Queensland Curtis LNG Project: LNG Facility and Associated Infrastructure

Acid Sulfate Soils Investigation, Friend Point and Curtis Island, Gladstone, QLD

for

Queensland Gas Company Limited (QGC)

April 2009

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FINAL REPORT

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April 2009

Reference: 0086165/11_ASS_R01.v0

For and on behalf of Environmental Resources Management Australia	
Approved by:	David Pope
Signed:	
Position:	Partner
Date:	22 April 2009

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1 INTRODUCTION

An investigation into the presence of Acid Sulfate Soils (ASS) was undertaken as part of the requirements specified in the Queensland Curtis LNG Project EIS and Permitting CTR documents CTR 2-02 and CTR 2-06 (Geology, Soils and Land Contamination). The report is intended to provide information on the environmental baseline values for each component of interest in order to assess the potential environmental impacts associated with the proposed development of the site.

To meet the requirements specified in CTR 2-02, detailed sampling and analysis of soils was undertaken by ERM and GeoCoastal to fully characterise the soils in areas identified with the potential to contain acid sulfate soils.

Geo Coastal group was subcontracted to undertake the sampling and field analysis, which was conducted between 28th October and 10th November 2008. The sampling protocols, field testing and laboratory testing were conducted in accordance with the procedures specified in *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland* (Ahern et al, 1998).

1.1 ACID SULFATE SOILS

Acid sulfate soils (ASS) occur predominantly in coastal lowlands with elevations less than 5 metres Australian Height Datum (AHD) including subsoil and sediments below 5m AHD where the natural ground level exceeds 5 m AHD. Acid sulfate soils contain iron sulfides, predominantly in the form of pyrite (FeS_2), which is produced through the interaction of iron-rich sediments and sulfate from seawater. The formation of pyrite generally occurs under anaerobic conditions commonly found in low energy estuarine environments. Undisturbed, these soils are present in the anaerobic subsurface environment as potential acid sulfate soils (PASS). Actual acid sulfate soils (AASS) are the oxidised form of PASS which may occur as a result of natural or anthropogenic disturbance or through fluctuations or changes in the groundwater levels and/or exposure to oxygen.

The site description criteria used to determine the likely presence of ASS include;

- Land at elevations less than 5 metres AHD;
- Sediments of recent geological (Holocene) age;
- Marine or estuarine sediments; and
- Coastal alluvial plains.

1.2 *OXIDATION OF SULFIDIC MATERIALS*[1]

The predominant sulphide compound in undisturbed ASS is the mineral iron pyrite. The overall equation for pyrite oxidation is:

$$FeS_2 + 15/4\ O_{2\ (g.aq.)} + 7/2\ H_2O \rightarrow Fe(OH)_3 + 2SO_4^{2-}{}_{(aq.)} + 4H^+{}_{(aq.)}$$

Each mole of pyrite yields 4 moles of acidity. The actual pyrite oxidation proceeds in stages. The first stage results in the formation of ferrous iron, sulfate and acid according to the reaction:

$$FeS_{2\ (s)} + 7/2\ O_{2\ (g.aq.)} + H_2O \rightarrow Fe^{2+}{}_{(aq.)} + 2SO_4^{2-}{}_{(aq.)} + 2H^+{}_{(aq.)}$$

The acid can be neutralised through a reaction with soil carbonates (such as shell fragments) or by displacing exchangeable cations. The excess acidity may then react with soil minerals, resulting in the release of major constituents such as potassium, magnesium and aluminium, as well as trace elements such as arsenic, copper, cadmium, chromium, nickel and zinc.

The ferrous iron produced by the reaction can be exported off-site and produce a further 2 moles of acid and lower the dissolved oxygen concentration in drainage waters. When the pH drops below 4, the rate of pyrite oxidation is increased by the catalytic oxidation of ferrous iron by the bacterium *Thiobacillus ferroxidans* to ferric iron, which can oxidise pyrite with regeneration of ferrous iron.

$$Fe^{2+}{}_{(aq)} + ¼O_{2\ (g.aq.)} + 3/2H_2O \rightarrow FeO.OH_{(s)} + 2H^+$$

$$Fe^{2+}{}_{(aq)} + ¼O_{2\ (g.aq.)} + H^{+\ T.ferroxidans} \rightarrow Fe^{3+}{}_{(aq.)} + ½H_2O$$

$$FeS_{2\ (s)} + 14Fe^{3+}{}_{(aq)} + 8H_2O \rightarrow 15Fe^{2+-}{}_{(aq)} + 2SO4^{2-} + 16H^+{}_{(aq)}$$

Hydrolysis of aluminium released from the soil matrix can also result in the release of acidity, according to the following step-wise reactions:

$$Al^{3+}{}_{(aq.)} + H_2O \rightarrow Al(OH)^{2+}{}_{(aq)} + H^+{}_{(aq)}$$

$$Al(OH)^{2+}{}_{(aq)} + H_2O \rightarrow Al(OH)_2^+{}_{(aq)} + H^+{}_{(aq)}$$

$$Al(OH)^{2+}{}_{(aq)} + H_2O \rightarrow Al(OH)_3^+{}_{(aq)} + H^+{}_{(aq)}$$

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[1] Thomas BP, Fitzpatrick RW, Merry RH and Hicks WS, 2003. Acid Sulfate Soil Technical Manual (version 1.2) Coastal Acid Sulfate Soil Management Guidelines, Barker Inlet, SA. *CSIRO Land and Water, Adelaide*

Undisturbed ASS may have a neutral or slightly alkaline pH, with no visible signs of the acidic potential. However, exposure to air, either through excavation or changes in the water table, can result in the oxidation of the pyrite and the subsequent release of toxic quantities of sulfuric acid (H_2SO_4), aluminium, iron and heavy metals which may contaminate the land and adjacent waterways. Following rainfall, the release of acidic products can be released into the runoff and enter the surrounding environment. The release of acid and heavy metals can result in red spot disease in fish and significant harm to aquatic flora and fauna, including highly visible fish kills.

Vegetation may also be adversely affected or killed as a result of the release of acid and metals into the environment from disturbance or drainage of acid sulfate soils. Infrastructure, such as pipes, foundations, road surfaces, pylons and footings may also be susceptible to corrosion from the release of acid from acid sulfate soils, resulting in premature failure and costly repairs.

1.3 PURPOSE OF INVESTIGATION

The development of the LNG plant and associated pipeline and access road infrastructure extending from Friend Point to Curtis Island, near Gladstone in central Queensland, contains appreciable areas of coastal lowlands. As such, there is a significant likelihood that acid sulfate soils are present.

The investigation was conducted to assess areas within the project site < 5 metres AHD to identify sediments and soils possibly containing actual acid sulfate soils (AASS) or potential acid sulfate soils (PASS), to characterise the sediments/soil through sampling, field and laboratory analysis to enable quantification of the AASS and/or PASS, using the approach as recommended by the Queensland Acid Sulfate Soils Investigation Team (QASSIT) and detailed in (Ahern et al 1998) *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland*.

In areas where net acidity > 0.03%S was identified (for areas where > 1,000 tonnes of soil is to be disturbed) there is a requirement to develop an acid sulfate soils management plan (ASSMP) to address the handling and treatment of the and soils in accordance with the procedures detailed in Dear et al (2002) *Queensland Acid Sulfate Soil Technical Manual Soil Management Guidelines*.

2 SCOPE OF WORKS

The scope of works conducted to assess the presence and to detail the properties of ASS in the proposed project area involved a staged approach. The stages are detailed as follows.

2.1 STAGE 1: REVIEW OF PREVIOUS INVESTIGATIONS AND SITE INFORMATION

The Stage 1 investigation involved the following:

- Review of topographic maps to identify land < 5 metres AHD;
- Review of aerial photographs;
- Previous reports on the locations of concern. The review included the Department of Natural Resources and Mines report Acid Sulfate Soils of the Narrows Area, Central Queensland Coast (Ross, 2005), Wiggins Island Coal Terminal Environmental Impact Statement (Connell Hatch 2006) and Gladstone LNG Project – Fisherman's Landing (Worley Parsons, 2008); and
- Develop a sampling and analytical strategy in accordance with to enable the identification and characterisation of sediments and soils.

2.2 STAGE 2: FIELD PARAMETERS: SAMPLING AND COLLECTION OF DATA

Geo Coastal were subcontracted to undertake the field works component of the ASS investigation. Stage 2 investigations consisted of field works, which involved the collection of sediment cores from areas identified in Stage 1 at or below 5 metres AHD, measurement of field parameters as detailed in Ahern et al (1998) and description of sediments according to McDonald et al (1998). All sampling locations were located by GPS, with an accuracy of ± 2 metres.

Field parameters field pH (pH_F) and field pH after oxidation with 30% peroxide (pH_{FOX}) were recorded for each sample core at 0.25 metre intervals. Samples in which the field parameters met the screening criteria were collected from 0.5m intervals and sent to ALS in Brisbane, a NATA accredited laboratory for SPOCAS (Suspension Peroxide Oxidation Combined Acidity and Sulfate) analysis for detailed characterisation of acid generating potential.

2.3 STAGE 3: ANALYSIS AND INTERPRETATION OF LABORATORY RESULTS

Stage 3 involved the assessment and interpretation of analytical results from the laboratory. Interpretation of the laboratory results involved the assessment against action levels of oxidisable sulphur, as a guide to determine

whether an ASS management plan is required or the appropriate treatment for small disturbances. As the natural pH buffering capacity of the soil is influenced by the clay content, the action levels are grouped by three broad texture categories, coarse, medium and fine, as defined in *Table 1*.

Table 1 ***Action Criteria based on ASS Analysis for Three Broad Texture Categories***

Type of Material		**Action Criteria 1-1000 tonnes disturbed**		**Action Criteria > 1000 tonnes disturbed**	
Texture Range *(McDonald et al 1990)*	*Approx. clay content (%)*	*Sulfur Trail % S oxidisable (oven-dry basis) eg S_{TOS} (or S_{POS})*	*Acid Trail mol H^+/tonne (oven-dry basis) eg TPA (or TSA)*	*Sulfur Trail % S oxidisable (oven-dry basis) eg S_{TOS} (or S_{POS})*	*Acid Trail mol H^+/tonne (oven-dry basis) eg TPA (or TSA)*
Coarse Texture Sands to loamy sands	< 5%	0.03	18	0.03	18
Medium Texture Sandy loams to light clays	5 – 40%	0.06	36	0.03	18
Fine Texture Medium to heavy clays and silty clays	> 40%	0.1	62	0.03	18

2.4 *STAGE 4: REPORTING AND DEVELOPMENT OF ASS MANAGEMENT PLAN*

Stage 4 of the ASS investigation comprised the reporting of the field and SPOCAS analytical results. Where the results from the field and laboratory analyses indicated that the soils exceeded the criteria specified in *Table 3.1*, an acid sulfate soil management plan (ASSMP) will be required. The ASSMP will need to detail measures to ensure that any disturbance of the soils during construction or excavation are handled and treated in a manner which will ensure that no environmental harm results. A separate ASSMP has been produced addressing the issues that may arise during the excavation and construction works for the LNG facility.

2.5 *QUEENSLAND SPECIFIC LEGISLATION*

The investigation of acid sulphate soils was conducted with respect to the relevant legislation governing development of land < 5 metres AHD, detailed below:

- State Planning Policy 2/02 *Planning and Managing Development Involving Acid Sulfate Soils (2002)*;
- Integrated Planning Policy 1997 and the Integrated Planning Regulation 1998;
- Environmental Protection Act 1994, (Parts 5 and 6);
- Fisheries Act 1994;
- Environmental Protection (Water) Act (1997);
- Coastal Protection and Management Act 1995; and
- Harbours and Marine Act 1955.

The following documents were also used in the development of a sampling and analytical plan:

- Dear SE, Moore NG, Dobos SK, Watling KM, Ahern CR. (2002). *Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines (version 3.8)*;
- Dear SE, Moore NG, Watling KM, Fahl D and Dobos SK (2004). *Queensland Acid Sulfte Soil Technical Manual – Legislation and Policy Guide (version 2.2)*;
- Ross DJ. (2005). Acid Sulfate Soils of the Narrows Area, Central Queensland Coast Department of Natural Resources and Mines; and
- McDonald RC, Isbell RF, Speight JG, Walker J, Hopkins MS (1998). Australian Soil and Land Survey Field Handbook (second Edition).

2.6 *REVIEW OF OTHER RELEVANT STUDIES*

The results of the mapping of ASS in the Narrows area (Ross, 2005) identified a total of 7,119.6 ha of acid sulfate soils within the survey area, which contained approximately 1,557 ha of land with AASS and 5,562.6 ha of land with PASS. Based on the limited assessment and the extent of land < 5 metres AHD, it was reported that ASS is likely to occur on a further 1,201.4 ha of land.

The majority of acid sulfate soils in the area surveyed and sampled by Ross (2005) occurred within the tidal zone. These soils are permanently wet and have a shallow water table. The soils are classified within the Australian Soil Classification (Isbell, 1996) as Hydrosols. Sulfidic Hydrosols and Histic-Sulfidic Hydrosols (potential acid sulfate soils) were reported to occur on the intertidal or mangrove mudflats. The supratidal flats (saltpans) and slightly elevated marine couch flats (extratidal flats) were classified as Sulfuric Hydrosols, which contain both actual and potential acid sulfate soil layers.

The maximum reported oxidisable sulfur level of 12.4% and potential acidity of 8,358 mol H^+/t within the study area were recorded from a depth of 0.8 - 1.0m on an intertidal flat (Munduran), to the north of the project area. The maximum value for oxidisable sulfur of 9.4% and potential acidity to 6,254 mol H^+/t for supratidal flats was reported from a depth of 0.8 - 1.0m, also at Munduran. These levels exceeded the highest levels previously recorded for the southern portion of the Central Queensland coast area (Ross, 2005).

The results from the analysis of soils within the investigation area revealed that ninety-six percent of the area assessed reported actual and potential acid sulfate soils, with acid sulfate soil layers within 0.5 m depth from the surface.

The results from samples collected within the LNG project area of Friend Point (intertidal to intratidal flats) reported oxidisable sulfur levels of <0.01% to 2.96%, with a maximum potential acidity of 2,148 mol H^+/t. The maximum oxidisable sulfur and potential acidity level was reported from a depth of 0.2 - 0.4 metres.

To date, there has been no detailed investigation of the extent and levels of acid sulfate soils in the proposed LNG site on Curtis Island. Investigations have been undertaken on the adjoining site occupied by Santos, although the information obtained from this investigation has not been made available to ERM to enable an assessment of the conditions likely to be encountered on Curtis Island.

Data from the Wiggins Island Coal Terminal development, located on the western shore of Gladstone Harbour and approximately 12 kilometres south of Friend Point, reported total peroxide acidity (TPA) (mol H^+/t) values of < 2 mol H^+/t (LOR) to 3,730 mol H^+/t. S_{POS} (%S) results ranged between <0.02% - 6.88%S, whilst the overall net acidity ranged between < 10 mol H^+/t (below LOR) to 4,460 mol H^+/t (Connell Hatch, 2006).

The results from the ASS investigations in the Gladstone area with relevance to the current investigation indicated that appreciable areas at elevations < 5 m AHD around Gladstone contain either actual acid sulfate soils (AASS) or potential sulfate soils (PASS) which contain significant quantities of sulfur and hence acid generating potential.

2.7 *GEOTECHNICAL ASSESSMENT – GOLDER ASSOCIATES (2009)*

A geotechnical investigation on Curtis Island incorporating limited sampling and analysis for acid sulfate soils was undertaken by Golder Associates during the periods November - 22 December 2008 and 22 December 2008 to end February 2009. The investigation consisted of sampling and analysis of soils from 18 boreholes and grab samples from two test pits. A number of the holes were on ground > 5 m AHD and away from the mud flats.

Soil samples were collected from 0.5 m intervals to a maximum depth of 3.6 m bgl, with a total of 39 samples selected for quantitative SPOCAS analysis, based on field screening parameters (pH_F and pH_{FOX}). The information of the sampling and depths in presented in *Table 2*.

Table 2 ***Soil Sampling Data November – 22 December 2008[1]***

Sample borehole No.	Depth (m bgl)	Lithology	Max Net Acidity ($molH^+/t$)
BH-1	0.0 - 1.05	Sandy loam, gravel	< 10
BH-4	0.0 – 3.6	Sandy loam, gravel	42 (3.5-3.6m)
BH-7	0.0– 1.5	Clay loam, gravel to light clay	18 (1.5m)
BH-11	0.0– 0.55	Silty loam to heavy clay	31 (0.5-0.55m)
BH-39	0.0 – 2.55	Silty loam to light clay	15 (2.5-2.55m)
BH-40	0.0 – 1.6	Light-med clay to sandy loam	18 (0.0-0.5m)
BH-42	0.0 – 3.45	Light clay to sand, gravel	62 (1.5-1.55m)
BH-44	0.0 – 3.1	Heavy clay to medium clay	27 (0.5-1.0m)
BH-45	0.0 – 2.1	Light to medium clay, sand	19 (0.0-0.5m)
TP 13	1.7	Heavy clay	25 (1.7m)
TP 14	1.4	Heavy clay	141 (1.3-1.4m)
Soil Sampling Data: 22 December 2008- end February 2009[2]			
BH-30	0.00-0.5	Loamy clay	< 10
BH-31	0.0-0.95	Silty loam, gravel	< 10
BH-32	0.0-2.1	Clay loam, gravel	20 (0.0-0.1m)
BH-35	0.0-0.5	Silty loam	< 10
BH-46	0.0-3.45	Light clay, gravel	16 (0.0-0.5m)
BH-47	0.0-2.95	Silty loam, gravel to medium clay	275 (1.4-1.5m)
BH-49	0.0-1.95	Loamy sand, gravel	30 (1.9-1.95m)
BH-52	0.0-5.95	Medium to light clay	87 (0.5-0.6m)

1. Golder Associates Queensland Curtis LNG Geotechnical Investigation Project Memorandum (19/1/2009)

2. Golder Associates Queensland Curtis LNG Geotechnical Investigation Project Memorandum (26/3/2009)

The samples reported varying lithologies, with most samples consisting of sandy to silty loam and gravel to light clays. Heavy clays were reported from four samples (BH-11, 0.5-0.55m, BH-44, 0.5-1.0m, TP13, 1.7m, TP14, 1.3-1.4m).

The results from the SPOCAS analysis indicated that S_{POS} (%S) for only three samples (TP 14, 0.19%S, BH-4_3.5-3.6m, 0.02%S and BH47_1.4-1.5m 0.03%S) were above the analytical limit of reporting (LOR) value of 0.02%S.

Calculated liming rates for two samples TP14 (16.5kg $CaCO_3$/t) and BH47_1.4-1.5m (31.5 kg $CaCO_3$/t) were greater than 7.5 kg $CaCO_3$/t, whilst the liming rate for the remaining samples ranged between 2 to 7.5 kg $CaCO_3$/t. In comparison, the ERM/Geo Coastal investigation for Curtis Island reported that 47% of samples analysed required liming rates > 100 kg $CaCO_3$/t.

The results from the Golder Associates geotechnical investigation reported that the net acidity and corresponding liming rates were significantly lower than those identified in the detailed study undertaken by ERM and Geo Coastal. The differences in analytical data indicate that samples collected from higher ground had negligible ASS potential. Sample BH47_1.4-1.5m, collected from near ERM/GeoCoastal sample BH34 which returned the highest net acidity result of 275 mol H^+/t, consisted of heavy clay and had soil characteristics most similar to those encountered by ERM/GeoCoastal on the mudflats.

The results from the limited sampling and analytical results from the Golder Associates investigation also revealed heterogeneous distribution of sulfides within the sediments.

3 ACID SULFATE SOIL (ASS) SAMPLING AND ANALYTICAL REQUIREMENTS

At the time of the site investigation and sampling, the final location of the infrastructure routes had not been finalised. Likewise, the maximum depths, extent and location of excavations and fill at various locations will not be confirmed until the detailed design associated with the development and construction of the LNG plant on Curtis Island has been finalised. Therefore, sampling for the pipeline and road infrastructure was conducted using provisional data concerning the probable locations of the infrastructure and LNG plant. The investigation was conducted in two areas:

- Area 1: The eastern side of the Narrows on the mainland from Friend Point to Phillipie's Landing; and
- Area 2: The western margin of Curtis Island.

The sampling locations for Friend Point and Curtis Island are shown in *Annex A*.

3.1 SAMPLING DENSITY

The QASSIT guidelines specify the following minimum sampling density required for ASS component for Environmental Impact Statements, detailed in *Table 3:*

Table 3 Minimum Number of Sampling Holes

Area of Site (hectares)	Number of Boreholes
Up to 1 hectare	4 holes
1 -2 hectares	6 holes
2 – 3 hectares	8 holes
3 – 4 hectares	10 holes
> 4 hectares	2 holes / hectare

3.1.1 Area 1: Friend Point

Investigation of this area was conducted to identify and characterise the extent of actual (AASS) or potential acid sulfate soils (PASS) present along the proposed gas pipeline and provisional road access routes. Sampling was conducted at 200 metre intervals along three provisional proposed routes in order to provide information on the extent and characteristics of potential ASS which may be encountered during construction and possible excavation works.

The salt flat area of Friend Point was fringed by mangroves along the foreshore flanking the eastern margin and along the central and western margins. The number of sampling boreholes was determined based on the following information:

- The land at < 5 metres AHD consisted of intertidal and supratidal salt flats, which occupy a total area of approximately 410 hectares;
- The total area to be impacted by the proposed gas pipeline and access road infrastructure, based on a 30 metre wide path, is 16 hectares; and
- The required minimum number of boreholes required, using the information in *Table 3.1* is 32 boreholes.

It was not possible to sample along the entire proposed east-west route due to difficulties with access, particularly on the western side of the area due to the presence of permanent water. Sampling was conducted on as much of the routes as was accessible, resulting in a total of 29 boreholes being sampled.

3.1.2 *Area 2: Curtis Island*

The area investigated on Curtis Island occurred on the western margin of the proposed Curtis Island LNG facility. The total area occupied by land < 5 metres AHD is approximately 15 hectares, and was between the main island to the east and mangroves on the western margin.

The area of investigation consisted of intertidal and intratidal flats. The surface of the flats contained a veneer of fine to medium gravel derived from outwash from creeks draining the adjacent hinterland. Gravel fragments were angular to sub-angular in shape and generally between 5mm and 40mm in size.

- Based on the area of the intertidal/intratidal flats determined from aerial photographs, the total area of was approximately 15 hectares was investigated and sampled; and
- The minimum number of boreholes required, using the information in *Table 3.1* was 30 boreholes.

A total of 186 samples from Friend Point and 94 samples from Curtis Island were submitted to ALS for SPOCAS analysis. All samples were placed into clip-seal bags and stored in ice in cooler boxes to minimise oxidation. The samples were subsequently frozen prior to overnight delivery to ALS laboratory in Brisbane. Chromium reducible sulfur (CRS) analysis was also obtained on a one in ten basis from the samples as a comparison for over/under estimation of the net acidity (mol H^+/tonne) and for quality assurance purposes.

3.2 *FIELD PARAMETERS*

Field parameters were measured in accordance with the requirements specified in Ahern et al (1998). Field measurements were used to identify which samples triggered the selection criteria for further detailed laboratory analysis. The criteria are summarised below:

- If field pH^F was < 4 then the oxidation of sulphides is likely to have occurred in the past (the presence of actual acid sulfate soils);
- If there was a strong reaction between the sample and peroxide this may indicate the presence of sulfides in the sample;
- If the measured pH^{FOX} is at least one unit below the measured pH^F, then this may indicate the presence of PASS;
- If the measured pH^{FOX} was < 3 then this will strongly indicate the presence of sulfides in the sample (particularly if other conditions above also apply):

  1. If the measured pH_{FOX} is between 3 and 4 then laboratory analysis is required to confirm the presence/absence of sulfides;
  2. If the measured pH_{FOX} is between 4 and 5 then laboratory is required to confirm the presence of small quantities of poorly reactive sulfides; and
  3. If measured pH_{FOX} is > 5 and there is little or no decrease in pH levels between pH_F and pH_{FOX} then little net acidifying capacity is indicated in the sample.

Sampling equipment was washed between sampling events to minimise the potential for cross-contamination. Following collection, field parameters (field pH and peroxide pH) were determined on all cores at 0.25 metre intervals. Detailed description of the main soil characteristics including colour, chroma, presence of mottles and shell fragments, organic matter and assessment of particle size distribution were also recorded.

Sampling was conducted in Area 1 – Friend Point, using hand push tube to a depth of 3 metres bellow ground surface, shown in Photo 1. The sampling depth was based on information obtained in the Stage 1 review of previous reports. At the time of sampling, details concerning the final location of the pipeline and access road routes had not been finalised. Sampling equipment was washed between sampling events to minimise the potential for cross-contamination.

Photo 1 ***Hand operated piston corer used for sample collection at Friend Point***

Sampling in Area 2 – Curtis Island, was conducted using Geoprobe drill rig. Cores were obtained using vacuum vibracore hollow push tube, shown in Photo 2. The depth of sampling ranged between 0.4 metres and 3.0 metres. The variable depth of the boreholes collected in this sampling was due to the variable depth to the underlying Pleistocene clays. It should be noted that samples were not obtained from sample locations BH-35, BH-36 and BH-37, as there was no tidal flat present in these locations. The sites were located along a narrow (<5 m) wide strip of grassed land between the mangroves and the island. Sampling was not possible as the drill rig was not able to access these locations.

Photo 2 ***Geoprobe rig with vibracore used for sampling on Curtis Island***

3.3 ANALYTICAL PARAMETERS

Samples for subsequent detailed SPOCAS (Suspension Peroxide Oxidation Combined Acidity and Sulfur) analysis were collected at 0.5 metre intervals. Details of the analytical methods, laboratory results and chain of custody (COC) and sample receipt advice documentation are provided in the GeoCoastal report in *Annex B*. Samples which met the field screening criteria were analysed for the following SPOCAS parameters:

3.3.1 Acidity Trail

The acidity trail component of the SPOCAS analysis is comprised of the following analytical methods:

- Titratable Actual Acidity (TAA) (mol H^+/t);
- Titratable Peroxide Acidity (TPA) (mol H^+/t); and
- Titratable Sulfidic Acidity (TSA) (mol H^+/t).

The Acidity Trail data assist in the quantification of the level of acidity present within the soil. TAA quantifies the amount of existing acid in the soil, measured as mol H^+/t. The total soil acidity is expressed as the sum of TAA and TPA results and is used to assess the presence/absence of existing/potential soil acidity.

TPA quantifies the amount of acid in the soil that is likely to be produced if oxidation were to occur during or as a result of disturbance.

TSA quantifies the amount of acid (existing or potential) in the soil that is attributable to pyrite (FeS_2), which indicates the presence/absence of ASS material.

3.3.2 *Sulfur Trail*

The Sulfur Trail component of the SPOCAS analysis is comprised of the following analytical methods:

- KCl Extractable Sulfur (%S);
- Peroxide Sulfur (%S);
- Peroxide oxidisable Sulfur (S_{POS}) (%S); and
- Acidity – Peroxide Oxidisable Sulfur (a-POS) (mol H^+/t).

The results from the sulphur trail are used to quantify the level of extractable sulfidic material present within the soil, which includes soluble and absorbed sulfate as well as sulfate from gypsum. The results are used as input into the acid-base accounting to assess the net acidity of the soil attributable to the sulfur content available through oxidation.

3.3.3 *Retained Acidity*

The retained acidity component of the SPOCAS analysis is comprised of the following analytical methods:

- Net Acid Soluble Sulfur (%S);
- Acidity - Net Acid Soluble Sulfur (mol H^+/t);
- Sulfidic - Net Acidity Soluble Sulfur (% pyrite S); and
- HCl Extractable Sulfur (%S).

The retained acidity methods quantify the fraction of existing acidity in the soil that is present in "less available" forms, such as jarosite, natrojarosite and aluminium hydroxysulfate minerals. The retained acidity may be released slowly into the environment by hydrolysis of these relatively insoluble sulfate minerals. The retained acidity results are used as input into the acid – base accounting for the net soil acidity.

3.3.4 *Neutralising Capacity*

The neutralising capacity component of the SPOCAS analysis is comprised of the following analytical methods:

- Acid reacted calcium (% Ca); and
- Acid reacted Magnesium (% Mg).

The neutralising capacity of the soils is controlled by the calcium and magnesium contents of the soil which react with the acid and the percentage of clay, which buffers the acid. The results of the analysis for calcium and magnesium are used in the acid-base accounting to determine the overall liming rates.

3.3.5 *Acid – Base Accounting and Liming Rates*

The *Laboratory Methods Guidelines* (Ahern *et al*. 2004) use an acid base accounting approach for predicting Net Acidity from sulfide oxidation. The acid – base accounting analysis component of the SPOCAS analysis is comprised of the following analytical methods:

- Net Acidity (sulfur units) (%S);
- Net Acidity (acidity units) (mol H^+/t); and
- Liming Rates (kg $CaCO_3$/t).

Net acidity is calculated using the following equation:

Net Acidity = Potential Sulfidic Acidity + Existing Acidity – Acid Neutralising Capacity

where: Existing Acidity = Actual Acidity + Retained acidity; and

Acid Neutralising Capacity (ANC) = measured ANC/Fineness Factor.

A Fineness Factor of 1.5 is used for the determination of the liming rate to provide an extra level of safety.

These results are used to provide the information required for the development of appropriate management measures for the effective treatment of materials disturbed during operations at the site. The formula used to calculate the liming rates is as follows (from Dear et al, 2002):

%S x 30.59 x 1.02 x 1.5 = kg $CaCO_3$/tonne of soil (1)

Where;

30.59 converts to H_2SO_4

1.02 converts to $CaCO_3$, and

1.5 is the safety factor.

To convert units from soil tonnes to cubic metres, multiply kg $CaCO_3$/tonne by soil bulk density. To change units from %S to mol H^+/tonne, multiply %S by 623.7.

The liming levels have been calculated based on the recommended treatment levels (Dear et al, 2002) for disturbance of > 1,000 tonnes of soil, and are summarised below:

- < 0.1 kg $CaCO_3$/t is *Low* treatment level;
- 0.1-1 kg $CaCO_3$/t is *Medium* treatment level;
- 1-5 kg $CaCO_3$/t is *High* treatment level;
- 5-25 kg $CaCO_3$/t is *Very High* treatment level; and
- > 25 kg $CaCO_3$/t is *Extremely High* treatment level.

4 RESULTS

4.1 GENERAL SITE DESCRIPTIONS

The samples obtained from the intertidal to intratidal flats at Friend Point consisted predominantly of dark grey silty clays to clays, with interspersed layers of organic-rich material up to 0.2 metres thick. The core samples exhibited an oxidised layer in the upper 0.1-0.3 metres.

The samples from Curtis Island were obtained from boreholes between 0.4 m and 2.8 m depth. The top 0.1 - 0.3 metres of the cores were generally dry, hard and oxidised and required the use of hand push tube to penetrate the surface. The underlying sediment consisted of dark grey silty clays to clays, which was underlain by stiff, pale grey to orange-grey Pleistocene clays.

Organic-rich layers were less commonly observed in the cores from Friend Point compared to the samples from Curtis Island. The cores from Curtis Island also contained gravel clasts up to 40mm in size and layers derived from the surrounding hinterland. The gravel layers in the cores occurred predominantly immediately above the Pleistocene clay base. Shell fragments were rare in the cores from both locations. The detailed core descriptions, logs and cross sections from Friend Point and Curtis Island are presented in the GeoCoastal report in *Annex B*.

A detailed interpretation of the geomorphological facies for Curtis Island and Friend Point was undertaken by Geo Coastal[2]. The key findings are outlined below.

4.2 CURTIS ISLAND

4.2.1 Pre-Holocene Facies

The pre-Holocene-aged sequence encountered at all sites consisted of residual soils of substantial antiquity, and therefore does 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 that has been reported by the authors and other workers at a number of locations in Queensland, where a shallow zone of discolouration occurs immediately below the surface of these pre-Holocene clays. This phenomenon is interpreted as a zone of infiltration by overlying Holocene-age interstitial water.

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[2] GeoCoastal Australia (2009). Acid Sulfate Soil and Geomorphological Modelling Report - Proposed QCLNG Facility, Gladstone, Queensland (unpubl) 36pp

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. This is observed in two boreholes: Borehole BH38 where penetration of pre-Holocene clayey gravels has produced a positive result of 1.38%S, and in Borehole BH46 where an exceptionally high result of 5.2%S is recorded in the immediate pre-Holocene substrate. Generally this infiltration effect is confined to the upper 0.5m of the pre-Holocene substrate.

4.2.2 *Holocene Facies*

Transgressive sandy gravelly lag

Net acidity results in these basal gravels were variable, but range to high (e.g. 3%S) levels in places where there has been a close association with mangroves.

