 - 2.8 - 3.0m,	GC/GLNG #54 - 0.8 - 1.0m,							
GC/GLNG #54 - 1.8 - 2.0m,	GC/GLNG #54 - 2.3 - 2.5m,							
GC/GLNG #11 - 0.3 - 0.5m,	GC/GLNG #22 - 0.3 - 0.5m,							
GC/GLNG #27 - 0 - 0.1m,	GC/GLNG #31 - 0 - 0.1m							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	8	76	**10.5**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	4	76	**5.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EB0812008**		
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG 08	Page	: 1 of 3
Order number	: ----		
C-O-C number	: 08/09 GLNG/on/ASS-4	Quote number	: EB20070176 (BN/248/07)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 04-SEP-2008	Issue Date	: 04-SEP-2008 15:29
Client Requested Due Date	: 11-SEP-2008	Scheduled Reporting Date	: **11-SEP-2008**

Delivery Details

Mode of Delivery	: Carrier	Temperature	: 4.0 C - Ice bricks present
No. of coolers/boxes	: 1 LARGE	No. of samples received	: 64
Sercurity Seal	: Intact.	No. of samples analysed	: 64

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0812008-001	02-SEP-2008 15:00	GC/GLNG #55 0.3-0.5m	✓
EB0812008-002	02-SEP-2008 15:00	GC/GLNG #55 0.8-1.0m	✓
EB0812008-003	02-SEP-2008 15:00	GC/GLNG #56 0.3-0.5m	✓
EB0812008-004	02-SEP-2008 15:00	GC/GLNG #56 0.8-1.0m	✓
EB0812008-005	02-SEP-2008 15:00	GC/GLNG #57 0-0.1m	✓
EB0812008-006	02-SEP-2008 15:00	GC/GLNG #57 0.3-0.5m	✓
EB0812008-007	02-SEP-2008 15:00	GC/GLNG #57 0.8-1.0m	✓
EB0812008-008	02-SEP-2008 15:00	GC/GLNG #58 0.3-0.5m	✓
EB0812008-009	02-SEP-2008 15:00	GC/GLNG #58 0.8-1.0m	✓
EB0812008-010	02-SEP-2008 15:00	GC/GLNG #59 0-0.1m	✓
EB0812008-011	02-SEP-2008 15:00	GC/GLNG #59 0.3-0.5m	✓
EB0812008-012	02-SEP-2008 15:00	GC/GLNG #59 0.8-1.0m	✓
EB0812008-013	02-SEP-2008 15:00	GC/GLNG #60 0.3-0.5m	✓
EB0812008-014	02-SEP-2008 15:00	GC/GLNG #60 0.8-1.0m	✓
EB0812008-015	02-SEP-2008 15:00	GC/GLNG #61 0.3-0.5m	✓
EB0812008-016	02-SEP-2008 15:00	GC/GLNG #61 0.8-1.0m	✓
EB0812008-017	02-SEP-2008 15:00	GC/GLNG #62 0.3-0.5m	✓
EB0812008-018	02-SEP-2008 15:00	GC/GLNG #62 0.8-1.0m	✓
EB0812008-019	02-SEP-2008 15:00	GC/GLNG #63 0-0.1m	✓
EB0812008-020	02-SEP-2008 15:00	GC/GLNG #63 0.3-0.5m	✓
EB0812008-021	02-SEP-2008 15:00	GC/GLNG #63 0.8-1.0m	✓
EB0812008-022	02-SEP-2008 15:00	GC/GLNG #64 0.3-0.5m	✓
EB0812008-023	02-SEP-2008 15:00	GC/GLNG #64 0.8-1.0m	✓
EB0812008-024	02-SEP-2008 15:00	GC/GLNG #65 0.3-0.5m	✓
EB0812008-025	02-SEP-2008 15:00	GC/GLNG #65 0.8-1.0m	✓
EB0812008-026	02-SEP-2008 15:00	GC/GLNG #66 0.3-0.5m	✓
EB0812008-027	02-SEP-2008 15:00	GC/GLNG #66 0.8-1.0m	✓
EB0812008-028	02-SEP-2008 15:00	GC/GLNG #67 0.3-0.5m	✓
EB0812008-029	02-SEP-2008 15:00	GC/GLNG #67 0.8-1.0m	✓
EB0812008-030	02-SEP-2008 15:00	GC/GLNG #68 0.3-0.5m	✓
EB0812008-031	02-SEP-2008 15:00	GC/GLNG #68 0.8-1.0m	✓
EB0812008-032	02-SEP-2008 15:00	GC/GLNG #69 0.3-0.5m	✓
EB0812008-033	02-SEP-2008 15:00	GC/GLNG #69 0.8-1.0m	✓
EB0812008-034	02-SEP-2008 15:00	GC/GLNG #70 0.3-0.5m	✓
EB0812008-035	02-SEP-2008 15:00	GC/GLNG #70 0.8-1.0m	✓

			SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0812008-036	02-SEP-2008 15:00	GC/GLNG #71 0.3-0.5m	✓
EB0812008-037	02-SEP-2008 15:00	GC/GLNG #71 0.8-1.0m	✓
EB0812008-038	02-SEP-2008 15:00	GC/GLNG #72 0.3-0.5m	✓
EB0812008-039	02-SEP-2008 15:00	GC/GLNG #72 0.8-1.0m	✓
EB0812008-040	02-SEP-2008 15:00	GC/GLNG #73 0-0.1m	✓
EB0812008-041	02-SEP-2008 15:00	GC/GLNG #73 0.3-0.5m	✓
EB0812008-042	02-SEP-2008 15:00	GC/GLNG #73 0.8-1.0m	✓
EB0812008-043	02-SEP-2008 15:00	GC/GLNG #74 0.3-0.5m	✓
EB0812008-044	02-SEP-2008 15:00	GC/GLNG #74 0.8-1.0m	✓
EB0812008-045	02-SEP-2008 15:00	GC/GLNG #75 0.3-0.5m	✓
EB0812008-046	02-SEP-2008 15:00	GC/GLNG #76 0.3-0.5m	✓
EB0812008-047	02-SEP-2008 15:00	GC/GLNG #77 0.3-0.5m	✓
EB0812008-048	02-SEP-2008 15:00	GC/GLNG #77 0.8-1.0m	✓
EB0812008-049	02-SEP-2008 15:00	GC/GLNG #78 0-0.1m	✓
EB0812008-050	02-SEP-2008 15:00	GC/GLNG #78 0.3-0.5m	✓
EB0812008-051	02-SEP-2008 15:00	GC/GLNG #78 0.8-1.0m	✓
EB0812008-052	02-SEP-2008 15:00	GC/GLNG #79 0.3-0.5m	✓
EB0812008-053	02-SEP-2008 15:00	GC/GLNG #79 0.8-1.0m	✓
EB0812008-054	02-SEP-2008 15:00	GC/GLNG #80 0.3-0.5m	✓
EB0812008-055	02-SEP-2008 15:00	GC/GLNG #80 0.8-1.0m	✓
EB0812008-056	02-SEP-2008 15:00	GC/GLNG #81 0.3-0.5m	✓
EB0812008-057	02-SEP-2008 15:00	GC/GLNG #81 0.8-1.0m	✓
EB0812008-058	02-SEP-2008 15:00	GC/GLNG #82 0.3-0.5m	✓
EB0812008-059	02-SEP-2008 15:00	GC/GLNG #82 0.8-1.0m	✓
EB0812008-060	02-SEP-2008 15:00	GC/GLNG #83 0-0.1m	✓
EB0812008-061	02-SEP-2008 15:00	GC/GLNG #83 0.3-0.5m	✓
EB0812008-062	02-SEP-2008 15:00	GC/GLNG #83 0.8-1.0m	✓
EB0812008-063	02-SEP-2008 15:00	GC/GLNG #84 0.3-0.5m	✓
EB0812008-064	02-SEP-2008 15:00	GC/GLNG #84 0.8-1.0m	✓

Requested Deliverables

DR RUNDI LARSEN

- *AU Certificate of Analysis - NATA	Email	rlarsen@geocoastal.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep)	Email	rlarsen@geocoastal.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA	Email	rlarsen@geocoastal.com.au
- A4 - AU Sample Receipt Notification - Environmental	Email	rlarsen@geocoastal.com.au
- A4 - AU Tax Invoice	Email	rlarsen@geocoastal.com.au
- Default - Chain of Custody	Email	rlarsen@geocoastal.com.au
- EDI Format - ENMRG	Email	rlarsen@geocoastal.com.au
- EDI Format - XTab	Email	rlarsen@geocoastal.com.au

GEO COASTAL
Australia

PO Box 4051, 111 Stanbrough Rd, Gumdale QLD 4154. Tel: (07) 3890 7392 Fax: (07) 3890 7599

CHAIN OF CUSTODY/SAMPLE LIST SHEET

PROJECT I.D:	GC/GLNG 08
COC No:	**08/09 GLNG/on/ASS-4**
DATES SAMPLED:	26-27 August 2008
CONTACT PERSON:	Dr Rundi Larsen
LABORATORY:	Aust Laboratory Services P/L, 32 Shand Street, Stafford, QLD
SAMPLE TYPE:	SANDY/MUDDY SEDIMENT
COLLECTION METHOD:	hand coring
SAMPLES:	- Kept chilled in esky & frozen within 6 hrs of collection - **66** samples for **COMPLETE CHROMIUM SUITE**

ALS QUOTE No. EN/248/07 -Blanket

RELINQUISHED BY	RECEIVED BY	DATE/TIME	DOCUMENTATION/ COMMENTS
		2 Sep 08	

CORE NUMBER	DEPTH (m)	
GC/GLNG #55	0.3-0.5	1
GC/GLNG #55	0.8-1.0	2
GC/GLNG #56	0.3-0.5	3
GC/GLNG #56	0.8-1.0	4
GC/GLNG #57	0 – 0.1	5
GC/GLNG #57	0.3-0.5	6
GC/GLNG #57	0.8-1.0	7
GC/GLNG #58	0.3-0.5	8
GC/GLNG #58	0.8-1.0	9
GC/GLNG #59	0 – 0.1	10
GC/GLNG #59	0.3-0.5	11
GC/GLNG #59	0.8-1.0	12

Environmental Division
Brisbane
Work Order
EB0812008

Telephone : +61-7-3243 7222

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GC/GLNG #60	0.3-0.5 13
GC/GLNG #60	0.8-1.0 14

CORE NUMBER	DEPTH (m)
GC/GLNG #61	0.3-0.5 15
GC/GLNG #61	0.8-1.0 16
GC/GLNG #62	0.3-0.5 17
GC/GLNG #62	0.8-1.0 18
GC/GLNG #63	0 – 0.1 19
GC/GLNG #63	0.3-0.5 20
GC/GLNG #63	0.8-1.0 21
GC/GLNG #64	0.3-0.5 22
GC/GLNG #64	0.8-1.0 23
GC/GLNG #65	0.3-0.5 24
GC/GLNG #65	0.8-1.0 25
GC/GLNG #66	0.3-0.5 26
GC/GLNG #66	0.8-1.0 27
GC/GLNG #67	0.3-0.5 28
GC/GLNG #67	0.8-1.0 29
GC/GLNG #68	0.3-0.5 30
GC/GLNG #68	0.8-1.0 31
GC/GLNG #69	0.3-0.5 32
GC/GLNG #69	0.8-1.0 33
GC/GLNG #70	0.3-0.5 34
GC/GLNG #70	0.8-1.0 35
GC/GLNG #71	0.3-0.5 36
GC/GLNG #71	0.8-1.0 37
GC/GLNG #72	0.3-0.5 38
GC/GLNG #72	0.8-1.0 39
GC/GLNG #73	0 – 0.1 40
GC/GLNG #73	0.3-0.5 41
GC/GLNG #73	0.8-1.0 42
GC/GLNG #74	0.3-0.5 43
GC/GLNG #74	0.8-1.0 44
GC/GLNG #75	0.3-0.5 45

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~~GC/GLNG #75~~	~~0.8-1.0~~
GC/GLNG #76	0.3-0.5 46
~~GC/GLNG #76~~	~~0.8-1.0~~
GC/GLNG #77	0.3-0.5 47
GC/GLNG #77	0.8-1.0 48

CORE NUMBER	DEPTH (m)
GC/GLNG #78	0 – 0.1 49
GC/GLNG #78	0.3-0.5 50
GC/GLNG #78	0.8-1.0 51
GC/GLNG #79	0.3-0.5 52
GC/GLNG #79	0.8-1.0 53
GC/GLNG #80	0.3-0.5 54
GC/GLNG #80	0.8-1.0 55
GC/GLNG #81	0.3-0.5 56
GC/GLNG $81	0.8-1.0 57
GC/GLNG #82	0.3-0.5 58
GC/GLNG #82	0.8-1.0 59
GC/GLNG #83	0 – 0.1 60
GC/GLNG #83	0.3-0.5 61
GC/GLNG #83	0.8-1.0 62
GC/GLNG #84	0.3-0.5 63
GC/GLNG #84	0.8-1.0 64

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0812008**	Page	: 1 of 8
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG 08	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: 08/09 GLNG/on/ASS-4	Date Samples Received	: 04-SEP-2008
Sampler	: ----	Issue Date	: 16-SEP-2008
Order number	: ----		
		No. of samples received	: 64
Quote number	: BN/248/07	No. of samples analysed	: 64

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Cass Sealby	Senior Chemist - Acid Sulphate Soils	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-A: Actual Acidity (QC Lot: 751314)									
EB0812008-001	GC/GLNG #55 0.3-0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.13	0.14	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	82	88	7.0	0% - 20%
		EA033: pH KCl (23A)	----	0.1	pH Unit	3.7	3.6	2.7	0% - 20%
EB0812008-011	GC/GLNG #59 0.3-0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.16	0.18	11.4	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	99	111	11.4	0% - 20%
		EA033: pH KCl (23A)	----	0.1	pH Unit	3.3	3.4	3.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 751315)									
EB0812008-021	GC/GLNG #63 0.8-1.0m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.07	0.07	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	42	45	8.2	0% - 20%
		EA033: pH KCl (23A)	----	0.1	pH Unit	4.2	4.1	2.4	0% - 20%
EB0812008-031	GC/GLNG #68 0.8-1.0m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.17	0.16	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	106	102	4.6	0% - 20%
		EA033: pH KCl (23A)	----	0.1	pH Unit	3.6	3.6	0.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 751316)									
EB0812008-041	GC/GLNG #73 0.3-0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.0	5.9	1.7	0% - 20%
EB0812008-051	GC/GLNG #78 0.8-1.0m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.5	6.6	1.5	0% - 20%
EA033-A: Actual Acidity (QC Lot: 751317)									
EB0812008-061	GC/GLNG #83 0.3-0.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	6.7	6.7	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 751314)									
EB0812008-001	GC/GLNG #55 0.3-0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.50	1.49	0.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	936	932	0.5	0% - 20%
EB0812008-011	GC/GLNG #59 0.3-0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	2.54	2.77	8.8	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	1580	1730	8.8	0% - 20%
EA033-B: Potential Acidity (QC Lot: 751315)									
EB0812008-021	GC/GLNG #63 0.8-1.0m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.49	1.30	13.9	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	932	810	13.9	0% - 20%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-B: Potential Acidity (QC Lot: 751315) - continued									
EB0812008-031	GC/GLNG #68 0.8-1.0m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	1.38	1.30	5.8	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	859	810	5.8	0% - 20%
EA033-B: Potential Acidity (QC Lot: 751316)									
EB0812008-041	GC/GLNG #73 0.3-0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.58	0.62	6.4	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	363	387	6.4	0% - 20%
EB0812008-051	GC/GLNG #78 0.8-1.0m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.78	0.78	0.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	484	484	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 751317)									
EB0812008-061	GC/GLNG #83 0.3-0.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.49	0.50	0.0	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	307	310	0.8	0% - 20%
EA033-C: Acid Neutralising Capacity (QC Lot: 751316)									
EB0812008-051	GC/GLNG #78 0.8-1.0m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	0.35	0.35	0.0	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	0.11	0.11	0.0	0% - 50%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	69	70	1.4	No Limit
EA033-C: Acid Neutralising Capacity (QC Lot: 751317)									
EB0812008-061	GC/GLNG #83 0.3-0.5m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	1.91	1.94	1.6	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	0.61	0.62	1.6	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	383	387	1.0	0% - 20%
EA033-D: Retained Acidity (QC Lot: 751314)									
EB0812008-001	GC/GLNG #55 0.3-0.5m	EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.75	0.72	3.8	0% - 20%
		EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.63	0.64	1.9	0% - 20%
		EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0812008-011	GC/GLNG #59 0.3-0.5m	EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	0.09	0.10	12.7	No Limit
		EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	0.12	0.14	12.7	No Limit
		EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.62	0.63	0.0	0% - 20%
		EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.74	0.77	3.2	0% - 20%
		EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	57	64	12.7	No Limit
EA033-D: Retained Acidity (QC Lot: 751315)									
EB0812008-021	GC/GLNG #63 0.8-1.0m	EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA033-D: Retained Acidity (QC Lot: 751315) - continued									
EB0812008-021	GC/GLNG #63 0.8-1.0m	EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.57	0.57	0.0	0% - 20%
		EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.56	0.50	11.6	0% - 20%
		EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0812008-031	GC/GLNG #68 0.8-1.0m	EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.61	0.58	4.1	0% - 20%
		EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.51	0.52	0.0	0% - 20%
		EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	<10	0.0	No Limit

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA033-A: Actual Acidity (QCLot: 751314)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 751315)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 751316)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 751317)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 751314)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 751315)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 751316)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 751317)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 751314)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 751315)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 751316)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
				Result	Concentration	LCS	Low	High
EA033-C: Acid Neutralising Capacity (QCLot: 751316) - continued								
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 751317)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-D: Retained Acidity (QCLot: 751314)								
EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----
EA033-D: Retained Acidity (QCLot: 751315)								
EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----
EA033-D: Retained Acidity (QCLot: 751316)								
EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----
EA033-D: Retained Acidity (QCLot: 751317)								
EA033: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA033: HCl Extractable Sulfur (20Be)	----	0.02	% S	<0.02	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) Results are required to be reported.**

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0812008**	Page	: 1 of 10
Client	: GEOCOASTAL (AUSTRALIA) PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG 08	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: 08/09 GLNG/on/ASS-4	Date Samples Received	: 04-SEP-2008
Sampler	: ----	Issue Date	: 16-SEP-2008
Order number	: ----		
		No. of samples received	: 64
Quote number	: BN/248/07	No. of samples analysed	: 64

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity - Continued								
Snap Lock Bag - frozen								
GC/GLNG #55 - 0.3-0.5m,	GC/GLNG #55 - 0.8-1.0m,	**02-SEP-2008**	**04-SEP-2008**	02-SEP-2009	✓	**11-SEP-2008**	09-DEC-2008	✓
GC/GLNG #56 - 0.3-0.5m,	GC/GLNG #56 - 0.8-1.0m,							
GC/GLNG #57 - 0-0.1m,	GC/GLNG #57 - 0.3-0.5m,							
GC/GLNG #57 - 0.8-1.0m,	GC/GLNG #58 - 0.3-0.5m,							
GC/GLNG #58 - 0.8-1.0m,	GC/GLNG #59 - 0-0.1m,							
GC/GLNG #59 - 0.3-0.5m,	GC/GLNG #59 - 0.8-1.0m,							
GC/GLNG #60 - 0.3-0.5m,	GC/GLNG #60 - 0.8-1.0m,							
GC/GLNG #61 - 0.3-0.5m,	GC/GLNG #61 - 0.8-1.0m,							
GC/GLNG #62 - 0.3-0.5m,	GC/GLNG #62 - 0.8-1.0m,							
GC/GLNG #63 - 0-0.1m,	GC/GLNG #63 - 0.3-0.5m,							
GC/GLNG #63 - 0.8-1.0m,	GC/GLNG #64 - 0.3-0.5m,							
GC/GLNG #64 - 0.8-1.0m,	GC/GLNG #65 - 0.3-0.5m,							
GC/GLNG #65 - 0.8-1.0m,	GC/GLNG #66 - 0.3-0.5m,							
GC/GLNG #66 - 0.8-1.0m,	GC/GLNG #67 - 0.3-0.5m,							
GC/GLNG #67 - 0.8-1.0m,	GC/GLNG #68 - 0.3-0.5m,							
GC/GLNG #68 - 0.8-1.0m,	GC/GLNG #69 - 0.3-0.5m,							
GC/GLNG #69 - 0.8-1.0m,	GC/GLNG #70 - 0.3-0.5m,							
GC/GLNG #70 - 0.8-1.0m,	GC/GLNG #71 - 0.3-0.5m,							
GC/GLNG #71 - 0.8-1.0m,	GC/GLNG #72 - 0.3-0.5m,							
GC/GLNG #72 - 0.8-1.0m,	GC/GLNG #73 - 0-0.1m,							
GC/GLNG #73 - 0.3-0.5m,	GC/GLNG #73 - 0.8-1.0m,							
GC/GLNG #74 - 0.3-0.5m,	GC/GLNG #74 - 0.8-1.0m,							
GC/GLNG #75 - 0.3-0.5m,	GC/GLNG #76 - 0.3-0.5m,							
GC/GLNG #77 - 0.3-0.5m,	GC/GLNG #77 - 0.8-1.0m,							
GC/GLNG #78 - 0-0.1m,	GC/GLNG #78 - 0.3-0.5m,							
GC/GLNG #78 - 0.8-1.0m,	GC/GLNG #79 - 0.3-0.5m,							
GC/GLNG #79 - 0.8-1.0m,	GC/GLNG #80 - 0.3-0.5m,							
GC/GLNG #80 - 0.8-1.0m,	GC/GLNG #81 - 0.3-0.5m,							
GC/GLNG #81 - 0.8-1.0m,	GC/GLNG #82 - 0.3-0.5m,							
GC/GLNG #82 - 0.8-1.0m,	GC/GLNG #83 - 0-0.1m,							
GC/GLNG #83 - 0.3-0.5m,	GC/GLNG #83 - 0.8-1.0m,							
GC/GLNG #84 - 0.3-0.5m,	GC/GLNG #84 - 0.8-1.0m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-B: Potential Acidity								
Snap Lock Bag - frozen								
GC/GLNG #55 - 0.3-0.5m,	GC/GLNG #55 - 0.8-1.0m,	**02-SEP-2008**	**04-SEP-2008**	02-SEP-2009	✓	**11-SEP-2008**	09-DEC-2008	✓
GC/GLNG #56 - 0.3-0.5m,	GC/GLNG #56 - 0.8-1.0m,							
GC/GLNG #57 - 0-0.1m,	GC/GLNG #57 - 0.3-0.5m,							
GC/GLNG #57 - 0.8-1.0m,	GC/GLNG #58 - 0.3-0.5m,							
GC/GLNG #58 - 0.8-1.0m,	GC/GLNG #59 - 0-0.1m,							
GC/GLNG #59 - 0.3-0.5m,	GC/GLNG #59 - 0.8-1.0m,							
GC/GLNG #60 - 0.3-0.5m,	GC/GLNG #60 - 0.8-1.0m,							
GC/GLNG #61 - 0.3-0.5m,	GC/GLNG #61 - 0.8-1.0m,							
GC/GLNG #62 - 0.3-0.5m,	GC/GLNG #62 - 0.8-1.0m,							
GC/GLNG #63 - 0-0.1m,	GC/GLNG #63 - 0.3-0.5m,							
GC/GLNG #63 - 0.8-1.0m,	GC/GLNG #64 - 0.3-0.5m,							
GC/GLNG #64 - 0.8-1.0m,	GC/GLNG #65 - 0.3-0.5m,							
GC/GLNG #65 - 0.8-1.0m,	GC/GLNG #66 - 0.3-0.5m,							
GC/GLNG #66 - 0.8-1.0m,	GC/GLNG #67 - 0.3-0.5m,							
GC/GLNG #67 - 0.8-1.0m,	GC/GLNG #68 - 0.3-0.5m,							
GC/GLNG #68 - 0.8-1.0m,	GC/GLNG #69 - 0.3-0.5m,							
GC/GLNG #69 - 0.8-1.0m,	GC/GLNG #70 - 0.3-0.5m,							
GC/GLNG #70 - 0.8-1.0m,	GC/GLNG #71 - 0.3-0.5m,							
GC/GLNG #71 - 0.8-1.0m,	GC/GLNG #72 - 0.3-0.5m,							
GC/GLNG #72 - 0.8-1.0m,	GC/GLNG #73 - 0-0.1m,							
GC/GLNG #73 - 0.3-0.5m,	GC/GLNG #73 - 0.8-1.0m,							
GC/GLNG #74 - 0.3-0.5m,	GC/GLNG #74 - 0.8-1.0m,							
GC/GLNG #75 - 0.3-0.5m,	GC/GLNG #76 - 0.3-0.5m,							
GC/GLNG #77 - 0.3-0.5m,	GC/GLNG #77 - 0.8-1.0m,							
GC/GLNG #78 - 0-0.1m,	GC/GLNG #78 - 0.3-0.5m,							
GC/GLNG #78 - 0.8-1.0m,	GC/GLNG #79 - 0.3-0.5m,							
GC/GLNG #79 - 0.8-1.0m,	GC/GLNG #80 - 0.3-0.5m,							
GC/GLNG #80 - 0.8-1.0m,	GC/GLNG #81 - 0.3-0.5m,							
GC/GLNG #81 - 0.8-1.0m,	GC/GLNG #82 - 0.3-0.5m,							
GC/GLNG #82 - 0.8-1.0m,	GC/GLNG #83 - 0-0.1m,							
GC/GLNG #83 - 0.3-0.5m,	GC/GLNG #83 - 0.8-1.0m,							
GC/GLNG #84 - 0.3-0.5m,	GC/GLNG #84 - 0.8-1.0m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-C: Acid Neutralising Capacity								
Snap Lock Bag - frozen								
GC/GLNG #55 - 0.3-0.5m,	GC/GLNG #55 - 0.8-1.0m,	**02-SEP-2008**	**04-SEP-2008**	02-SEP-2009	✓	**11-SEP-2008**	09-DEC-2008	✓
GC/GLNG #56 - 0.3-0.5m,	GC/GLNG #56 - 0.8-1.0m,							
GC/GLNG #57 - 0-0.1m,	GC/GLNG #57 - 0.3-0.5m,							
GC/GLNG #57 - 0.8-1.0m,	GC/GLNG #58 - 0.3-0.5m,							
GC/GLNG #58 - 0.8-1.0m,	GC/GLNG #59 - 0-0.1m,							
GC/GLNG #59 - 0.3-0.5m,	GC/GLNG #59 - 0.8-1.0m,							
GC/GLNG #60 - 0.3-0.5m,	GC/GLNG #60 - 0.8-1.0m,							
GC/GLNG #61 - 0.3-0.5m,	GC/GLNG #61 - 0.8-1.0m,							
GC/GLNG #62 - 0.3-0.5m,	GC/GLNG #62 - 0.8-1.0m,							
GC/GLNG #63 - 0-0.1m,	GC/GLNG #63 - 0.3-0.5m,							
GC/GLNG #63 - 0.8-1.0m,	GC/GLNG #64 - 0.3-0.5m,							
GC/GLNG #64 - 0.8-1.0m,	GC/GLNG #65 - 0.3-0.5m,							
GC/GLNG #65 - 0.8-1.0m,	GC/GLNG #66 - 0.3-0.5m,							
GC/GLNG #66 - 0.8-1.0m,	GC/GLNG #67 - 0.3-0.5m,							
GC/GLNG #67 - 0.8-1.0m,	GC/GLNG #68 - 0.3-0.5m,							
GC/GLNG #68 - 0.8-1.0m,	GC/GLNG #69 - 0.3-0.5m,							
GC/GLNG #69 - 0.8-1.0m,	GC/GLNG #70 - 0.3-0.5m,							
GC/GLNG #70 - 0.8-1.0m,	GC/GLNG #71 - 0.3-0.5m,							
GC/GLNG #71 - 0.8-1.0m,	GC/GLNG #72 - 0.3-0.5m,							
GC/GLNG #72 - 0.8-1.0m,	GC/GLNG #73 - 0-0.1m,							
GC/GLNG #73 - 0.3-0.5m,	GC/GLNG #73 - 0.8-1.0m,							
GC/GLNG #74 - 0.3-0.5m,	GC/GLNG #74 - 0.8-1.0m,							
GC/GLNG #75 - 0.3-0.5m,	GC/GLNG #76 - 0.3-0.5m,							
GC/GLNG #77 - 0.3-0.5m,	GC/GLNG #77 - 0.8-1.0m,							
GC/GLNG #78 - 0-0.1m,	GC/GLNG #78 - 0.3-0.5m,							
GC/GLNG #78 - 0.8-1.0m,	GC/GLNG #79 - 0.3-0.5m,							
GC/GLNG #79 - 0.8-1.0m,	GC/GLNG #80 - 0.3-0.5m,							
GC/GLNG #80 - 0.8-1.0m,	GC/GLNG #81 - 0.3-0.5m,							
GC/GLNG #81 - 0.8-1.0m,	GC/GLNG #82 - 0.3-0.5m,							
GC/GLNG #82 - 0.8-1.0m,	GC/GLNG #83 - 0-0.1m,							
GC/GLNG #83 - 0.3-0.5m,	GC/GLNG #83 - 0.8-1.0m,							
GC/GLNG #84 - 0.3-0.5m,	GC/GLNG #84 - 0.8-1.0m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-D: Retained Acidity								
Snap Lock Bag - frozen								
GC/GLNG #55 - 0.3-0.5m,	GC/GLNG #55 - 0.8-1.0m,	**02-SEP-2008**	**04-SEP-2008**	02-SEP-2009	✓	**11-SEP-2008**	09-DEC-2008	✓
GC/GLNG #56 - 0.3-0.5m,	GC/GLNG #56 - 0.8-1.0m,							
GC/GLNG #57 - 0-0.1m,	GC/GLNG #57 - 0.3-0.5m,							
GC/GLNG #57 - 0.8-1.0m,	GC/GLNG #58 - 0.3-0.5m,							
GC/GLNG #58 - 0.8-1.0m,	GC/GLNG #59 - 0-0.1m,							
GC/GLNG #59 - 0.3-0.5m,	GC/GLNG #59 - 0.8-1.0m,							
GC/GLNG #60 - 0.3-0.5m,	GC/GLNG #60 - 0.8-1.0m,							
GC/GLNG #61 - 0.3-0.5m,	GC/GLNG #61 - 0.8-1.0m,							
GC/GLNG #62 - 0.3-0.5m,	GC/GLNG #62 - 0.8-1.0m,							
GC/GLNG #63 - 0-0.1m,	GC/GLNG #63 - 0.3-0.5m,							
GC/GLNG #63 - 0.8-1.0m,	GC/GLNG #64 - 0.3-0.5m,							
GC/GLNG #64 - 0.8-1.0m,	GC/GLNG #65 - 0.3-0.5m,							
GC/GLNG #65 - 0.8-1.0m,	GC/GLNG #66 - 0.3-0.5m,							
GC/GLNG #66 - 0.8-1.0m,	GC/GLNG #67 - 0.3-0.5m,							
GC/GLNG #67 - 0.8-1.0m,	GC/GLNG #68 - 0.3-0.5m,							
GC/GLNG #68 - 0.8-1.0m,	GC/GLNG #69 - 0.3-0.5m,							
GC/GLNG #69 - 0.8-1.0m,	GC/GLNG #70 - 0.3-0.5m,							
GC/GLNG #70 - 0.8-1.0m,	GC/GLNG #71 - 0.3-0.5m,							
GC/GLNG #71 - 0.8-1.0m,	GC/GLNG #72 - 0.3-0.5m,							
GC/GLNG #72 - 0.8-1.0m,	GC/GLNG #73 - 0-0.1m,							
GC/GLNG #73 - 0.3-0.5m,	GC/GLNG #73 - 0.8-1.0m,							
GC/GLNG #74 - 0.3-0.5m,	GC/GLNG #74 - 0.8-1.0m,							
GC/GLNG #75 - 0.3-0.5m,	GC/GLNG #76 - 0.3-0.5m,							
GC/GLNG #77 - 0.3-0.5m,	GC/GLNG #77 - 0.8-1.0m,							
GC/GLNG #78 - 0-0.1m,	GC/GLNG #78 - 0.3-0.5m,							
GC/GLNG #78 - 0.8-1.0m,	GC/GLNG #79 - 0.3-0.5m,							
GC/GLNG #79 - 0.8-1.0m,	GC/GLNG #80 - 0.3-0.5m,							
GC/GLNG #80 - 0.8-1.0m,	GC/GLNG #81 - 0.3-0.5m,							
GC/GLNG #81 - 0.8-1.0m,	GC/GLNG #82 - 0.3-0.5m,							
GC/GLNG #82 - 0.8-1.0m,	GC/GLNG #83 - 0-0.1m,							
GC/GLNG #83 - 0.3-0.5m,	GC/GLNG #83 - 0.8-1.0m,							
GC/GLNG #84 - 0.3-0.5m,	GC/GLNG #84 - 0.8-1.0m							

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-E: Acid Base Accounting								
Snap Lock Bag - frozen								
GC/GLNG #55 - 0.3-0.5m,	GC/GLNG #55 - 0.8-1.0m,	**02-SEP-2008**	**04-SEP-2008**	02-SEP-2009	✓	**11-SEP-2008**	09-DEC-2008	✓
GC/GLNG #56 - 0.3-0.5m,	GC/GLNG #56 - 0.8-1.0m,							
GC/GLNG #57 - 0-0.1m,	GC/GLNG #57 - 0.3-0.5m,							
GC/GLNG #57 - 0.8-1.0m,	GC/GLNG #58 - 0.3-0.5m,							
GC/GLNG #58 - 0.8-1.0m,	GC/GLNG #59 - 0-0.1m,							
GC/GLNG #59 - 0.3-0.5m,	GC/GLNG #59 - 0.8-1.0m,							
GC/GLNG #60 - 0.3-0.5m,	GC/GLNG #60 - 0.8-1.0m,							
GC/GLNG #61 - 0.3-0.5m,	GC/GLNG #61 - 0.8-1.0m,							
GC/GLNG #62 - 0.3-0.5m,	GC/GLNG #62 - 0.8-1.0m,							
GC/GLNG #63 - 0-0.1m,	GC/GLNG #63 - 0.3-0.5m,							
GC/GLNG #63 - 0.8-1.0m,	GC/GLNG #64 - 0.3-0.5m,							
GC/GLNG #64 - 0.8-1.0m,	GC/GLNG #65 - 0.3-0.5m,							
GC/GLNG #65 - 0.8-1.0m,	GC/GLNG #66 - 0.3-0.5m,							
GC/GLNG #66 - 0.8-1.0m,	GC/GLNG #67 - 0.3-0.5m,							
GC/GLNG #67 - 0.8-1.0m,	GC/GLNG #68 - 0.3-0.5m,							
GC/GLNG #68 - 0.8-1.0m,	GC/GLNG #69 - 0.3-0.5m,							
GC/GLNG #69 - 0.8-1.0m,	GC/GLNG #70 - 0.3-0.5m,							
GC/GLNG #70 - 0.8-1.0m,	GC/GLNG #71 - 0.3-0.5m,							
GC/GLNG #71 - 0.8-1.0m,	GC/GLNG #72 - 0.3-0.5m,							
GC/GLNG #72 - 0.8-1.0m,	GC/GLNG #73 - 0-0.1m,							
GC/GLNG #73 - 0.3-0.5m,	GC/GLNG #73 - 0.8-1.0m,							
GC/GLNG #74 - 0.3-0.5m,	GC/GLNG #74 - 0.8-1.0m,							
GC/GLNG #75 - 0.3-0.5m,	GC/GLNG #76 - 0.3-0.5m,							
GC/GLNG #77 - 0.3-0.5m,	GC/GLNG #77 - 0.8-1.0m,							
GC/GLNG #78 - 0-0.1m,	GC/GLNG #78 - 0.3-0.5m,							
GC/GLNG #78 - 0.8-1.0m,	GC/GLNG #79 - 0.3-0.5m,							
GC/GLNG #79 - 0.8-1.0m,	GC/GLNG #80 - 0.3-0.5m,							
GC/GLNG #80 - 0.8-1.0m,	GC/GLNG #81 - 0.3-0.5m,							
GC/GLNG #81 - 0.8-1.0m,	GC/GLNG #82 - 0.3-0.5m,							
GC/GLNG #82 - 0.8-1.0m,	GC/GLNG #83 - 0-0.1m,							
GC/GLNG #83 - 0.3-0.5m,	GC/GLNG #83 - 0.8-1.0m,							
GC/GLNG #84 - 0.3-0.5m,	GC/GLNG #84 - 0.8-1.0m							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	7	64	**10.9**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	4	64	**6.3**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

SAMPLE RECEIPT NOTIFICATION (SRN)

Comprehensive Report

Work Order	: **EB0807957**		
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG OFF	Page	: 1 of 3
Order number	: ----		
C-O-C number	: 08/06 GLNG/ASS	Quote number	: EB20070176 (BN/248/07)
Site	: ----		
Sampler	: ----	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Dates

Date Samples Received	: 17-JUN-2008	Issue Date	: 18-JUN-2008 14:14
Client Requested Due Date	: 25-JUN-2008	Scheduled Reporting Date	: **25-JUN-2008**

Delivery Details

Mode of Delivery	: Client Drop off	Temperature	: -2.6 C, 8.6 C - Ice bricks present
No. of coolers/boxes	: 1 MEDIUM, 1 LOOSE	No. of samples received	: 43
Sercurity Seal	: Intact.	No. of samples analysed	: 43

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Requested Deliverables
- **Samples received in appropriately pretreated and preserved containers.**
- **Sample(s) have been received within recommended holding times.**
- **Please be advised that the extra samples received were logged as per your COC.**
- Please direct any turn around / technical queries to the laboratory contact designated above.
- Please direct any queries related to sample condition / numbering / breakages to Maggie Kahi.
- Analytical work for this work order will be conducted at ALS Brisbane.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Sample Disposal - Aqueous (14 days), Solid (90 days) from date of completion of work order.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exist.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process neccessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
When date(s) and/or time(s) are shown bracketed, these have been assumed by the laboratory for processing

Matrix: **SOIL**

Laboratory sample ID	*Client sampling date / time*	*Client sample ID*	SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0807957-001	06-JUN-2008 15:00	GC/GLNG OFF#1 0-0.1m	✓
EB0807957-002	06-JUN-2008 15:00	GC/GLNG OFF#1 1.8-2..	✓
EB0807957-003	06-JUN-2008 15:00	GC/GLNG OFF#1 2.8-3..	✓
EB0807957-004	06-JUN-2008 15:00	GC/GLNG OFF#1 3.3-3..	✓
EB0807957-005	06-JUN-2008 15:00	GC/GLNG OFF#1 3.8-4..	✓
EB0807957-006	06-JUN-2008 15:00	GC/GLNG OFF#3 1.8-2..	✓
EB0807957-007	06-JUN-2008 15:00	GC/GLNG OFF#3 3.3-3..	✓
EB0807957-008	06-JUN-2008 15:00	GC/GLNG OFF#5 0-0.1m	✓
EB0807957-009	06-JUN-2008 15:00	GC/GLNG OFF#5 1.0-1..	✓
EB0807957-010	06-JUN-2008 15:00	GC/GLNG OFF#5 1.8-2..	✓
EB0807957-011	06-JUN-2008 15:00	GC/GLNG OFF#5 2.3-2..	✓
EB0807957-012	06-JUN-2008 15:00	GC/GLNG OFF#5 3.3-3..	✓
EB0807957-013	06-JUN-2008 15:00	GC/GLNG OFF#5 4.3-4..	✓
EB0807957-014	06-JUN-2008 15:00	GC/GLNG OFF#5 5.8-6..	✓
EB0807957-015	06-JUN-2008 15:00	GC/GLNG OFF#6 0.3-0..	✓
EB0807957-016	06-JUN-2008 15:00	GC/GLNG OFF#6 0.8-1..	✓
EB0807957-017	06-JUN-2008 15:00	GC/GLNG OFF#6 1.8-2..	✓
EB0807957-018	06-JUN-2008 15:00	GC/GLNG OFF#6 2.3-2..	✓
EB0807957-019	06-JUN-2008 15:00	GC/GLNG OFF#6 3.3-3..	✓
EB0807957-020	06-JUN-2008 15:00	GC/GLNG OFF#6 4.3-4..	✓
EB0807957-021	06-JUN-2008 15:00	GC/GLNG OFF#9 0-0.1m	✓
EB0807957-022	06-JUN-2008 15:00	GC/GLNG OFF#9 0.3-0..	✓
EB0807957-023	06-JUN-2008 15:00	GC/GLNG OFF#9 1.1-1..	✓
EB0807957-024	06-JUN-2008 15:00	GC/GLNG OFF#9 1.8-2..	✓
EB0807957-025	06-JUN-2008 15:00	GC/GLNG OFF#9 3.3-3..	✓
EB0807957-026	06-JUN-2008 15:00	GC/GLNG OFF#10 0-0...	✓
EB0807957-027	06-JUN-2008 15:00	GC/GLNG OFF#10 0.4-..	✓
EB0807957-028	06-JUN-2008 15:00	GC/GLNG OFF#10 1.3-..	✓
EB0807957-029	06-JUN-2008 15:00	GC/GLNG OFF#10 2.4-..	✓
EB0807957-030	06-JUN-2008 15:00	GC/GLNG OFF#11 0.3-..	✓
EB0807957-031	06-JUN-2008 15:00	GC/GLNG OFF#11 0.8-..	✓
EB0807957-032	06-JUN-2008 15:00	GC/GLNG OFF#11 1.8-..	✓
EB0807957-033	06-JUN-2008 15:00	GC/GLNG OFF#12 0-0...	✓
EB0807957-034	06-JUN-2008 15:00	GC/GLNG OFF#12 0.8-..	✓
EB0807957-035	06-JUN-2008 15:00	GC/GLNG OFF#12 1.8-..	✓