Stillstand gravelly silt/clayey sand ridge

This facies was not intersected in many boreholes, but revealed a level of 2.27%S (sPOCAS) in Borehole #31.

Stillstand nearshore clayey silt

This facies appears to be restricted to the southern area of the embayment where the pre-Holocene substrate is deeper (Boreholes BH28 and BH29). The presence of calcium carbonate has had some neutralising effect in this facies, however, values still range between 1 %S to >2 %S because of the proximity to a supply of organic carbon.

Progradational mangrove ridge

This facies appears to be confined to the southern portion of the embayment (Boreholes BH28 and BH29), and given its immediate proximity to mangroves, has a high potential for acid sulfate soil development.

Progradational nearshore and mangrove deposits

These facies consist of very soft, highly organic clayey silts and form the bulk of the Holocene deposition underlying the tidal flats within the embayment. These facies represent the classic scenario for acid sulfate soil formation, ie; low-energy, organic-rich, anaerobic sediments with little inherent neutralisation capacity. Consequently, very high levels of PASS (i.e. commonly in the range of 2 %S to 7 %S - sPOCAS) are recorded in this facies. Generally there is a trend toward increasing PASS up sequence coinciding with the seaward progradation of the mangrove forest.

Progradational rear mangrove gravelly, sandy clayey silt

This deposit was only intersected in Borehole BH29, but may be indicative of the area currently occupied by the mangrove forest. It has a predictably high level of > 2%S.

Supratidal surface silty clay layer

This layer often shows low to negligible levels of ASS, but exceptions such as in Boreholes BH23, BH25 and BH34 defy making this a generalisation.

Colluvial fan

Generally it might be expected that these terrestrially sourced, subaerially deposited sediments would be acid sulphate benign, however, a positive result in the surface of Borehole BH31 again indicates caution when making this assumption.

4.3 ACTUAL ACID SULFATE SOILS (AASS)

A high proportion of the cores within the study revealed a low level Actual Acid Sulfate Soil (AASS) condition. The widespread occurrence of AASS around South Curtis Island is 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 may be hydro-isostatic 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 depth 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.

4.4 FRIEND POINT

4.4.1 Pre-Holocene Facies

The pre-Holocene mature soil/rock substrate was not intersected by coring along this transect, as it was beyond investigation depth. Manual penetrometer surveying was conducted along the sampling transects to test the depth of this substrate for engineering purposes. Therefore, the pre-Holocene is not characterised, other than by approximate depth.

4.4.2 *Holocene Facies*

Estuarine central-basin silt clay

These sediments were encountered toward the base of the intersected sequence in the majority of boreholes (i.e. BH-11 to BH-19), and are characteristic of deeper central-basin suspension sediment accretion in large proto-estuary/restricted marine depositional settings such as Port Curtis.

The sediments consist of very dark greenish grey, moist, soft, poorly plastic, silt/clay sediments. These sediments are 'unripe' and despite commonly being described (incorrectly) as 'marine clays' because of their high visible shell content, they generally incorporate a high percentage of silt.

A very soft clayey silt deposit succeeds this deeper silt/clay deposit in boreholes BH-18 to BH-20, which is interpreted as a later, but associated, phase of similar shelly suspension sediment deposition. A winnowed shell concentration is observed toward the upper boundary of this deeper facies in a number of boreholes (e.g. BH-15, BH-17, BH-18, and BH-20), suggesting that accretion had raised the seabed to within range of the strong tidal currents that operate through this area.

Estuarine basin silty-clay sediments were also intersected in borehole BH21, and it is tempting to see this as contemporaneous deposition with the basal sequence observed in boreholes BH-11 to BH-19. However, both the intervention of the clayey silt deposit in BH-20 and the coarse shelly sand deposits identified in BH-21 make it difficult to reconcile as a contiguous deposit.

The up-sequence transition in BH-21 to progressively coarser channel deposits is consistent with there having been a passage at this location, within which deposition post-dated the adjacent sequence.

Mangrove clayey silt

The early phase of shelly silt clay deposition was succeeded by highly organic, very soft, clayey silt sediments representing the establishment of mangroves. Accretion of the deeper silt clays had raised the seabed to within range of mangrove colonisation (i.e. approaching mean sea level). This deposition dominates the majority of the intermediate sequence intersected (~-0.25m to ~1.25m AHD), except for the coarse sandy deposition in the western passage discussed earlier (BH-21), and other lower energy passages where fine muddy sandy sediments dominate. A wide passage is identified at the eastern end of the transect as it approaches Friend Point (BH-11 to BH-14).

Upper tidal/Supratidal clayey silt and silty clay

The mangrove phase is succeeded up sequence by relatively organic-free, very soft, clayey silt deposition between boreholes BH-11 to BH-18, suggesting that the main mangrove forest had prograded, leaving this area as a protected tidal flat environment. Progressively a supratidal cap of soft to firm silt/clay has mantled this tract forming a sedimentary isthmus between the mainland and Friend Point.

5 ANALYTICAL RESULTS

5.1 FIELD SCREENING RESULTS (pH_F AND pH_{FOX})

The results of field data pH_F from Friend Point samples were generally slightly acidic to slightly alkaline, with the range of 4.04 – 8.81. pH_F < 6 was recorded in a total of 13 samples, with the lowest result (pH_F 4.04) recorded from 0.25 metres depth in BH-5. Acidic conditions (ie: pH_F < 5) were most commonly recorded in samples from the upper 0.5 metres.

pH_{FOX} results from Friend Point ranged between 0.91 - 4.50, with the majority of the results being less than pH_{FOX} 2.0 Samples in which pH_{FOX} > 3 contained a greater proportion of shell material, or less commonly coarser sand / gravel sized material.

The results of pH_F from Curtis Island samples were slightly acidic to alkaline, with the range of 6.21 – 9.23. pH_F <6 was observed in a total of 16 samples, with the lowest result (pH_F 3.84) observed at 0.25 metres depth in core BH-24. Acidic conditions (ie: pH_F < 5) were most commonly recorded in the upper 0.5 metres.

pH_{FOX} results from Curtis Island ranged between 0.71 - 2.34, with the majority of the results being less than pH_{FOX} 2.0. Samples in which pH_{FOX} > 3 (contained a greater proportion of coarser sand / gravel sized material, or less commonly, shell material.

The smallest decrease between pH_F and pH_{FOX} was observed in the upper 0.25 metres, where evidence of oxidation was present and in the lower-most portion of cores where Pleistocene clays were present (Curtis Island). The presence of shell fragments in core BH-15 at a depth of 2.75 m resulted in pH_{FOX} 3.55, a result which was 2 units lower than the pH_{FOX} measurements from above and below this horizon.

5.2 LABORATORY RESULTS

The Acidity Trail (TPA), Sulfur Trail (S_{POS}), and net acidity (mol H^+/t) results for the SPOCAS analysis for the samples from Friend Point (184 samples) and Curtis Island (94 samples) are detailed below.

5.2.1 *Sulfur Trail*

The total peroxide oxidisable sulfur (S_{POS}) results of samples from Friend Point and Curtis Island are summarised in *Table 4.* The distribution of S_{POS} (%S) and TPA (mol H^+/t) across the sampling sites are presented in the GeoCoastal report (*Annex B)*. The results from Friend Point indicated that the S_{POS} ranged between < 0.02 - 3.72 %S. The maximum measured S_{POS} from each depth sampled ranged between 2.37% S (1.9-2.0 m) to 3.72% S (1.3-1.5 m).

The results for S_{POS} from Curtis Island ranged between < 0.02 – 7.20 %S, with the maximum S_{POS} recorded from a depth of 0.8-1.0 metres in BH-38. The maximum S_{POS} values from each depth ranged between 1.98% S (0-0.1m) to 7.20%S (0.8-1.0 m). It is worth noting that a total of 17 samples from Curtis Island reported S_{POS} > 4.0 %S (4.29 – 7.20 %S) compared to the results from Friend Point, where there were no reported S_{POS} greater than 4 %S.

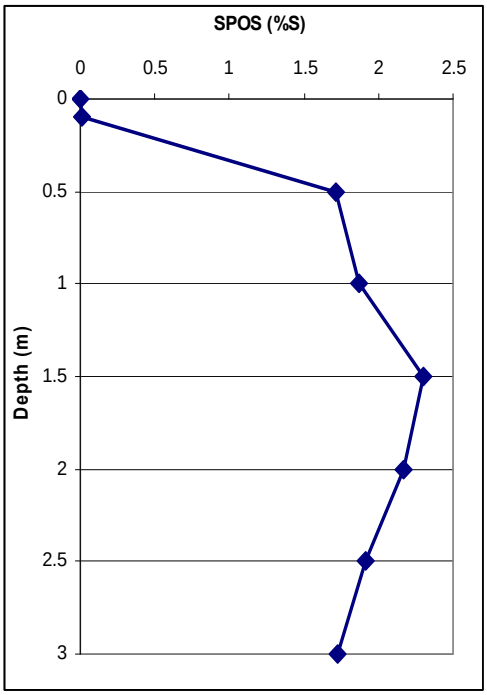
Overall, the samples from Curtis Island recorded a higher proportion of S_{POS} greater than 2.0%, with 49% of all samples having S_{POS} > 2.0% S compared with only 21% of all samples from Friend Point containing S_{POS} > 2.0% S. The results from individual sampling depths from Friend Point and Curtis Island indicated that the greatest percentage of results < 0.02%S occurred in the upper 0.1 metres, which corresponded with the observed oxidation of this upper layer.

The results from Friend Point showed a relatively constant concentration of S_{POS} from 0.3m to 3.0 m, with S_{POS} in the range of 0.2-2.0 %S accounting for 60% of all samples. At Curtis Island, S_{POS} results > 4.0 %S occurred between the depths of 0.3-1.5 metres.

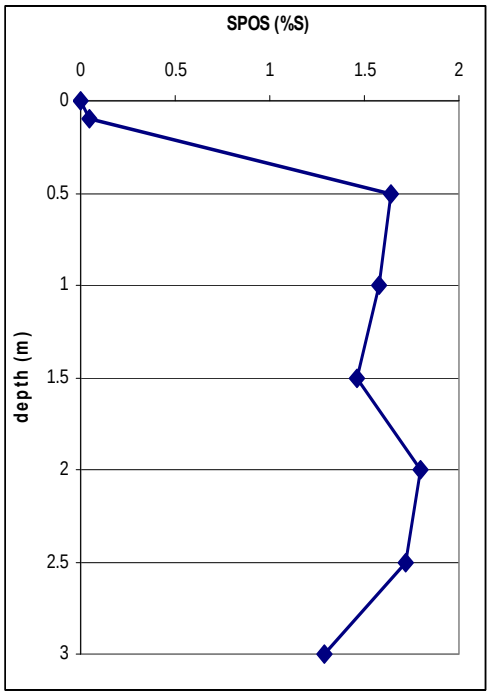
Table 4 ***Peroxide Oxidisable Sulfur (S_{POS}) (%S) Results***

				FRIEND POINT				
Depth (m)	**0-0.1**	**0.3-0.5**	**0.8-1.0**	**1.3-1.5**	**1.8-2.0**	**2.3-2.5**	**2.8-3.0**	
Min (%S)	< 0.02	< 0.02	0.08	0.51	1.01	0.14	0.09	
Max (%S)	3.03	3.70	3.39	3.72	2.37	2.96	3.19	
				PERCENT DISTRIBUTION				
< 0.02 %S	6.9	3.5	0	0	0	0	0	***1.6%***
0.02 - 0.20	69	31.0	7.1	0	0	4	4.2	***17.7%***
0.20 - 2.0	17.2	51.7	60.7	65.4	88	72	70.8	***59.7%***
2.0 - 4.0	6.9	13.8	32.2	34.6	12	24	25	***21.0%***
> 4.0	0	0	0	0	0	0	0	***0%***
				CURTIS ISLAND				
Depth (m)	**0-0.1**	**0.3-0.5**	**0.8-1.0**	**1.3-1.5**	**1.8-2.0**	**2.3-2.5**	**2.8-3.0**	
Min (%S)	< 0.02	0.04	< 0.02	0.02	0.02	0.14	0.16	
Max (%S)	1.98	7.16	7.20	4.72	3.48	3.03	3.04	
				PERCENT DISTRIBUTION				
< 0.02 %S	4.8	0	5.6	0	0	0	0	***2.1%***
0.02 - 0.20	52.4	9.5	0	18.7	20	16.7	50	***21.3%***
0.20 - 2.0	42.8	19.0	22.2	18.7	30	50	0	***27.7%***
2.0 - 4.0	0	33.3	27.8	56.3	50	33.3	50	***30.8%***
> 4.0	0	38.1	44.4	6.3	0	0	0	***18.1%***

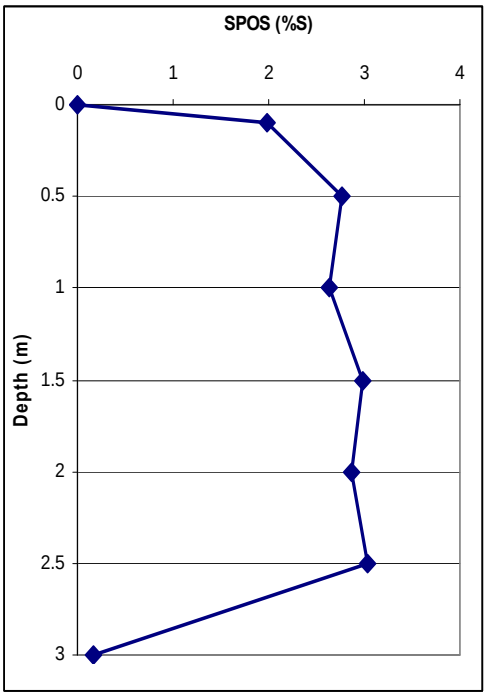
Typical depth profiles for samples from Friend Point (BH-6, BH-18) and Curtis Island (BH-28, BH-38) are shown in *Figure 1*. The profiles from both locations reveal a sharp increase in S_{POS} (%S) at 0.5 m depth, with the %S remaining relatively constant further down profile. The profile from Curtis Island (BH-28) shows a sharp decrease at the base of the profile, commensurate with the intersection of the underlying Pleistocene clay.



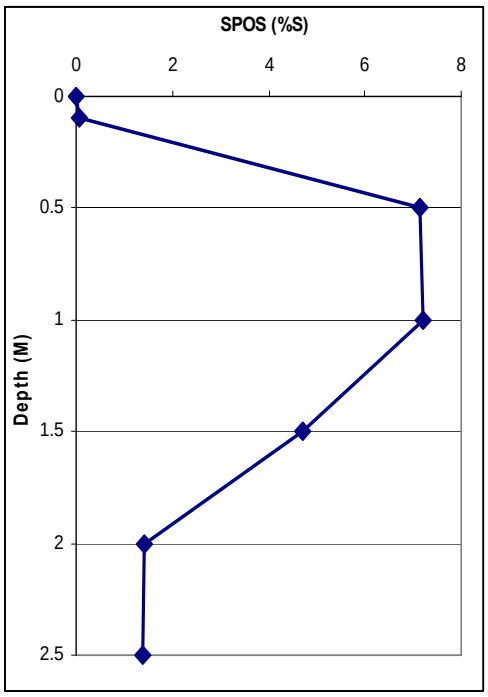
S_{POS} (% S) Profile BH-6



S_{POS} (%S) Profile BH-18



S_{POS} (%S) Profile BH–28



S_{POS} (%S) Profile BH-38

Figure 1 *S_{POS} (%S) profiles from Friend Point (BH6, BH18) and Curtis Island (BH28, BH38)*

5.2.2 *Acidity Trail*

The titratable peroxide acidity (TPA) results for samples from Friend Point and Curtis Island are summarised in *Table 5*.

Table 5 Titratable Peroxide Acidity (TPA)(mol H+/t) Results

FRIEND POINT								
Depth (m)	**0-0.1**	**0.3-0.5**	**0.8-1.0**	**1.3-1.5**	**1.8-2.0**	**2.3-2.5**	**2.8-3.0**	
Min	<2	<2	<2	<2	<2	<2	<2	
Max	1080	1730	3090	1400	1020	1200	1380	
PERCENT DISTRIBUTION								
<2 mol H^+/t	72.4	31.1	3.6	3.8	8	20	12.5	***22.6%***
2 - 500	24.2	20.7	25	19.2	36	32	54.2	***29.6%***
500 - 1000	0	37.9	53.6	42.3	52	40	20.8	***34.9%***
> 1000	3.4	10.3	17.8	34.7	4	8	12.5	***12.9%***
CURTIS ISLAND								
Depth (m)	**0-0.1**	**0.3-0.5**	**0.8-1.0**	**1.3-1.5**	**1.8-2.0**	**2.3-2.5**	**2.8-3.0**	
Min	<2	<2	<2	<2	<2	10	<2	
Max	678	5600	4160	2200	1520	1120	170	
PERCENT DISTRIBUTION								
<2 mol H^+/t	42.9	4.8	5.6	18.8	10	0	50	***17%***
2 - 500	38.1	14.2	11.1	6.2	20	50	50	***21.3%***
500 - 1000	19	4.8	5.6	18.8	40	33.3	0	***16.0%***
> 1000	0	76.2	77.7	56.2	30	16.7	0	***45.7%***

The analytical results from Friend Point indicated that approximately 72% of the samples from depth 0.0-0.10 m depth were below the analytical limit of reporting (LOR) value of 2 mol H^+/t, whereas only 43% of the samples from 0.0-0.1 m depth from Curtis Island were below LOR.

The maximum TPA result from Friend Point was 3,090 mol H^+/t, measured in sample BH-47 from 0.8-1.0 m depth, whilst the maximum result from Curtis Island was 5,600 mol H^+/t, reported in sample BH-44 from a depth of 0.3-0.5 m.

The percentage distribution for the results from Friend Point indicated that 13% of samples across the site had TPA > 1,000 mol H^+/t, whilst 23% of all samples were below the LOR of 2 mol H^+/t. The percentage distribution for the results from Curtis Island indicated that 46% of the samples had TPA > 1,000 mol H^+/t whilst 17% of all samples analysed had TPA below the LOR value of 2 mol H^+/t.

5.2.3 *Retained Acidity*

Retained acidity was identified from a limited number of samples, with HCl extractable sulfur (% S) being reported in nine samples from Friend Point, ranging between 0.20 – 0.66 %S (mean = 0.49 %S).

The results from Curtis Island reported a total of 24 samples with retained acidity, with the HCl extractable %S ranging between 0.10 – 0.74 %S (mean = 0.46 %S).

5.2.4 *Neutralising Capacity (Ca%)*

The excess neutralising capacity was reported from a total of 29 samples from Friend Point, with the Ca% ranging between 0.06-3.91 % (mean = 0.53 Ca%). The maximum result of 3.91% was reported from sample BH-21 (1.3-1.5 m).

Excess neutralising capacity was reported from only two samples from Curtis Island, corresponding with the results which contained a higher proportion of retained acidity. The results indicated that there was little to no excess neutralising capacity in the samples analysed from Friend Point or Curtis Island.

5.2.5 *Acid – Base Accounting: Net Acidity*

The results for net acidity (sulfur units) (%S) from Friend Point and Curtis Island are summarised in *Table 6*. The net acidity for samples from Friend Point ranged between LOR (< 0.02%S) to 3.74 %S (BH16 0.8-1.0m), whilst the results for samples from Curtis Island ranged between LOR (< 0.02 %S) to 7.21 %S (BH38 0.8-1.0m).

Table 6 ***Net Acidity (%S) Results: Friend Point and Curtis Island***

FRIEND POINT							
Depth (m)	**0-0.1**	**0.3-0.5**	**0.8-1.0**	**1.3-1.5**	**1.8-2.0**	**2.3-2.5**	**2.8-3.0**
Min (%S)	< 0.02	< 0.02	0.02	< 0.02	0.37	< 0.02	< 0.02
Max (%S)	1.35	3.71	3.45	3.74	2.39	2.74	2.53
CURTIS ISLAND							
Depth (m)	**0-0.1**	**0.3-0.5**	**0.8-1.0**	**1.3-1.5**	**1.8-2.0**	**2.3-2.5**	**2.8-3.0**
Min (%S)	< 0.02	< 0.02	< 0.02	< 0.02	16	35	< 0.02
Max (%S)	1.99	7.18	7.21	4.73	3.49	2.21	3.04

5.3 *ACID BASE ACCOUNTING: LIMING RATES*

The liming rates[3] reported for the samples from Friend Point ranged between < 1 kg $CaCO_3$/t to 175 kg $CaCO_3$/t, with 8% of the samples ranging between 6-25 kg $CaCO_3$/t (Very High treatment level) and 72% of the samples between 28-175 kg $CaCO_3$/t (Extremely High treatment level).

The liming rates reported for the samples analysed from Curtis Island ranged between < 1 kg $CaCO_3$/t to 338 kg $CaCO_3$/t, with 9% of samples ranging between 7-22 kg $CaCO_3$/t (Very High Treatment level) and 68% of the samples ranging between 28-338 kg $CaCO_3$/t (Extremely High treatment level).

A total of 22 (12%) samples from Friend Point reported liming rates in excess of 100 kg $CaCO_3$/t whilst 44 (47%) samples from Curtis Island reported liming rates in excess of 100 kg $CaCO_3$/t.

The liming rates required for neutralisation for soils in the investigation areas will be dependent upon the volume of soil to be excavated. The required liming rates for the reported S% content of the soils can be determined from *Table 7*.

[3] Liming rate is calculated on a dry weight basis using a safety factor of 1.5

Table 7 Estimating treatment levels and lime required to treat the total weight of disturbed acid sulfate soil (after Ahern et al. 1998).

Disturbed ASS (Tonnes) (m³xBD)	**Soil Analysis - Existing Acidity plus Potential Acidity (converted to equivalent S% units)**													
	0.03	**0.06**	**0.1**	**0.2**	**0.4**	**0.6**	**0.8**	**1**	**1.5**	**2**	**2.5**	**3**	**4**	**5**
1	0	0	0	0	0	0.03	0.04	0.05	01	0.1	0.1	0.1	0.2	0.2
5	0	0	0	0.05	0.1	0.1	0.2	0.2	0.4	0.5	0.6	0.7	0.9	1.2
10	0	0.03	0.05	0.1	0.2	0.3	0.4	0.5	0.7	0.9	1.2	1.4	1.9	2.3
50	0.1	0.1	0.2	0.5	0.9	1.4	1.9	2.3	3.5	4.7	5.9	7.0	9.4	12
100	0.1	0.3	0.5	0.9	1.9	2.8	3.7	4.7	7.0	9.4	12	14	19	23
200	0.3	0.6	0.9	1.9	3.7	5.6	7.5	9.4	14	19	23	28	37	47
250	0.4	0.7	1.2	2.3	4.7	7.0	9.4	12	18	23	29	35	47	59
350	0.5	1.0	1.6	3.3	6.6	10	.13	16	25	33	41	49	66	82
500	0.7	1.4	2.3	4.7	9.4	14	19	23	35	47	59	70	94	117
600	0.8	1.7	2.8	5.6	11	17	22	28	42	56	70	84	112	140
750	1.1	2.1	3.5	7.0	14	21	28	35	53	70	88	105	140	176
900	1.3	2.5	4.2	8.4	17	25	34	42	63	84	105	126	168	211
1000	1.4	2.8	4.7	9.4	19	28	37	47	70	94	117	140	187	234
2000	2.8	5.6	9.4	19	37	56	75	94	140	187	234	281	374	468
5000	7.0	14	23	47	94	140	187	234	351	468	585	702	936	1170
10000	14	28	47	94	187	281	374	468	702	936	1170	1404	1872	2340

L	Low treatment: (≤ 0.1 tonnes lime)
M	Medium treatment: (› 0.1 to 1 tonne lime)
H	High treatment: (› 1 to 5 tonnes lime)
VH	Very High treatment: (› 5 to 25 tonnes lime)
XH	Extra high treatment: (› 25 tonnes lime)

Note: Lime rates are for pure fine aglime, $CaCO_3$ assuming an NV of 100% and using a safety factor of 1.5. A factor that accounts for Effective Neutralising Value is needed for commercial grade lime. (See the *Information Sheets* on *Neutralising Agents – Neutralising Considerations*).

† An approximate soil weight (tonnes) can be obtained from the calculated volume by multiplying volume (cubic m) by bulk density (t/m³). (Use 1.7 if B.D. is not known). Dense fine sandy soils may have a BD up to 1.7, and hence 100 m³ of such soil may weigh up to 170 t. In these calculations, it is necessary to convert to dry soil masses, since analyses are reported on a dry weight basis. # Potential acidity can be determined by Chromium Reducible Sulphur (SCR), Peroxide Oxidisable Sulphur (SPOS) and Total Oxidisable Sulphur (STOS). For samples with pH <5.5, the existing acidity must also be determined by appropriate laboratory analysis eg; Titratable Actual Acidity (TAA). Soils with retained acidity eg. jarosite or other similar insoluble compounds have a less available acidity and will require more detailed analysis. The amount of treatment required may be reduced if the self-neutralising capacity of the soil is appropriately measured. Consult the **Queensland Acid Sulphate Soils Technical Manual, Laboratory Methods Guidelines.**

6 SPOCAS AND CHROMIUM REDUCIBLE SULFUR SOIL ANALYSIS COMPARISON

Chromium reducible sulfur (CRS) analysis was conducted on a total of 29 samples collected from Friend Point and Curtis Island to provide a comparison of the sulfur content and over/under estimation of liming rates. The results and relative percentage difference (RPD) between SPOCAS and CRS results are presented in *Table 8*.

The geometric mean S_{POS} (%S) result was 0.84%S whilst the geometric mean for CRS was 0.62 %S. The RPD between S_{POS} (%S) and CRS (%S) ranged between 10% - 190%. The variation between the S_{POS} and CRS analyses was generally consistent, with the S_{POS} data being consistently greater than the corresponding CRS results. The difference between the two analytical processes is due to the presence of organically-bound sulfur, which was analysed as part of the overall sulfur (oxidisable S + organic S) in the SPOCAS suite compared to oxidisable sulfur as determined by CRS analysis. The results indicated that samples from Friend Point contained less organic matter, and hence less organically-bound sulfur than samples from Curtis Island.

A scatter plot of the two pairs of analyses (S_{POS} vs CRS) is shown in *Figure 2*. This graph shows that for most samples there was a strong correlation between the two methods (R^2 = 0.918), with the trendline biased slightly towards the S_{POS} axis. At the lower levels (< 0.1%S), the results from both analytical methods were similar. These samples were from the upper portion of the cores and represented oxidized surface materials, ie: generally non-acid sulfate soils. By comparison, the samples with higher %S concentrations were from unoxidised estuarine silt clays with numerous to abundant organic debris or fragments. The scatter plot trnd line bias toward the S_{POS} axis support previous statements that the analysis of sediments containing organic material, the sPOS method returns higher levels of oxidisable sulfur than the CRS method.

Table 8 RPD Between SPOCAS (SPOS) (%S) and CRS (%S)

Sample No	Depth (m)	S_{POS} (%S)	CRS (%S)	RPD (%)
Detection Limit (%S)		**0.02**	**0.02**	
BH-2	0.8-1.0	1.31	0.89	38
BH-3	2.3-2.5	1.85	0.92	67
BH-5	0.3-0.5	1.72	0.95	57
BH-6	1.8-2.0	2.17	1.50	37
BH-8	0.0-0.1	<0.02	<0.02	0.0
BH-9	1.3-1.5	2.54	1.57	47
BH-10	2.8-3.0	2.25	1.31	53
BH-12	0.8-1.0	0.08	0.04	66
BH-13	2.3-2.5	1.95	1.38	34
BH-15	0.3-0.5	0.07	<0.02	55*.
BH-16	2.8-3.0	1.22	0.99	21
BH-18	1.3-1.5	1.46	1.14	25
BH-19	0.0-0.1	0.05	<0.02	43*
BH-20	0.0-0.1	0.90	0.64	33
BH-22	1.3-1.5	0.51	0.44	15
BH-22	1.8-2.0	1.92	1.72	11
BH-23	0.0-0.1	1.06	0.03	190
BH-25	0.8-1.0	4.91	5.15	20
BH-29	1.3-1.5	0.97	0.55	55
BH-33	0.8-1.0	3.30	1.99	50
BH-34	0.8-1.0	5.28	3.22	48
BH-38	0.8-1.0	7.20	5.54	26
BH-42	0.0-0.1	0.04	0.03	28
BH-45	0.3-0.5	0.21	0.19	10
BH-46	0.0-0.1	0.30	0.19	44
BH-47	1.15-1.3	0.70	0.44	45
BH-50	0.8-1.0	0.64	0.52	14
BH-52	0.0-0.1	0.14	0.08	80
BH-53	1.8-2.0	1.71	1.12	42

* *RPD calculated assuming CRS value of 0.02%*

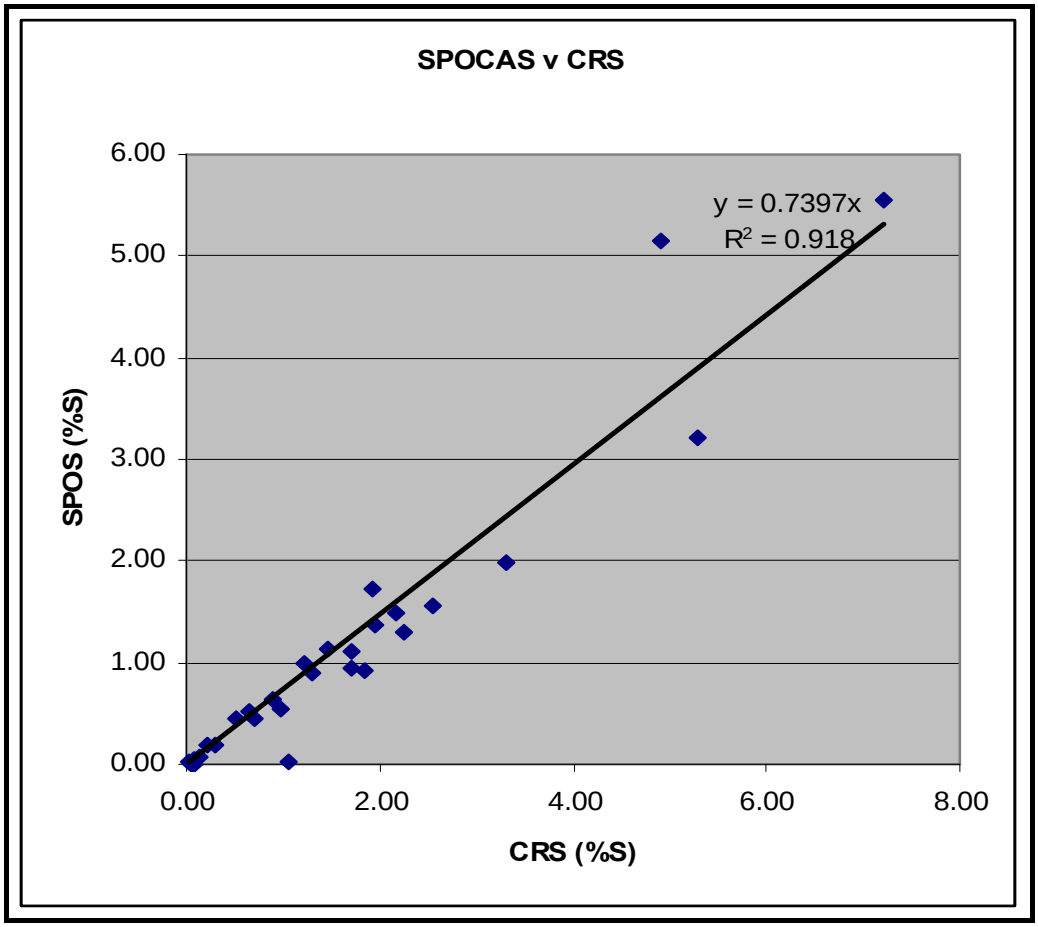


Figure 2 *SPOCAS (SPOS) against CRS scatter plot*

6.1 QA/QC

The validity and quality of the analytical data is an important factor in the overall assessment of the areas being investigated. The reproducibility and quality assurance of data provides the confidence in the accuracy of the reported results and the subsequent interpretation and assessment of the ASS potential of the areas of interest.

Duplicate analyses and method blanks were conducted on a total of 35 samples (13% of the total samples, n = 278), which was above the accepted number of duplicate samples of 1 in 20.

The Relative Percent Difference (RPD) was determined fro each of the duplicate samples. This is a measure of the reproducibility of the results, with the acceptable level generally between 10-20%. The RPD for the duplicate analyses, with the exception of several magnesium and calcium analyses, were within the acceptable range, and were predominantly between 0-20%.

The RPD for the parameters used for the overall assessment of the acid-generating potential of the soils, peroxide oxidisable sulfur (S_{POS} - %S) and Total Peroxide Acidity (TPA – mol H+/t), were within the range 0-20%, with the analytical results for samples reporting elevated RPD being close to the LOR.

A limited number of duplicate analyses, particularly for magnesium and calcium, reported RPD outside the acceptable range. For most of these samples, the reported concentrations of were close to the analytical detection limits, which resulted in the elevated RPD. Where the analytical results were above the LOR, the variation in the magnesium and calcium results may have been due to sample heterogeneity, as both magnesium and calcium are principally associated with shell material, which was not uniformally distributed throughout the sample.

Analysis of method blanks were all below the relevant limit of reporting (LOR) and were therefore considered acceptable.

Overall the analytical results and the method blank QC procedures were considered acceptable for the purposes of the investigation. The QA/QC laboratory results and report are provided in the GeoCoastal report (*Annex B)*.

7 DISCUSSION OF FINDINGS

The results from the sampling and analytical investigation conducted by ERM and Geo Coastal in October-November 2008 identified the presence of significant sulfur concentrations and net acidity within the sediments at both Friend Point and more particularly, on Curtis Island. Sampling at Friend Point was limited to 3 metres by the hand operated sampling equipment and the inability to access the site with the Geoprobe rig. The sampling depth was also based on the assumption that the planned excavations for the pipeline were to extend to a depth of 3 metres below AHD. The sampling on Curtis Island was conducted to determine the depth to the underlying Pleistocene basement, which was encountered at depths between 1-3 m bgl.

The geomorphological and facies modelling of the Friend Point and Curtis Island, were detailed in the report by GeoCoastal (*Annex B*), which identified a range of transgressive and progradational facies during the Holocene which resulted in deposition of silty sediments and mangrove forests across the areas of investigation. The input of organic-rich materials coupled with fine grained sediments provided the ideal setting for the development of ASS.

Field parameters (pH_F and pH_{FOX}) were measured on the soil cores at 0.25 m intervals to determine which samples should undergo further SPOCAS analysis. The field parameters revealed that pH_F in samples from Friend Point ranged between pH_F 4.04 – 8.81, whereas samples from Curtis Island ranged between pH_F 3.84 – 9.23. Acidic conditions were recorded predominantly in the upper 0.5 m at both sites, similar to previous findings reported by Ross (2005) and from the Wiggins Island Coal Terminal investigation (Connell Hatch 2007).

The results from the SPOCAS analysis revealed that soils from Curtis Island contained higher TPA (mol H^+/t) and S_{POS} (%S) than samples from Friend Point. The maximum Net Acidity (7.21 %S), recorded in sample BH-38 (0.8-1.0m), whilst not as high as the maximum value of 12.4 %S reported by Ross (2005) from the Narrows area, indicated that significant sulphur concentrations are present in the sediments. The results from the current investigation indicated that disturbance of soils in this area will necessitate the development of a stringent ASSMP to ensure that no environmental harm arises from the potential oxidation of this soil as a result of disturbance or excavation.

The analytical results indicated the variability in %S and TPA of the soils in both investigation areas. The variability indicated the presence of "hot spots" both across the sites and within individual profiles. The presence of "hot spots" identified as a result of the sampling and analysis of the sediments at Friend Point, and particularly on Curtis Island, indicates that further sampling may be necessary to fully delineate the acid-generating potential of the sediments, primarily in the areas designated for excavation works, but also in areas where significant use of fill material is proposed. The strategic sampling and analysis of sediments within these precincts will enable the development

of more site-specific management plans to address the issues associated with the disturbance of ASS.

Based on the results obtained from the ASS investigation conducted at Friend Point and Curtis Island, an acid sulfate soils management plan (ASSMP) will be required to address the issues arising from the disturbance of identified PASS soils during the construction phase of the works. This will include the development of the LNG plant at Curtis Island and the construction of the access road ways and gas pipeline from the mainland (Friend Point) across the Narrows to the LNG facility on Curtis Island.

The SPOCAS results indicated that excavations which may be undertaken, particularly on land < 5 metres AHD on Curtis Island, will require extremely high liming rates to mitigate the environmental impacts resulting from the (potential) oxidation of PASS. The calculated liming rates revealed that 12% of all samples from Friend Point and 47% of the samples from Curtis Island will require liming rates in excess of 100 kg $CaCO_3$/t, and up to 338 kg $CaCO_3$/t, to effectively neutralise the acid generating potential of the PASS identified in the current investigation.

The difference between the CRS and SPOCAS determination of sulfur content of the soils identified through the duplicate analyses reported in *Table 3.8* indicated that organic sulphur is present in the soils at differing amounts. The presence of organically bound sulfur should be considered during the development of the acid sulphate soil management plan (ASSMP), with the subsequent impact on the determination of liming rates to adequately neutralise all sulfur present within the sediments.

The identification of extensive elevated sulphur concentrations within the sediments from both locations will require liming rates well in excess of the > 25 kg $CaCO_3$/t (*Extremely High* treatment level) classification of Dear et al (2002). Given the extreme liming rates calculated for the complete neutralisation of the ASS material identified to date, it may be prudent to incorporate the ASS data obtained from the preliminary investigation on Curtis Island and Friend Point into the design and pre-construction considerations and subsequent ASSMP to avoid issues that may arise from disturbance of ASS material during subsequent site works.

Alternatively, given the maximum reported liming rate of 338 kg $CaCO_3$/t it may prove too costly or difficult to effectively treat these high net acidity (%S) values and therefore the best line of action may be to avoid any possible disturbance of soils where the liming rates are > 100 kg $CaCO_3$/t.

8 REFERENCES

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, Resource Sciences Centre, Indooroopilly

Ahern CR, McElnea AE, Sullivan LA (2004). *Acid Sulfate Soils Laboratory Methods Guidelines*. Queensland Department of Natural Resources, Mines and Energy, Indooroopilly, Queensland, Australia.

Connell Hatch (2006). Environmental Impact Statement Wiggins Island Coal Terminal Central Queensland Ports Authority and Queensland Rail

Dear SE, Moore NG, Dobos SK, Watling KM and Ahern CR (Eds) (2002). Soil Management Guidelines In *Queensland Acid Sulfate Soils Technical Manual*. Department of Natural Resources and Mines, Indooroopilly, Queensland, Australia

Dear SE, Moore NG, Watling KM, Fahl D and Dobos SK (Eds) (2004). Legislation and Policy Guide In *Queensland Acid Sulfate Soils Technical Manual*. Department of Natural Resources and Mines, Indooroopilly, Queensland, Australia

GeoCoastal Australia (2009). Acid Sulfate Soil and Geomorphological Modelling Report - Proposed QCLNG Facility, Gladstone, Queensland (unpubl) 36pp

Golder Associates (2009) Queensland Curtis Island Geotechnical Investigation Project Memorandum (19th January 2009)

Golder Associates (2009) Queensland Curtis LNG Geotechnical Investigation Project Memorandum (26th March 2009)

McDonald RC, Isbell RF, Speight JG, Walker J and Hopkins MS (1998). *Australian Soil and Land Survey Fieldbook*, 2nd Ed. Inkata Press, Melbourne

Queensland Government (2001*). Instructions for the Treatment and Management of Acid Sulfate Soils, 2001* Queensland Environment Protection Agency, Department of Natural Resources and Mines and Department of Primary Industries

Queensland Government (2001*).* State Planning Policy 2/02. *Planning and Managing Development Involving Acid Sulfate Soils*

Ross DJ. (2005). *Acid Sulfate Soils of the Narrows Area, Central Queensland Coast* Department of Natural Resources and Mines

Thomas BP, Fitzpatrick RW, Merry RH and Hicks WS, 2003. Acid Sulphate Soil Technical Manual (version 1.2) *Coastal Acid Sulfate Soil Management Guidelines*, Barker Inlet, SA. *CSIRO Land and Water, Adelaide*

Annex A

Sampling Locations - Friend Point and Curtis Island

Table A.1 Sampling Locations – Friend Point

Sample Location	Depth (m)	Easting	Northing
BH-1	3	0310180	7372293
BH-2	3	0310385	7372292
BH-3	3	0310590	7372281
BH-4	3	0310791	7372274
BH-5	3	0311015	7372270
BH-6	3	0311199	7372291
BH-7	3	0311400	7372299
BH-8	3	0311658	7372280
BH-9	3	0311930	7372276
BH-10	3	0312216	7372380
BH-11	3	0311828	7372306
BH-12	3	0311659	7372190
BH-13	3	0311483	7372084
BH-14	3	0311345	7371937
BH-15	3	0311195	7371798
BH-16	3	0311094	7371621
BH-17	3	0311020	7371445
BH-18	3	0310949	7371242
BH-19	3	0310845	7371069
BH-20	3	0310738	7370901
BH-21	3	0310659	7370739
BH-22	3	0310572	7370541
BH-47	1.5	0309951	7371734
BH-48	1.0	0309642	7371719
BH-49	0.5	0309344	7371698
BH-50	1.0	0309043	7371694
BH-51	3	0310736	7372085
BH-52	3	0310531	7371869
BH-53	3	0310249	7371766

Table A.2 Sampling Locations – Curtis Island

Sample Location	Depth (m)	Easting	Northing
BH-23	1.5	0315606	7370727
BH-24	2.0	0315652	7370576
BH-25	2.0	0315696	7370393
BH-26	3	0315908	7370255
BH-27	2.0	0316000	7369919
BH-28	3	0315895	7369881
BH-29	2.5	0315921	7369732
BH-30	1.5	0316138	7369722
BH-31	1.5	0316063	7369915
BH-32	1.0	0316023	7370224
BH-33	1.5	0315969	7370388
BH-34	2.5	0315965	7369837
BH-351	n.a.	0316073	7369649
BH-361	n.a.	0316214	7369515
BH-371	n.a.	0316342	7369353
BH-38	.2.5	0315831	7370284
BH-30	2.0	0315797	7370377
BH-40	1.5	0315751	7370460
BH-41	0.5	0315746	7370561
BH-42	0.5	0315670	7370629
BH-43	1.5	0315524	7370736
BH-44	2.5	0315562	7370636
BH-45	0.5	0315648	7370565
BH-46	1.0	0315641	7370361

1. Sample points BH-35, BH-36, BH-37 were not sampled as the points were located on a narrow grassed strip (3-6 metres wide) between the mangroves and island which was not accessible to the drilling rig.

Legend

Monitoring Location

Figure A1

Acid Sulfate Soil Sampling Locations - Friend Point

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	09/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by:-
Scale:	Refer to Scale Bar	

N

0 40 80 160 240 320 m

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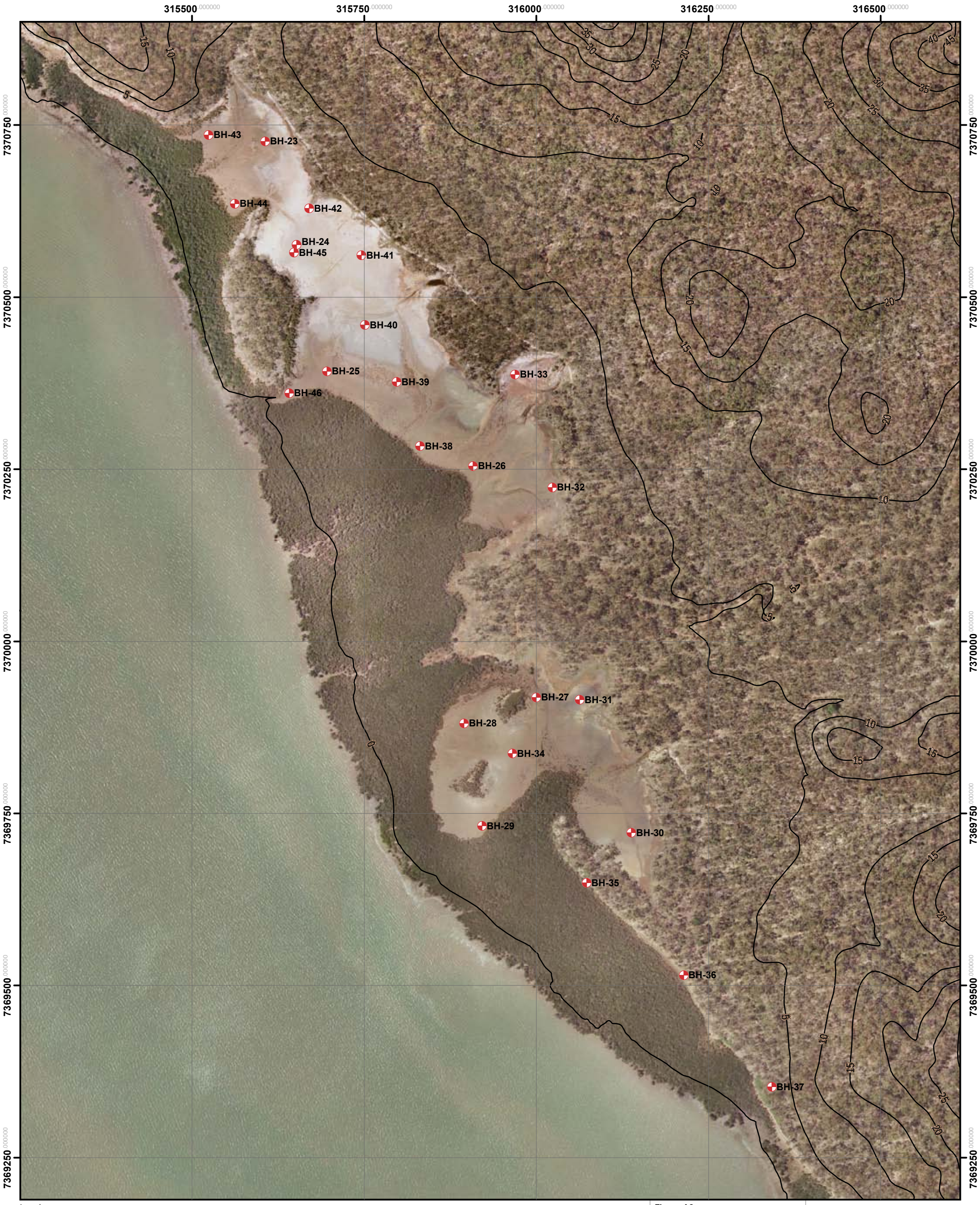

Legend

Borehole Locations

Elevation Contours (mAHD)

Figure A2

Acid Sulphate Soil Sampling Locations - Curtis Island

QUEENSLAND CURTIS LNG
A BG Group – QGC Alliance

Client:	BG/QGC
Project:	Queensland Curtis LNG Project
Drawing No:	0086165s_GS_GIS005_R0
Date:	17/12/2008
Drawing size:	A4
Drawn by:	JF
Reviewed by:	GO

Source Note:
Source: Department Infrastructure and Planning

Note: Boreholes BH35, BH36 and BH37 were not analysed in this study.

Projection: UTM MGA Zone 56 Datum: GDA 94

Disclaimer:
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N

0 20 40 80 120 m

Scale: **1:5,000**

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Annex B

GeoCoastal (2009) Report

ACID SULFATE SOIL AND GEOMORPHOLOGICAL MODELLING REPORT

PROPOSED QCLNG FACILITY, GLADSTONE, QUEENSLAND.

Prepared for

BG Group

March 2009

T.L. Graham & R.M. Larsen

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EXECUTIVE SUMMARY

GeoCoastal (Australia) Pty Ltd was commissioned by ERM Pty Ltd on behalf of BG Group to conduct an Acid Sulfate Soils survey in lands below 5m AHD within areas on the south-western coast of Curtis Island and Friend Point on the mainland coast, north of Gladstone, Queensland, where development of an LNG Facility and associated infrastructure / service routes are proposed.

The program involved acid sulfate soil assessment of an embayment tidal flat area on Curtis Island, and along a proposed road and pipeline route traversing a tidal isthmus from the mainland to Friend Point, from where a bridge across The Narrows is proposed. The sample analysis plan was dictated by a strategy that was primarily focussed on filling, and therefore sampling was conducted to the 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 vibra-vacuum rig, and manual piston coring at 50 land sites. A total of 280 samples were analysed using the sPOCAS suite, and 10% were repeated using the CRS test.

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 soils (PASS), and there is also a widespread occurrence of generally low level Actual acid sulfate soil (AASS). The combination of high ASS and the poor geotechnical properties of the generally very soft, organic sediments is challenging for construction. An iterative process between site engineers, acid sulfate soil consultants and regulators is proposed in order to integrate best practice acid sulfate soils management with the proposed development.

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Acid Sulfate Soil and Geomorphological Modelling Report: Proposed QCLNG Facility, Gladstone, Queensland.

1 INTRODUCTION

1.1 BACKGROUND

GeoCoastal (Australia) was commissioned by ERM Australia Pty Ltd on behalf of the BG Group to undertake an Acid Sulfate Soil assessment of areas that would be disturbed by construction of the proposed LNG Facility and supporting infrastructure in accordance with legislative requirements in areas subject to excavation or filling below the level of 5 metres AHD.

The proposed LNG Facility is to be located on Curtis Island, 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 (Figure 1). Further road/pipleline access will be required to be constructed in an easterly or south-easterly direction from Friend Point.

1.2 GEOLOGICAL SETTING

1.2.1 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.

Determination of the local upper Pleistocene and Holocene sedimentary sequences was part of the objective of the coring program undertaken and are thus provided within the body of this report.

1.3 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.

Figure 1 Location map of proposed QCLNG facilities on Curtis Island and Friend Point.

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:

i. *Field methodologies* including advanced continuous coring methods, geomorphological logging of sedimentary sequences, and field pH testing
ii. *Coastal facies modelling, laboratory analysis* and determination of *ASS/Stratigraphic Relationships*
iii. *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.

Please refer to more detailed explanation of this investigation system included in Section 8.

1.4 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.

1.5 PROGRAM OBJECTIVES

The objectives of the sediment investigation were to:

- Conduct an acid sulfate soil investigation which complies with prevailing state and local government guidelines and policies;
- 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
- 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.

2 SCOPE OF WORKS

2.1 SAMPLING AND ANALYSIS PROGRAM

Sampling and analysis were conducted with reference to the documents –

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

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

2.1.1 Sampling rationale

The sampling strategy in the two 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.

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

2.2 FIELD WORK

2.2.1 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.

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.

2.2.2 Core Locations

Acid sulfate soil core locations were recorded by hand-held GPS.

2.2.3 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.

2.2.4 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 0.25m down the borehole, according to the Queensland Sampling Guidelines. A spear point pH electrode and field pH meter were used and peroxide reaction characteristics were noted.

2.3 LABORATORY METHODS AND DATA PRODUCTION

2.3.1 Laboratory Analysis

Samples downcore were selected by a senior geomorphologist with consideration of facies boundaries and stratigraphic uniformity vs variability and were submitted to ALS Environmental laboratory, Brisbane, (a NATA accredited laboratory). Samples were analysed using sPOCAS (suspension Peroxide Oxidation Combined Acidity & Sulfur) suite Acid Base Accounting according to the *Acid Sulfate Soils Laboratory Methods Guidelines* chapter of the Queensland Acid Sulfate Soils Technical Manual (2005). 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. Sediments within the subject area have previously been shown to have high levels of organic matter (Ross 2005; 2 to 9% Total Organic Carbon) that may contribute to an over-estimate of the amount of oxidisable sulfur present. Therefore, Chromium Reducible Sulfur (CRS) analysis was additionally undertaken on one in every ten samples submitted. The CRS method extracts inorganic sulfur only (eg. pyrite) compared to the suspension Peroxide Oxidisable Sulfur (sPOS) test which includes both organic and inorganic sulfur.

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

2.3.2 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 progenetive 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.

To allow fuller understanding of how the Net Acidity (N.A) results relate to their soil/sediment profile, the oxidisable sulfur and TAA values in addition to N.A values (as %S) were plotted against depth in the digital logs. This enables demonstration of situations where inherent buffering capacity of the (usually shelly) sediments may override the acid producing potential from reduced sulfides.

2.3.3 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.

2.4 ACID SULFATE SOILS 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.

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.

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

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

Figure 2 Location of ASS boreholes and transects for stratigraphic cross sections in the Friend Point area.

Figure 3 Location of ASS boreholes and transects for stratigraphic cross sections on Curtis Island.

3 RESULTS

3.1 PRESENTATION OF DATA

As mentioned above, the ASS chemistry data are shown graphically against stratigraphic and sedimentary attributes in the digital log displays (Appendix 1). Field pH data are provided in Appendix 2. Laboratory Certificates from ALS are given in Appendix 3 and Chain of Custody/Quality Assurance documents in Appendix 4.

The stratigraphic information was used to compile five cross sections illustrating the depositional sequence(s) across the site. Concentrations of Net Acidity (NA) are displayed against each core sample on the cross sections which are presented in Appendix 5. NA values and Titratable Actual Acidity (TAA) concentrations at depths of 1, 2 and 3 metres below ground level are displayed for the Friend Point and Curtis Island areas in Appendix 6. These sets of figures are referred to throughout the following section.

3.2 BOREHOLE LOCATIONS

A total of 50 sites were cored. The core sites are shown in Figures 2 and 3 for Friend Point and Curtis Island respectively. The 29 cores in the Friend Point area (cores #1 to #22 and #47 to #53) were undertaken at intervals of approximately 200 m to assess the proposed pipeline route and bridge access roads.

Borehole co-ordinates for are given in the following tables.

FRIEND POINT					
Borehole	Easting	Northing	Borehole	Easting	Northing
BH-1	310180	7372293	BH-16	311094	7371621
BH-2	310385	7372292	BH-17	311020	7371445
BH-3	310590	7372281	BH-18	310949	7371242
BH-4	310791	7372274	BH-18	310949	7371242
BH-5	311015	7372270	BH-19	310845	7371069
BH-6	311199	7372291	BH-20	310738	7370901
BH-7	311400	7372299	BH-21	310659	7370739
BH-8	311658	7372280	BH-22	310572	7370541
BH-9	311930	7372276	BH-47	309951	7371734
BH-10	312216	7372380	BH-48	309642	7371719
BH-11	311828	7372306	BH-49	309344	7371698
BH-12	311659	7372190	BH-50	309043	7371694
BH-13	311483	7372084	BH-51	310736	7372085
BH-14	311345	7371937	BH-52	310531	7371869
BH-15	311195	7371798	BH-53	310249	7371766

Table 2 Location coordinates for ASS Boreholes in the Friend Point area. Projection UTM MGA Zone 56, datum GDA 94.

CURTIS ISLAND					
Borehole	Easting	Northing	Borehole	Easting	Northing
BH-23	315606	7370727	BH-34	315965	7369837
BH-24	315652	7370576	BH-38	315831	7370284
BH-25	315696	7370393	BH-30	315797	7370377
BH-26	315908	7370255	BH-40	315751	7370460
BH-27	316000	7369919	BH-41	315746	7370561
BH-28	315895	7369881	BH-42	315670	7370629
BH-29	315921	7369732	BH-43	315524	7370736
BH-30	316138	7369722	BH-44	315562	7370636
BH-31	316063	7369915	BH-45	315648	7370565
BH-32	316023	7370224	BH-46	315641	7370361
BH-33	315969	7370388			

Table 3 Location coordinates for ASS Boreholes on Curtis Island.
Projection UTM MGA Zone 56, datum GDA 94.

3.3 STRATIGRAPHY

3.3.1 Friend Point Transects

The stratigraphy discussed in the following text is displayed in Figures 1 to 3 of Appendix 5.

3.3.1.1 Pre-Holocene Facies

The pre-Holocene mature soil/rock substrate was not intersected by coring along this transect, as it was beyond investigation depth. However, a manual penetrometer survey was conducted along the transect to test the depth of this substrate for engineering purposes. Therefore, the pre-Holocene is not characterised, other than by approximate depth.

3.3.1.2 Holocene Facies

Estuarine central-basin silt clay

These sediments were encountered toward the base of the intersected sequence in the majority of boreholes (i.e. BH #11 to BH#19), and are characteristic of deeper central-basin suspension sediment accretion in large proto-estuary/restricted marine depositional settings such as Port Curtis. Materially they are very dark greenish grey, moist, soft, poorly plastic, silt/clay sediments. These sediments are 'unripe' and despite commonly being described (incorrectly) as 'marine clays' because of their high visible shell content, they generally incorporate a high percentage of silt.

A very soft clayey silt deposit succeeds this deeper silt/clay deposit in Boreholes #18 to #20, and is interpreted as a later, but associated, phase of similar shelly suspension sediment deposition. A winnowed shell concentration is observed toward the upper boundary of this deeper facies in a number of boreholes (e.g. BH #15, BH #17, BH #18, & BH #20), suggesting that accretion had raised the seabed to within range of the strong tidal currents that operate through this area.

Estuarine basin silt clay sediments were also intersected in Borehole #21, and it is tempting to see this as contemporaneous deposition with the basal sequence observed in Boreholes BH#11 to BH#19. However, both the intervention of the clayey silt deposit in BH#20 (refer Figure 1, Appendix 5) and the coarse shelly sand deposits in BH#21 make it difficult to reconcile as a contiguous deposit. The up-sequence transition in BH#21 to progressively coarser channel deposits is consistent with there having been a passage at this location, within which deposition post-dated the adjacent sequence.

Mangrove clayey silt

The early phase of shelly silt clay deposition was succeeded by highly organic, very soft, clayey silt sediments signalling the establishment of mangroves. Accretion of the deeper silt clays had raised the seabed to within range of mangrove colonisation (i.e. approaching mean sea level). This deposition dominates the majority of the intermediate sequence intersected (~-0.25m to ~1.25m AHD), except for the coarse sandy deposition in the western passage discussed earlier (BH#21), and other lower energy passages where fine muddy sandy sediments dominate. A wide passage is identified at the eastern end of the transect as it approaches Friend Point (BH#11 to BH#14).

Upper tidal/Supratidal clayey silt and silty clay

The mangrove phase is succeeded up sequence by relatively organic-free, very soft, clayey silt deposition between Boreholes #11 to #18, suggesting that the main mangrove forest had prograded , leaving this area as a protected tidal flat environment. Progressively a supratidal cap of soft to firm silt/clay has mantled this tract forming a sedimentary isthmus between the mainland and Friend Point.

3.3.2 Curtis Island Tidal Flats

The stratigraphy discussed in the following text is displayed in Figures 4 and 5 of Appendix 5.

3.3.2.1 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 ranging to 2.75m+ beneath the mangrove fringe.

This substrate is characteristically composed of greenish grey (mottled) to brown/olive grey, clay: stiff to very stiff, moderately to highly plastic, gravelly in places. A shallow zone of discolouration immediately below the surface of these clays was observed in a number 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 a large number of boreholes pebble beds were encountered, which have experienced penetration of the overlying Holocene-age sediments within the pore spaces.

3.3.2.2 Holocene Facies

Small embayments such as the one that is the subject of this assessment can achieve a similar complexity of depositional evolution to a larger embayment, but compressed into a shorter distance.

As such the depositional sequence illustrated in Figure 5 (Appendix 5) reveals a complex suite of facies with a diverse physical character. The shallower, northern embayment reveals a less complex sequence (Figure 4).

Transgressive sandy gravelly lag

A coarse sandy, gravelly lag mantling the antecedent clay substrate testifies to the inexorable march of the rising early Holocene sea across the landscape (i.e. the Holocene marine transgression). As sea level began to reach its maximum position (i.e. 'stillstand') dynamic shoreline processes deposited a ridge of this sandy gravelly sediment toward the rear of the embayment (e.g. Boreholes #30, #31, #32, #33, #41, #41). Abundant organic debris among this gravel indicates that mangroves had colonised this rearward embayment strand deposit. Three factors contribute toward the development of a coarse ridge in rearward embayments:

I. energy arriving at the shore is not sapped by shallow nearshore deposits,
II. the cessation of sea level rise allows a single position to be reinforced by repeated high energy events,
III. iii. turbulence created by the baffling effect of mangrove roots.

Stillstand gravelly silt/clayey sand ridge

This deposit is essentially the further development of the terminal transgressive ridge described above after sea level has ceased to rise, and is intersected in Borehole #31.

Stillstand nearshore clayey silt

The cessation of sea level rise allows sedimentary processes to commence filling the submarine 'accommodation' provided by the marine transgression. This deposit is the characterised by soft, suspension silt/clay sediments which have accreted in the nearshore providing habitat for shell bearing organisms. This facies is encountered in the southern embayment where the pre-Holocene substrate is deeper (Boreholes #28 and #29).

Progradational mangrove ridge

In the southern embayment accretion of the nearshore as described above has provides a platform for the deposition (chenier-like) of a coarse strand deposit along the mouth of the embayment (Boreholes #28 and #29). Within this depositional scenario a storm deposit becomes the locus for longshore movement of coarse material and subsequently the colonisation of mangroves. In this manner the shoreline steps seaward intermittently, and there may be other similar ridges within the embayment sediments.

Progradational nearshore and mangrove deposits

These very soft, highly organic clayey silts are laid down initially in the immediate nearshhore of a mangrove shoreline, and are subsequently enveloped by the seaward progradation of this shoreline. Texturally the lower lower and upper sequence are the same, the main distinction being a greater percentage of organic debris in the upper in response to a more direct mangrove influence. This facies represents the main depositional type throughout the embayment

Progradational mangrove gravelly, sandy clayey silt

This deposition is the perpetuation of, and subsequent seaward migration of, the initial embayment mouth ridge (progradational mangrove ridge) that is described above. This is most likely due to the combination high energy events and turbulence created by the baffling effect of mangrove roots in the main, but may also be influenced by gradual elevation of the shoreline by long term adjustments in the earth's asthenosphere (i.e.hydroisostacy).

Supratidal surface silty clay layer

This layer presents a firmer and moderately plastic surface veneer over the very soft underlying sediments, and is deposited in a primarily subaerially exposed environment. It develops to a thickness of ~0.25m on the main tidal flat and feathers out of existence as it approaches the lower lying mangrove fringe.

Colluvial fan

The ultimate Holocene deposit witnessed commonly along the rear of the tidal flat is a colluvial fan of terrestrially sourced silty clays including sand and gravel in places.

3.4 ACID SULFATE RESULTS

3.4.1 Field pH tests

Field-measured pH values of samples before and after oxidation with hydrogen peroxide are shown graphically in the core logs (Appendix 1) and tabulated in Appendix 2.

Field pH values for cores ranged from 3.84 through to 9.32. The former reflect the sediments with actual acidity which had low pH drops after peroxide oxidation and generally nil or small reactions to the peroxide.

In contrast, the highly reactive organic Holocene silty clays showed large pH drops (generally 5-6.5 units up to 7 pH units) from the usual field pH range of around 7.1 – 8.3.

A number of high 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). Cores with Pleistocene material at depth (3 metres in this survey) were obtained from the Curtis Island area only, eg., #24, 25, 28, 30, 31, 34, 44.

3.4.2 Laboratory Sediment Chemistry

A total of 280 samples were submitted for sPOCAS suite analysis, with 28 also analysed for CRS. Laboratory results from all analyses are provided in Appendix 3. There were a number of Net Acidity results of 0.04%S, as calculated by the laboratory's computer program, representing the sum of the sPOS result of 0.03%S and a TAA result of <0.02%S (the Limit of Reporting [LOR] for this analysis). A figure of 0.01%S (half the LOR of the TAA analysis) is used in the calculation. These two results taken independently would be considered to indicate non-significant acid sulfate content. It is proposed that the resultant 0.04%S, although above the action threshold, is taken to indicate only marginally significant ASS.

Generally, the NA values calculated by the laboratory were verified (by one of the authors of this report) to be correct although they often differed by 0.01 or occasionally 0.02 %S due to the use of more decimal places in their calculations, giving a result which is then reduced to two for reporting.

3.4.2.1 sPOCAS versus CRS

As noted previously, one in ten samples was analysed for oxidisable sulfur using the Chromium Reducible Sulfur method as well as sPOS, and these results are also shown in the Certificates of Analysis. A scatter plot of the two pairs of analyses (n = 28) was generated and is provided in Figure 4. This graph shows that for most samples there was a direct correlation between the two methods (R^2 = 0.98) although the trendline was biased away from the ideal (y = x) towards the sPOS axis. At the lower levels, eg. less than 0.1%S, values were similar; these samples were from surface materials, generally non-acid sulfate soils. The predominance of samples with higher %S concentrations were from estuarine silt clays with numerous to abundant organic debris or fragments. These results support previous statements that in organic sediments the sPOS method returns higher levels of oxidisable sulfur than the CRS method.