			SOIL - EA033 Chromium Suite for Acid Sulphate Soils
EB0807957-036	06-JUN-2008 15:00	GC/GLNG OFF#12 2.8-..	✓
EB0807957-037	06-JUN-2008 15:00	GC/GLNG OFF#12 3.8-..	✓
EB0807957-038	06-JUN-2008 15:00	GC/GLNG OFF#1 0.8-1..	✓
EB0807957-039	06-JUN-2008 15:00	GC/GLNG OFF#2 2.8-3..	✓
EB0807957-040	06-JUN-2008 15:00	GC/GLNG OFF#2 3.8-4..	✓
EB0807957-041	06-JUN-2008 15:00	GC/GLNG OFF#3 0.9-1..	✓
EB0807957-042	06-JUN-2008 15:00	GC/GLNG OFF#13 0-0...	✓
EB0807957-043	06-JUN-2008 15:00	GC/GLNG OFF#9 4.5-4..	✓

Requested Deliverables

DR RUNDI LARSEN

- *AU Certificate of Analysis - NATA	Email	rlarsen@geocoastal.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep)	Email	rlarsen@geocoastal.com.au
- *AU QC Report ¿ DEFAULT (Anon QC Rep) - NATA	Email	rlarsen@geocoastal.com.au
- A4 - AU Sample Receipt Notification - Environmental	Email	rlarsen@geocoastal.com.au
- A4 - AU Tax Invoice	Email	rlarsen@geocoastal.com.au
- Default - Chain of Custody	Email	rlarsen@geocoastal.com.au
- EDI Format - ENMRG	Email	rlarsen@geocoastal.com.au
- EDI Format - XTab	Email	rlarsen@geocoastal.com.au

25/6

GEO COASTAL
Australia
PO Box 4051, 111 Stanbrough Rd, Gumdale QLD 4154. Tel: (07) 3890 7392 Fax: (07) 3890 7599

CHAIN OF CUSTODY/SAMPLE LIST SHEET

PROJECT I.D: GC/GLNG/OFF

COC No: **08/06 GLNG/ASS**

DATES SAMPLED: 6-9 June 2008

CONTACT PERSON: Dr Rundi Larsen

LABORATORY: Aust Laboratory Services P/L, 32 Shand Street, Stafford, QLD

SAMPLE TYPE: SANDY/MUDDY SEDIMENT

COLLECTION METHOD: Vibro-vaccum coring

SAMPLES:
- Kept chilled in esky & frozen within 6 hrs of collection
- **43** samples for **COMPLETE CHROMIUM SUITE**

ALS QUOTE No. EN/248/07 BQ.

RELINQUISHED BY	RECEIVED BY	DATE/TIME	DOCUMENTATION/ COMMENTS
M. Holmes.	Christian V.	16/6/08 16:10	

CORE NUMBER	DEPTH (m)
GC/GLNG OFF#1	1 0 – 0.1
GC/GLNG OFF#1	0.9 – 1.1
GC/GLNG OFF#1	2 1.8 – 2.0
GC/GLNG OFF#1	3 2.8 – 3.0
GC/GLNG OFF#1	4 3.3 – 3.5
GC/GLNG OFF#1	5 3.8 – 4.0
GC/GLNG OFF#3	SUB 0.3 – 0.5
GC/GLNG OFF#3	SUB 0.8 – 1.0
GC/GLNG OFF#3	6 1.8 – 2.0
GC/GLNG OFF#3	7 3.3 – 3.5
GC/GLNG OFF#3	SUB 4.8 – 5.0
GC/GLNG OFF#3	SUB 6.3 – 6.5

Labelled 0.8 - 1.0m

SCANNED DATE BY

Environmental Division
Brisbane
Work Order
EB0807957

Telephone : +61-7-3243 7222

SCANNED
DATE 17.6.08 BY

GEO COASTAL
Australia
PO Box 4051, 111 Stanbrough Rd, Gumdale QLD 4154. Tel: (07) 3890 7392 Fax: (07) 3890 7599

CORE NUMBER	DEPTH (m)
GC/GLNG OFF#5	8 0 – 0.1
GC/GLNG OFF#5	9 1.0 – 1.2
GC/GLNG OFF#5	10 1.8 – 2.0
GC/GLNG OFF#5	11 2.3 – 2.5
GC/GLNG OFF#5	12 3.3 – 3.5
GC/GLNG OFF#5	13 4.3 – 4.5
GC/GLNG OFF#5	14 5.8 – 6.0
GC/GLNG OFF#6	15 0.3 – 0.5
GC/GLNG OFF#6	16 0.8 – 1.0
GC/GLNG OFF#6	17 1.8 – 2.0
GC/GLNG OFF#6	18 2.3 – 2.5
GC/GLNG OFF#6	19 3.3 – 3.5
GC/GLNG OFF#6	20 4.3 – 4.5
GC/GLNG OFF#9	21 0 – 0.1
GC/GLNG OFF#9	22 0.3 – 0.5
GC/GLNG OFF#9	23 1.1 – 1.3
GC/GLNG OFF#9	24 1.8 – 2.0
GC/GLNG OFF#9	25 3.3 – 3.5
GC/GLNG OFF#9	SUR 4.3 – 4.5
GC/GLNG OFF#10	26 0 - 0.1
GC/GLNG OFF#10	27 0.4 – 0.6
GC/GLNG OFF#10	28 1.3 – 1.5
GC/GLNG OFF#10	29 2.4 – 2.6
GC/GLNG OFF#11	30 0.3 – 0.5
GC/GLNG OFF#11	31 0.8 – 1.0
GC/GLNG OFF#11	32 1.8 – 2.0
GC/GLNG OFF#12	33 0 – 0.1
GC/GLNG OFF#12	34 0.8 - 1.0
GC/GLNG OFF#12	35 1.8 – 2.0
GC/GLNG OFF#12	36 2.8 – 3.0
GC/GLNG OFF#12	37 3.8 – 4.0

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0807957**	Page	: 1 of 6
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG OFF	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: 08/06 GLNG/ASS	Date Samples Received	: 17-JUN-2008
Sampler	: ----	Issue Date	: 25-JUN-2008
Order number	: ----		
		No. of samples received	: 43
Quote number	: BN/248/07	No. of samples analysed	: 43

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

NATA Accredited Laboratory 825

This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Jessica Janson	Supervisor - Acid Sulphate Soils	Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been preformed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insuffient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = Chemistry Abstract Services number
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Client sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Recovery Limits (%)*
EA033-A: Actual Acidity (QC Lot: 687643)									
EB0807957-001	GC/GLNG OFF#1 0-0.1m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.0	9.0	0.0	0% - 20%
EB0807957-011	GC/GLNG OFF#5 2.3-2.5m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	8.6	8.6	0.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 687644)									
EB0807957-021	GC/GLNG OFF#9 0-0.1m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.3	9.3	0.0	0% - 20%
EB0807957-031	GC/GLNG OFF#11 0.8-1.0m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.5	9.4	1.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 687645)									
EB0807957-041	GC/GLNG OFF#3 0.9-1.1m	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.4	9.4	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 687643)									
EB0807957-001	GC/GLNG OFF#1 0-0.1m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.19	0.19	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	120	116	3.3	0% - 50%
EB0807957-011	GC/GLNG OFF#5 2.3-2.5m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.70	0.67	4.7	0% - 20%
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	438	418	4.7	0% - 20%
EA033-B: Potential Acidity (QC Lot: 687644)									
EB0807957-021	GC/GLNG OFF#9 0-0.1m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	10	0.0	No Limit
EB0807957-031	GC/GLNG OFF#11 0.8-1.0m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA033-B: Potential Acidity (QC Lot: 687645)									
EB0807957-041	GC/GLNG OFF#3 0.9-1.1m	EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	0.08	0.08	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	51	49	3.9	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Laboratory Duplicate (DUP) Report					
				LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA033-C: Acid Neutralising Capacity (QC Lot: 687643)									
EB0807957-001	GC/GLNG OFF#1 0-0.1m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	5.09	5.86	14.1	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	1.63	1.88	14.1	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	1020	1170	14.1	0% - 20%
EB0807957-011	GC/GLNG OFF#5 2.3-2.5m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	14.3	13.8	3.5	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	4.58	4.43	3.5	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	2860	2760	3.5	0% - 20%
EA033-C: Acid Neutralising Capacity (QC Lot: 687644)									
EB0807957-021	GC/GLNG OFF#9 0-0.1m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	1.76	1.69	3.9	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	0.56	0.54	3.9	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	351	338	3.9	0% - 20%
EB0807957-031	GC/GLNG OFF#11 0.8-1.0m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	3.76	3.96	5.1	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	1.20	1.27	5.1	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	752	791	5.1	0% - 20%
EA033-C: Acid Neutralising Capacity (QC Lot: 687645)									
EB0807957-041	GC/GLNG OFF#3 0.9-1.1m	EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	13.7	14.0	2.3	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	4.38	4.48	2.3	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	2730	2790	2.3	0% - 20%

Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EA033-A: Actual Acidity (QCLot: 687643)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 687644)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 687645)								
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 687643)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 687644)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 687645)								
EA033: Chromium Reducible Sulfur (22B)	----	0.02	% S	<0.02	----	----	----	----
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 687643)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 687644)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 687645)								
EA033: Acid Neutralising Capacity (19A1)	----	0.01	% CaCO3	<0.01	----	----	----	----
EA033: acidity - Acid Neutralising Capacity (a-19A1)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A1)	----	0.01	% pyrite S	<0.01	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) Results are required to be reported.**

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: **EB0807957**	Page	: 1 of 9
Client	: GEOCOASTAL (AUSTRALIA) PTY LTD	Laboratory	: Environmental Division Brisbane
Contact	: DR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: rlarsen@geocoastal.com.au	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: GC GLNG OFF	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: ----		
C-O-C number	: 08/06 GLNG/ASS	Date Samples Received	: 17-JUN-2008
Sampler	: ----	Issue Date	: 25-JUN-2008
Order number	: ----		
		No. of samples received	: 43
Quote number	: BN/248/07	No. of samples analysed	: 43

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers

Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non -volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-A: Actual Acidity								
Snap Lock Bag - frozen								
GC/GLNG OFF#1 - 0-0.1m,	GC/GLNG OFF#1 - 1.8-2.0m,	**06-JUN-2008**	**16-JUN-2008**	06-JUN-2009	✓	**23-JUN-2008**	21-SEP-2008	✓
GC/GLNG OFF#1 - 2.8-3.0m,	GC/GLNG OFF#1 - 3.3-3.5m,							
GC/GLNG OFF#1 - 3.8-4.0m,	GC/GLNG OFF#3 - 1.8-2.0m,							
GC/GLNG OFF#3 - 3.3-3.5m,	GC/GLNG OFF#5 - 0-0.1m,							
GC/GLNG OFF#5 - 1.0-1.2m,	GC/GLNG OFF#5 - 1.8-2.0m,							
GC/GLNG OFF#5 - 2.3-2.5m,	GC/GLNG OFF#5 - 3.3-3.5m,							
GC/GLNG OFF#5 - 4.3-4.5m,	GC/GLNG OFF#5 - 5.8-6.0m,							
GC/GLNG OFF#6 - 0.3-0.5m,	GC/GLNG OFF#6 - 0.8-1.0m,							
GC/GLNG OFF#6 - 1.8-2.0m,	GC/GLNG OFF#6 - 2.3-2.5m,							
GC/GLNG OFF#6 - 3.3-3.5m,	GC/GLNG OFF#6 - 4.3-4.5m,							
GC/GLNG OFF#9 - 0-0.1m,	GC/GLNG OFF#9 - 0.3-0.5m,							
GC/GLNG OFF#9 - 1.1-1.3m,	GC/GLNG OFF#9 - 1.8-2.0m,							
GC/GLNG OFF#9 - 3.3-3.5m,	GC/GLNG OFF#10 - 0-0.1m,							
GC/GLNG OFF#10 - 0.4-0.6m,	GC/GLNG OFF#10 - 1.3-1.5m,							
GC/GLNG OFF#10 - 2.4-2.6m,	GC/GLNG OFF#11 - 0.3-0.5m,							
GC/GLNG OFF#11 - 0.8-1.0m,	GC/GLNG OFF#11 - 1.8-2.0m,							
GC/GLNG OFF#12 - 0-0.1m,	GC/GLNG OFF#12 - 0.8-1.0m,							
GC/GLNG OFF#12 - 1.8-2.0m,	GC/GLNG OFF#12 - 2.8-3.0m,							
GC/GLNG OFF#12 - 3.8-4.0m,	GC/GLNG OFF#1 - 0.8-1.0m,							
GC/GLNG OFF#2 - 2.8-3.0m,	GC/GLNG OFF#2 - 3.8-4.0m,							
GC/GLNG OFF#3 - 0.9-1.1m,	GC/GLNG OFF#13 - 0-0.1m,							
GC/GLNG OFF#9 - 4.5-4.7m								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-B: Potential Acidity								
Snap Lock Bag - frozen								
GC/GLNG OFF#1 - 0-0.1m,	GC/GLNG OFF#1 - 1.8-2.0m,	**06-JUN-2008**	**16-JUN-2008**	06-JUN-2009	✓	**23-JUN-2008**	21-SEP-2008	✓
GC/GLNG OFF#1 - 2.8-3.0m,	GC/GLNG OFF#1 - 3.3-3.5m,							
GC/GLNG OFF#1 - 3.8-4.0m,	GC/GLNG OFF#3 - 1.8-2.0m,							
GC/GLNG OFF#3 - 3.3-3.5m,	GC/GLNG OFF#5 - 0-0.1m,							
GC/GLNG OFF#5 - 1.0-1.2m,	GC/GLNG OFF#5 - 1.8-2.0m,							
GC/GLNG OFF#5 - 2.3-2.5m,	GC/GLNG OFF#5 - 3.3-3.5m,							
GC/GLNG OFF#5 - 4.3-4.5m,	GC/GLNG OFF#5 - 5.8-6.0m,							
GC/GLNG OFF#6 - 0.3-0.5m,	GC/GLNG OFF#6 - 0.8-1.0m,							
GC/GLNG OFF#6 - 1.8-2.0m,	GC/GLNG OFF#6 - 2.3-2.5m,							
GC/GLNG OFF#6 - 3.3-3.5m,	GC/GLNG OFF#6 - 4.3-4.5m,							
GC/GLNG OFF#9 - 0-0.1m,	GC/GLNG OFF#9 - 0.3-0.5m,							
GC/GLNG OFF#9 - 1.1-1.3m,	GC/GLNG OFF#9 - 1.8-2.0m,							
GC/GLNG OFF#9 - 3.3-3.5m,	GC/GLNG OFF#10 - 0-0.1m,							
GC/GLNG OFF#10 - 0.4-0.6m,	GC/GLNG OFF#10 - 1.3-1.5m,							
GC/GLNG OFF#10 - 2.4-2.6m,	GC/GLNG OFF#11 - 0.3-0.5m,							
GC/GLNG OFF#11 - 0.8-1.0m,	GC/GLNG OFF#11 - 1.8-2.0m,							
GC/GLNG OFF#12 - 0-0.1m,	GC/GLNG OFF#12 - 0.8-1.0m,							
GC/GLNG OFF#12 - 1.8-2.0m,	GC/GLNG OFF#12 - 2.8-3.0m,							
GC/GLNG OFF#12 - 3.8-4.0m,	GC/GLNG OFF#1 - 0.8-1.0m,							
GC/GLNG OFF#2 - 2.8-3.0m,	GC/GLNG OFF#2 - 3.8-4.0m,							
GC/GLNG OFF#3 - 0.9-1.1m,	GC/GLNG OFF#13 - 0-0.1m,							
GC/GLNG OFF#9 - 4.5-4.7m								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-C: Acid Neutralising Capacity								
Snap Lock Bag - frozen								
GC/GLNG OFF#1 - 0-0.1m,	GC/GLNG OFF#1 - 1.8-2.0m,	**06-JUN-2008**	**16-JUN-2008**	06-JUN-2009	✓	**23-JUN-2008**	21-SEP-2008	✓
GC/GLNG OFF#1 - 2.8-3.0m,	GC/GLNG OFF#1 - 3.3-3.5m,							
GC/GLNG OFF#1 - 3.8-4.0m,	GC/GLNG OFF#3 - 1.8-2.0m,							
GC/GLNG OFF#3 - 3.3-3.5m,	GC/GLNG OFF#5 - 0-0.1m,							
GC/GLNG OFF#5 - 1.0-1.2m,	GC/GLNG OFF#5 - 1.8-2.0m,							
GC/GLNG OFF#5 - 2.3-2.5m,	GC/GLNG OFF#5 - 3.3-3.5m,							
GC/GLNG OFF#5 - 4.3-4.5m,	GC/GLNG OFF#5 - 5.8-6.0m,							
GC/GLNG OFF#6 - 0.3-0.5m,	GC/GLNG OFF#6 - 0.8-1.0m,							
GC/GLNG OFF#6 - 1.8-2.0m,	GC/GLNG OFF#6 - 2.3-2.5m,							
GC/GLNG OFF#6 - 3.3-3.5m,	GC/GLNG OFF#6 - 4.3-4.5m,							
GC/GLNG OFF#9 - 0-0.1m,	GC/GLNG OFF#9 - 0.3-0.5m,							
GC/GLNG OFF#9 - 1.1-1.3m,	GC/GLNG OFF#9 - 1.8-2.0m,							
GC/GLNG OFF#9 - 3.3-3.5m,	GC/GLNG OFF#10 - 0-0.1m,							
GC/GLNG OFF#10 - 0.4-0.6m,	GC/GLNG OFF#10 - 1.3-1.5m,							
GC/GLNG OFF#10 - 2.4-2.6m,	GC/GLNG OFF#11 - 0.3-0.5m,							
GC/GLNG OFF#11 - 0.8-1.0m,	GC/GLNG OFF#11 - 1.8-2.0m,							
GC/GLNG OFF#12 - 0-0.1m,	GC/GLNG OFF#12 - 0.8-1.0m,							
GC/GLNG OFF#12 - 1.8-2.0m,	GC/GLNG OFF#12 - 2.8-3.0m,							
GC/GLNG OFF#12 - 3.8-4.0m,	GC/GLNG OFF#1 - 0.8-1.0m,							
GC/GLNG OFF#2 - 2.8-3.0m,	GC/GLNG OFF#2 - 3.8-4.0m,							
GC/GLNG OFF#3 - 0.9-1.1m,	GC/GLNG OFF#13 - 0-0.1m,							
GC/GLNG OFF#9 - 4.5-4.7m								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-D: Retained Acidity								
Snap Lock Bag - frozen								
GC/GLNG OFF#1 - 0-0.1m,	GC/GLNG OFF#1 - 1.8-2.0m,	**06-JUN-2008**	**16-JUN-2008**	06-JUN-2009	✓	**23-JUN-2008**	21-SEP-2008	✓
GC/GLNG OFF#1 - 2.8-3.0m,	GC/GLNG OFF#1 - 3.3-3.5m,							
GC/GLNG OFF#1 - 3.8-4.0m,	GC/GLNG OFF#3 - 1.8-2.0m,							
GC/GLNG OFF#3 - 3.3-3.5m,	GC/GLNG OFF#5 - 0-0.1m,							
GC/GLNG OFF#5 - 1.0-1.2m,	GC/GLNG OFF#5 - 1.8-2.0m,							
GC/GLNG OFF#5 - 2.3-2.5m,	GC/GLNG OFF#5 - 3.3-3.5m,							
GC/GLNG OFF#5 - 4.3-4.5m,	GC/GLNG OFF#5 - 5.8-6.0m,							
GC/GLNG OFF#6 - 0.3-0.5m,	GC/GLNG OFF#6 - 0.8-1.0m,							
GC/GLNG OFF#6 - 1.8-2.0m,	GC/GLNG OFF#6 - 2.3-2.5m,							
GC/GLNG OFF#6 - 3.3-3.5m,	GC/GLNG OFF#6 - 4.3-4.5m,							
GC/GLNG OFF#9 - 0-0.1m,	GC/GLNG OFF#9 - 0.3-0.5m,							
GC/GLNG OFF#9 - 1.1-1.3m,	GC/GLNG OFF#9 - 1.8-2.0m,							
GC/GLNG OFF#9 - 3.3-3.5m,	GC/GLNG OFF#10 - 0-0.1m,							
GC/GLNG OFF#10 - 0.4-0.6m,	GC/GLNG OFF#10 - 1.3-1.5m,							
GC/GLNG OFF#10 - 2.4-2.6m,	GC/GLNG OFF#11 - 0.3-0.5m,							
GC/GLNG OFF#11 - 0.8-1.0m,	GC/GLNG OFF#11 - 1.8-2.0m,							
GC/GLNG OFF#12 - 0-0.1m,	GC/GLNG OFF#12 - 0.8-1.0m,							
GC/GLNG OFF#12 - 1.8-2.0m,	GC/GLNG OFF#12 - 2.8-3.0m,							
GC/GLNG OFF#12 - 3.8-4.0m,	GC/GLNG OFF#1 - 0.8-1.0m,							
GC/GLNG OFF#2 - 2.8-3.0m,	GC/GLNG OFF#2 - 3.8-4.0m,							
GC/GLNG OFF#3 - 0.9-1.1m,	GC/GLNG OFF#13 - 0-0.1m,							
GC/GLNG OFF#9 - 4.5-4.7m								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA033-E: Acid Base Accounting								
Snap Lock Bag - frozen								
GC/GLNG OFF#1 - 0-0.1m,	GC/GLNG OFF#1 - 1.8-2.0m,	**06-JUN-2008**	**16-JUN-2008**	06-JUN-2009	✓	**23-JUN-2008**	21-SEP-2008	✓
GC/GLNG OFF#1 - 2.8-3.0m,	GC/GLNG OFF#1 - 3.3-3.5m,							
GC/GLNG OFF#1 - 3.8-4.0m,	GC/GLNG OFF#3 - 1.8-2.0m,							
GC/GLNG OFF#3 - 3.3-3.5m,	GC/GLNG OFF#5 - 0-0.1m,							
GC/GLNG OFF#5 - 1.0-1.2m,	GC/GLNG OFF#5 - 1.8-2.0m,							
GC/GLNG OFF#5 - 2.3-2.5m,	GC/GLNG OFF#5 - 3.3-3.5m,							
GC/GLNG OFF#5 - 4.3-4.5m,	GC/GLNG OFF#5 - 5.8-6.0m,							
GC/GLNG OFF#6 - 0.3-0.5m,	GC/GLNG OFF#6 - 0.8-1.0m,							
GC/GLNG OFF#6 - 1.8-2.0m,	GC/GLNG OFF#6 - 2.3-2.5m,							
GC/GLNG OFF#6 - 3.3-3.5m,	GC/GLNG OFF#6 - 4.3-4.5m,							
GC/GLNG OFF#9 - 0-0.1m,	GC/GLNG OFF#9 - 0.3-0.5m,							
GC/GLNG OFF#9 - 1.1-1.3m,	GC/GLNG OFF#9 - 1.8-2.0m,							
GC/GLNG OFF#9 - 3.3-3.5m,	GC/GLNG OFF#10 - 0-0.1m,							
GC/GLNG OFF#10 - 0.4-0.6m,	GC/GLNG OFF#10 - 1.3-1.5m,							
GC/GLNG OFF#10 - 2.4-2.6m,	GC/GLNG OFF#11 - 0.3-0.5m,							
GC/GLNG OFF#11 - 0.8-1.0m,	GC/GLNG OFF#11 - 1.8-2.0m,							
GC/GLNG OFF#12 - 0-0.1m,	GC/GLNG OFF#12 - 0.8-1.0m,							
GC/GLNG OFF#12 - 1.8-2.0m,	GC/GLNG OFF#12 - 2.8-3.0m,							
GC/GLNG OFF#12 - 3.8-4.0m,	GC/GLNG OFF#1 - 0.8-1.0m,							
GC/GLNG OFF#2 - 2.8-3.0m,	GC/GLNG OFF#2 - 3.8-4.0m,							
GC/GLNG OFF#3 - 0.9-1.1m,	GC/GLNG OFF#13 - 0-0.1m,							
GC/GLNG OFF#9 - 4.5-4.7m								