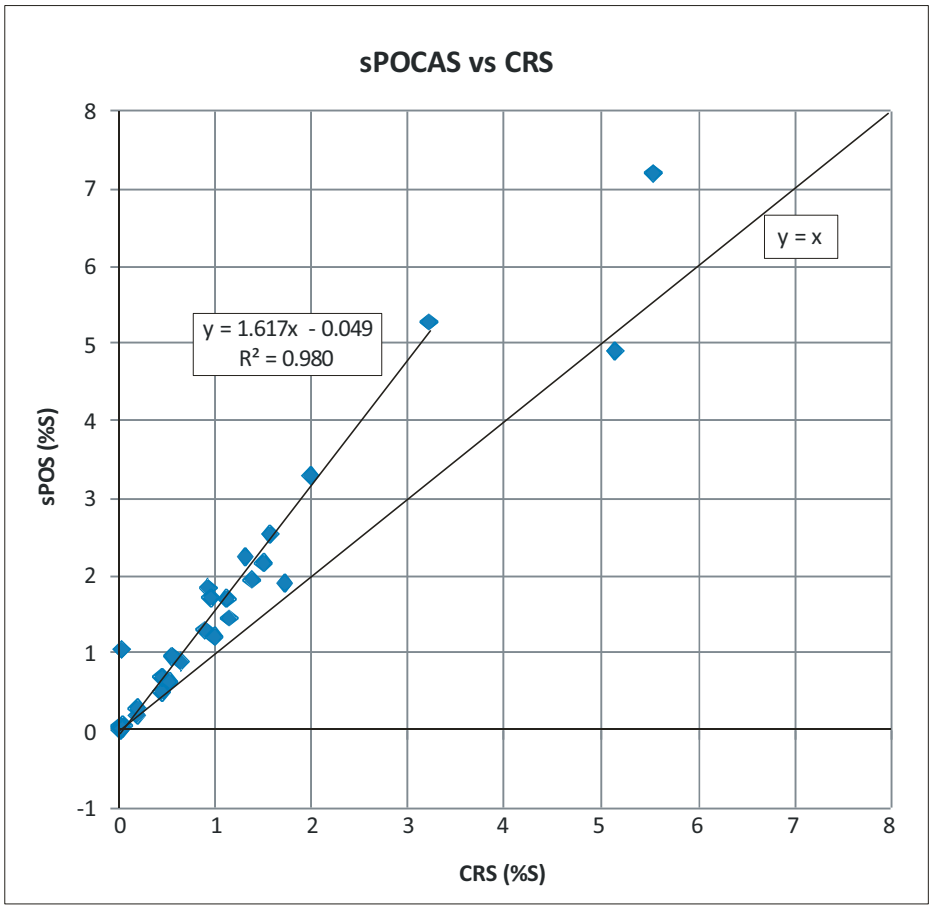


Figure 4 Relationship between oxidisable sulfur concentrations analysed by CRS and sPOS methods.

3.4.2.2 Friend Point Laboratory results

Laboratory data from Friend Point core samples are summarised in Table 4.

Of the samples analysed for TAA, 14 had levels ≥ 0.03%, with the maximum recorded at 0.08 %S. These are shown spatially for one metre depth intervals in Figures 4 - 6 of Appendix 6.

Values of sPOS ≥ 0.03 %S were recorded in all samples, with 11 samples less than 0.1 %S. Approximately two-thirds of samples had excess Acid Neutralising Capacity (either measured directly as ANCe (QASSIT method 23Q) or by a combination of acid reacted calcium plus magnesium divided by the fineness factor. A maximum of 1.9 %S (equivalent) and overall mean of 0.22 %S (equivalent) was recorded. The presence of this neutralising or buffering capacity led to the overall Net Acidity of 16 samples being negative, that is having Net Alkalinity. These samples were generally from either the surface or at depth (3 m BGL) where there was a notable shell presence (see logs in Appendix 1 and Figures 1 to 3 of Appendix 5**).**

Of ten samples where retained acidity was measured (as net acid-soluble sulfur [NAS]), five had values greater than the laboratory's Level of Reporting (0.02 %S equivalent) with a maximum of 0.06 %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.

Net Acidity values ranged from negative concentrations as discussed above to a maximum of 3.74 %S (sPOS). Almost all cores had NA concentrations less than the action threshold of 0.03 %S or negative in surface samples (0-0.1m BGL) and some also at depth. NA values were generally highest in the 0 – 1 metre depth range, however significant levels (> 1.0 %S) also occurred down to 3 metre depths (refer Figures 1 – 3 in Appendix 6).

Analyte	Unit	LOR	Max	Min	Mean	n
Titratable Actual Acidity	% pyrite S	0.02	0.08	<0.02	0.013	186
Net Acid Soluble Sulfur	% pyrite S	0.02	0.06	<0.02	0.03	10
Potential Oxidisable Sulfur	% S	0.02	3.72	<0.02	1.36	186
Excess ANC / calcium + magnesium[#]	% pyrite S	0.02	1.90	0.02	0.20	121
Net Acidity	% S	0.02	3.74	-0.49	1.08	186

[#] *Sum of Acid Reacted Calcium and Magnesium values divided by the fineness factor (1.5).*

Table 4 Summary of laboratory data for ASS cores from Friend Point.

3.4.2.3 Curtis Island Laboratory Results

Laboratory data from Curtis Island core samples are summarised in Table 5.

TAA was measured above the 0.03 %S (equivalent) threshold within the top metre of 14 of the 21 core sites with number of positive sites reducing at the 2 metre level and none present at 3 metres BGL (illustrated spatially in Figures 10-12 of Appendix 6). The values ranged up to a maximum of 0.16 %S (equivalent). Retained acidity was measured at levels greater than 0.03 %S (equivalent) in nine of the 25 samples analysed with a maximum of 0.16 %S. These samples were from within the top metre but not at the surface.

Potential Oxidisable sulfur concentrations (sPOS) ranged from below the laboratory detection limit to a maximum of 7.2 %S. Apart from 27 samples where excess ANC values allowed a reduction of the Net Acidity, the NA results were a close reflection (or slightly higher due to actual acidity influence) of the sPOS concentrations. The highest NA values generally occurred within the top metre although very high levels (greater than 2.0 %S) were still present in a number of cores in the 2 – 3 metre depth

range (illustrated in Figures 7 – 9, Appendix 6). Around half the core locations had NA concentrations less than the action threshold of 0.03 %S or negative in surface samples (0-0.1m BGL).

Analyte	Unit	LOR	Max	Min	Mean	n
Titratable Actual Acidity	% pyrite S	0.02	0.16	<0.02	0.031	94
Net Acid Soluble Sulfur	% pyrite S	0.02	0.12	<0.02	0.028	25
Potential Oxidisable Sulfur	% S	0.02	7.20	<0.02	2.20	94
Excess Acid Neutralising Capacity	% pyrite S	0.02	0.76	<0.02	0.10	27
Net Acidity	% S	0.02	7.21	-0.08	2.18	94

Table 5 Summary of laboratory data for ASS cores from Curtis Island.

4 SEDIMENTARY FACIES/ACID SULFATE SOIL ASSOCIATIONS

4.1 INTRODUCTION

As discussed in the introduction it is the objective of the geomorpholocial/facies modelling approach to examine the relationship between discrete depositional elements and the distribution of acid sulfate soils results, in order to provide a predictive model of acid sulfate soil occurrence.

4.2 FRIEND POINT TRANSECT

4.2.1 Holocene Facies

4.2.1.1 Estuarine central-basin silt clay

These sediments accrete as uniform suspension sediments in large proto-estuarine water bodies. They occupy the submarine accommodation between the marine flooded (transgressed) surface and a level which shallow processes can begin to produce more diverse deposits.

From an acid sulfate soil perspective they present, as a background, a quiescent, anaerobic environment that is favourable for ASS development, but it is inherently divergent positive and negative forces which ultimately determine the strength of acid sulfate potential. These competing forces are governed on the one hand by the presence of organic carbon (i.e. which stimulate the bacterial action), and the presence of calcium carbonate which provides acid neutralisation capacity. This latter is commonly identified as visible shell content, however, the contribution of microscopic carbonate (e.g. foraminferal tests) may be equally or more important.

The contrasting influences of the organic carbon and calcium carbonate fractions are well illustrated in the Friend Point transects. Commonly inherent PASS is observed at significant levels of ~1.75% ± ~0.5% (sPOCAS), but at some locations where a strong organic presence is recorded and little shell such as in Boreholes #1, #4 and #53 PASS levels are elevated in the range of 2% to >3%S. Calcium carbonate provides varying degrees of neutralisation capacity in most boreholes reducing PASS levels commonly to levels of ~1.0% ± ~0.5% (sPOCAS), but in places (e.g. the base of Boreholes #12 and #15) may provide total neutralisation.

A winnowed shell layer occurs near the upper boundary of this facies in a number of boreholes (e.g. BH#15, #17,#18 & #20), resulting in a corresponding neutralisation spike.

Mangrove clayey silt and passage clayey silty sands

These highly organic, very soft, clayey silt sediments would have accreted in very close proximity to mangroves which have subsequently prograded seaward from this position. This depositional environment represents the classic scenario for acid sulfate soil formation, that is, low-energy, organic-rich, anaerobic sediments with little inherent neutralisation capacity. Consequently, high levels of PASS (i.e. commonly in the range of 2%S to 3+%S - SPOCAS) are recorded in this facies.

Upper tidal/Supratidal clayey silt and silty clays

In the great majority of boreholes this facies, which is largely devoid of a visible organic content, has low to negligible levels of PASS, although notable exceptions such as BH #13 (1.11%S) and BH #22 (3.05%S) are contrary to this generalisation.

4.3 CURTIS ISLAND SITES

4.3.1 Pre-Holocene Facies

The pre-Holocene-aged sequence encountered at all sites relates to residual soils of substantial antiquity, and therefore does 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 that has been reported by the authors and other workers at a number of locations in Queensland, where a shallow zone of discolouration occurs immediately below the surface of these pre-Holocene clays. This phenomenon is interpreted by the authors as a zone of infiltration by overlying Holocene-age interstitial water.

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. This is observed in two boreholes; Borehole #38 where penetration of pre-Holocene clayey gravels has produced a positive result of 1.38%S, and in Borehole #46 where an exceptionally high result of 5.2%S is recorded in the immediate pre-Holocene substrate.

Generally this infiltration effect is confined to the upper 0.5m of the pre-Holocene substrate.

4.3.2 Holocene Facies

Transgressive sandy gravelly lag

Net acidity results in these basal gravels were variable, but range to high (e.g. 3%S) levels in places where there has been a close association with mangroves.

Stillstand gravelly silt/clayey sand ridge

This facies was not intersected in many boreholes, but revealed a level of 2.27%S (sPOCAS) in Borehole #31.

Stillstand nearshore clayey silt

This facies appears to be restricted to the southern area of the embayment where the pre-Holocene substrate is deeper (Boreholes #28 and #29). The presence of calcium carbonate has had some neutralising effect in this facies, however, values still range between 1 %S to >2 %S because of the proximity to a supply of organic carbon.

Progradational mangrove ridge

Again this facies appears to be confined to the southern portion of the embayment (Boreholes #28 and #29), and given its immediate proximity to mangroves, has a high potential for acid sulphate soil development .

Progradational nearshore and mangrove deposits

These very soft, highly organic clayey silts form the bulk of the Holocene deposition underlying the tidal flats within the embayment, and similar to their Friend Point counterparts described previously, they represent the classic scenario for acid sulfate soil formation, that is, low-energy, organic-rich, anaerobic sediments with little inherent neutralisation capacity. Consequently, very high levels of PASS (i.e. commonly in the range of 2 %S to 7 %S - sPOCAS) are recorded in this facies. Generally there is a trend toward increasing PASS up sequence coinciding with the seaward progradation of the mangrove forest.

Progradational rear mangrove gravelly, sandy clayey silt

This deposit was only intersect in Borehole #29, but may be indicative of the area currently occupied by the mangrove forest. It has a predictably high level of 2+%S.

Supratidal surface silty clay layer

Similar to its Friend Point counterpart this layer often shows low to negligible levels of ASS, but exceptions such as in Boreholes #23, #25 and #34 defy making this a generalisation.

Colluvial fan

Generally it might be expected that these terrestrially sourced, subaerially deposited sediments would be acid sulfate benign, however, a positive result in the surface of Borehole #31 again indicates caution when making this assumption.

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.

5 ACID SULFATE SOIL: POTENTIAL IMPACTS

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

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

5.1 POTENTIAL ACID SULFATE SOILS

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 approximately 0.5m immediately below the Holocene/Pleistocene boundary in some boreholes revealed an inheritance of moderate acid sulfate soil potential from the overlying sequence by infiltration of interstitial waters.

Environmental risk from site construction activities may occur in three main ways:

1. direct disturbance and exposure of PASS to an oxidising environment,
2. lowering of the water table on site leading to *in situ* oxidation of PASS

3. filling – an identifiable risk from 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).

5.2 ACTUAL ACID SULFATE SOIL

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

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

5.3 MITIGATION OF ACID SULFATE SOIL IMPACTS

5.3.1 Potential Acid Sulfate Soil

This acid sulfate soil assessment has revealed the presence of substantial levels of PASS, and as such development plans of the site will need to remain cognisant of the need to develop a best practice Acid Sulfate Soil Management Plan. As such a strategy is being developed for an iterative process whereby site engineers, acid sulfate soils consultants and regulatory authorities integrate acid sulfate soil management with the site development proposal to refine a best practice ASSMP.

In response to the three main risks identified in the previous section:

1. Disturbance - 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
2. Groundwater drawdown – a regimen of groundwater investigation, monitoring and modelling is required to provide a baseline dataset. Careful management of the water table will be required if the ultimate strategy is to leave sediments *in situ.*
3. 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:

i. filling at a rate that controls the development of bulging; and
ii. 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.

5.3.2 Actual Acid Sulfate Soil

1. Disturbance – excavation and neutralisation of the Actual Acid Sulfate Soil layer is problematic because it is logistically difficult to selectively remove this layer without creating a major exposure of very volatile PASS underlying. The very soft, poorly cohered nature of the material makes it difficult to work with equipment.
2. Filling - as noted above, the restriction on filling over AASS presents a substantial limitation on any proposal to fill existing embayment tidal sediments with dredge spoil and or terrestrially sourced sediment. However, some aspects of this particular area and an adjacent source of possible fill, may provide a basis for examining a strategy whereby filling can 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. recent testing of marine sediments from the adjacent offshore have an excess calcium carbonate neutralising capacity (*pers. obs*.) and may provide a source of fill;
    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 with select marine dredge spoil could occur on these tidal flats without creating an environmental impact.

6 REFERENCES

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, Sullivan LA. (2004). *Acid Sulfate Soils Laboratory Methods Guidelines.* In: *Queensland Acid Sulfate Soil Manual 2004.* Dept. Natural Resources, Mines and Energy, Indooroopilly, QLD.

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 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.

Ross D.J (2005). *Acid Sulfate Soils, Keppel Sands Yeppoon Area, Central Queensland Coast.* Dept. Natural Resources and Mines, QLD., QNRM03370.

State Planning Policy 2/02: *Planning and Managing Development Involving Acid Sulfate Soils.*

7 ACID SULFATE SOIL ASSESSMENT: SAMPLING DENSITY

Justification for undertaking reduced sampling density for ASS Assessment using Coastal Facies Modelling Approach

The sampling regime defined in the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998* is rigorous in order to provide a sufficient density of data to achieve a level of confidence in a 'black box' style investigation. The progressive development of geological methods of data acquisition and scientific synthesis has historically been aimed at providing 'illumination' within this underground 'black box'. Commencing some 15 years ago at a time when GeoCoastal's Principal Geologist, [§]Dr. Trevor Graham, managed the Commonwealth Government's national Coastal Geology Program, he began actively pursuing and refining geological procedures for providing enhanced associations between acid sulfate soil properties and the sedimentary bodies ('facies') within which they occur.

From this research and development a tripartite system of assessment has evolved which has generally been recognised by regulatory authorities over the past decade as providing a superior level of information from a reduced density of field sampling. This system has generally been both endorsed and preferred by state and local government authorities such as the Queensland Acid Sulfate Soils Investigation Team (QASSIT: Queensland Dept. of Natural Resources and Water), Queensland Environmental Protection Agency, and a number of local governments. GeoCoastal have been contracted directly by QASSIT, EPA and Gold Coast City Council to apply this style of investigation. Dr. Graham has presented this methodology at a number of scientific conferences, and by invitation at QASSIT workshops, and has supervised a number of post-graduate students working within QASSIT on this methodology.

The tripartite geological system approach used by GeoCoastal involves the following elements:

1. **Field methodology -**
   Continuous coring - GeoCoastal were the first to introduce 100% undisturbed continuous core recovery in unconsolidated sediments in Queensland, and have progressively refined this methodology to provide rapid, high-quality core to 24m depth in all sedimentary media within which acid sulfate soils occur, such as liquefied silts, flowing sands, and estuarine silt/clays.
   Geomorphological logging – GeoCoastal's senior coastal geologists (ie. each with >25 years of professional geological background) conduct detailed geomorphological logging of coastal 'facies' in the field. This allows for a scientifically directed sampling strategy aimed at providing the best understanding of a site. These detailed logs produced by highly experienced scientists provide an essential foundation for the following stages.

2. **Coastal Facies Modelling and Examination of ASS/Facies Associations -**
   Composite digital graphic logs – detailed logging conducted in the previous stage provides for scientific selection of samples to best define associations between sedimentary facies and acid sulfate soil character. Detailed field logs are then converted to an equally detailed broadsheet format including graphic presentation to assist in the assimilation of information. The results of laboratory analyses are then plotted on this graphic format in order to establish visual relationships between stratigraphic elements and acid sulfate soil chemistry.

Coastal Facies Modelling – this phase relies on the practitioner having a sound knowledge of the evolution of coastal depositional systems in response to major sea level change, and the process of coastal facies modelling of the resultant sequence. GeoCoastal's senior geologists have >25 years of individual professional experience in this regard. From this process a detailed model of the site's coastal sedimentary stratigraphy is generated.

ASS/Facies Associations – during this stage GeoCoastal's senior geologists and senior environmental scientist, Dr. Rundi Larsen, examine the relationships between acid sulfate soil and sedimentary stratigraphy on site

3. **Graphic Presentation -**
The detailed attention to all facets of the investigation in the previous stages provides a platform for high resolution graphic presentation of the site stratigraphy with associated ASS information annotation. This presentation can then be used as a basis for graphically presenting zones that require neutralisation and liming rates etc. in ASS Management Plans. This provides for easy assimilation of information by both authorities and site personnel tasked with ASS Management.

This highly specialised system of acid sulfate soil investigation is in keeping with GeoCoastal's general ethos of using highly experienced scientists to produce superior quality environmental investigations at economical rates. In regard to Acid Sulfate Soil, this superior quality assessment has generally been generated from the combination of the above facies modelling based system and a sampling density of ~ 1 site hectare, and has been consistently complimented by a range of regulatory authorities.

Relevant Reports

R.M. Larsen & T.L. Graham (2006) *Sediment Management Investigation, Flat Rock Creek, Currumbin, Queensland.* February 2006. GC Report 2006-2-II24 for Gold Coast City Council.

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

Graham T.L. & Larsen R.M. (2003b) *Acid Sulfate Soil and Stratigraphic Investigation: Logan-Coomera Rivers Coastal Plain, Queensland.* GC Report 2003-3-IV18 for Gold Coast City Council, NE Albert Landcare and Rocky Point Canegrowers.

Graham T.L., Larsen R.M & L.J Kapral (2002) *Pre-dredge Sediment Investigation & Environmental Management Plan, Bienvenue Lake and Flat Rock Creek Lake, Currumbin, Queensland.* for Gold Coast City Council, GC Reports 2002-8-VIII23 and 9-VIII30

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 (2000) *Issues and Options for Environmental Rehabilitation of Witt Avenue Drain, Carrara, Queensland.* GC Report 2000-1-II03, commissioned by Environmental Protection Agency (Qld), Gold Coast City Council and Hungtat Worldwide P/L.

8 GLOSSARY

TO COME

APPENDIX 1

Digital stratigraphic logs of boreholes and Acid Sulfate chemistry data.

SITE: GC/ BG# 01

FEATURE: Mangrove fringed tidal flat

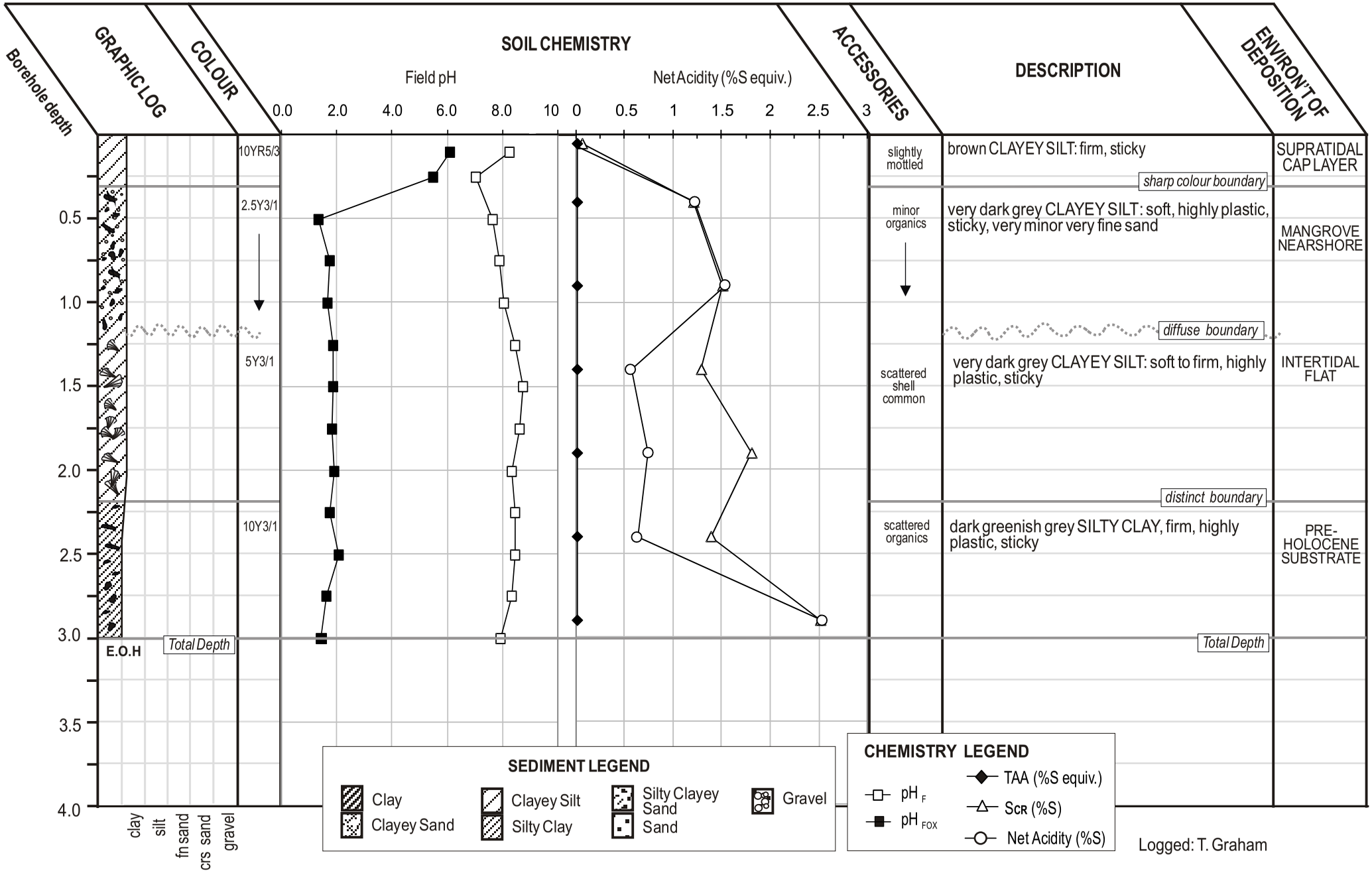
LOCATION: Friend Pt, Gladstone, QLD
WGS 84 310180°**S** 7372293°**E**

SAMPLING METHOD: Hand Auger

DATE: 29/10/ 08

Geo Coastal Australia

Borehole #01



Logged: T. Graham

SITE: GC/ BG# 02

FEATURE: Mangrove fringed Supratidal Flat

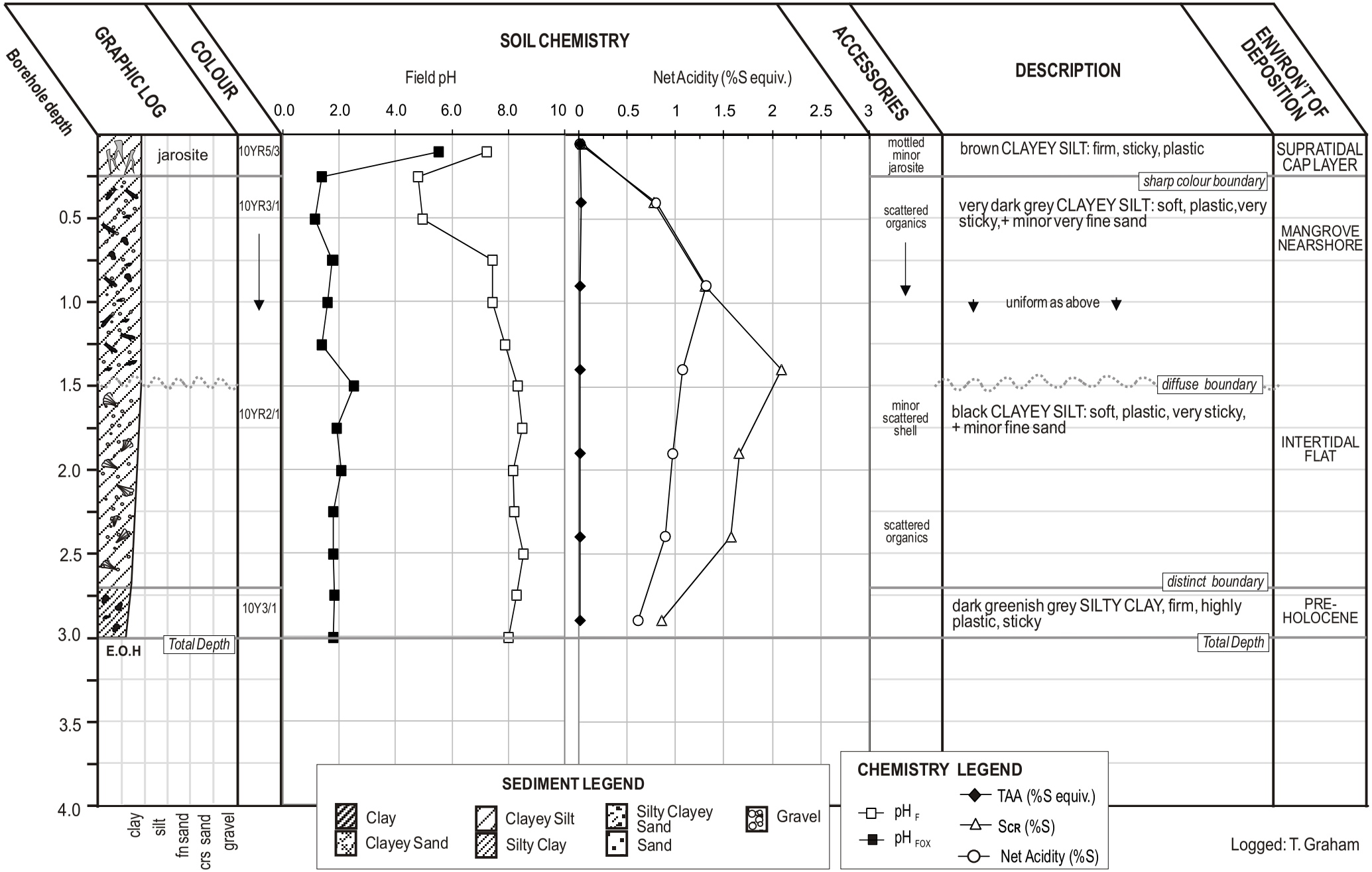
LOCATION: Friend Pt, Gladstone, QLD
WGS 84 310385°**S** 7372292°**E**

SAMPLING METHOD: Hand Auger

DATE: 29/10/ 08

Geo Coastal Australia

Borehole #02



Logged: T. Graham

SITE: GC/ BG# 03

LOCATION: Friend Pt, Gladstone, QLD
WGS 84 310590°**S** 7372281°**E**

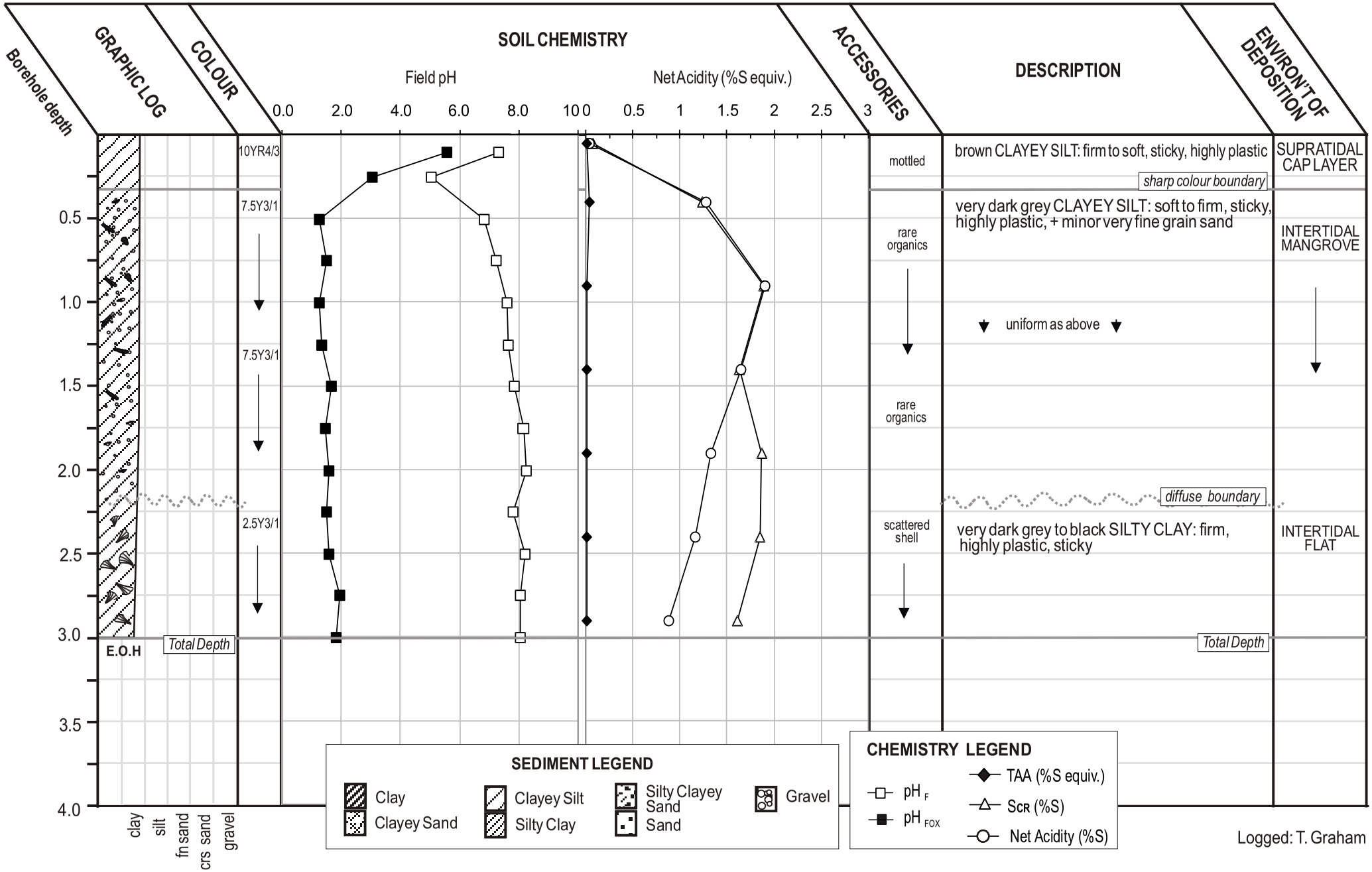
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 29/10/ 08