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	5	43	**11.6**	**10.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	3	43	**7.0**	**5.0**	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.

Preparation Methods	Method	Matrix	Method Descriptions
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house

Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW 846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- **For all matrices, no Method Blank value outliers occur.**
- **For all matrices, no Duplicate outliers occur.**
- **For all matrices, no Laboratory Control outliers occur.**
- **For all matrices, no Matrix Spike outliers occur.**

Regular Sample Surrogates

- **For all regular sample matrices, no surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- **No Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- **No Quality Control Sample Frequency Outliers exist.**

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil

Appendix D

GeoCoastal were instructed by the client to carry out a preliminary assessment of the distribution of Actual Acid Sulfate Soils on additional tidal flat areas that may be suitable for receiving dredge spoil. In order to expedite this investigation it was proposed that shallow (1 metre) coring would be conducted in conjunction with field pH testing and a limited number of laboratory tests. This assessment took place at two locations:

1) a tidal flat occupying an embayment to the east of Boatshed Point (Location 5); and

2) a tidal flat south of Laird Point (Location 6; refer Figure 2-1).

Fifteen sites were investigated at the first of these locations (cores #55 to #69), and fifteen sites at the second (cores #70 to #84).

D.1 Facies

The shallow depth of investigation in this component of the program does not provide for any comprehensive assessment of facies, however, some observations can be made.

D.1.1 Area 5 – east of Boatshed Point

Pre-Holocene substrate – the antecedent pre-Holocene substrate was not encountered in any borehole within the 1m investigation depth.

Prograding mangrove – consistent with the sequence in adjacent Area 1 to the west of Boatshed Point, the upper sedimentary sequence immediately underlying the tidal flat cap was characterised by very highly organic (mangrove), very dark grey, very soft, clayey silts: moist, weakly cohered.

Tidal flat cap – a contiguous, thin (~20 cm) capping layer of light olive brown/brown silt/clay (sandy across much of the site) mantles this tidal flat.

D.1.2 Area 6 – south of Laird Point

Pre-Holocene substrate – the antecedent pre-Holocene substrate was encountered in three boreholes within the 1m investigation depth, but not recovered because of the light, manual coring equipment used.

Prograding mangrove – consistent with the findings in other locations the upper sedimentary sequence immediately underlying the tidal flat cap is again characterised by very highly organic (mangrove), very dark grey, very soft, clayey silts: moist, weakly cohered.

Tidal flat cap – again a contiguous, thin (~20 cm) capping layer of light olive brown silt/clay, and brown sandy silty/clay caps this tidal flat.

D.2 Field pH screening data

BH55

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.39	5.93	0.1	XX	1.46
5.07	1.01	0.25	XXXX!	4.06
6.14	0.91	0.5	XXX!	5.23
5.94	1.19	0.75	XXXX!	4.75
5.89	1.06	1.0	XXXX!	4.83

BH60

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.66	6.32	0.1	XX!	1.34
4.32	1.08	0.25	XX!	3.24
5.88	0.91	0.5	XXXX!	4.97
6.42	0.98	0.75	XXXX!	5.44
6.46	0.97	1.0	XXXX!	5.49

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil

Appendix D

BH56

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
5.35	5.15	0.1	XX	0.20
4.49	0.93	0.25	XXXX!	3.56
5.31	0.73	0.5	XXX!	4.58
6.35	0.85	0.75	XXX!	5.50
7.08	1.21	1.0	XXXX!	5.87

BH57

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.77	6.81	0.1	XXX!	0.96
4.72	1.14	0.25	XXXX!	3.58
6.09	1.12	0.5	XXXX!	4.97
6.67	1.14	0.75	XXXX!	5.53
6.72	0.98	1.0	XXXX!	5.74

BH58

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
6.94	6.05	0.1	XX!	0.89
4.19	3.48	0.25	X	0.71
4.64	0.79	0.5	XXXX!	3.85
5.40	0.89	0.75	XXXX!	4.51
5.83	0.79	1.0	XXXX!	5.04

BH59

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.28	6.10	0.1	XX!	1.18
4.15	3.42	0.25	X	0.73
4.43	1.06	0.5	XXXX!	3.37
5.06	0.85	0.75	XXXX!	4.21
6.02	0.77	1.0	XXXX!	5.25

BH61

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.71	5.95	0.1	XX!	1.76
5.50	1.07	0.25	XXXX!	4.43
6.05	1.07	0.5	XXXX!	4.98
6.41	1.00	0.75	XXXX!	5.41
6.45	0.80	1.0	XXXX!	5.65

BH62

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.94	6.16	0.1	XX!	1.78
5.80	3.49	0.25	X	2.31
6.59	0.85	0.5	XXXX!	5.74
6.99	0.81	0.75	XXXX!	6.18
7.10	0.88	1.0	XXXX!	6.22

BH63

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.57	6.15	0.1	XX	1.42
5.18	0.71	0.25	XX	4.47
5.85	1.11	0.5	XXX!	4.74
6.35	0.96	0.75	XXXX!	5.39
6.50	0.77	1.0	XXXX!	5.73

BH64

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.93	6.16	0.1	XX	1.77
5.45	0.94	0.25	XXXX!	4.51
6.50	0.64	0.5	XXX	5.86
6.92	1.04	0.75	XXXX!	5.88
6.81	1.19	1.0	XXXX!	5.62

BH65

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.86	6.23	0.1	XXX	1.63
5.39	1.00	0.25	XX	4.39
6.72	1.00	0.5	XXXX!	5.72
6.93	0.87	0.75	XXXX!	6.06
6.87	0.97	1.0	XXXX!	5.90

BH66

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.75	6.32	0.1	XXX	1.43
4.98	0.79	0.25	XXXX!	4.19
6.58	0.82	0.5	XXXX!	5.76
6.67	0.99	0.75	XXXX!	5.68
6.96	0.87	1.0	XXXX!	6.09

BH70

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.90	8.01	0.1	XXXX	-0.11
7.33	0.98	0.25	XXXX!	6.35
6.93	0.99	0.5	XXXX!	5.94
6.87	1.08	0.75	XXXX!	5.79
6.97	1.31	1.0	XXXX!	5.66

BH71

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
7.65	6.01	0.1	XX	1.64
6.49	1.52	0.25	XX	4.97
6.36	0.95	0.5	XXXX!	5.41
6.32	0.92	0.75	XXXX!	5.40
6.53	0.80	1.0	XXXX!	5.73

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil

Appendix D

BH67

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.71	6.23	0.1	XX	1.48
6.23	0.92	0.25	XXXX!	5.31
6.69	0.81	0.5	XXXX!	5.88
6.46	0.71	0.75	XXXX!	5.75
6.64	0.72	1.0	XXXX!	5.92

BH68

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.93	6.53	0.1	XX	1.40
5.29	1.19	0.25	XXXX!	4.10
6.31	0.97	0.5	XXXX!	5.34
5.80	0.99	0.75	XXXX!	4.81
6.62	1.05	1.0	XXXX!	5.57

BH69

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.99	6.62	0.1	XXXX	1.37
6.09	0.96	0.25	XXXX!	5.13
6.69	0.97	0.5	XXXX!	5.72
6.88	0.74	0.75	XXXX!	6.14
6.77	0.80	1.0	XXXX!	5.97

BH75

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.54	5.89	0.1	XXXX!	1.65
5.14	0.79	0.25	XX	4.35
4.56	0.94	0.5	XXX!	3.62

BH76

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
8.04	7.62	0.1	XXXX!	0.42
4.44	3.35	0.25	X	1.09
5.53	1.04	0.5	XXX!	4.49

BH77

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.93	6.39	0.1	XX	1.54
4.15	4.14	0.25	XXX!	0.01
4.35	0.83	0.5	XXXX!	3.52
5.04	1.02	0.75	XXXX!	4.02
6.31	0.79	1.0	XXXX!	5.52

BH72

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.88	6.08	0.1	XX	1.80
6.87	2.73	0.25	XX	4.14
6.29	0.80	0.5	XXXX!	5.49
6.13	0.98	0.65	XXXX!	5.15

BH73

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.29	6.98	0.1	XXXX	0.31
6.57	1.48	0.25	XXX!	5.09
6.77	1.36	0.5	XXXX!	5.41
6.57	1.27	0.75	XXXX!	5.30
7.07	1.23	1.0	XXXX!	5.84

BH74

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
8.04	6.55	0.1	XX	1.49
5.77	1.03	0.25	XXX!	4.74
6.26	1.07	0.5	XXXX!	5.19
6.46	1.02	0.75	XXXX!	5.44
6.95	0.75	1.0	XXXX!	6.20

BH80

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
7.73	6.24	0.1	XX!	1.49
4.83	4.06	0.25	X	0.77
5.13	1.43	0.5	XXXX!	3.70
6.85	1.32	0.75	XX	5.53
7.34	1.42	1.0	XXXX!	5.92

BH81

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
8.09	6.76	0.1	XXXX!	1.33
5.30	4.17	0.25	X	1.13
6.01	1.49	0.5	XXXX!	4.52
7.36	1.35	0.75	XXXX!	6.01
7.58	1.19	1.0	XX	6.39

BH82

pH $_F$	pH $_{FOX}$	Reaction	Sample depth	pH drop
8.16	7.82	0.1	XXXX!	0.34
7.36	1.16	0.25	XX	6.20
7.52	1.58	0.5	XXXX!	5.94
7.57	1.54	0.75	XXXX!	6.03
7.48	1.18	1.0	XX	6.30

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil

Appendix D

BH78

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.24	6.48	0.1	XX	1.76
6.23	5.12	0.25	X	1.11
7.47	2.23	0.5	XX	5.24
8.15	0.99	0.75	XXX	7.16
7.82	0.89	1.0	XX	6.93

BH79

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.08	6.25	0.1	XX	1.83
5.27	4.43	0.25	X	0.84
4.28	1.50	0.5	X	2.78
5.84	0.97	0.75	XXXX!	4.87
7.31	4.81	1.0	XX	2.50

BH83

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.13	7.01	0.1	XXXX!	1.12
5.01	0.90	0.25	XXXX!	4.11
6.66	1.24	0.5	XXXX!	5.42
6.90	1.04	0.75	XXXX!	5.86
7.13	1.06	1.0	XXXX!	6.07

BH84

pH_F	pH_{FOX}	Reaction	Sample depth	pH drop
8.10	6.88	0.1	XXXX!	1.22
7.47	0.95	0.25	XXXX!	6.52
7.03	0.94	0.5	XXXX!	6.09
6.78	0.98	0.75	XXXX!	5.80
6.96	1.18	1.0	XXXX!	5.78

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil Assessment

Appendix D

D.3 Laboratory Results

		Core No.	GLNG #55	GLNG #55	GLNG #56	GLNG #56	GLNG #57	GLNG #57	GLNG #57	GLNG #58	GLNG #58	GLNG #59	GLNG #59	GLNG #59	GLNG #60
		Depth (m)	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0-0.1	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0-0.1	0.3-0.5	0.8-1.0	0.3-0.5
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	3.7	4.5	4.2	3.5	4.9	3.3	3.5	3.5	3.5	4.6	3.3	3.4	5
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.13	0.05	0.08	0.13	0.03	0.12	0.12	0.14	0.16	0.07	0.16	0.19	0.04
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	1.5	1.3	1.56	2.23	0.23	2.35	2.19	2.5	2.66	0.18	2.54	4.48	2.17
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01													
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02													
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02	0.01		0.01	0.01		0.01	0.01	0.01	0.01		0.09	0.01	
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	1.63	1.35	1.64	2.36	0.26	2.47	2.31	2.64	2.82	0.26	2.79	4.67	2.21
Liming Rate	kg CaCO3/t	1	76	63	77	110	12	115	108	124	132	12	131	218	104
Data Verification RL (ASS Lab Methods V2.1, 2004)			1.63	1.35	1.64	2.36	0.26	2.47	2.31	2.64	2.82	0.25	2.7	4.67	2.21

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil Assessment

Appendix D

		Core No.	GLNG #60	GLNG #61	GLNG #61	GLNG #62	GLNG #62	GLNG #63	GLNG #63	GLNG #63	GLNG #64	GLNG #64	GLNG #65	GLNG #65	GLNG #66
		Depth (m)	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0-0.1	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	6.1	4.9	3.8	3.9	4	8	4.1	4.2	4.6	5.4	4	4.3	4.2
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.01	0.03	0.1	0.06	0.06	0.01	0.07	0.07	0.07	0.02	0.08	0.06	0.07
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	1.88	1.18	1.88	0.68	0.95	0.01	1.57	1.49	2.42	1.65	3.04	2.31	1.8
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01						2.9							
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02						0.93							
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02			0.01	0.01	0.01		0.01	0.01			0.01	0.01	0.01
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	1.89	1.21	1.98	0.74	1.01	0.01	1.64	1.56	2.5	1.67	3.13	2.37	1.87
Liming Rate	kg CaCO3/t	1	89	57	93	35	47	<1	77	73	117	78	146	111	88
Data Verification RL (ASS Lab Methods V2.1, 2004)			1.89	1.21	1.98	0.74	1.01	-0.61	1.64	1.56	2.49	1.67	3.12	2.37	1.87

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil Assessment

Appendix D

		Core No.	GLNG #66	GLNG #67	GLNG #67	GLNG #68	GLNG #68	GLNG #69	GLNG #69	GLNG #70	GLNG #70	GLNG #71	GLNG #71	GLNG #72	GLNG #72
		Depth (m)	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	5.1	4.2	4	3.8	3.6	4.2	4	3.7	3.8	3.5	3.4	4.6	5.6
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.02	0.08	0.07	0.14	0.17	0.09	0.15	0.14	0.14	0.18	0.18	0.04	0.01
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	1.96	1.65	2.15	1.8	1.38	2.62	2.66	1.92	3.32	5.22	3.2	1.3	1.3
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01													
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02													
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02		0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01		
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	1.98	1.73	2.23	1.95	1.55	2.71	2.8	2.06	3.46	5.4	3.38	1.34	1.31
Liming Rate	kg CaCO3/t	1	93	81	104	91	72	127	131	97	162	253	158	63	61
Data Verification RL (ASS Lab Methods V2.1, 2004)			1.98	1.73	2.22	1.94	1.55	2.71	2.81	2.06	3.46	5.4	3.38	1.34	1.31

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil Assessment

Appendix D

		Core No.	GLNG #73	GLNG #73	GLNG #73	GLNG #74	GLNG #74	GLNG #75	GLNG #76	GLNG #77	GLNG #77	GLNG #78	GLNG #78	GLNG #78	GLNG #79
		Depth (m)	0-0.1	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.3-0.5	0.3-0.5	0.8-1.0	0-0.1	0.3-0.5	0.8-1.0	0.3-0.5
EA033-A: Actual Acidity	Units	LOR													
pH KCL (23A)	pH unit	0.1	7.8	6	4.3	4.2	4.1	4.2	4.7	3.9	4.3	7.4	5.6	6.5	4.5
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.01	0.01	0.06	0.06	0.07	0.08	0.01	0.12	0.07	0.01	0.01	0.01	0.04
EA033-B: Potential Acidity															
Chromium Reducible Sulfur	% S	0.02	0.05	0.58	1.44	1.59	2.48	3.18	0.7	2.56	1.44	0.04	0.58	0.78	0.62
EA033-C: Acid Neutralising Capacity															
Acid Neutralising Capacity	%CaCO3	0.01	0.76									1.38		0.35	
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02	0.24									0.44		0.11	
EA033-D: Retained Acidity															
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02			0.01	0.01	0.01	0.01		0.01	0.01				
EA033-E: Acid Base Accounting															
Net Acidity (sulfur units)	% S	0.02	0.01	0.58	1.5	1.66	2.56	3.26	0.71	2.68	1.5	0.01	0.59	0.7	0.67
Liming Rate	kg CaCO3/t	1	<1	27	70	77	120	152	33	125	70	<1	28	33	31
Data Verification RL (ASS Lab Methods V2.1, 2004)			-0.11	0.59	1.5	1.65	2.55	3.26	0.71	2.68	1.51	-0.25	0.59	0.71	0.66

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil Assessment

Appendix D

		Core No.	GLNG #79	GLNG #80	GLNG #80	GLNG #81	GLNG #81	GLNG #82	GLNG #82	GLNG #83	GLNG #83	GLNG #83	GLNG #84	GLNG #84
		Depth (m)	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0	0-0.1	0.3-0.5	0.8-1.0	0.3-0.5	0.8-1.0
EA033-A: Actual Acidity	Units	LOR												
pH KCL (23A)	pH unit	0.1	5.3	5	6.3	5.4	6.7	6.5	6.6	3.8	6.7	4.4	4.1	3.9
sulfidic – Titratable Actual Acidity	% pyrite S	0.02	0.01	0.02	0.01	0.01	0.01	0.01	0.01	0.11	0.01	0.07	0.06	0.1
EA033-B: Potential Acidity														
Chromium Reducible Sulfur	% S	0.02	1.51	0.58	0.54	0.81	0.7	1.47	1.07	3.41	0.49	1.71	1.82	2.87
EA033-C: Acid Neutralising Capacity														
Acid Neutralising Capacity	%CaCO3	0.01					0.65	0.79	0.82		1.91			
sulfidic – Acid Neutralising Capacity	% pyrite S	0.02					0.21	0.25	0.26		0.61			
EA033-D: Retained Acidity														
Sulfidic – Net Acid Soluble Sulfur	% pyrite S	0.02								0.01		0.01	0.01	0.01
EA033-E: Acid Base Accounting														
Net Acidity (sulfur units)	% S	0.02	1.53	0.6	0.54	0.83	0.56	1.31	0.89	3.52	0.08	1.77	1.88	2.98
Liming Rate	kg CaCO3/t	1	72	28	26	39	26	61	42	165	4	83	88	139
Data Verification RL (ASS Lab Methods V2.1, 2004)			1.52	0.6	0.55	0.82	0.56	1.47	1.07	3.52	0.08	1.78	1.88	2.97

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil

Appendix D

D.4 ASS Chemistry and Distribution of Actual Acid Sulfate Soil.

Summaries of the ASS chemistry for the two groups of short (1 metre) cores in Sites 5 and 6 are tabulated below and the following observations made:

- Both sites had widespread but low level TAA (<0.02 to 0.19 %S or 117 mol H^+/t) that occurred in many locations right through the top metre.
- Retained acidity was recorded in only one sample at a concentration of 0.09 %S.
- In Site 5, 8 of 15 locations had TAA values at levels ≥ 0.1%S (60 mol H^+/t) whilst 6 of 15 locations in Site 6 TAA values had ≥ 0.1%S.
- ANC was variable, with nil to moderate (up t0 0.93 %S equivalent) concentrations, and was only present in one core in Site 5 but was more widely spread in Site 6.
- S_{CR} values ranged to very high (to 5.22%S) with lower amounts in some surface samples but overall Net Acidities ranged between <0.02%S to 5.40%S.

Southern Curtis Site 5 Cores #55 - #69						
	Unit	LOR	Min.	Max.	Mean	n
pH KCL	pH unit	0.1	3.3	8	4.28	33
Titratable Actual Acidity	% pyrite S	0.02	<0.02	0.19	0.09	33
Chromium Reducible Sulfur	% S	0.02	<0.02	4.48	1.91	33
Acid Neutralising Capacity	% pyrite S	0.01	0.93	0.93	0.93	1
Net Acid Soluble Sulfur	% pyrite S	0.02	<0.02	0.09	0.09	23
Net Acidity	% S	0.02	<0.02	4.67	1.99	33

Northwest Curtis Site 6 Cores #70 - #84						
	Unit	LOR	Min	Max	Mean	n
pH KCl	pH unit	0.1	3.4	7.8	5.06	31
Titratable Actual Acidity	% pyrite S	0.02	0.02	0.18	0.09	17
Chromium Reducible Sulfur	% S	0.02	0.04	5.22	1.59	31
Acid Neutralising Capacity	% pyrite S	0.01	0.11	0.61	0.30	7
Net Acid Soluble Sulfur	% pyrite S	0.02	<0.02	<0.02	<0.02	0
Net Acidity	% S	0.02	0.08	5.4	1.72	29

D.5 Conclusion

Very high level PASS occurs throughout the top metre of sediment within these two mangrove fringed bays, with the majority of sites having AASS above the action limit of 0.03%S (18 mol H+/t) (Figure D-1). Just under half of the thirty locations sampled had Actual ASS (as TAA) at levels ≥ 0.1%S. The depths of AASS varied but were present in many locations at 1 metre BGL. These concentrations would classify the sediments as being low-

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil

Appendix D

level Actual ASS and very high level PASS (high level ASS has a Net Acidity of >1000 mol H^+/t or 1.5 %S, Ross [2005]).

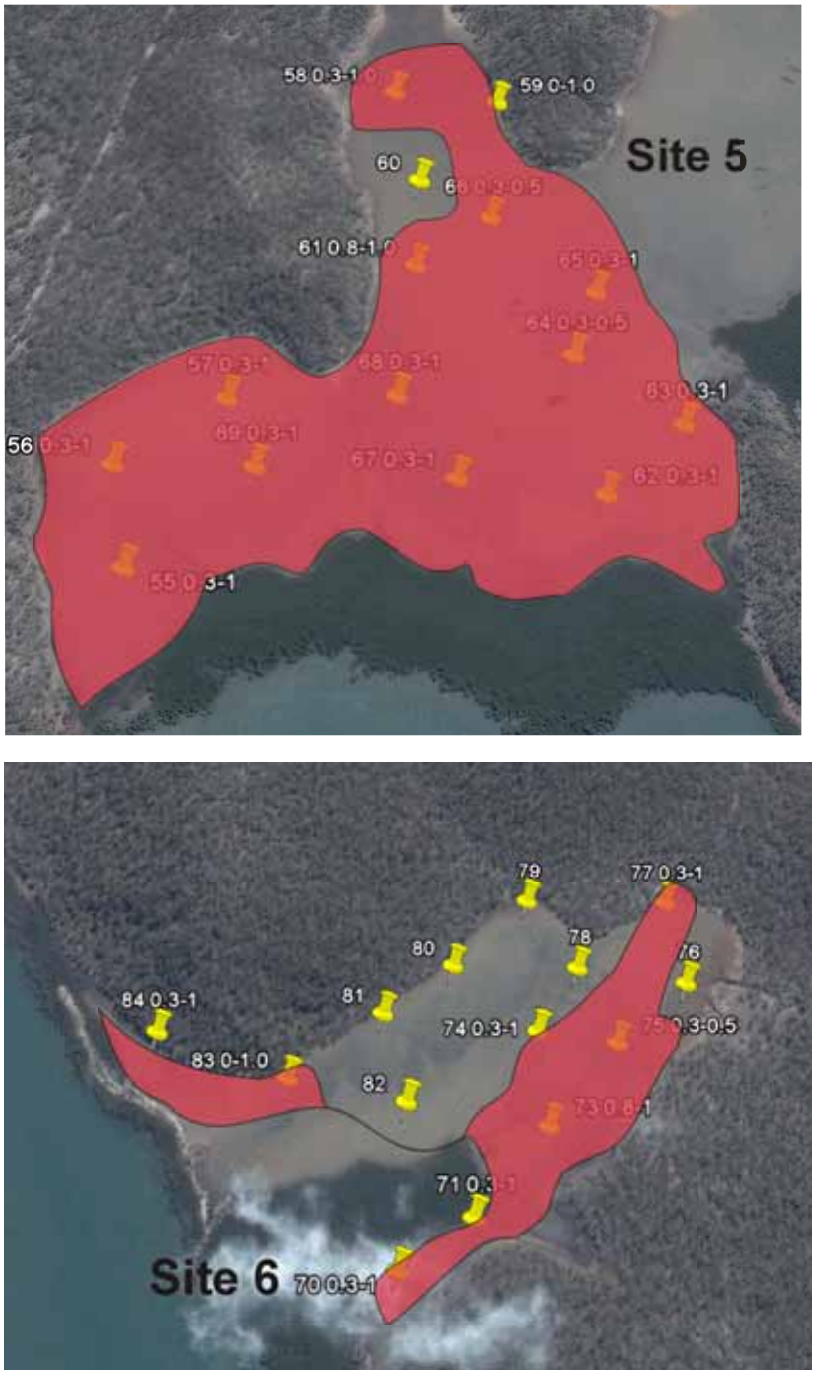


Figure D-1 Distribution of low but actionable levels of AASS (>0.03%S or 18 mol H^+/t) within the top 1 metre.

Preliminary assessment of adjacent South Curtis Island tidal flat areas for Actual Acid Sulfate Soil

Appendix D

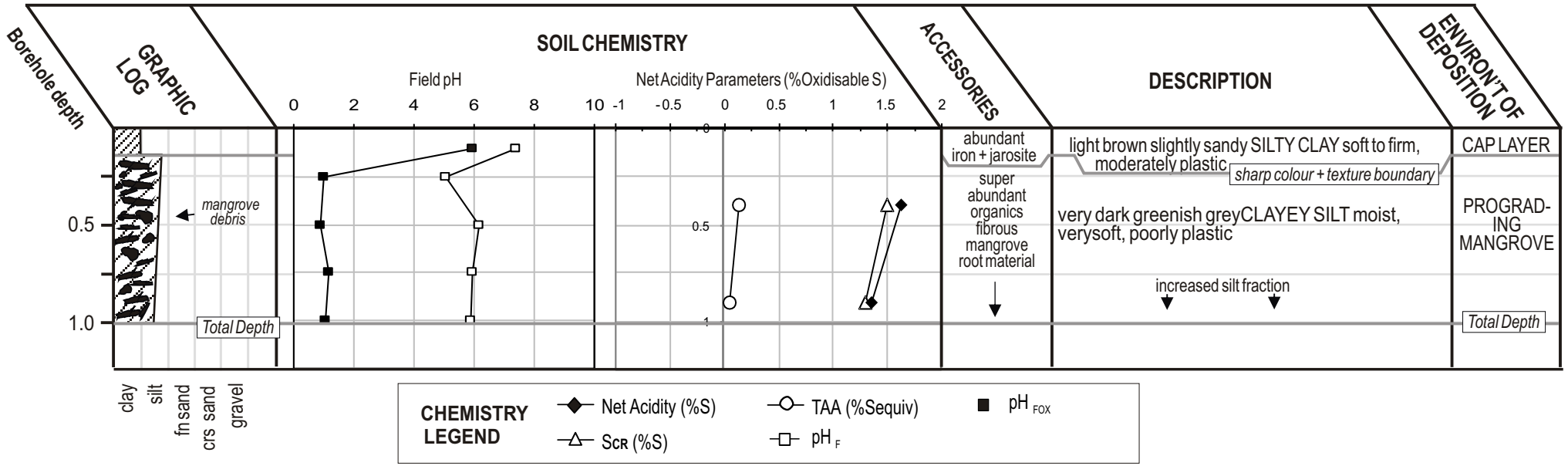
D.6 Logs for #55 to #84

SITE: GC/ GLNG# 55
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78918°**S** 151.23386°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #55

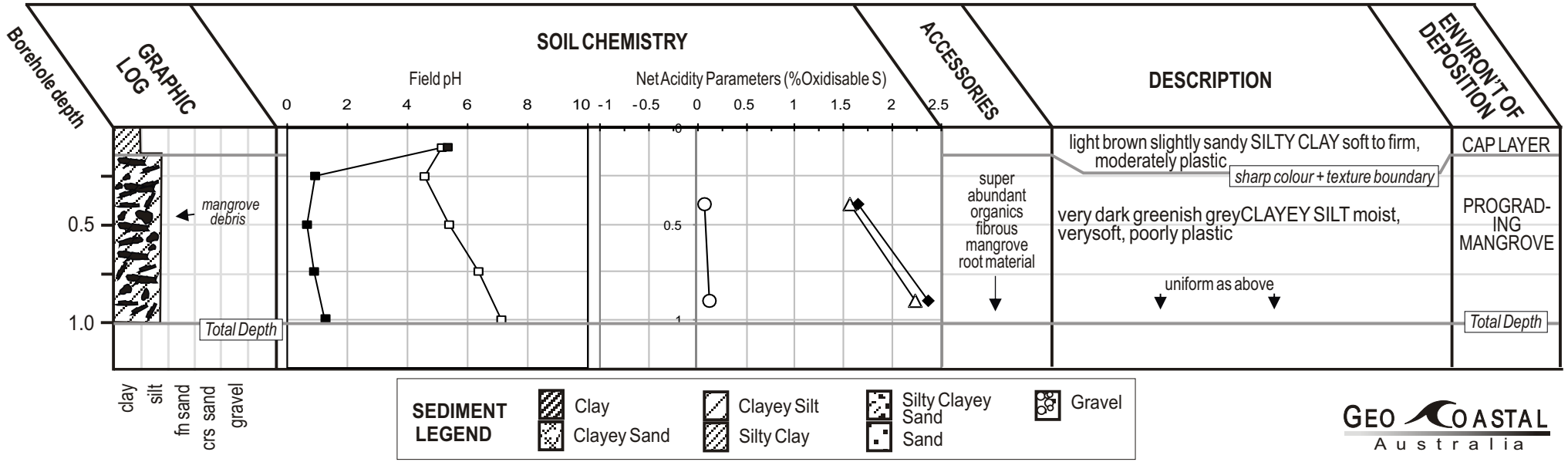


SITE: GC/ GLNG# 56
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78785°**S** 151.23343°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #56



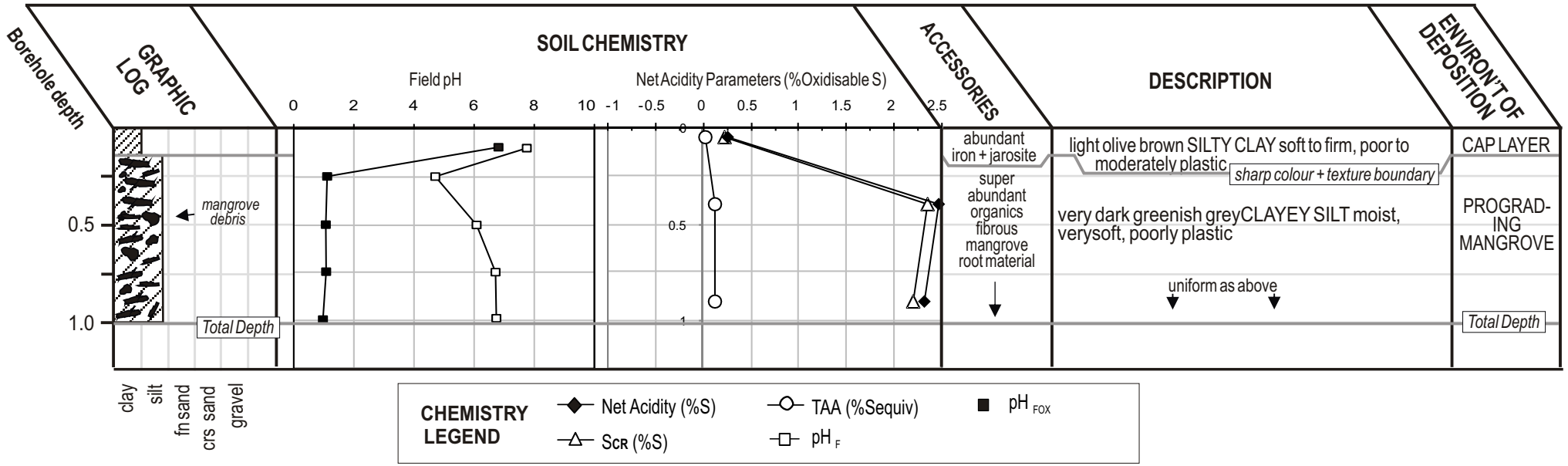
GEO COASTAL Australia

SITE: GC/ GLNG# 57
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78695°**S** 151.23471°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #57

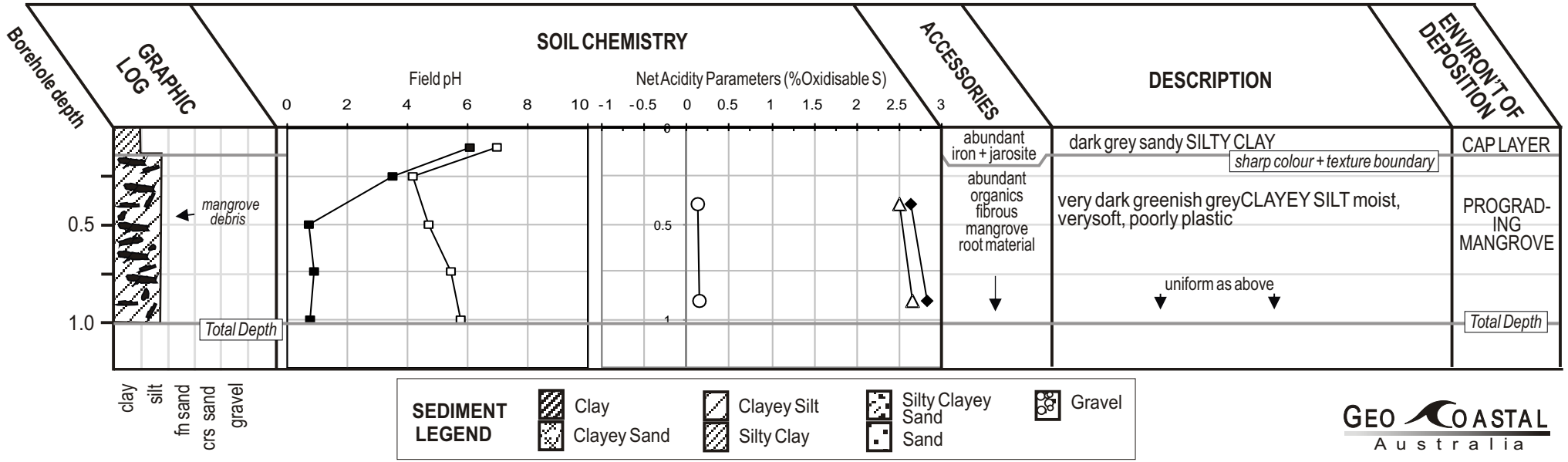


SITE: GC/ GLNG# 58
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78229°**S** 151.23625°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #58



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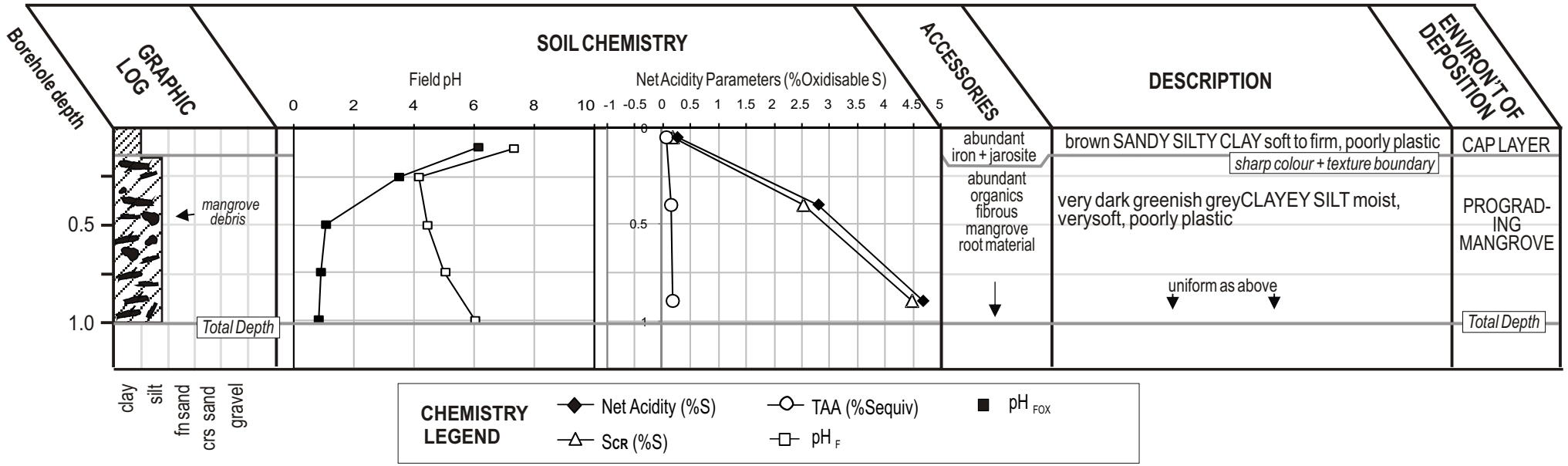
SITE: GC/ GLNG# 59
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78244°**S** 151.23773°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #59