Geo Coastal Australia

Borehole #03



Logged: T. Graham

SITE: GC/ BG# 04

LOCATION: Friend Pt, Gladstone, QLD
WGS 84 310791°**S** 7372274°**E**

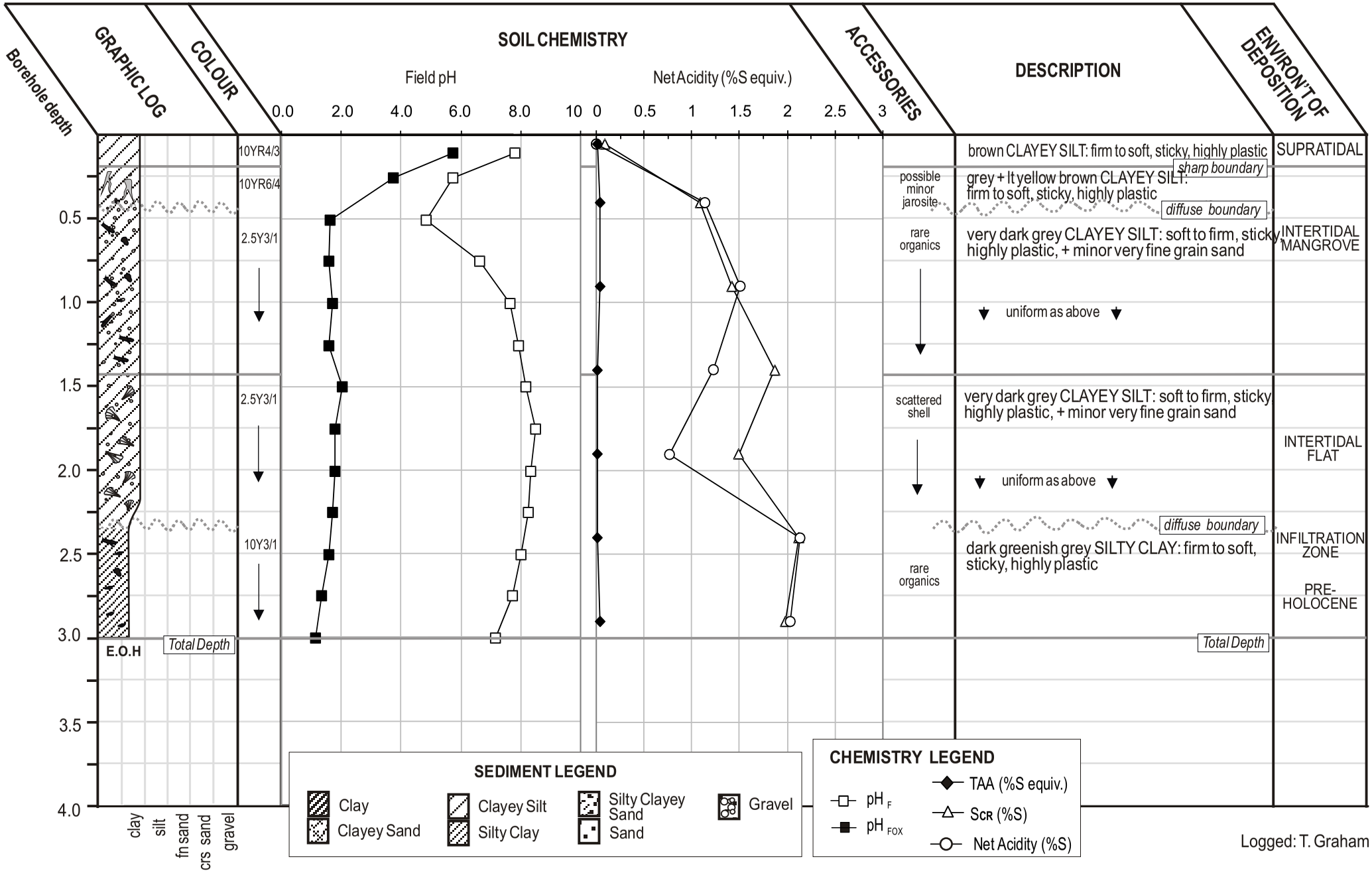
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 29/10/08

Geo Coastal Australia

Borehole #04



Logged: T. Graham

SITE: GC/ BG# 05

LOCATION: Friend Pt, Gladstone, QLD
WGS 84 311015°**S** 7372270°**E**

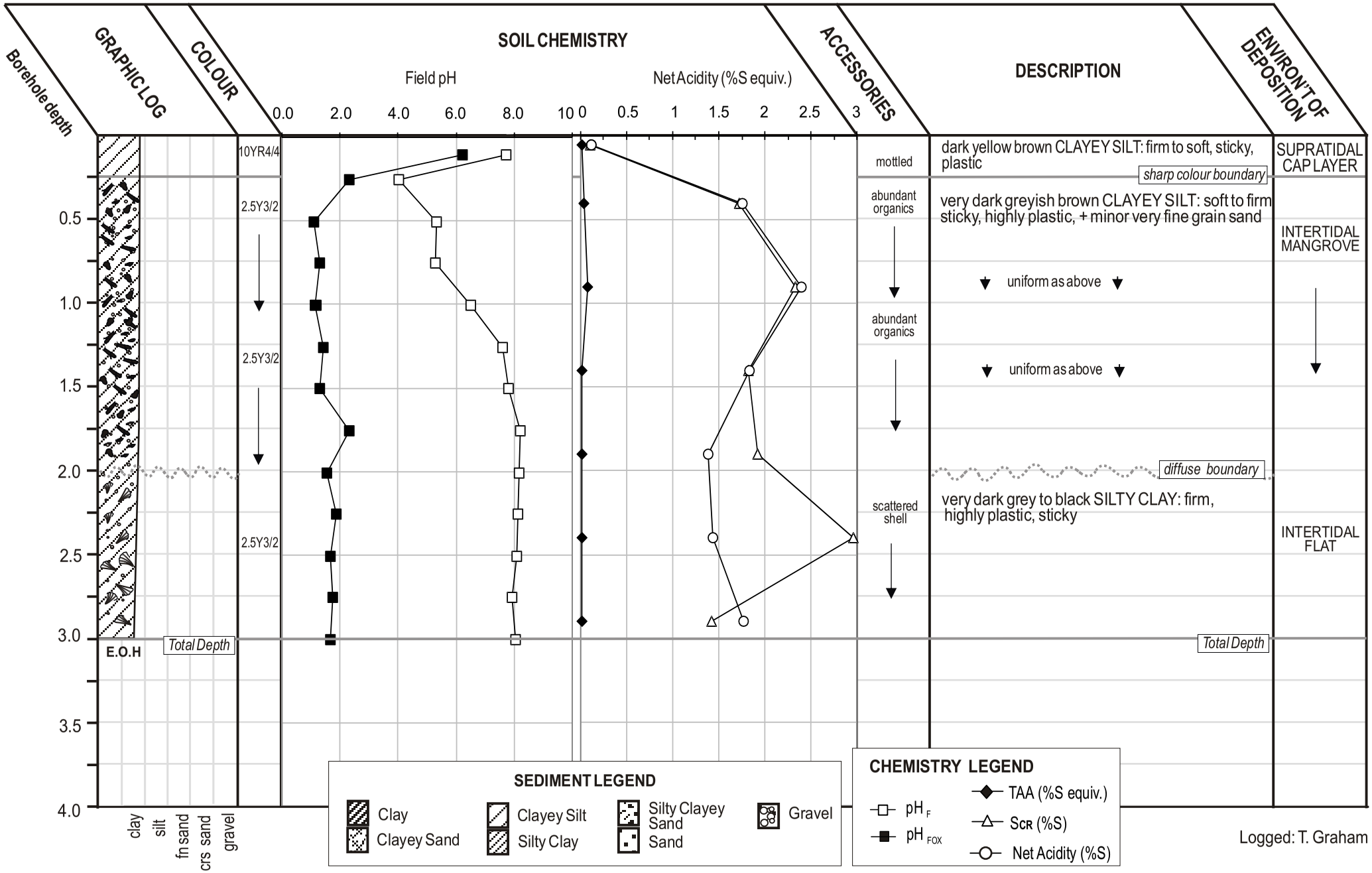
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 29/10/ 08

Geo Coastal Australia

Borehole #05



Logged: T. Graham

SITE: GC/ BG# 06

LOCATION: Friend Pt, Gladstone, QLD
WGS 84 311199°**S** 7372291°**E**

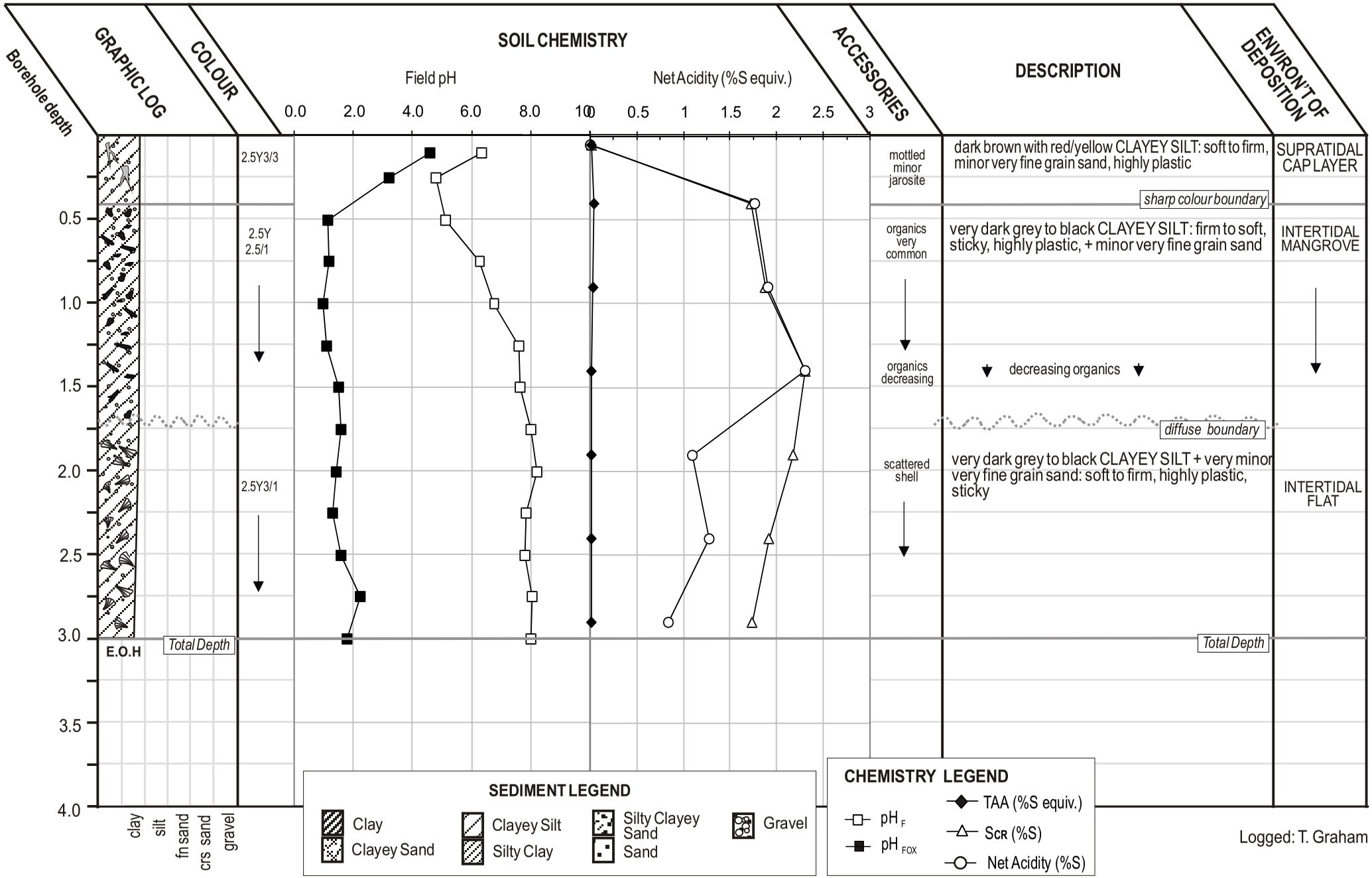
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 29/10/ 08

Geo Coastal Australia

Borehole #06



Logged: T. Graham

SITE: GC/ BG# 07

FEATURE: Mangrove fringed Supratidal Flat

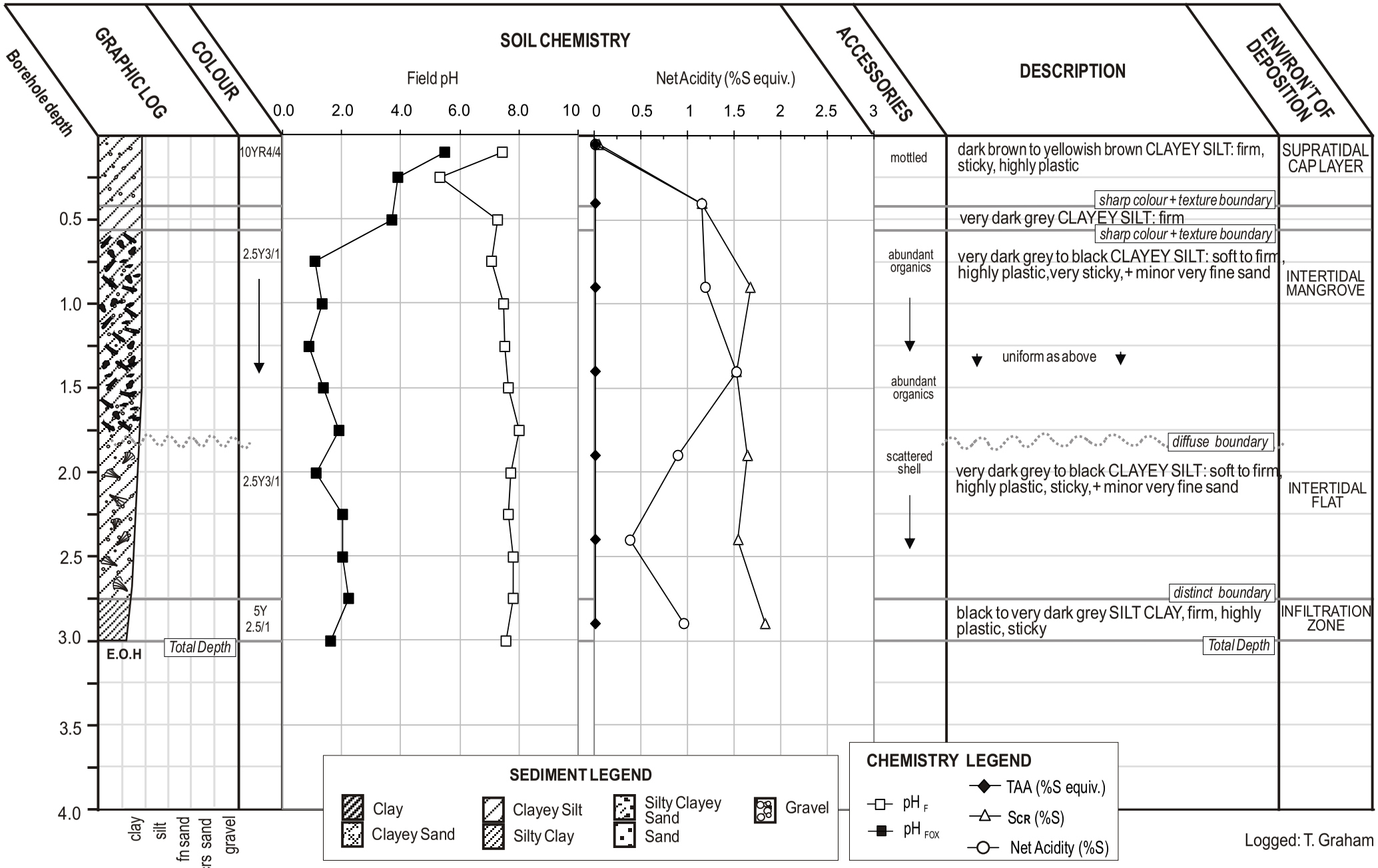
LOCATION: Friend Pt, Gladstone, QLD
WGS 84 311400°**S** 7372299°**E**

SAMPLING METHOD: Hand Auger

DATE: 29/10/ 08

Geo Coastal Australia

Borehole #07



Logged: T. Graham

SITE: GC/ BG# 08

LOCATION: Friend Pt, Gladstone
WGS 84 0311658°**S** 7372280°**E**

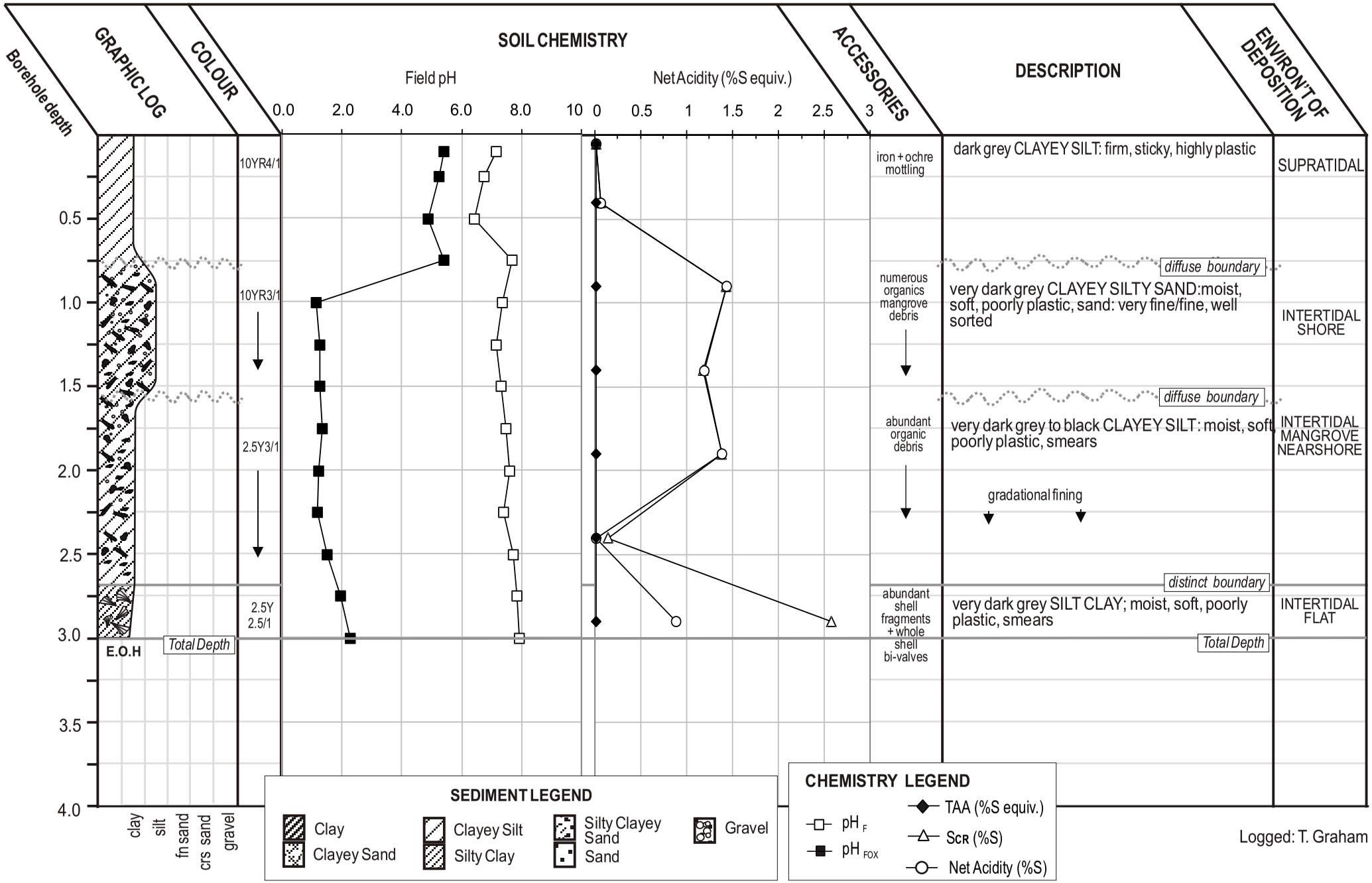
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 30/10/ 08

Geo Coastal Australia

Borehole #08



Logged: T. Graham

SITE: GC/ BG# 09

FEATURE: Mangrove fringed Supratidal Flat

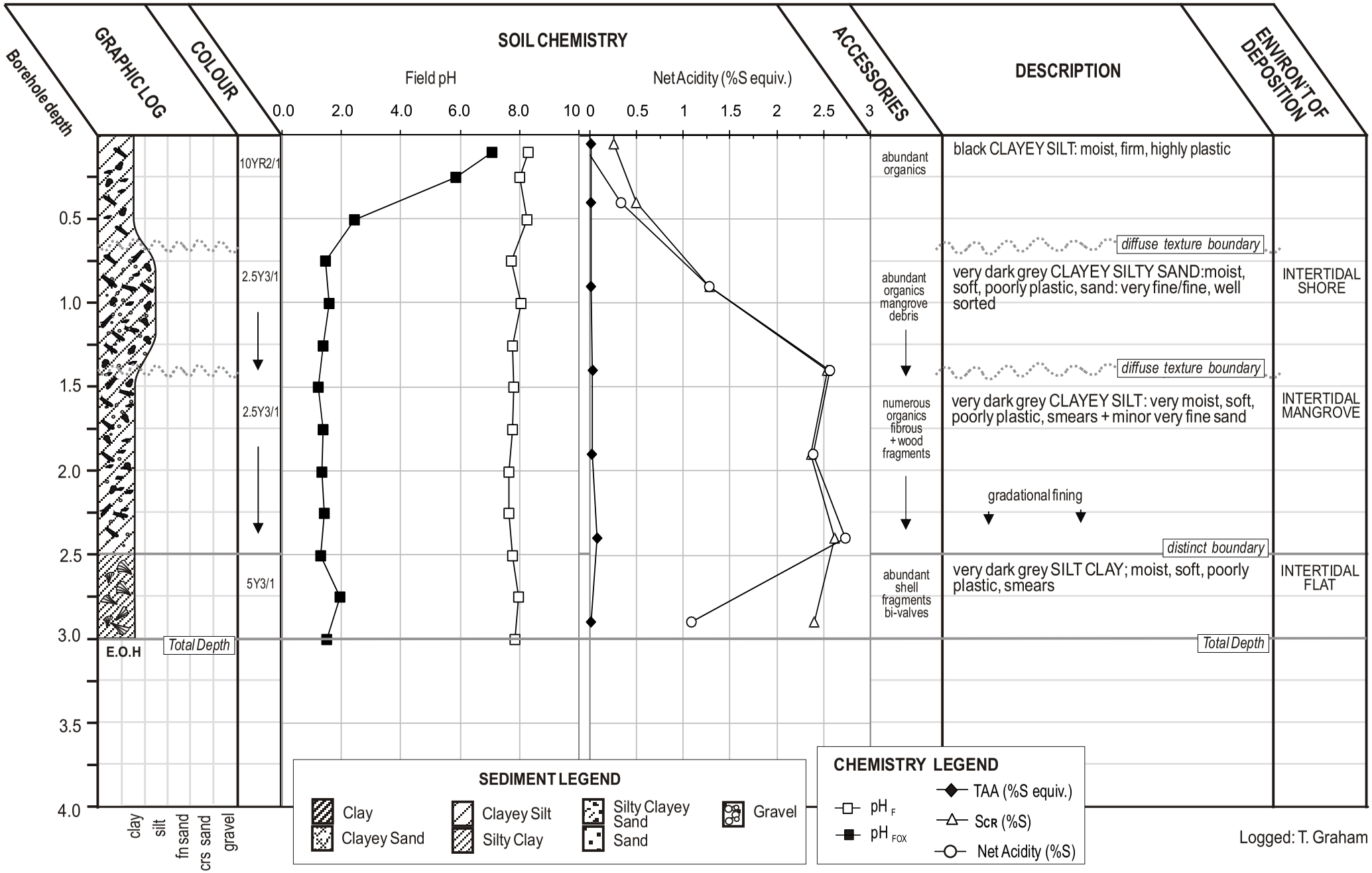
LOCATION: Friend Pt, Gladstone
WGS 84 0311930°**S** 7372276°**E**

SAMPLING METHOD: Hand Auger

DATE: 30/10/08

Geo Coastal Australia

Borehole #09



Logged: T. Graham

SITE: GC/ BG# 10

LOCATION: Friend Pt, Gladstone
WGS 84 0312216°**S** 7372380°**E**

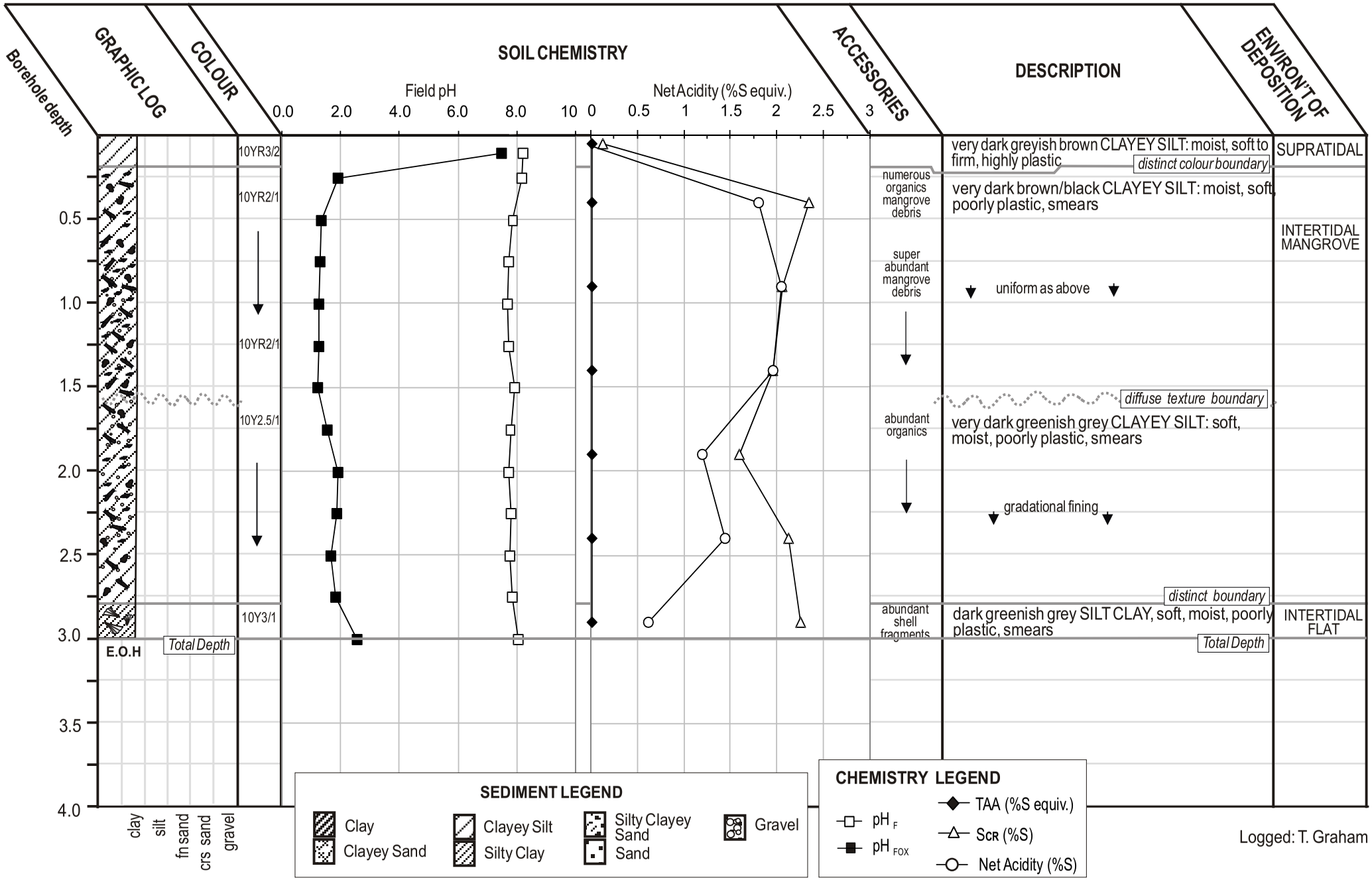
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 30/10/ 08

Geo Coastal Australia

Borehole #10



Logged: T. Graham

SITE: GC/ BG# 11

LOCATION: Friend Pt, Gladstone
WGS 84 0311828°**S** 7372306°**E**

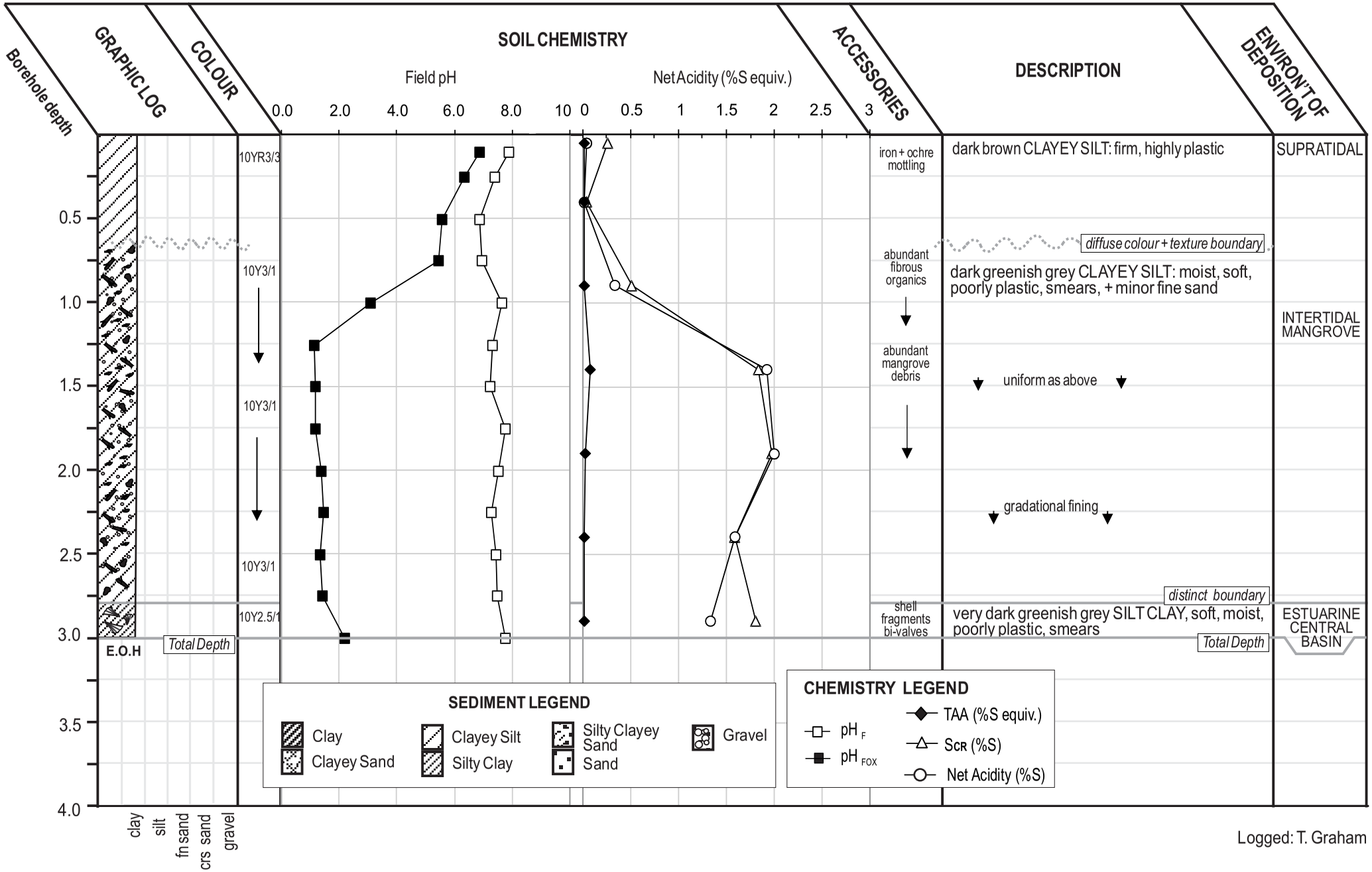
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 30/10/ 08

Geo Coastal Australia

Borehole #11



Logged: T. Graham

SITE: GC/ BG# 12

LOCATION: Friend Pt, Gladstone
WGS 84 0311659°**S** 7372190°**E**

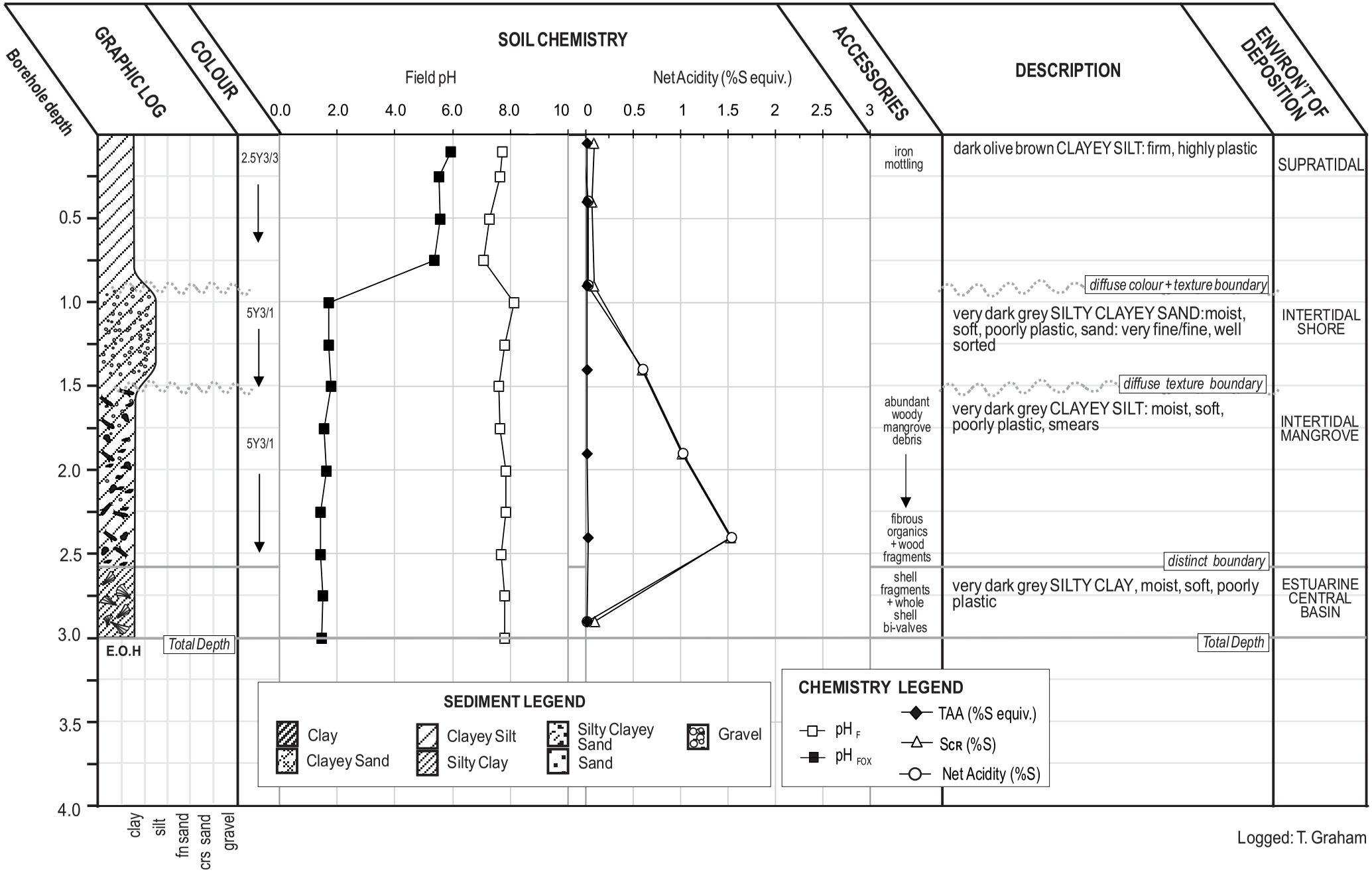
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 30/10/ 08

Geo Coastal Australia

Borehole #12



Logged: T. Graham

SITE: GC/ BG# 13

LOCATION: Friend Pt, Gladstone
WGS 84 0311483°**S** 7372084°**E**

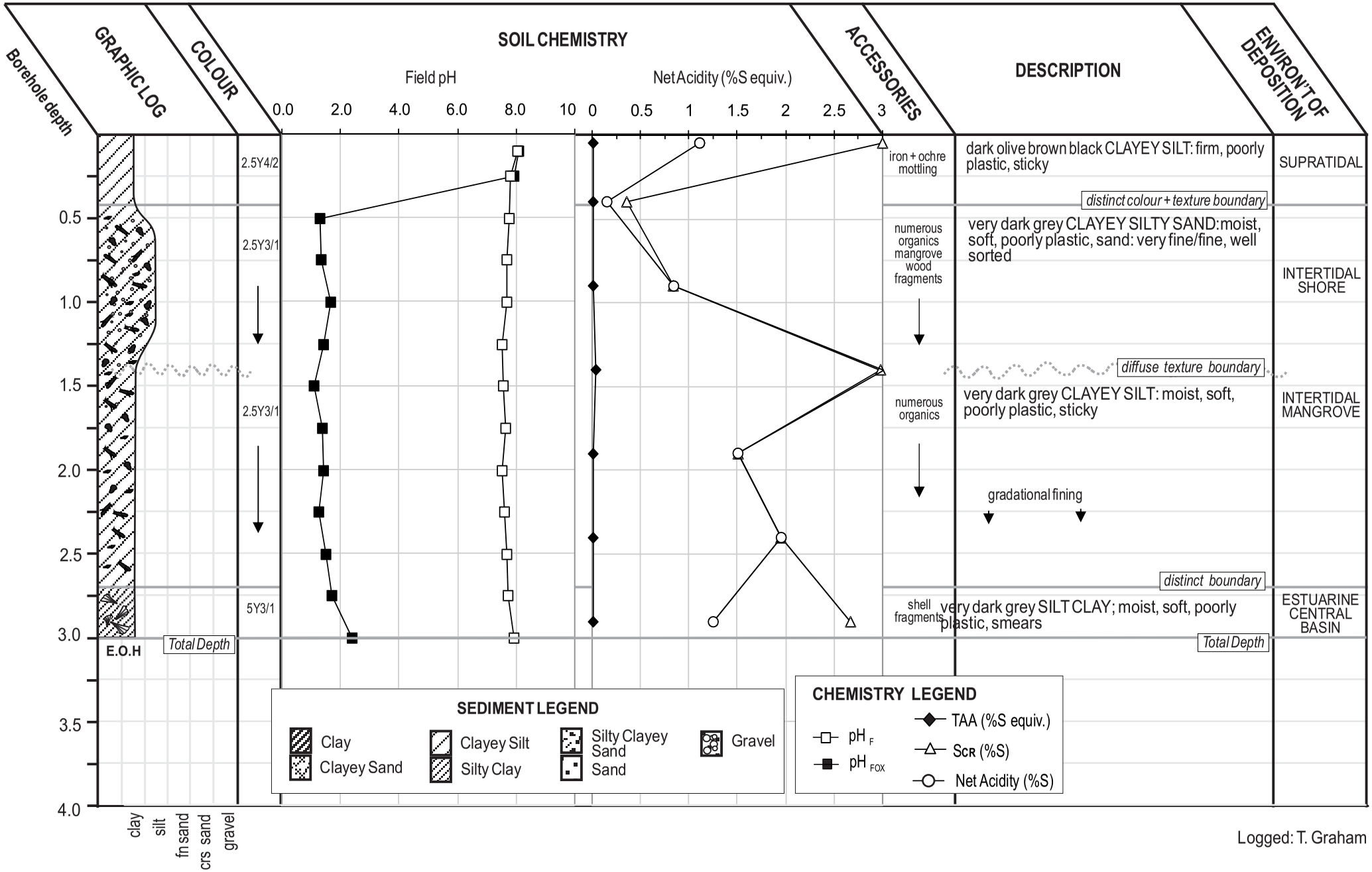
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 30/10/ 08

Geo Coastal Australia

Borehole #13



Logged: T. Graham

SITE: GC/ BG# 14

LOCATION: Friend Pt, Gladstone
WGS 84 0311345°**S** 7371937°**E**

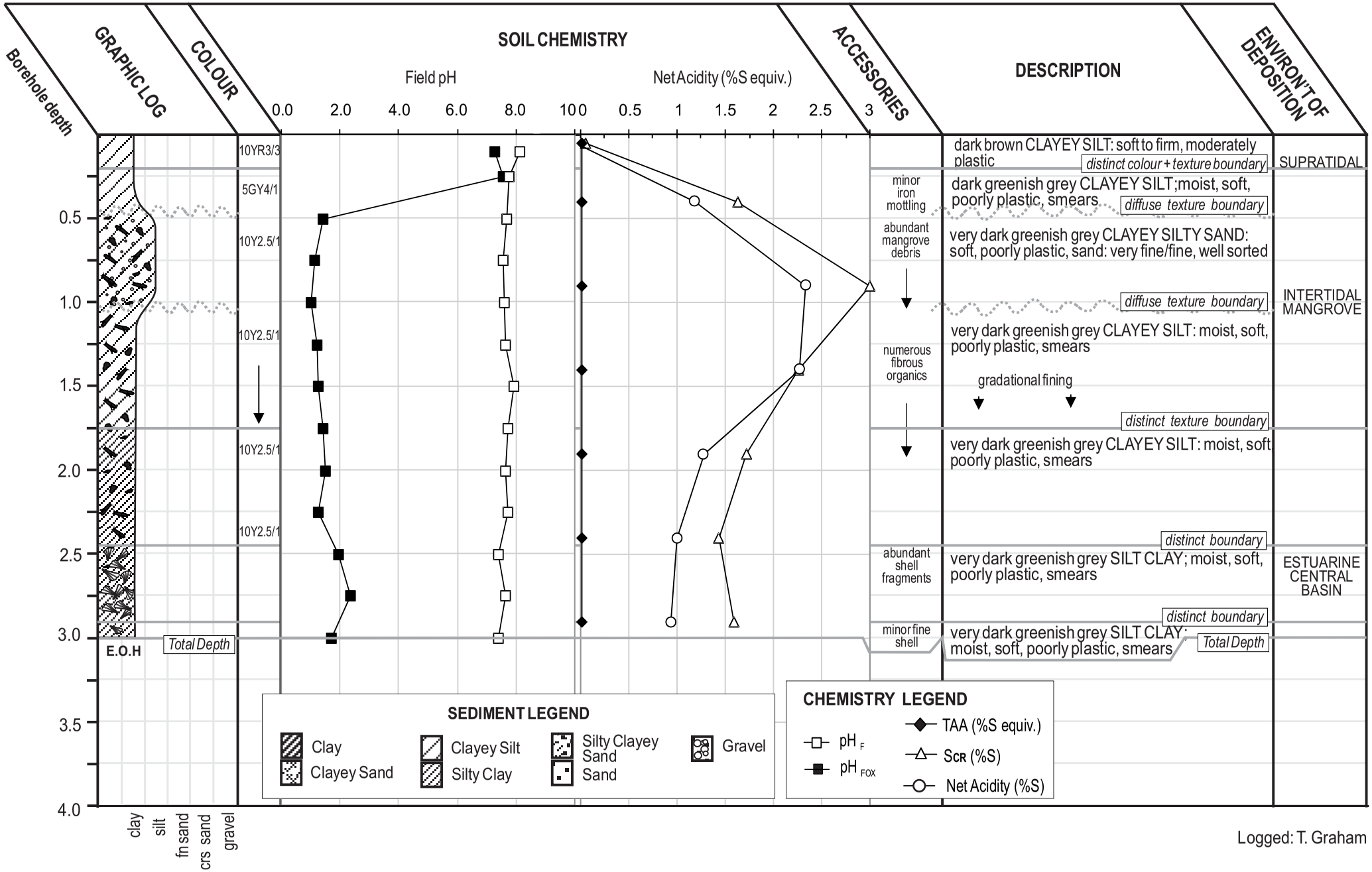
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 30/10/ 08

Geo Coastal Australia

Borehole #14



Logged: T. Graham

SITE: GC/ BG# 15

LOCATION: Friend Pt, Gladstone
WGS 84 0311195°**S** 7371798°**E**

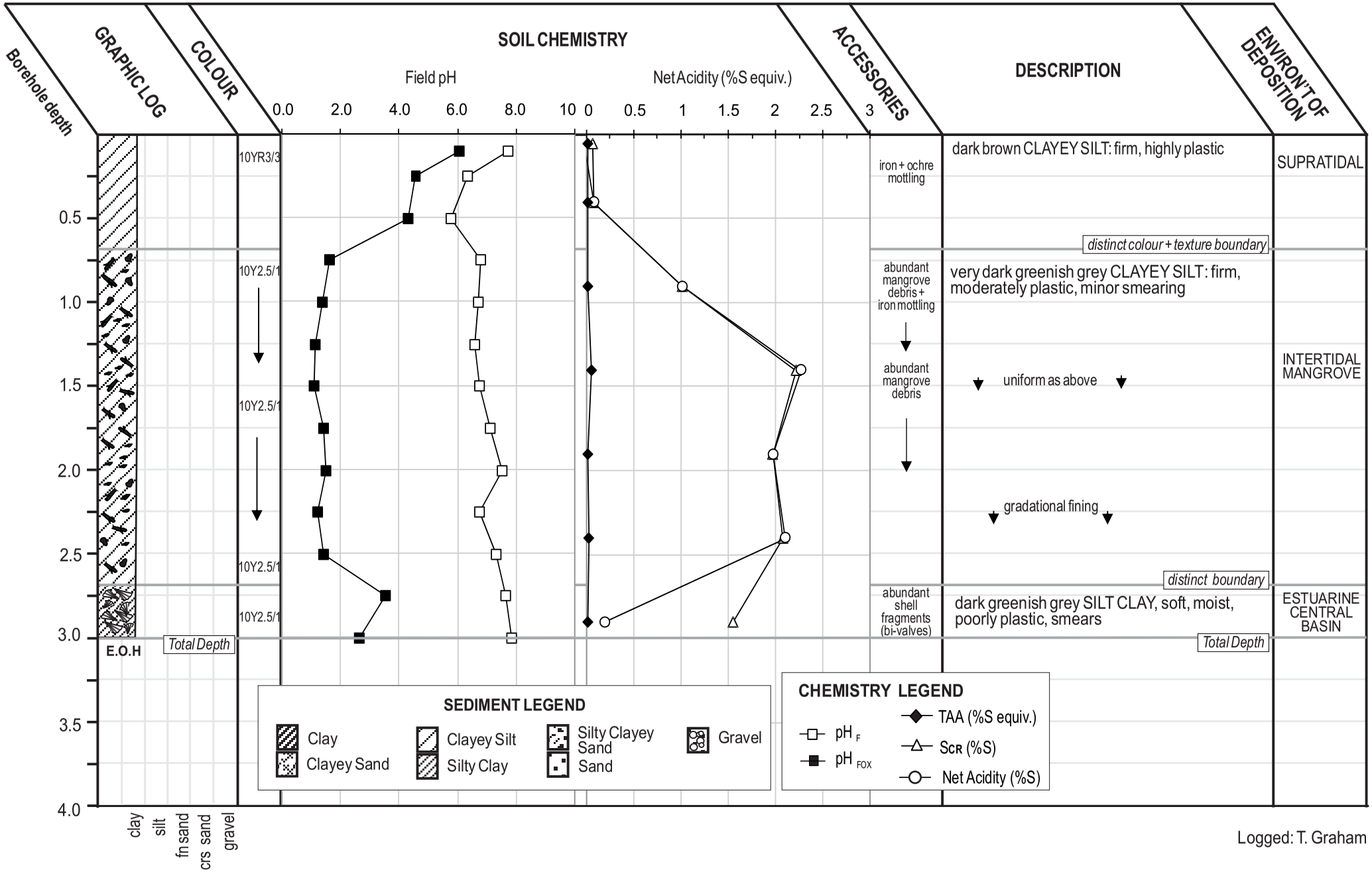
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 30/10/08

Geo Coastal Australia

Borehole #15



Logged: T. Graham

SITE: GC/ BG# 16

LOCATION: Friend Pt, Gladstone
WGS 84 0311094°S 7371621°E

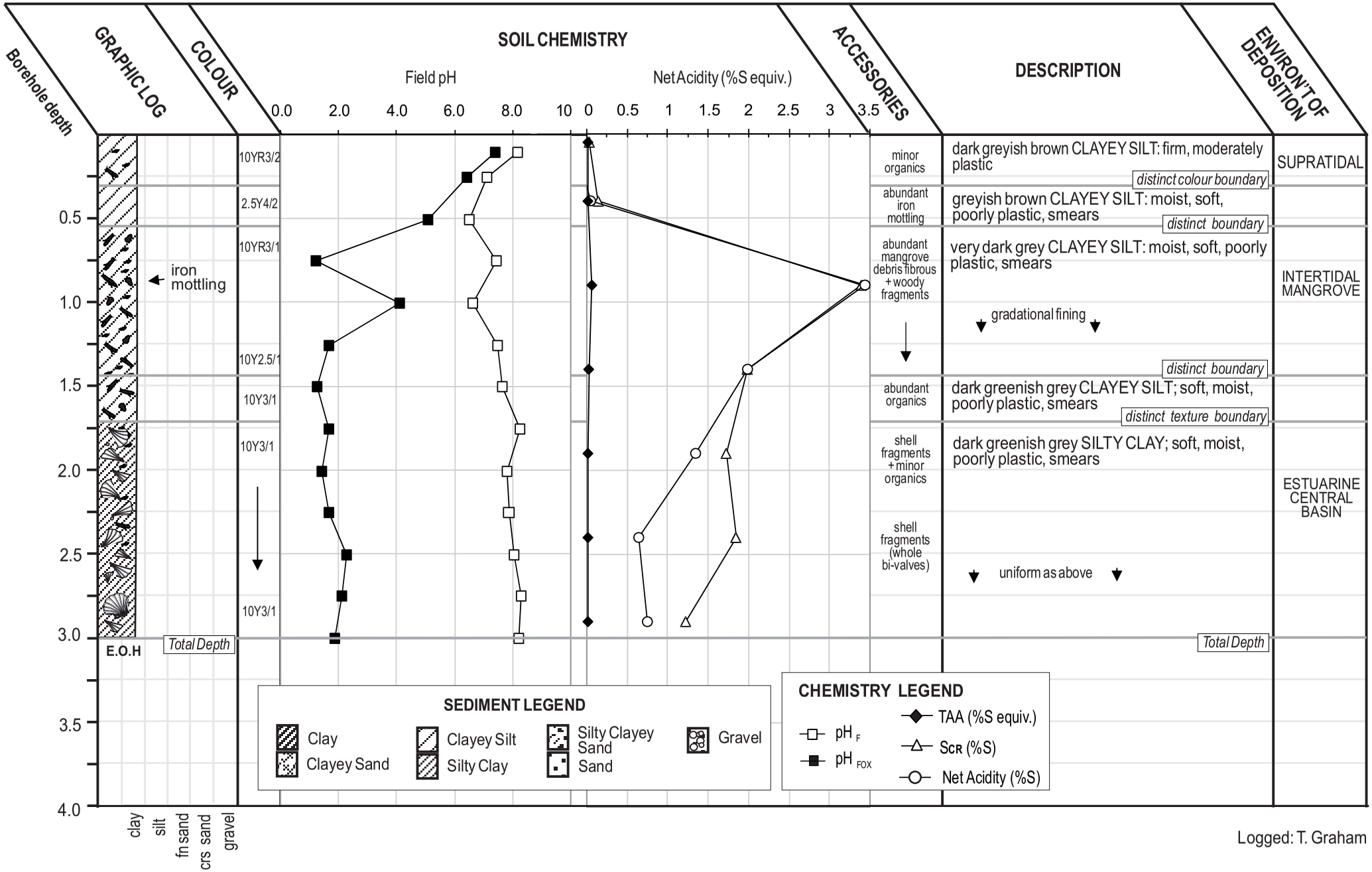
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 30/10/ 08

Geo Coastal Australia

Borehole #16



Logged: T. Graham

SITE: GC/ BG# 17

LOCATION: Friend Pt, Gladstone
WGS 84 0311020°**S** 7371445°**E**

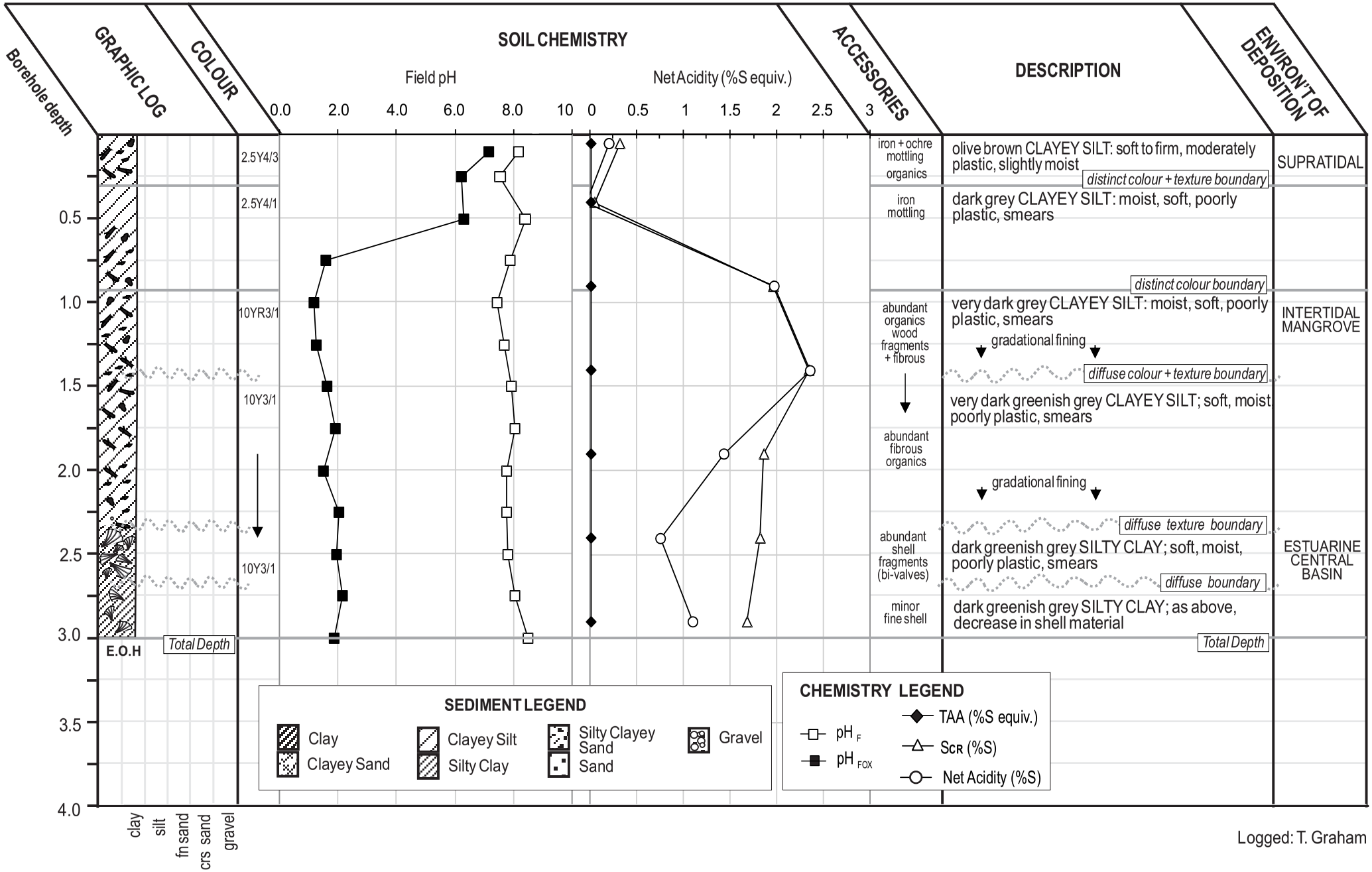
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 1/11/08

Geo Coastal Australia

Borehole #17



Logged: T. Graham

SITE: GC/ BG# 18

LOCATION: Friend Pt, Gladstone
WGS 84 0313949°**S** 7371242°**E**

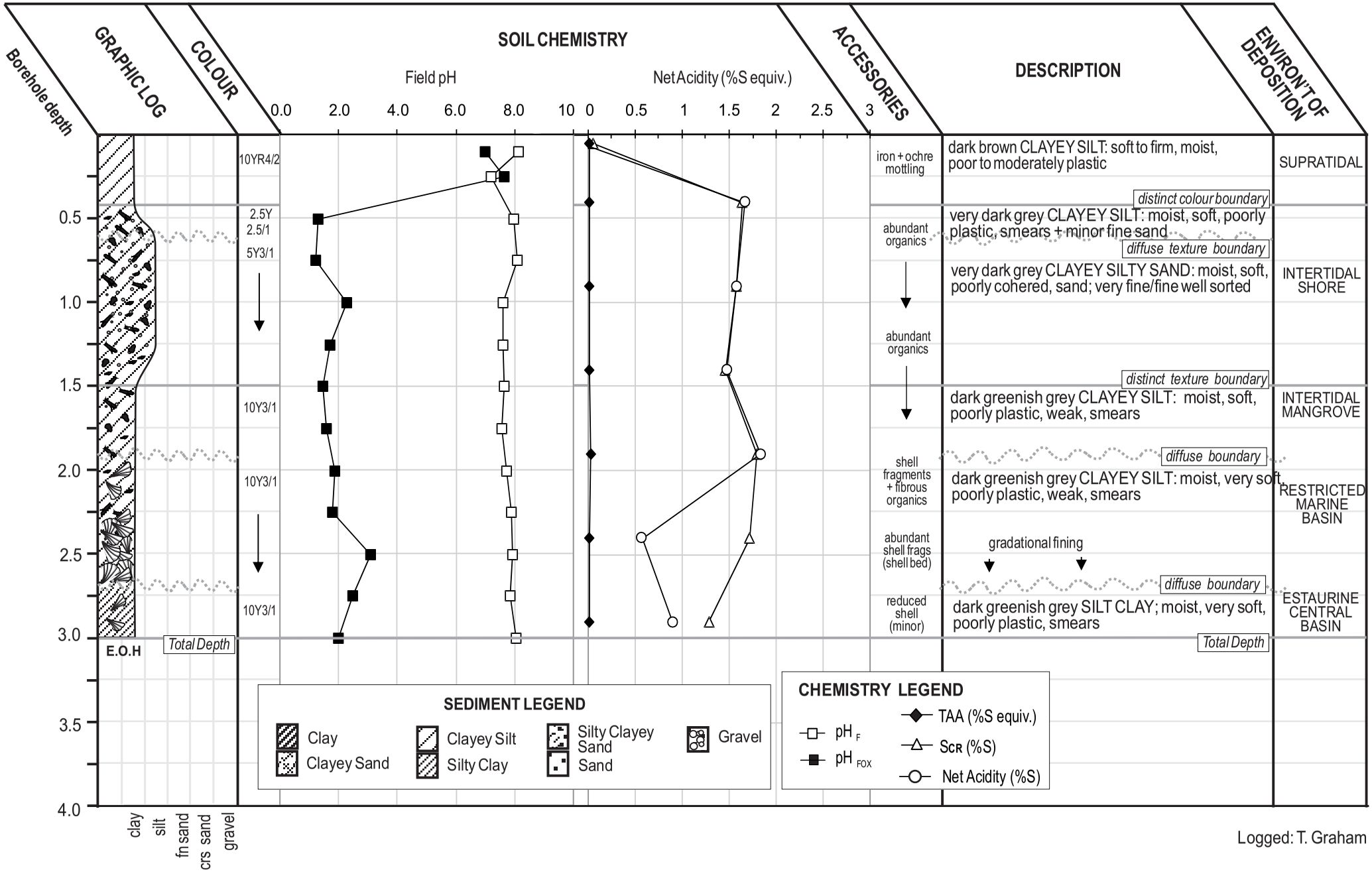
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 1/11/ 08

Geo Coastal Australia

Borehole #18



Logged: T. Graham

SITE: GC/ BG# 19

LOCATION: Friend Pt, Gladstone
WGS 84 310845°**S** 7371069°**E**

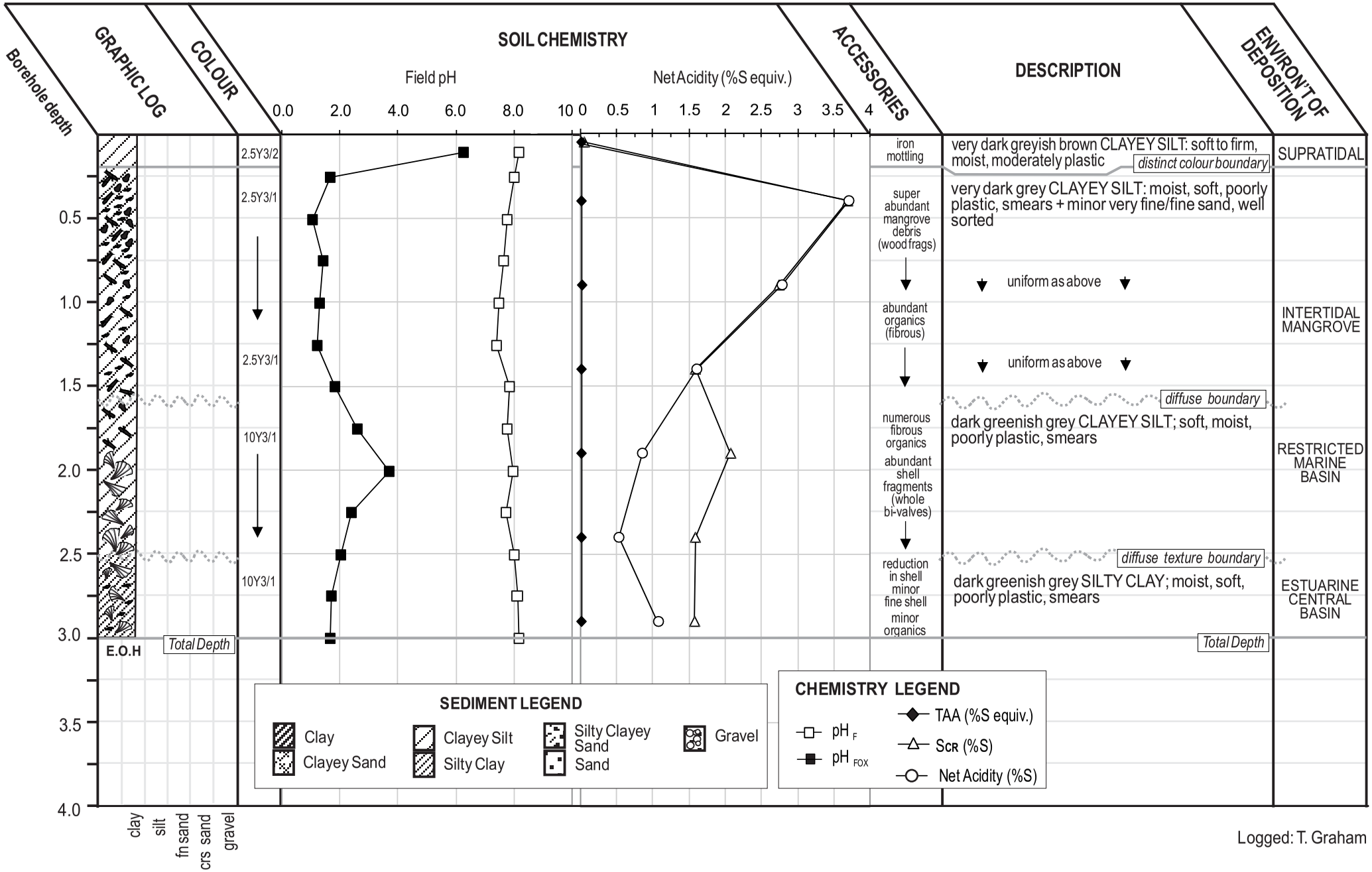
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 1/11/08