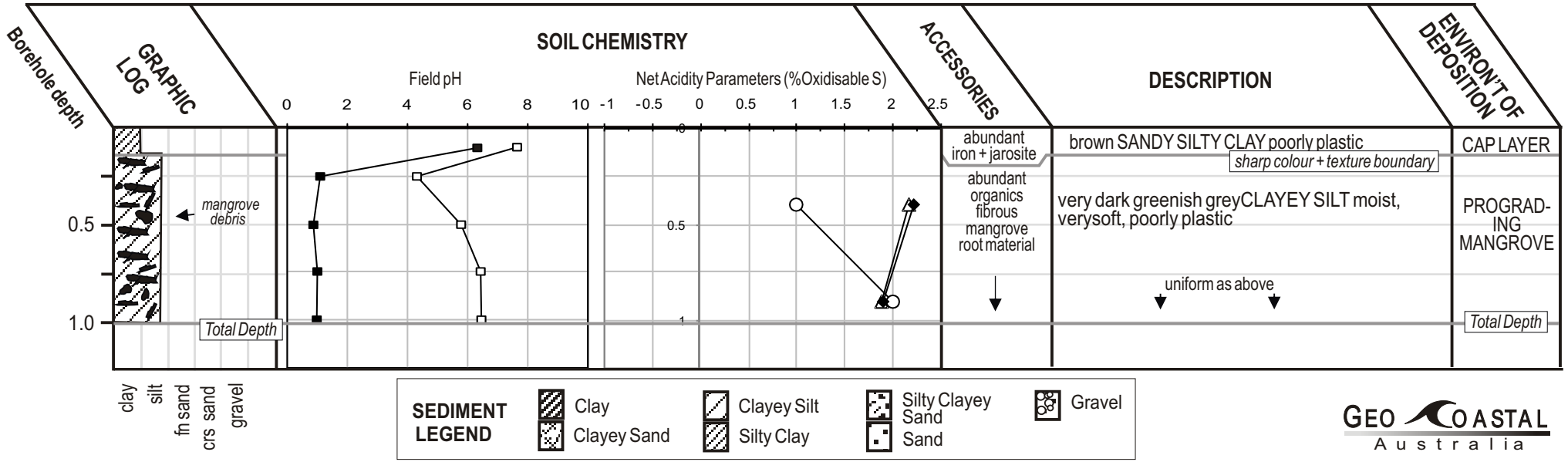


SITE: GC/ GLNG# 60
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78374°**S** 151.23680°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #60



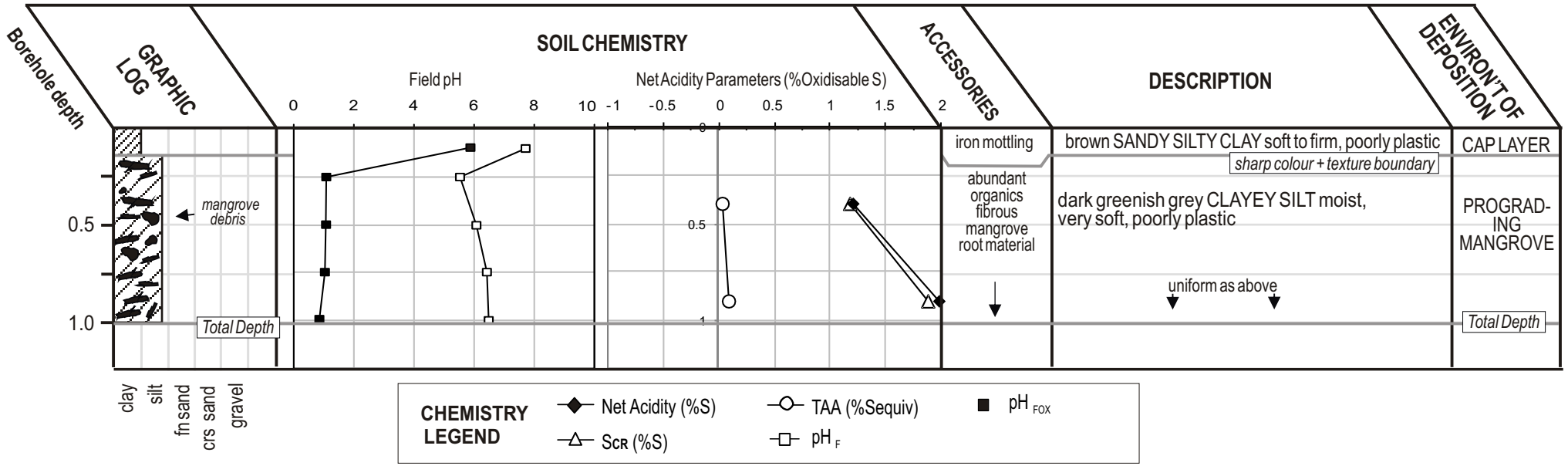
GEO COASTAL Australia

SITE: GC/ GLNG# 61
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78504°**S** 151.23691°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #61

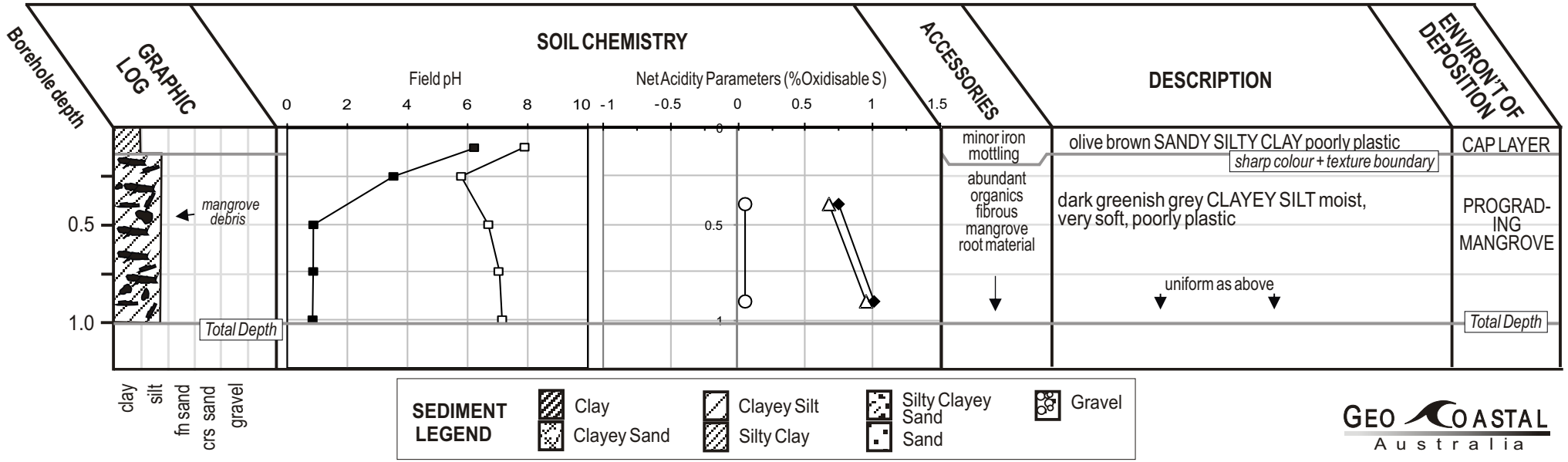


SITE: GC/ GLNG# 62
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78823°**S** 151.23976°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #62



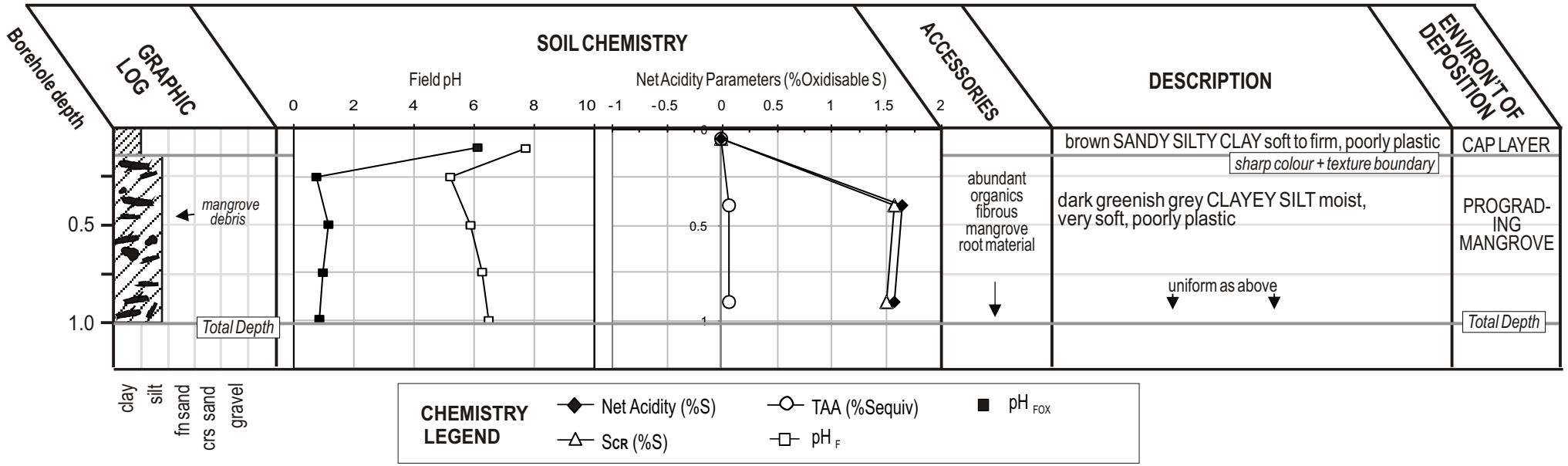
GEO COASTAL Australia

SITE: GC/ GLNG# 63
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78729°**S** 151.24069°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #63

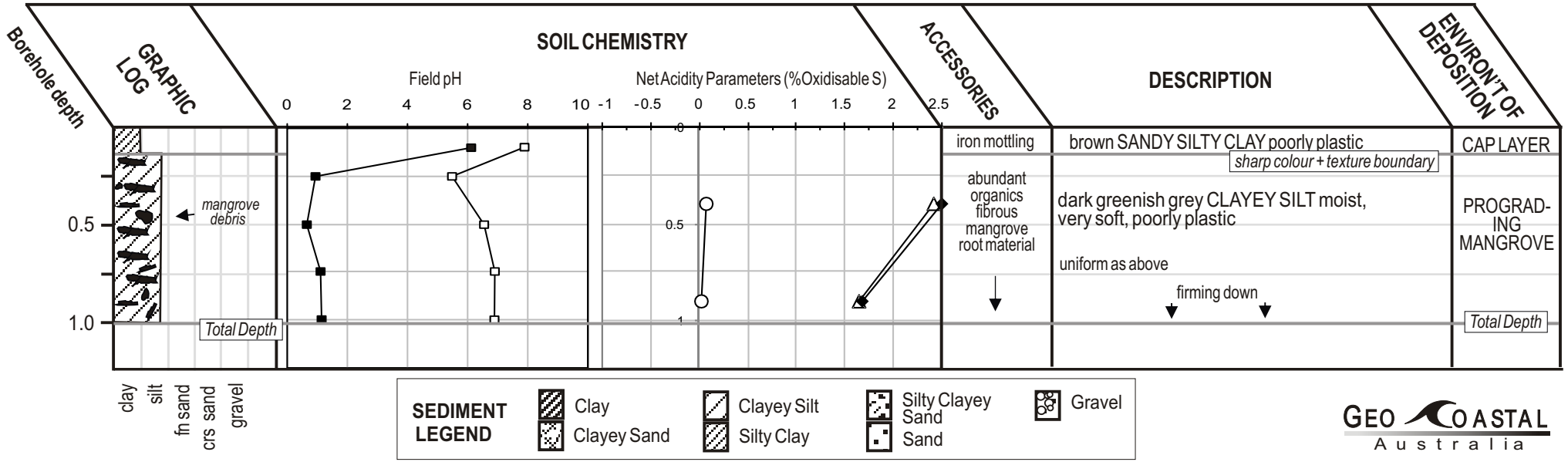


SITE: GC/ GLNG# 64
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78634°**S** 151.23918°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #64



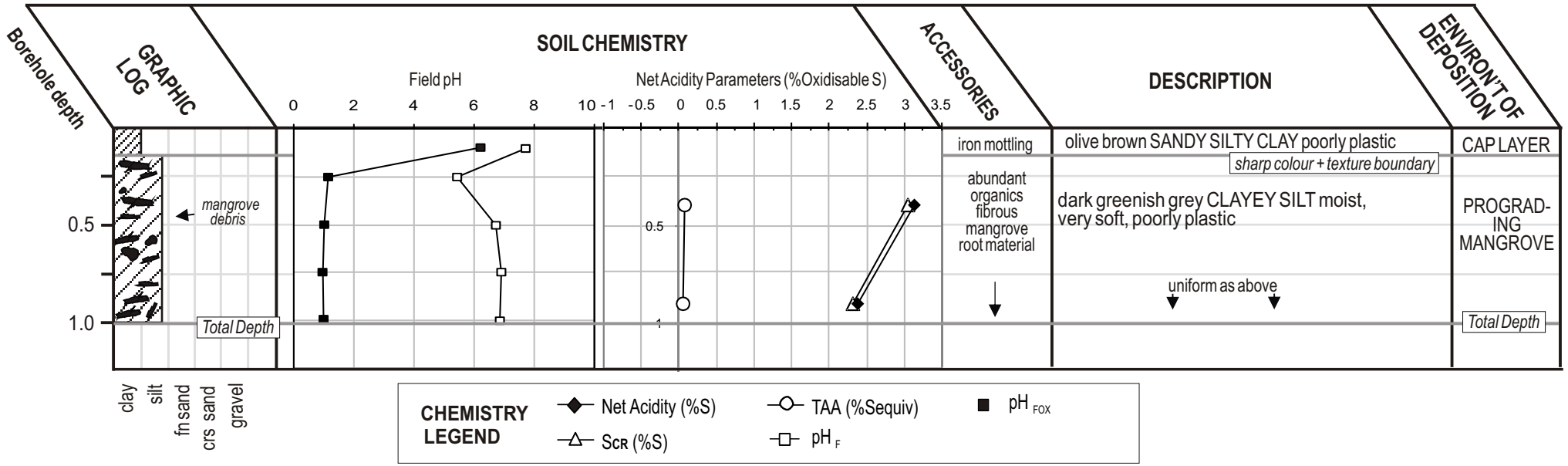
GEO COASTAL Australia

SITE: GC/ GLNG# 65
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78543°**S** 151.23940°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #65

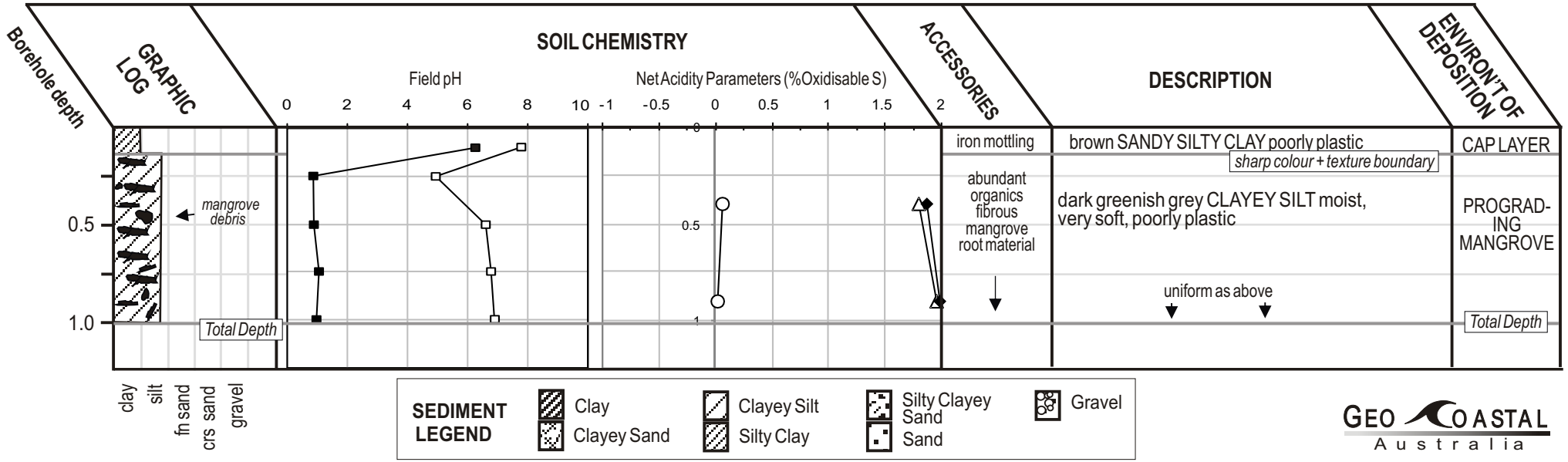


SITE: GC/ GLNG# 66
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78430°**S** 151.23875°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #66



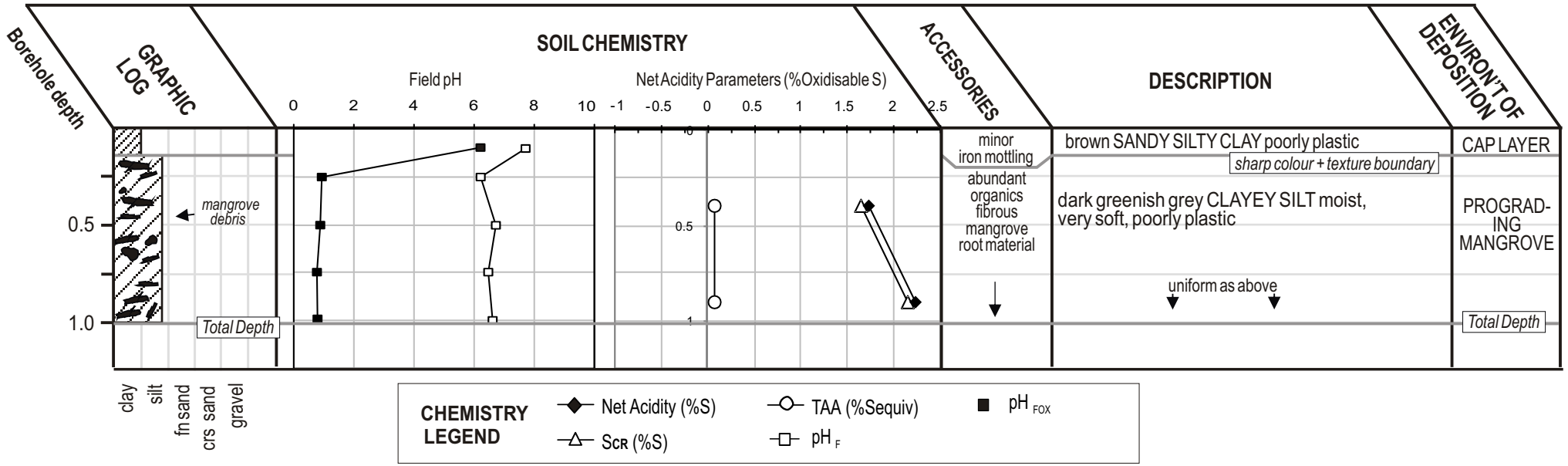
GEO COASTAL Australia

SITE: GC/ GLNG# 67
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78802°**S** 151.23784°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #67