Geo Coastal Australia

Borehole #19



Logged: T. Graham

SITE: GC/ BG# 20

LOCATION: Friend Pt, Gladstone
WGS 84 310738°**S** 7370901°**E**

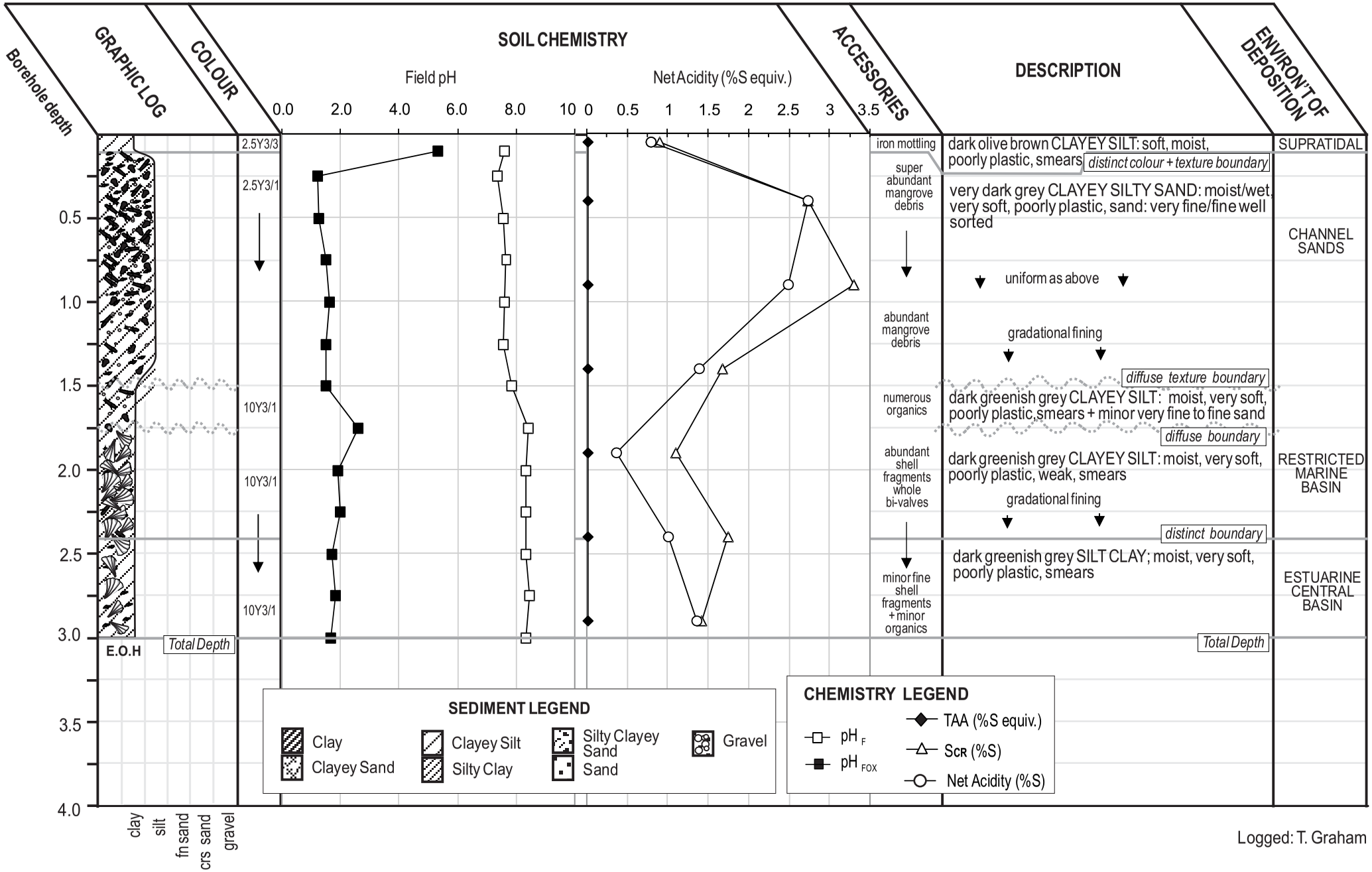
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 1/11/ 08

Geo Coastal Australia

Borehole #20



Logged: T. Graham

SITE: GC/ BG# 21

LOCATION: Friend Pt, Gladstone
WGS 84 310659°**S** 7370739°**E**

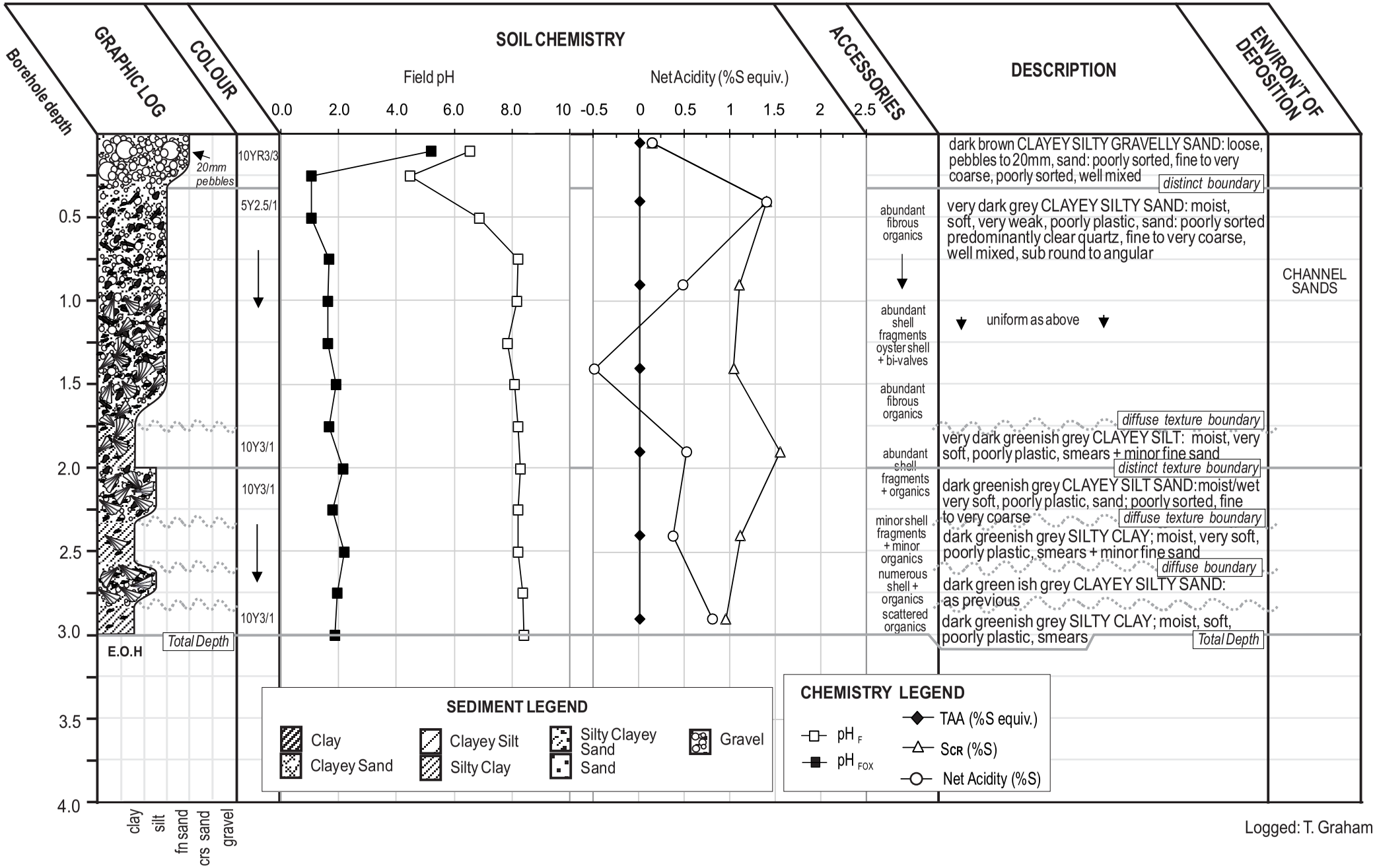
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 1/11/ 08

Geo Coastal Australia

Borehole #21



Logged: T. Graham

SITE: GC/ BG# 22

LOCATION: Friend Pt, Gladstone, QLD
WGS 84 310572°**S** 7370541°**E**

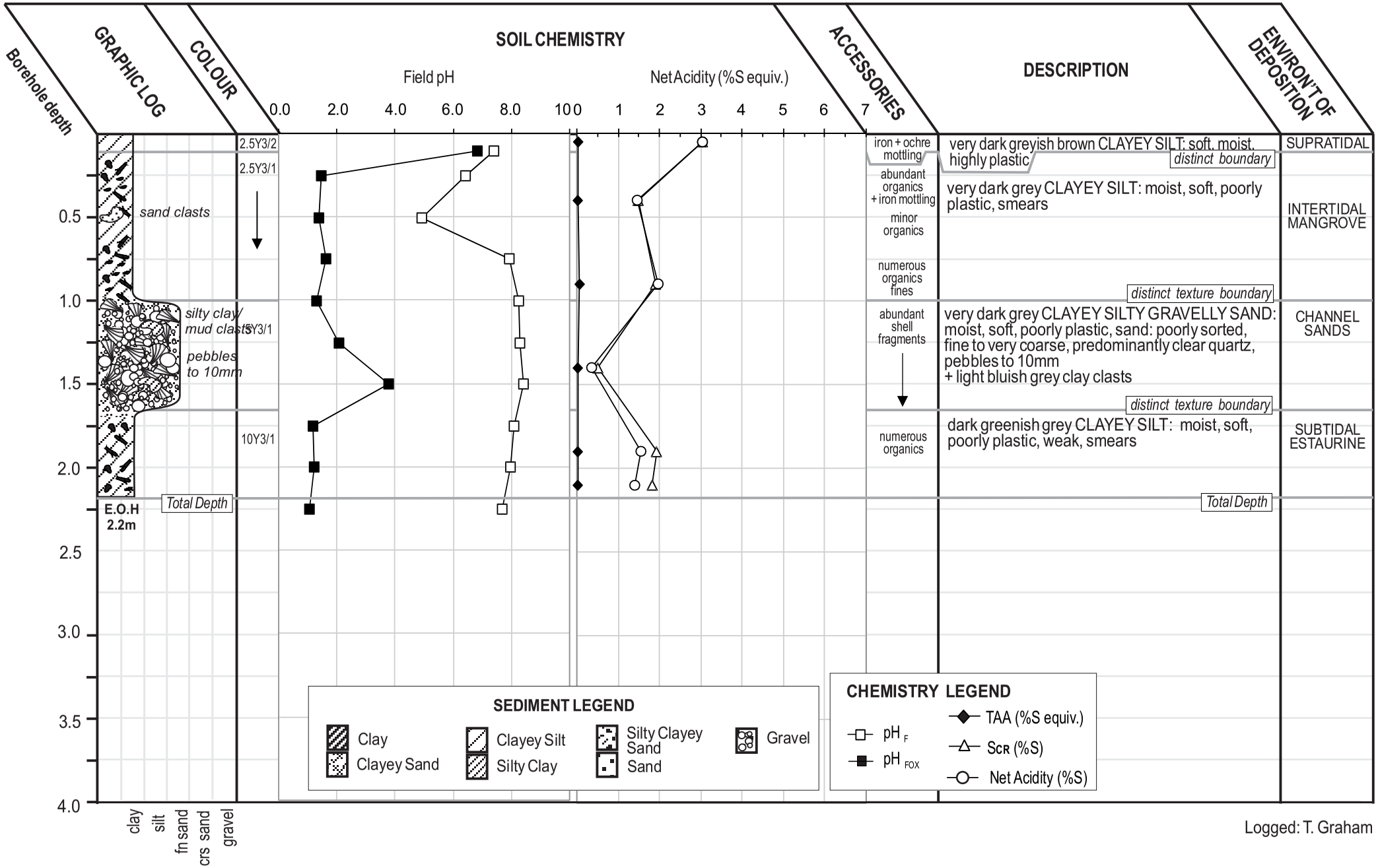
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 1/11/ 08

GeoCoastal Australia

Borehole #22



Logged: T. Graham

SITE: GC/ BG# 23

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315606°**S** 7370727°**E**

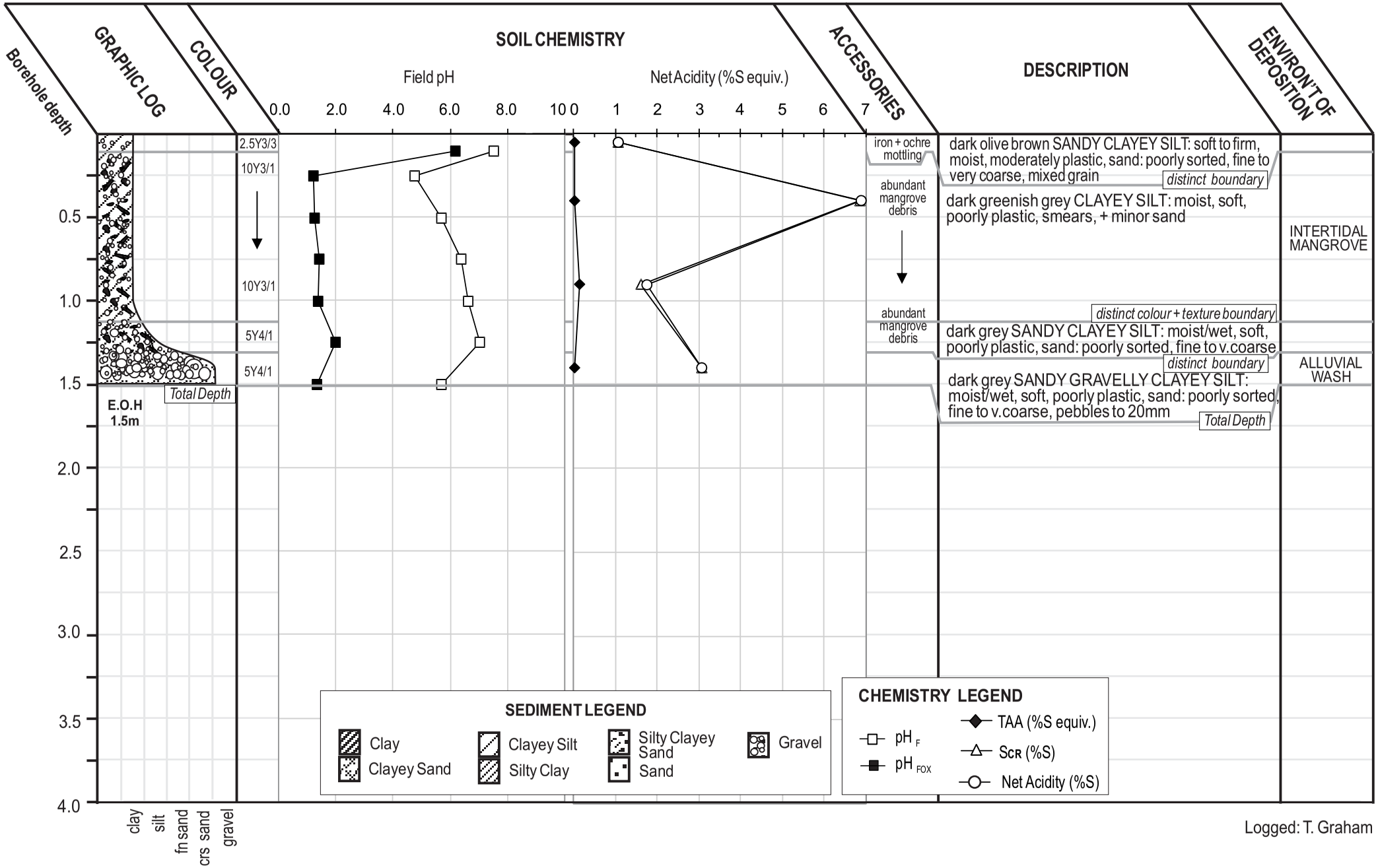
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 1/11/ 08

GeoCoastal Australia

Borehole #23



Logged: T. Graham

SITE: GC/ BG# 24

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315652°**S** 7370576°**E**

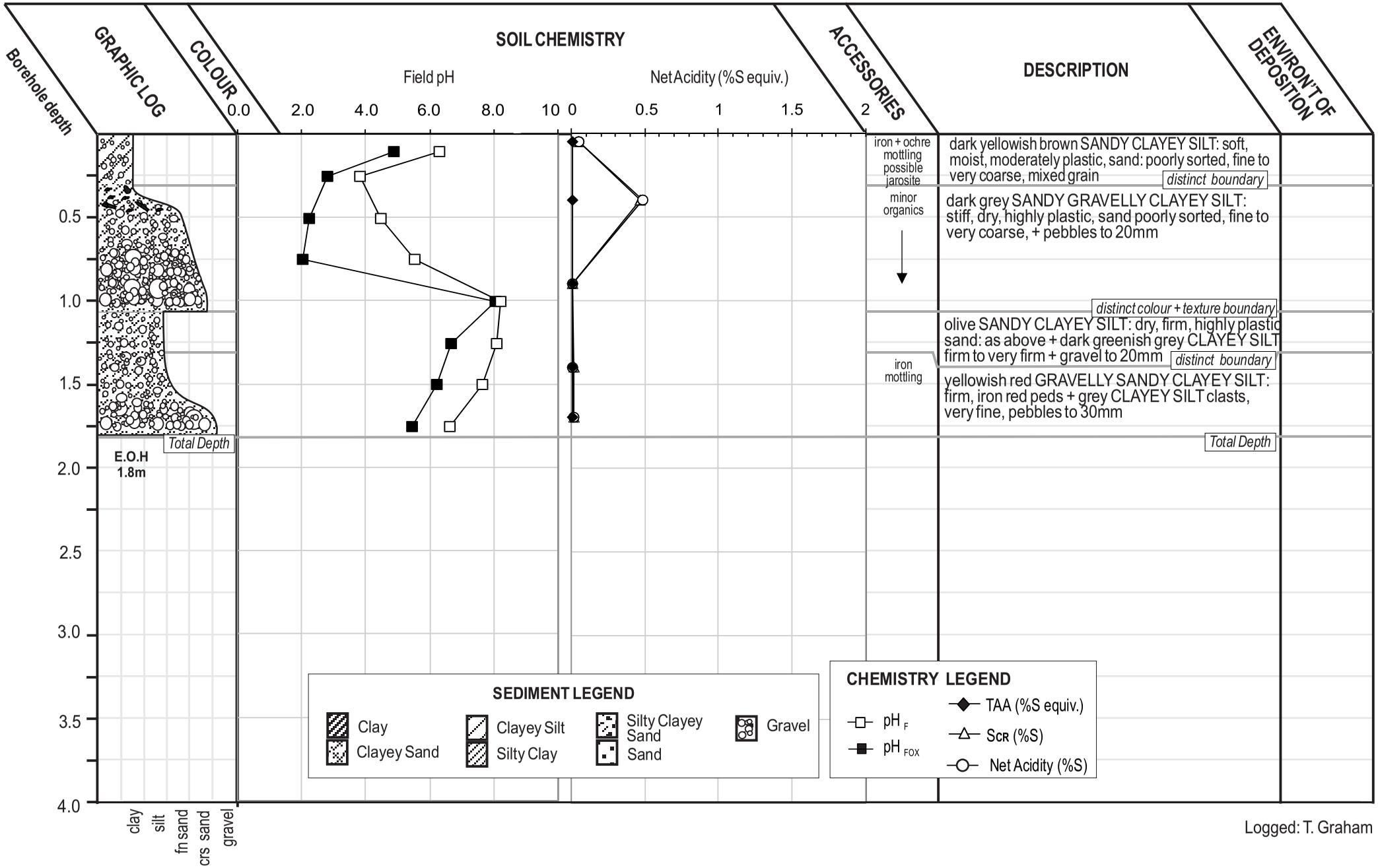
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 5/11/ 08

GeoCoastal Australia

Borehole #24



Logged: T. Graham

SITE: GC/ BG# 25

LOCATION: Curtis Island, Gladstone
WGS 84 315696°**S** 7370393°**E**

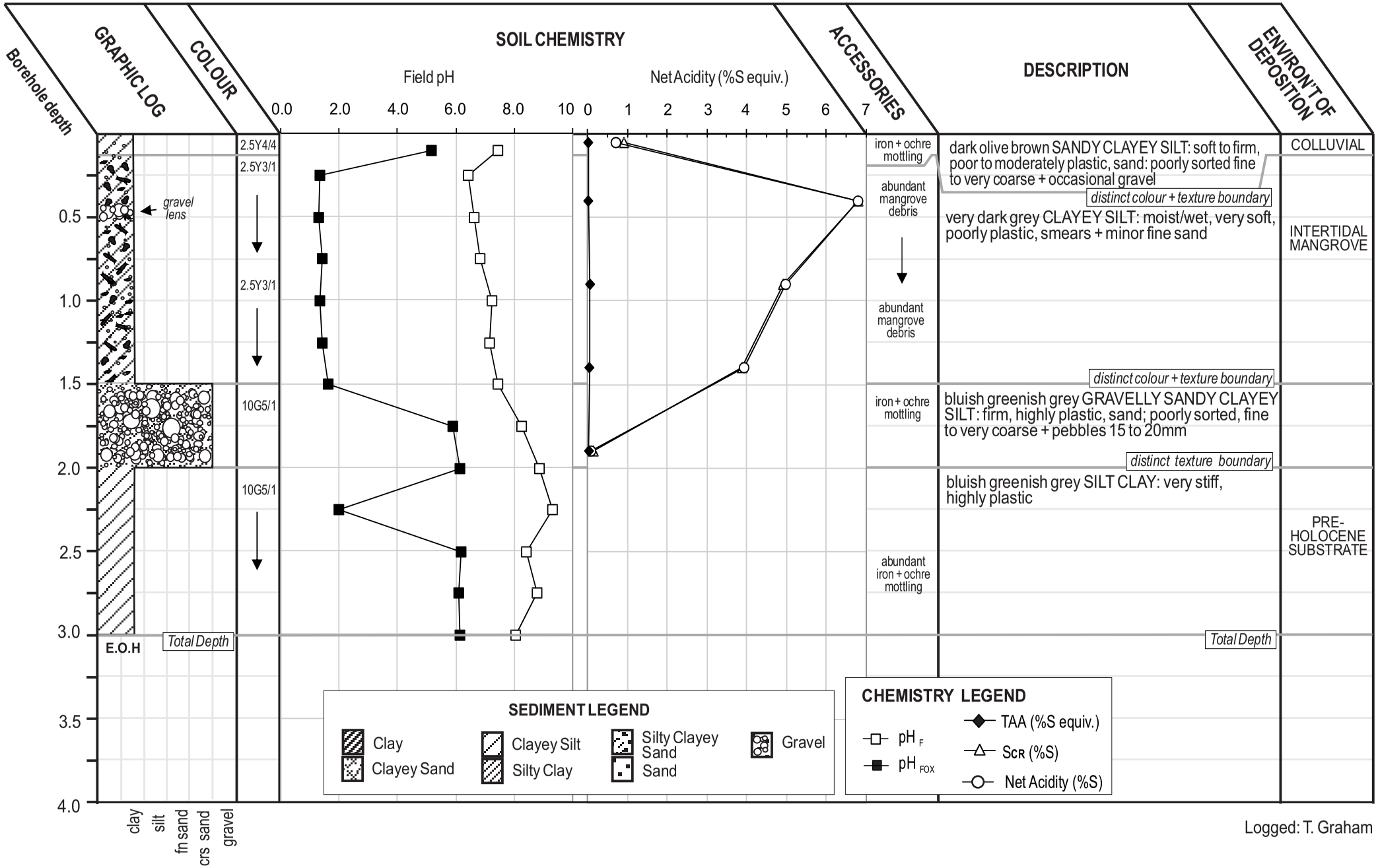
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 5/11/ 08

Geo Coastal Australia

Borehole #25



Logged: T. Graham

SITE: GC/ BG# 26

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315908°**S** 7370255°**E**

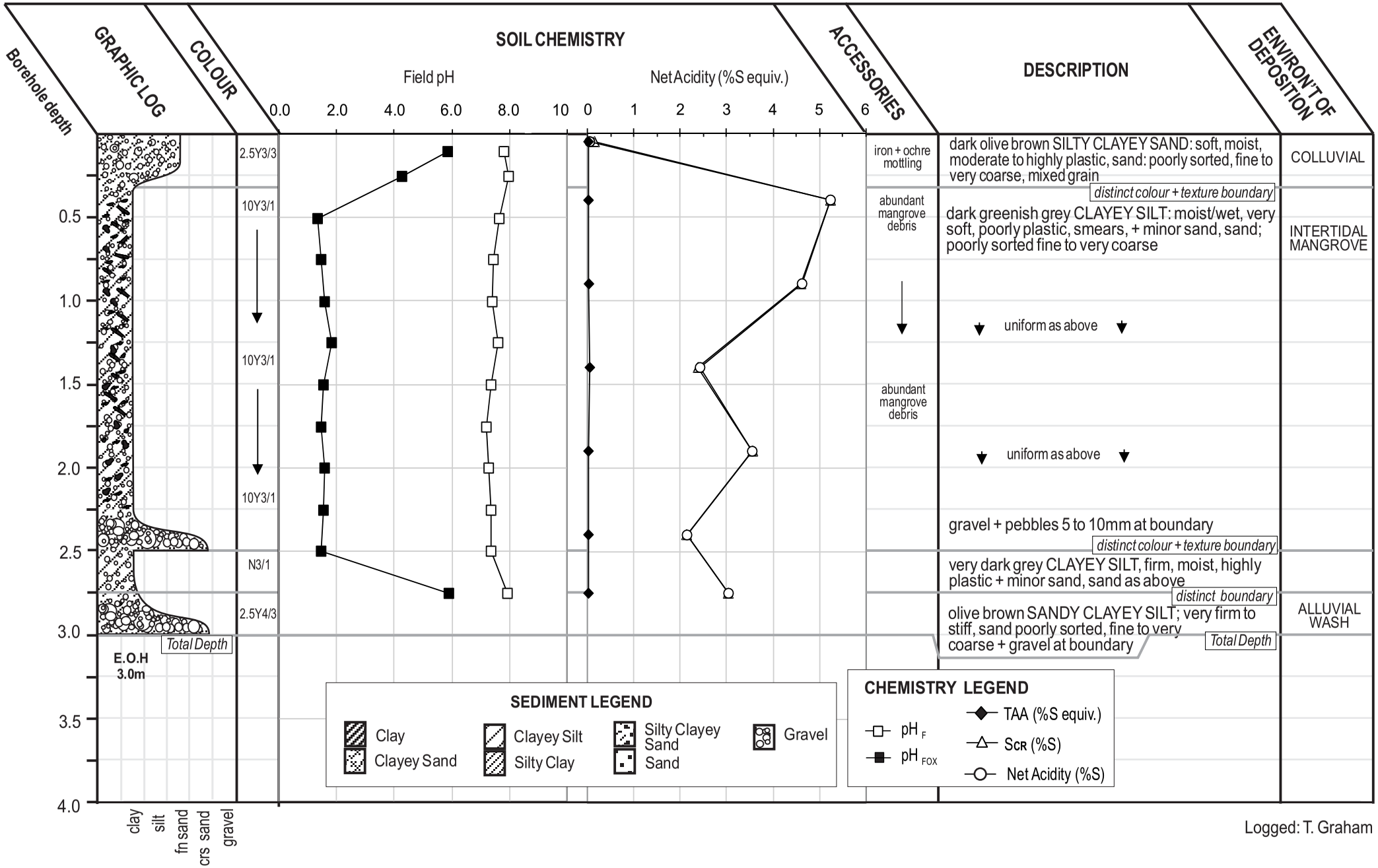
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 5/11/ 08

GeoCoastal Australia

Borehole #26



Logged: T. Graham

SITE: GC/ BG# 27

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 316000°S 7369919°E

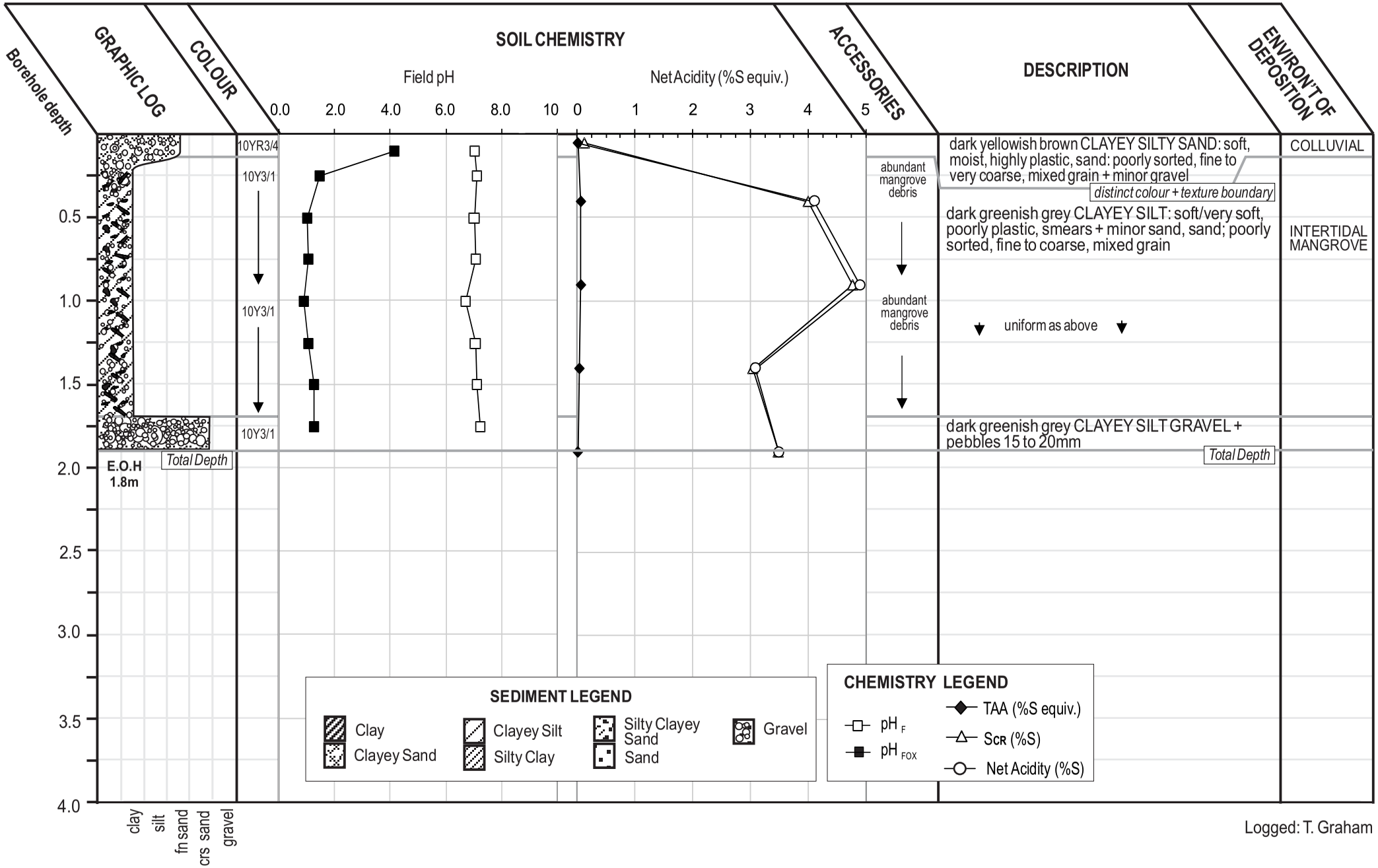
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 6/11/ 08

GeoCoastal Australia

Borehole #27



Logged: T. Graham

SITE: GC/ BG# 28

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315895°S 7369881°E

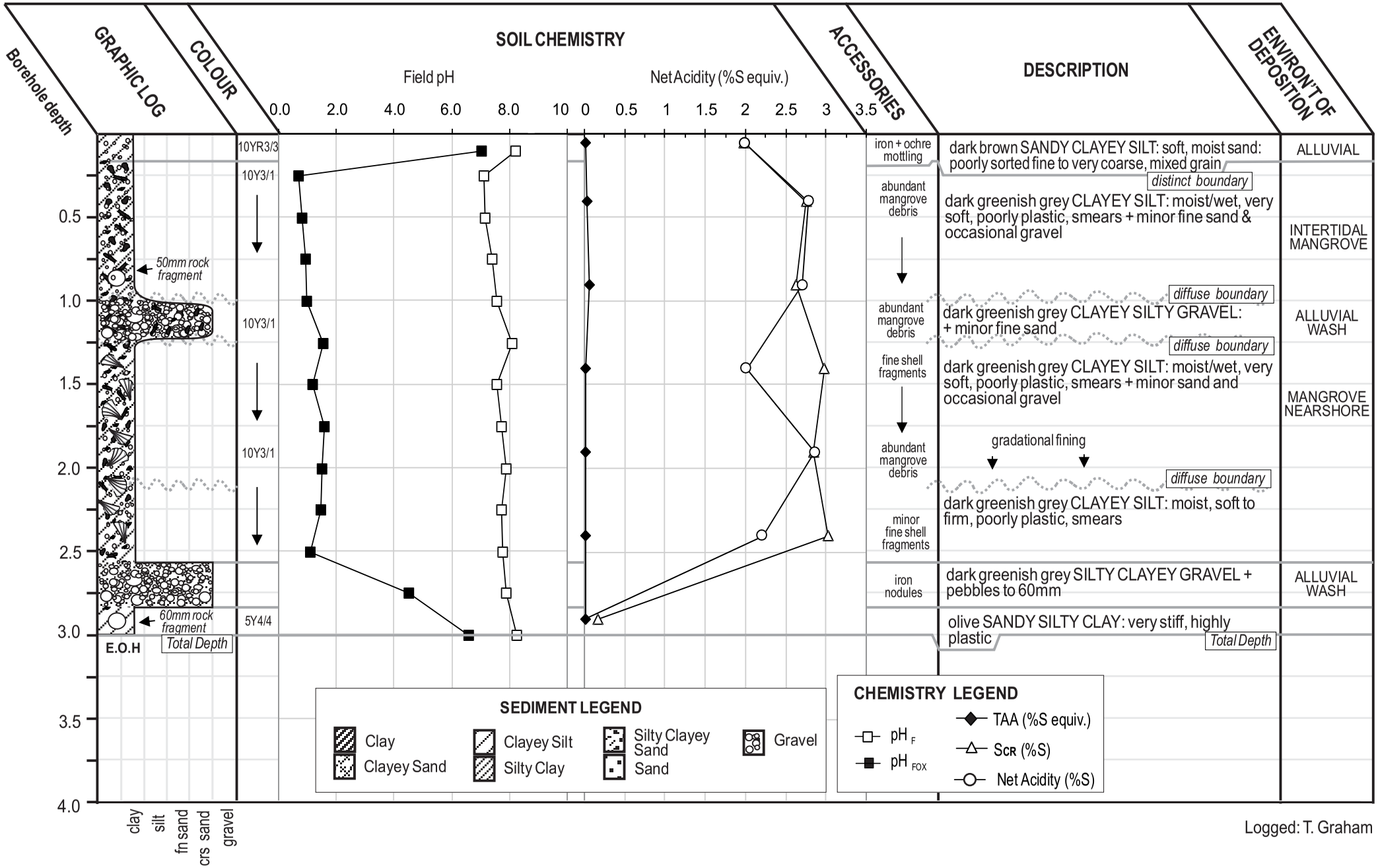
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 6/11/ 08