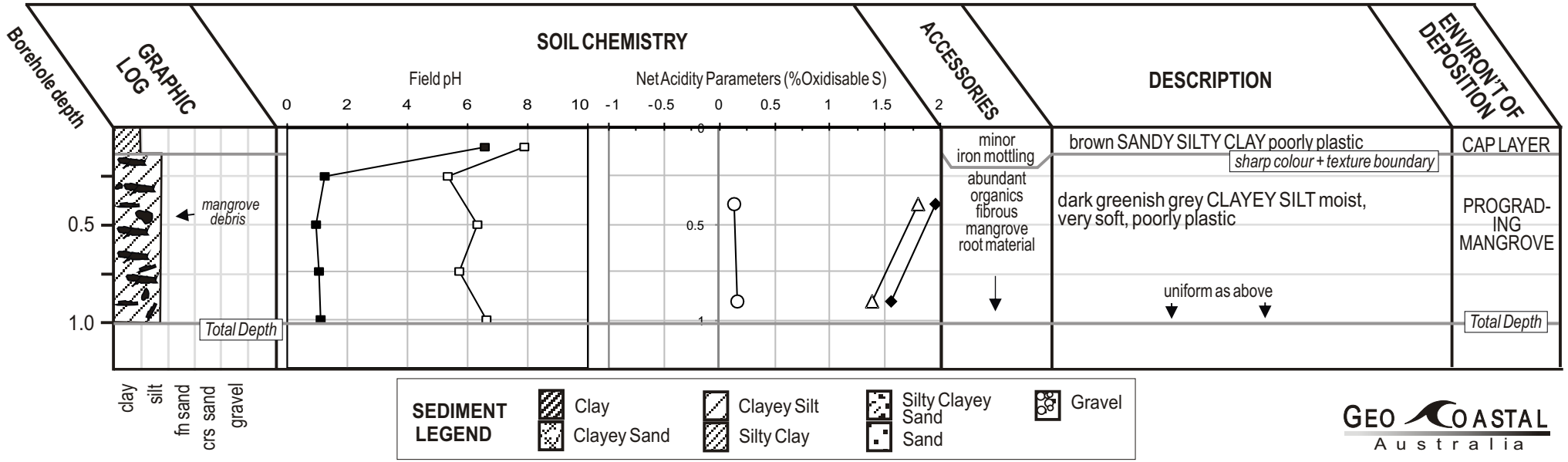


SITE: GC/ GLNG# 68
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78691°**S** 151.23692°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #68



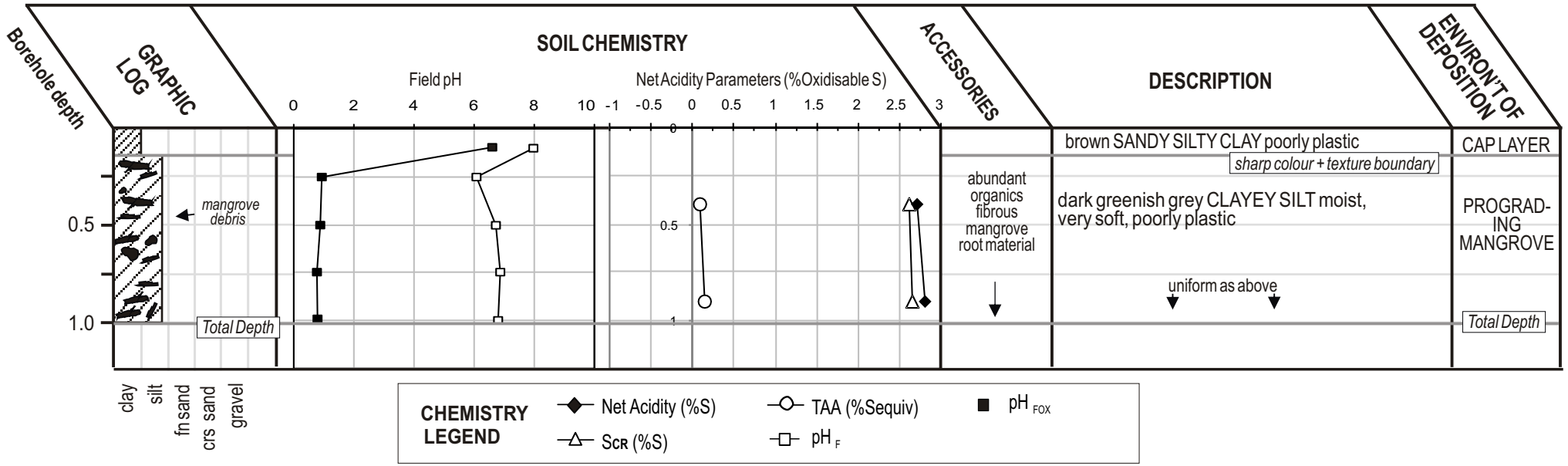
GEO COASTAL Australia

SITE: GC/ GLNG# 69
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.78787°**S** 151.23524°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 26/ 8/ 08

Borehole #69

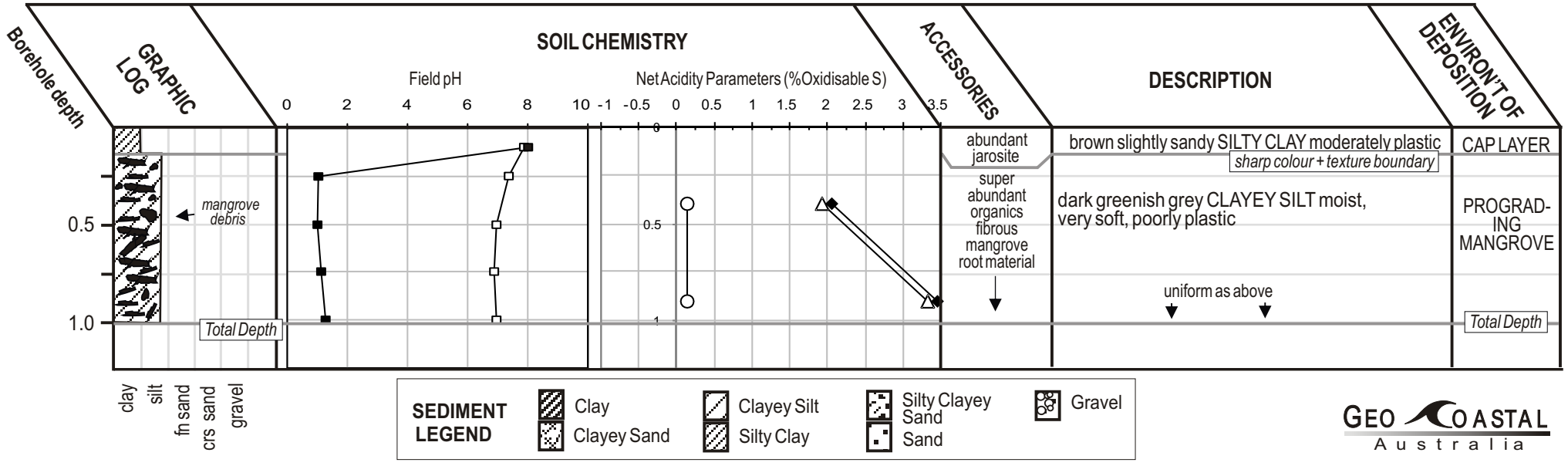


SITE: GC/ GLNG# 70
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75675°**S** 151.18433°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/ 8/ 08

Borehole #70



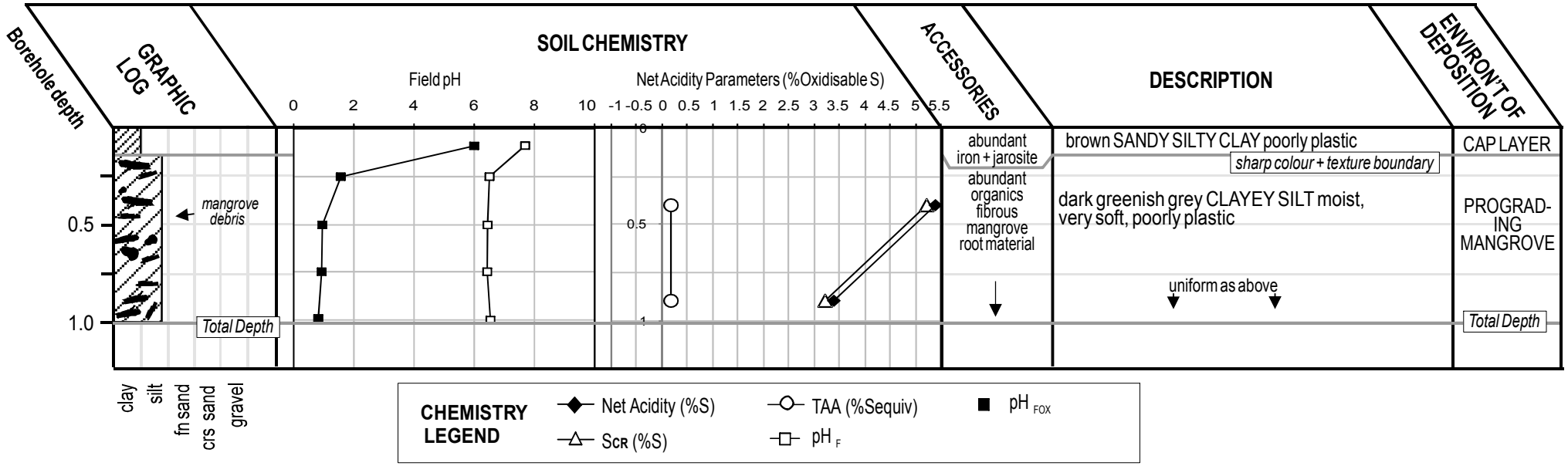
GEO COASTAL Australia

SITE: GC/GLNG#71
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75601°**S** 151.18542°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #71

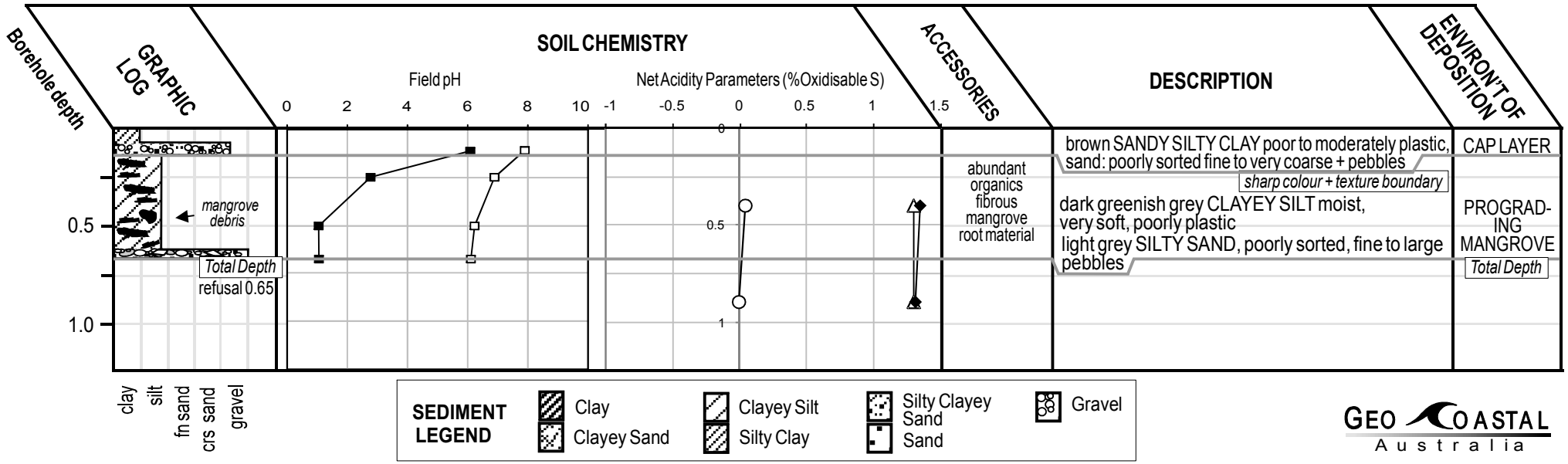


SITE: GC/GLNG#72
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75566°**S** 151.18668°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #72



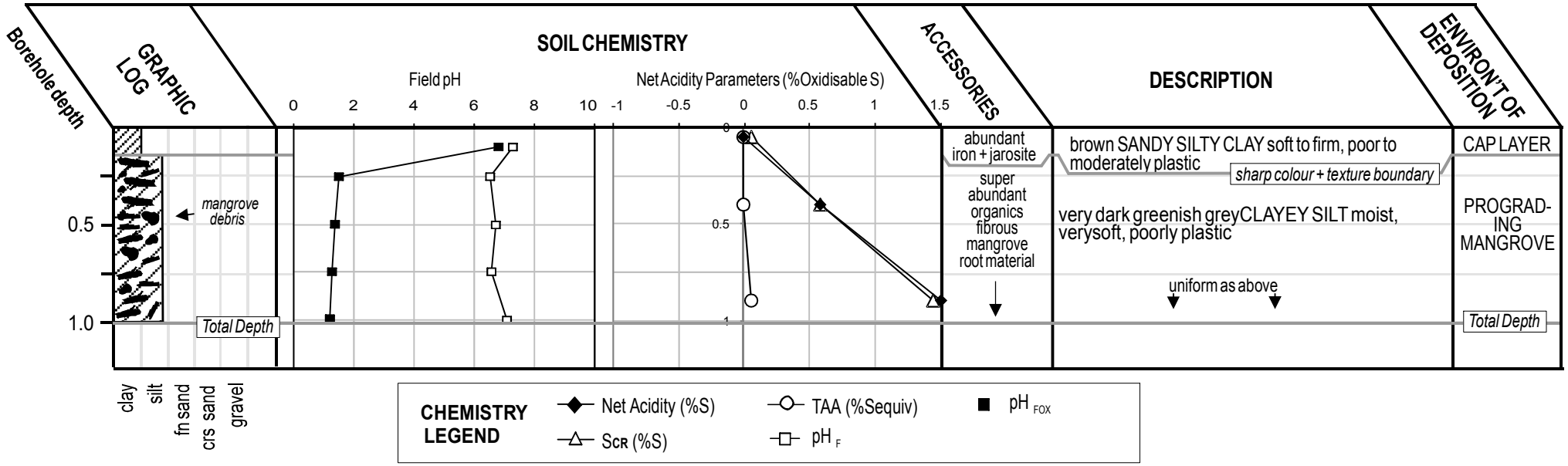
GEO COASTAL Australia

SITE: GC/GLNG#73
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75466°**S** 151.18649°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #73

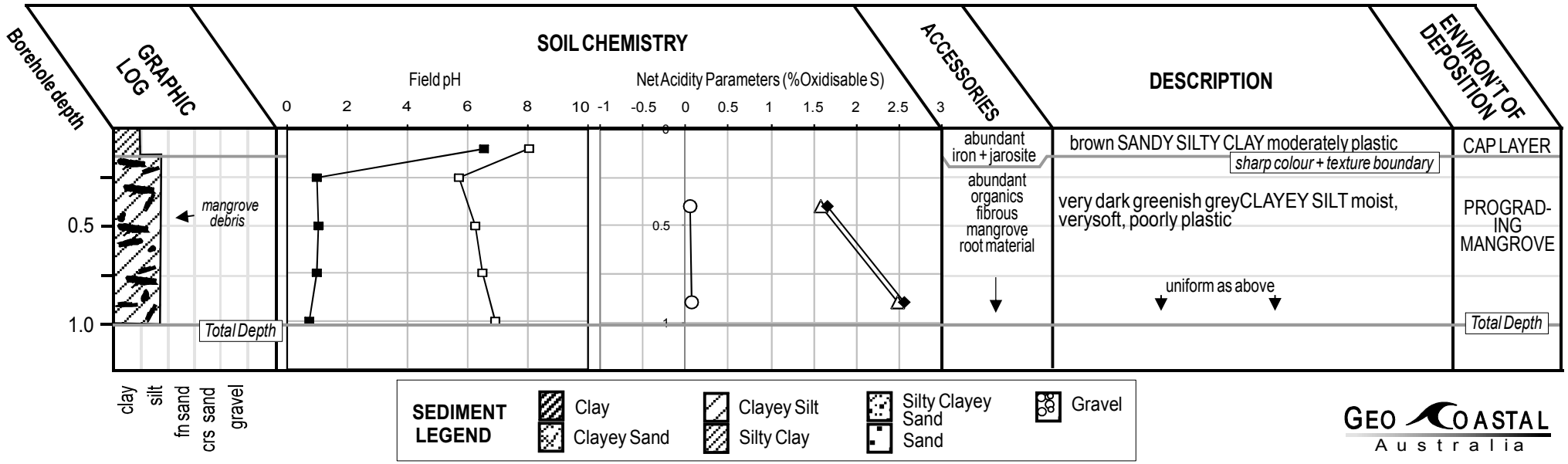


SITE: GC/GLNG#74
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75320°**S** 151.18657°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #74



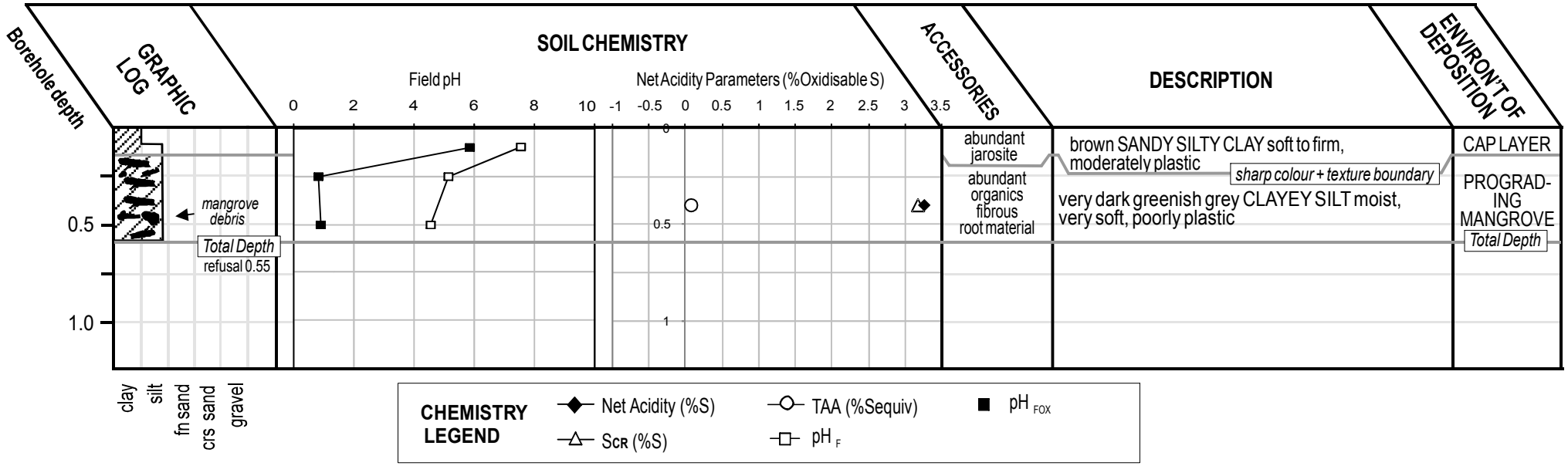
GEO COASTAL Australia

SITE: GC/GLNG#75
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75340°**S** 151.18788°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #75

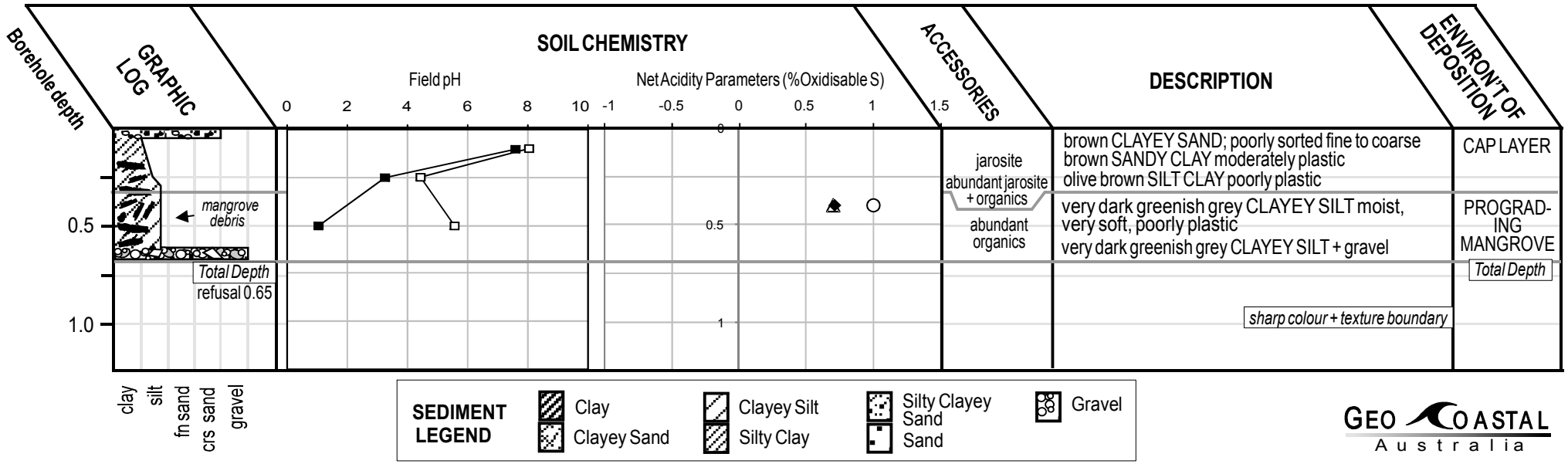


SITE: GC/GLNG#76
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75243°**S** 151.18912°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #76



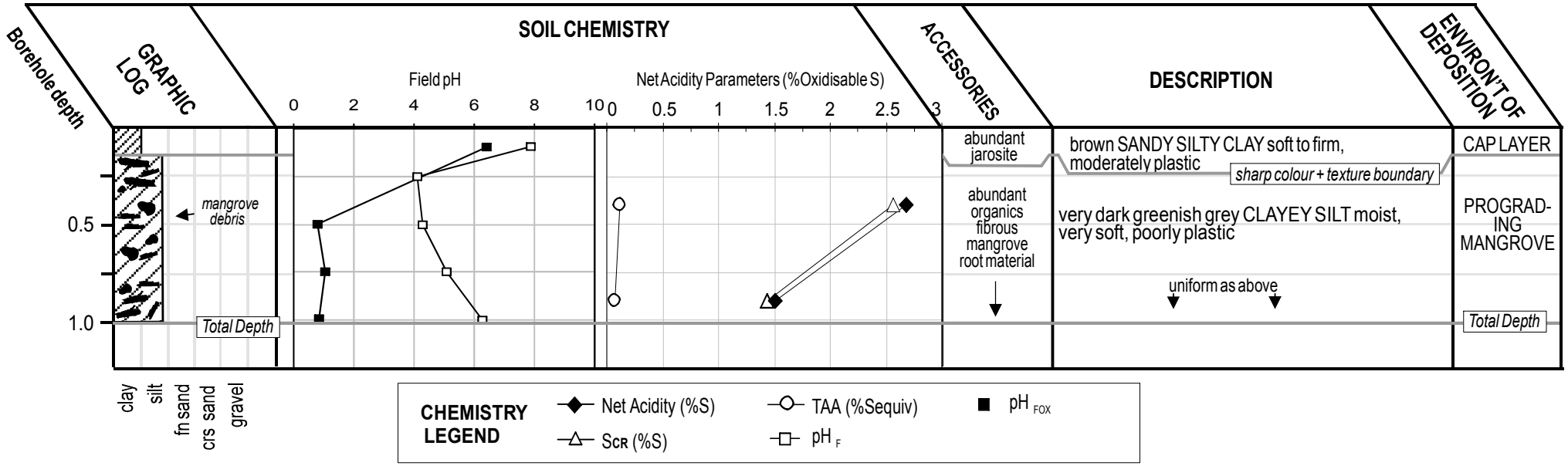
GEO COASTAL Australia

SITE: GC/GLNG#77
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75107°**S** 151.18889°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #77

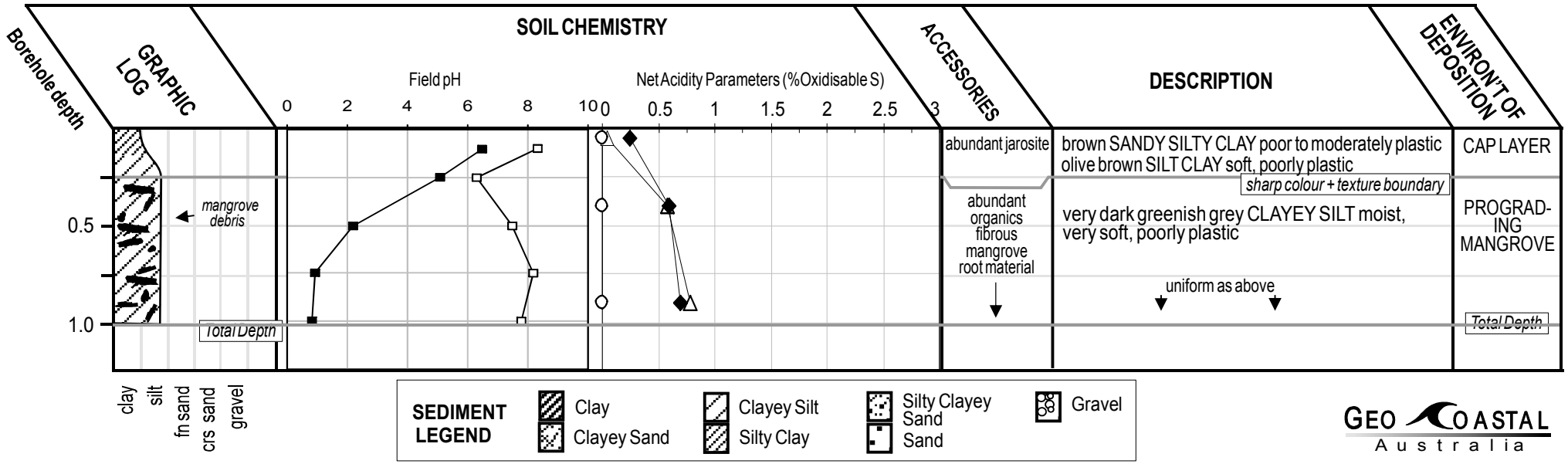


SITE: GC/GLNG#78
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75217°**S** 151.18730°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #78



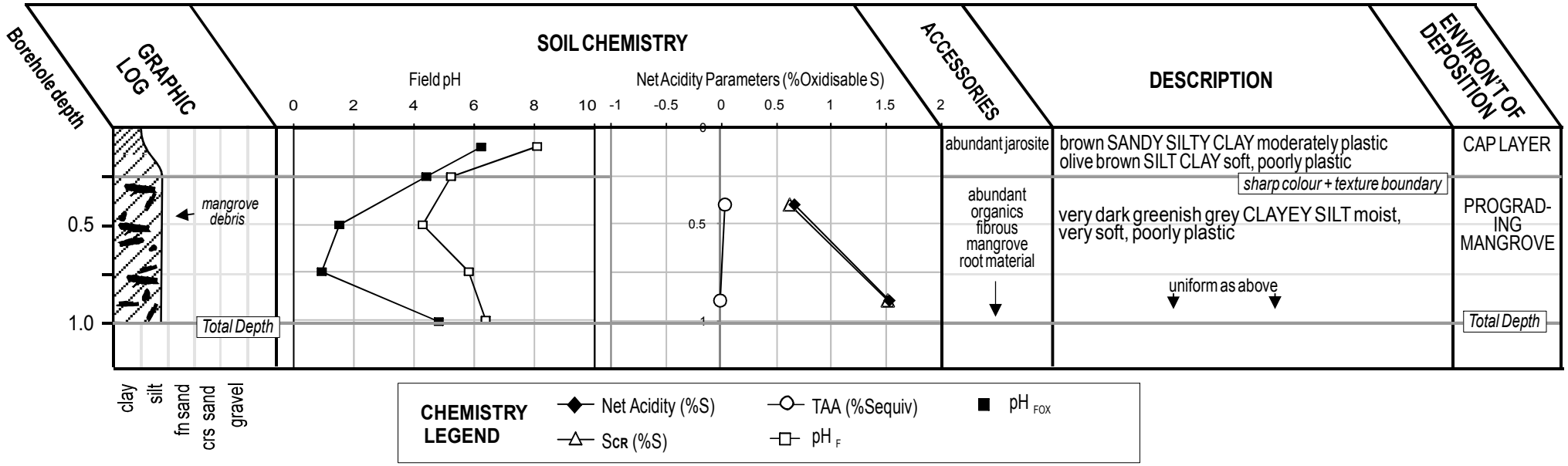
GEO COASTAL Australia

SITE: GC/GLNG#79
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75103°**S** 151.18649°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #79

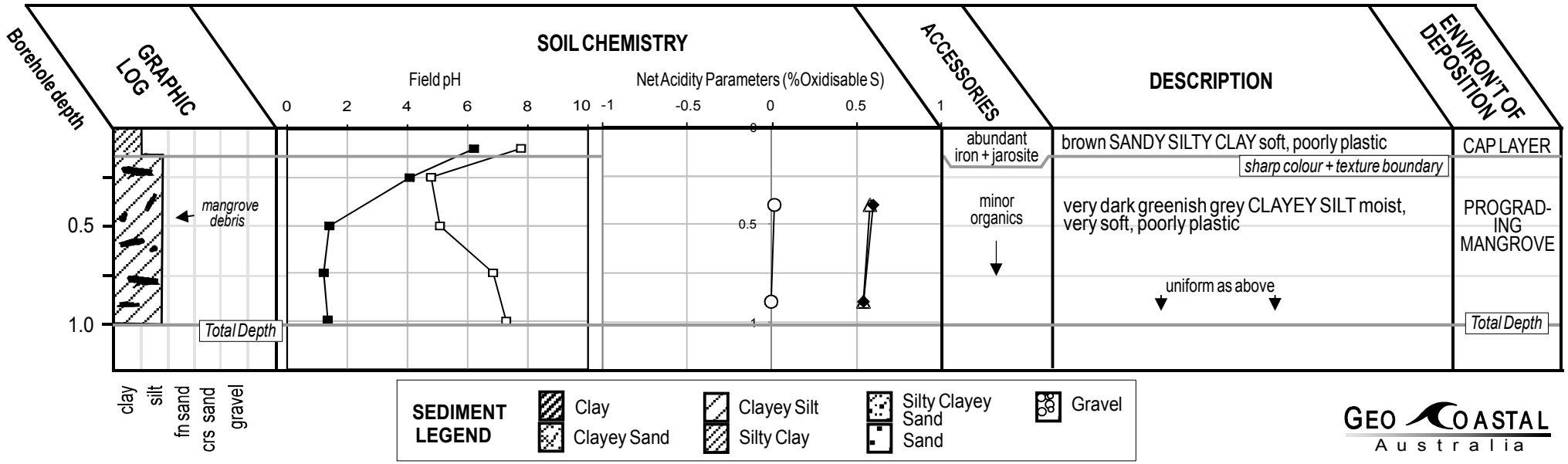


SITE: GC/GLNG#80
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75213°**S** 151.18518°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #80



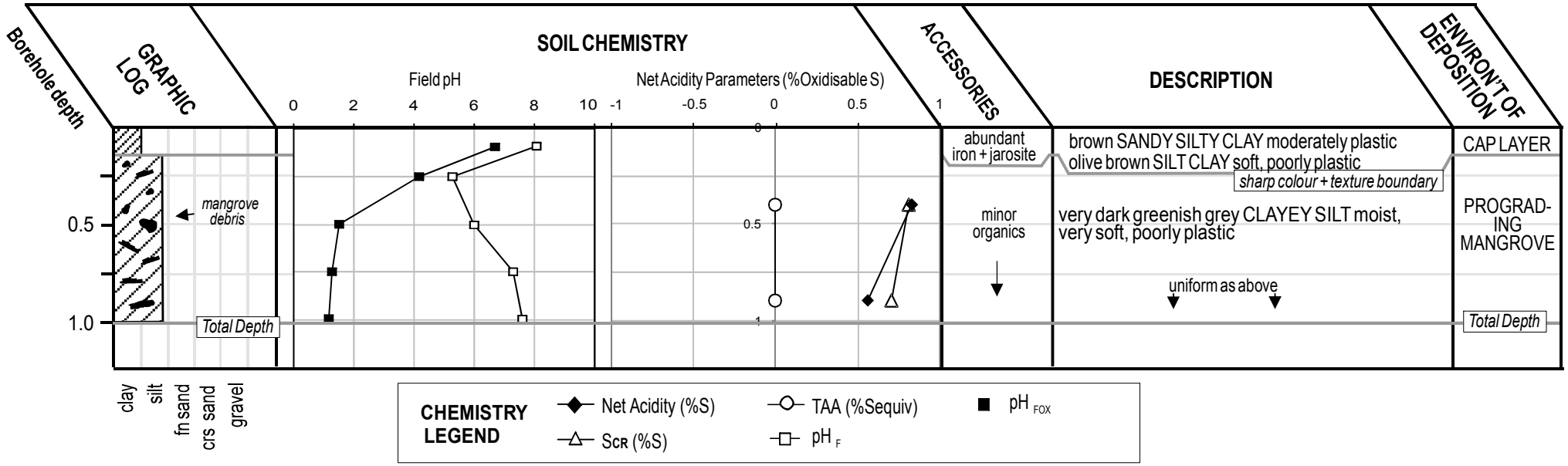
GEO COASTAL Australia

SITE: GC/GLNG#81
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75292°**S** 151.18399°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #81

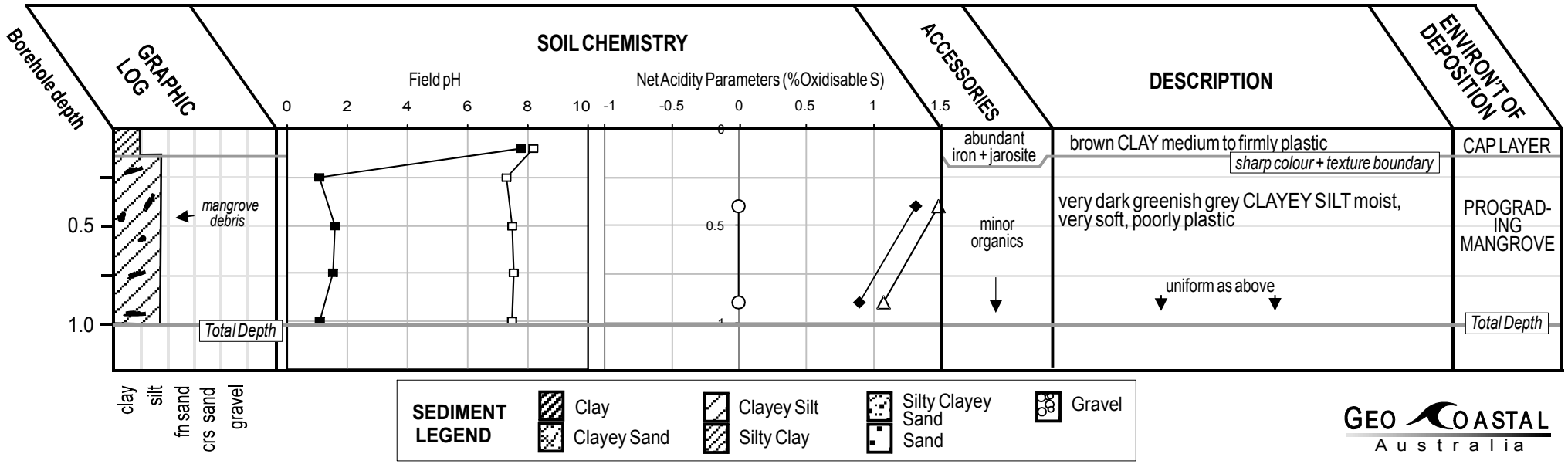


SITE: GC/GLNG#82
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75431°**S** 151.18437°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #82



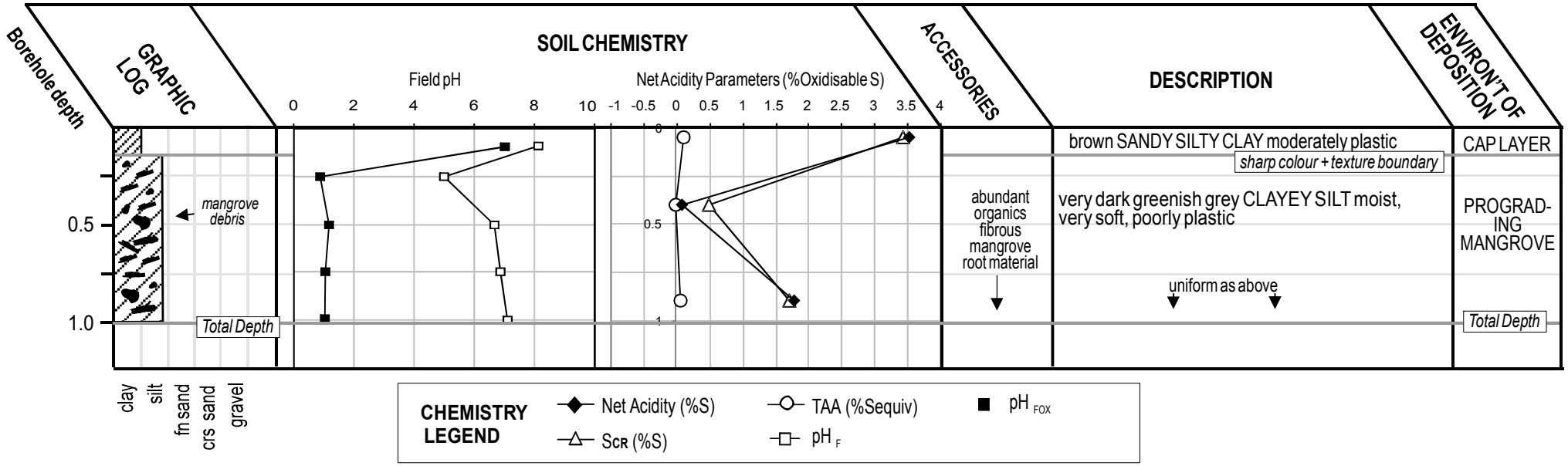
GEO COASTAL Australia

SITE: GC/GLNG#83
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75396°**S** 151.18243°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #83

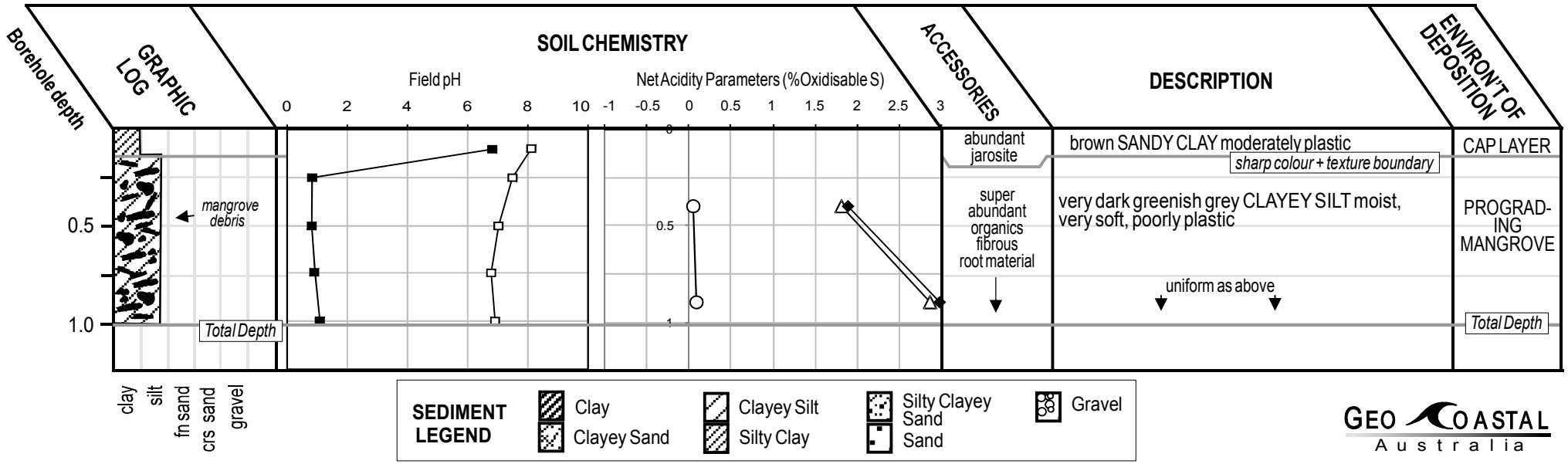


SITE: GC/GLNG#84
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 23.75325°**S** 151.18024°**E**

FEATURE: Mangrove fringed tidal flat
SAMPLING METHOD: GeoCoastal Piston Hand Corer

DATE: 27/8/08

Borehole #84



GEO COASTAL Australia