GeoCoastal Australia

Borehole #28



Logged: T. Graham

SITE: GC/ BG# 29

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315921°**S** 7369732°**E**

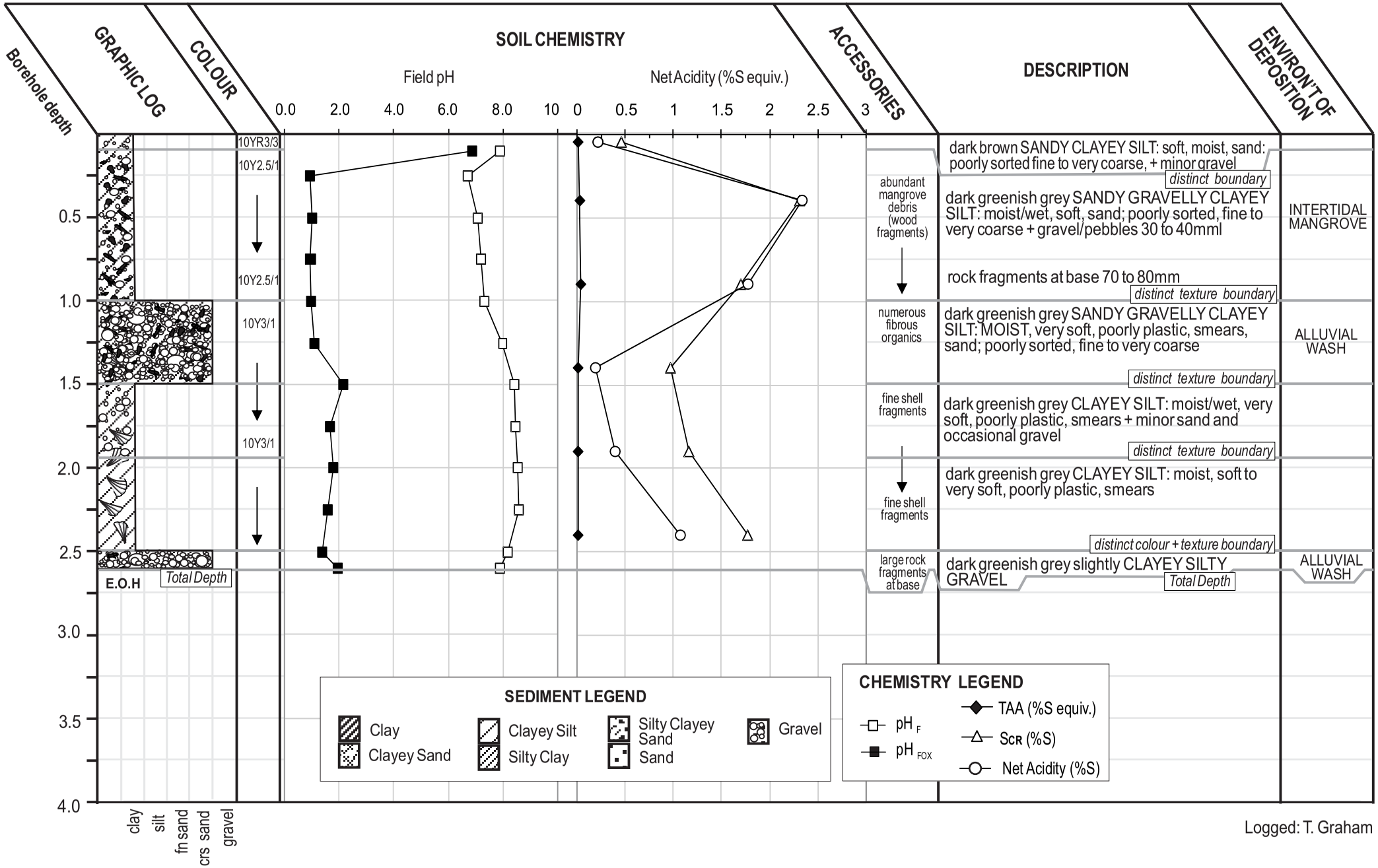
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 6/11/ 08

GeoCoastal Australia

Borehole #29



Logged: T. Graham

SITE: GC/ BG# 30

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 316138°**S** 7369722°**E**

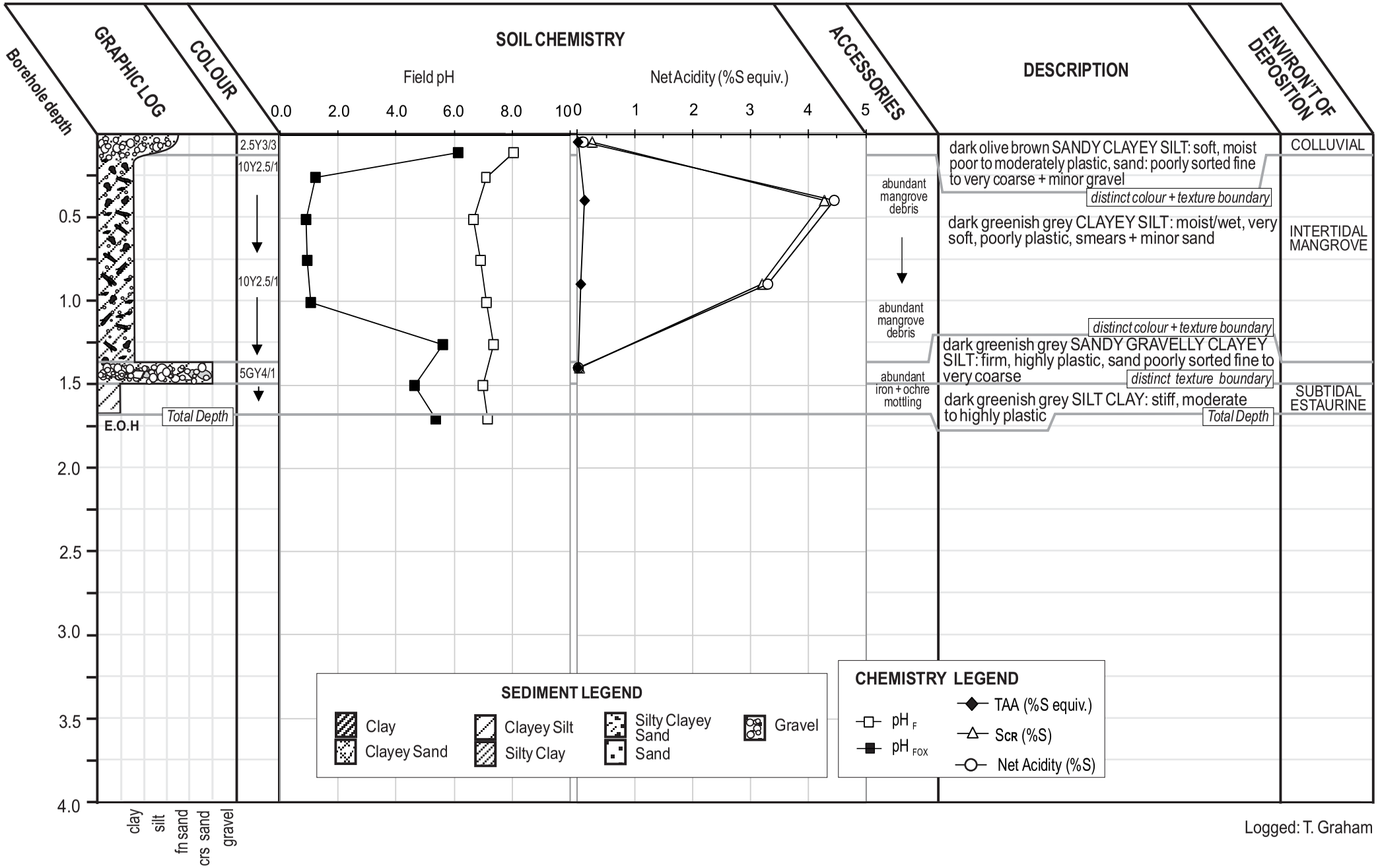
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibrocore

DATE: 6/11/ 08

GeoCoastal Australia

Borehole #30



Logged: T. Graham

SITE: GC/ BG# 31

FEATURE: Mangrove fringed Supratidal Flat

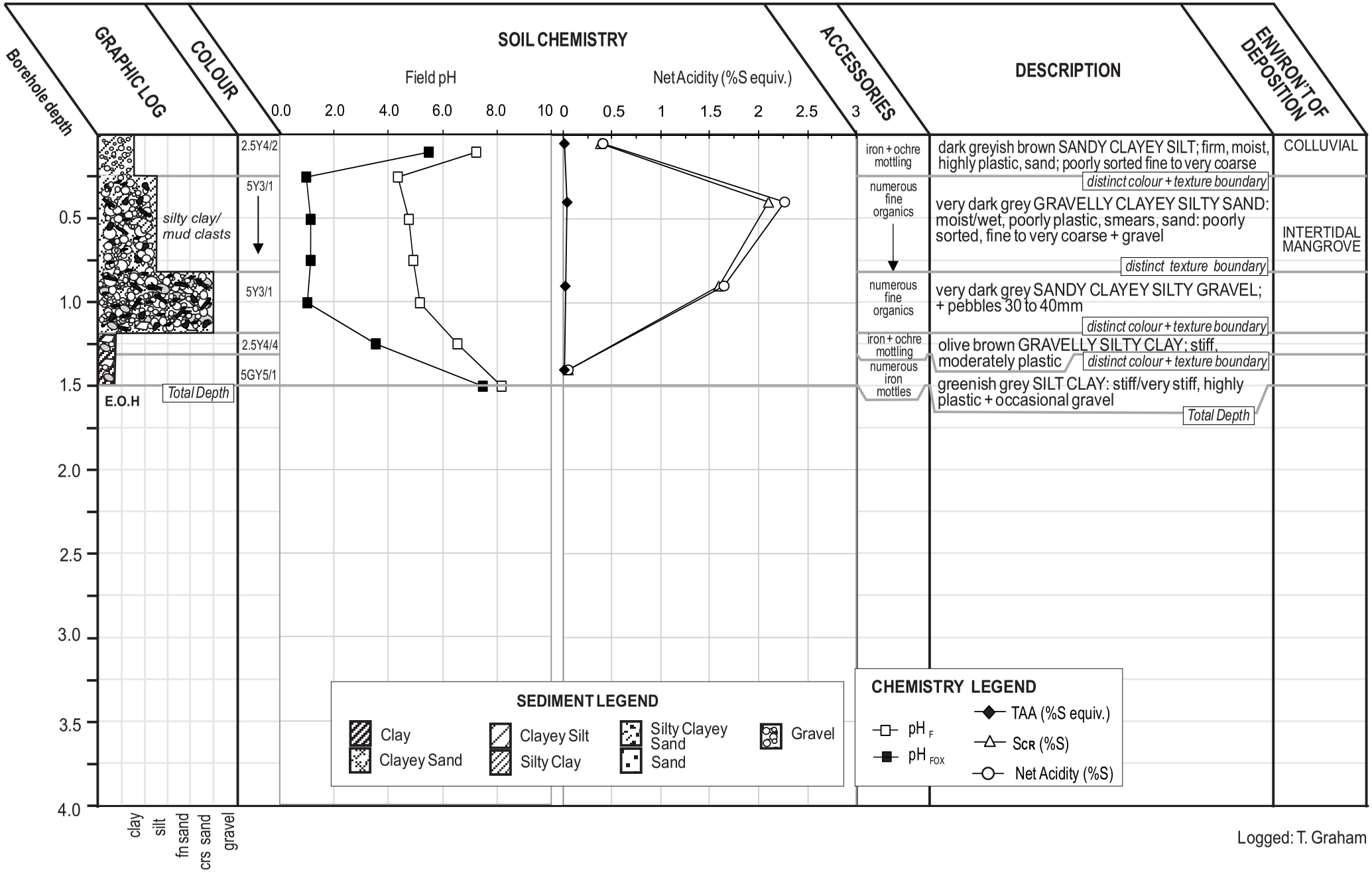
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 316063°**S** 7369915°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibrocore

DATE: 6/11/ 08

GeoCoastal Australia

Borehole #31



Logged: T. Graham

SITE: GC/ BG# 32

FEATURE: Mangrove fringed Supratidal Flat

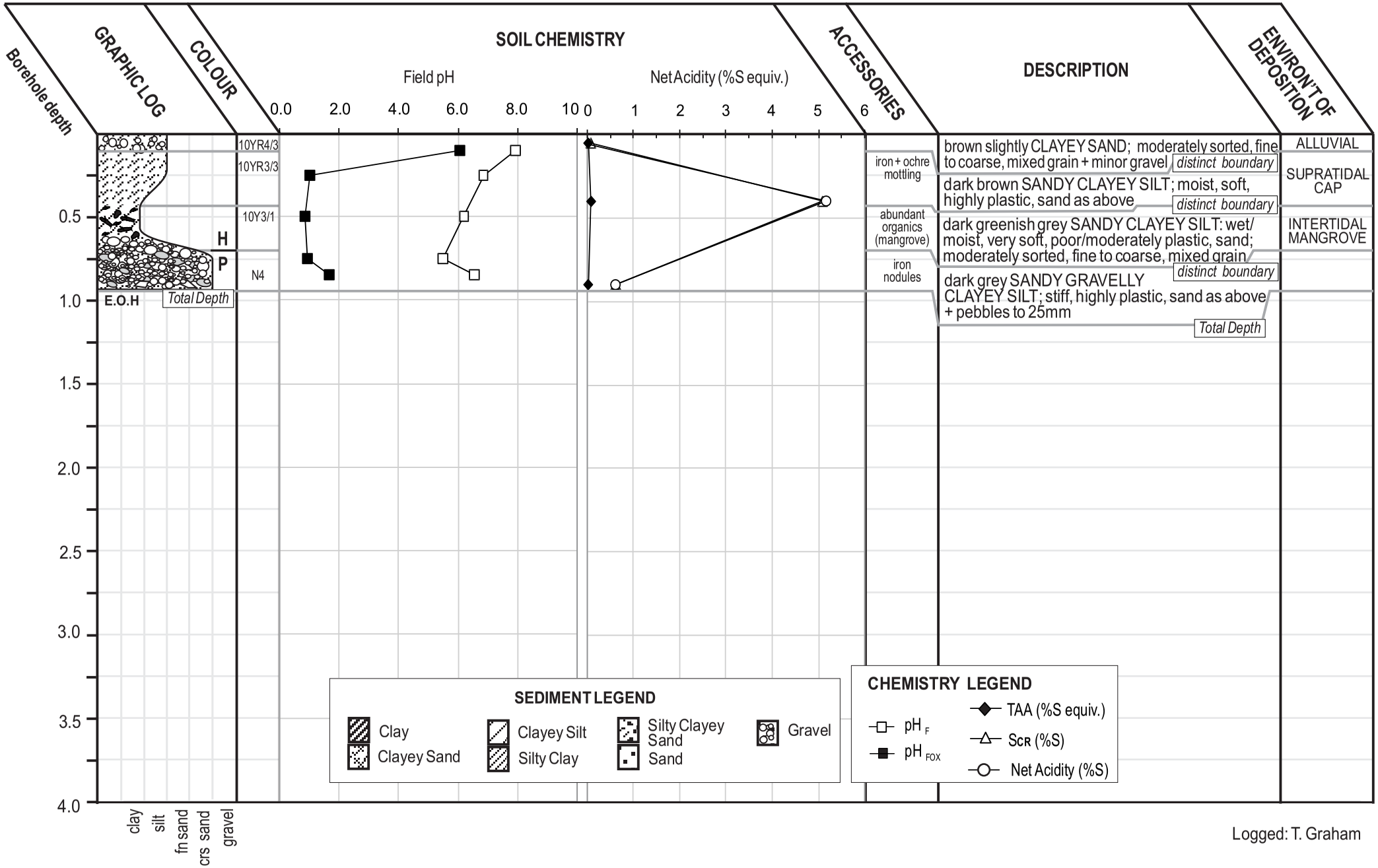
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 316023°S 7370224°E

SAMPLING METHOD: GeoCoastal Hydraulic Vibrocore

DATE: 6/11/08

GeoCoastal Australia

Borehole #32



Logged: T. Graham

SITE: GC/ BG# 33

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315921°**S** 7370323°**E**

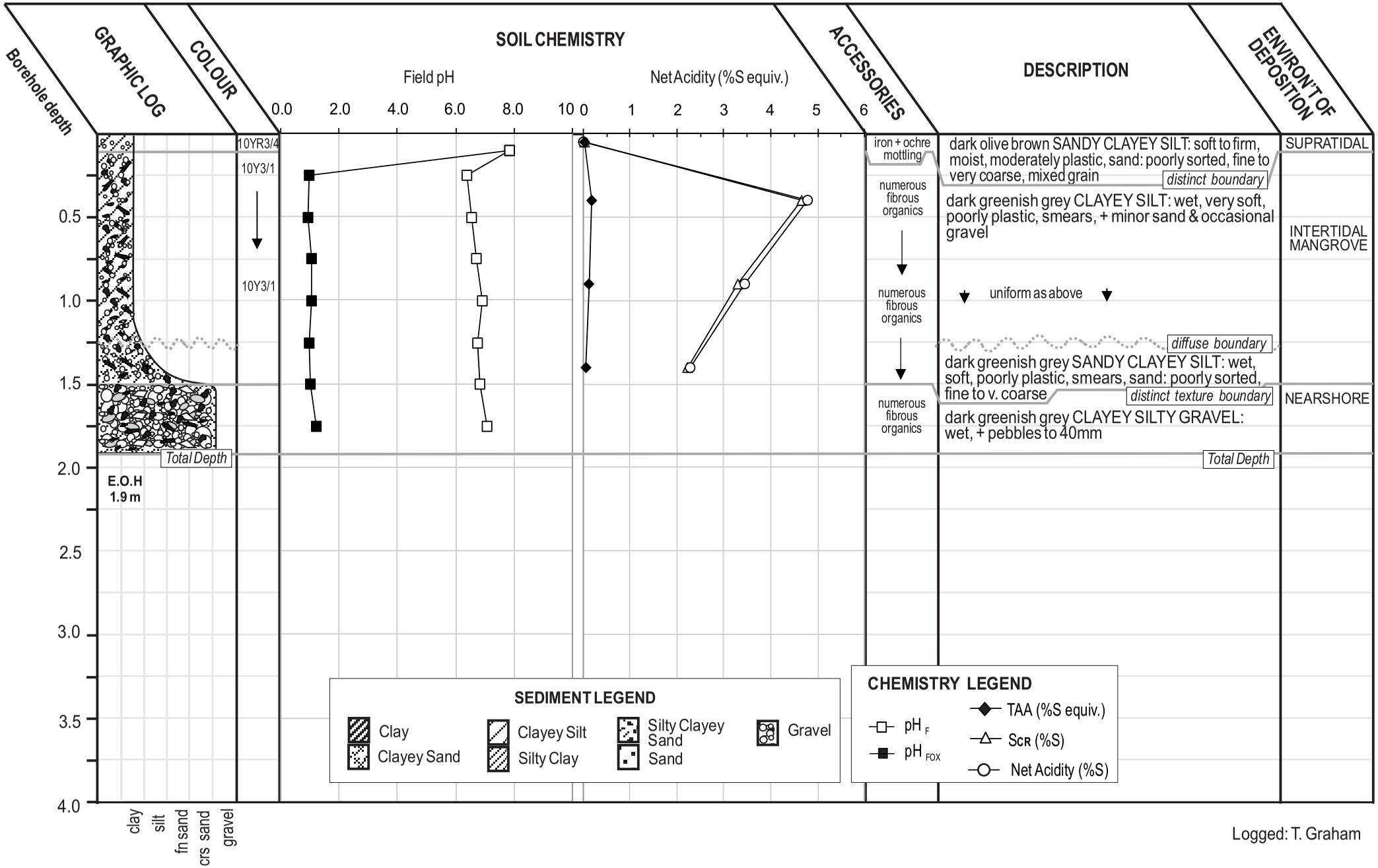
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 7/11/08

GeoCoastal Australia

Borehole #33



Logged: T. Graham

SITE: GC/ BG# 34

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315965**S** 7369837°**E**

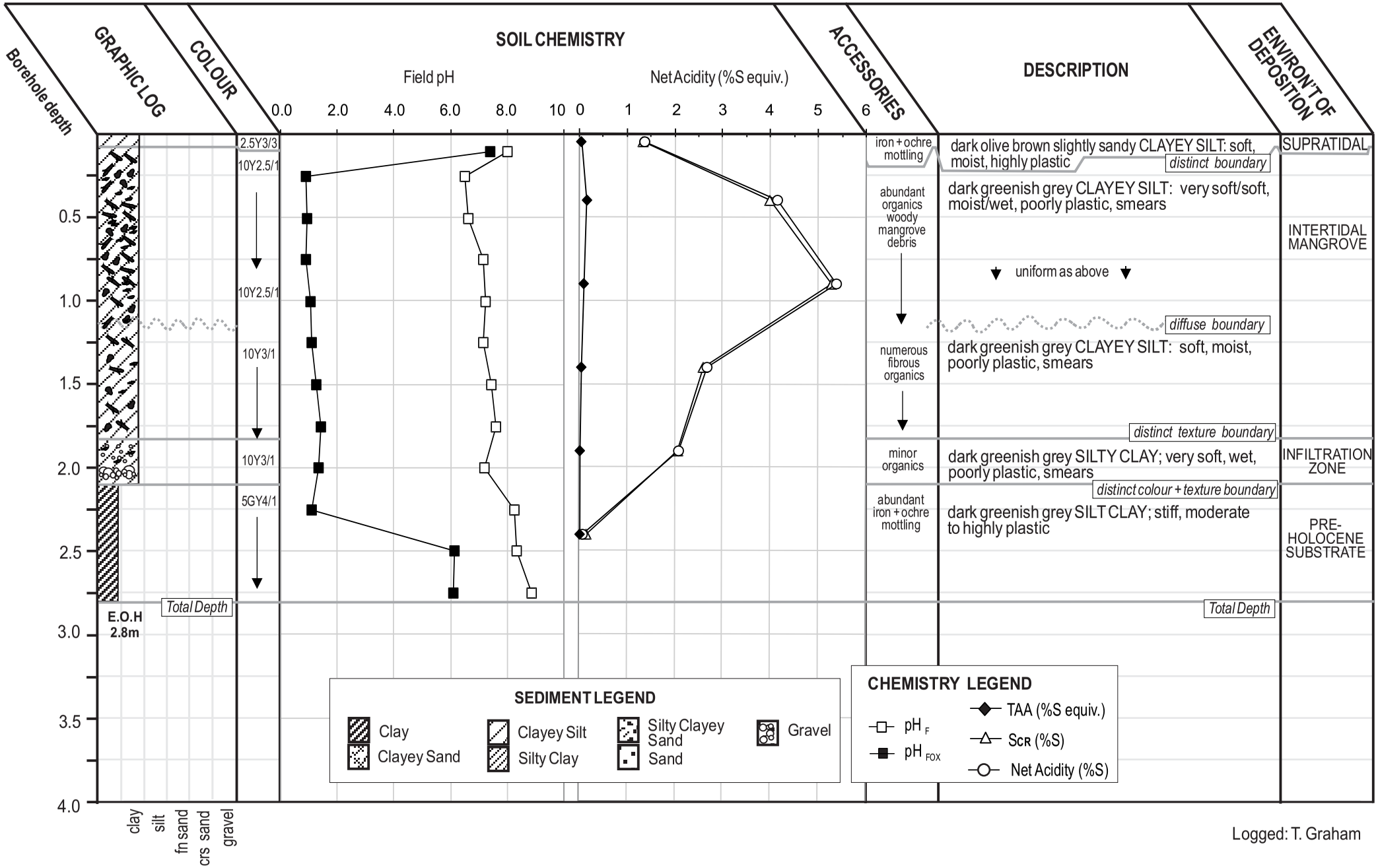
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: Hand Auger

DATE: 6/11/08

Geo Coastal Australia

Borehole #34



Logged: T. Graham

SITE: GC/ BG# 38

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315838°**S** 7370281°**E**

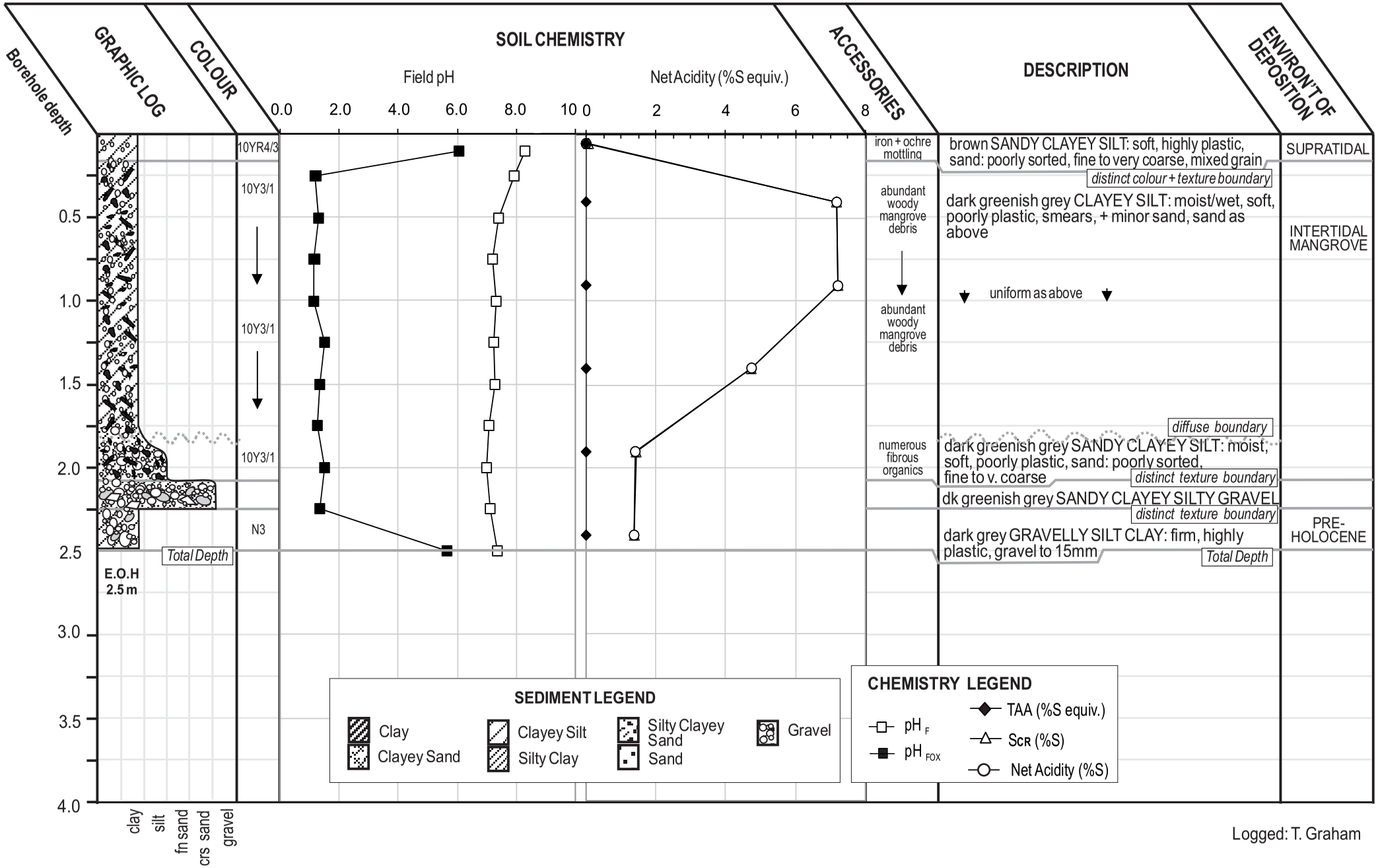
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE:7/11/ 08

GeoCoastal Australia

Borehole #38



Logged: T. Graham

SITE: GC/ BG# 39

FEATURE: Mangrove fringed Supratidal Flat

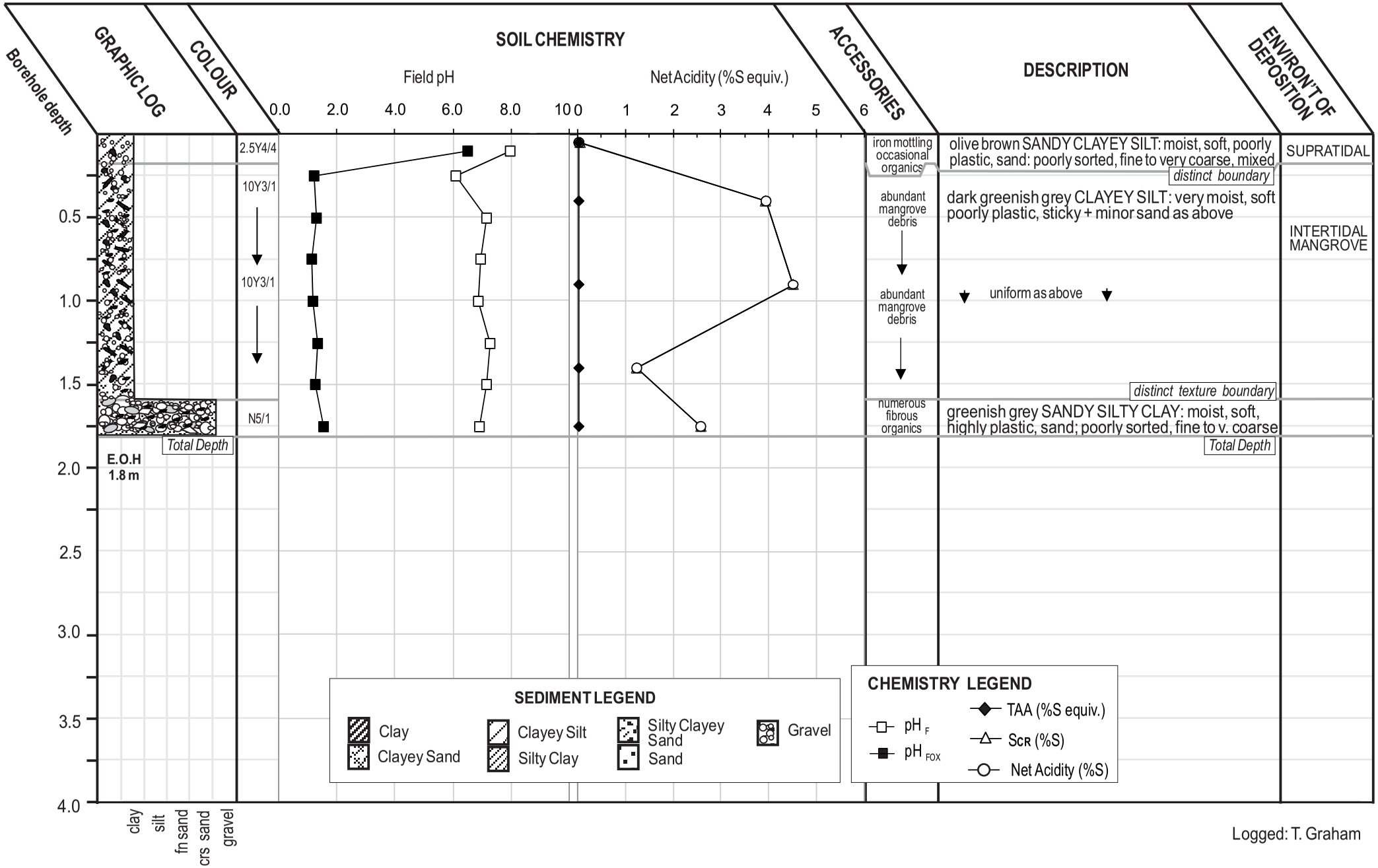
LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315798°**S** 7370375°**E**

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 8/11/08

GeoCoastal Australia

Borehole #39



Logged: T. Graham

SITE: GC/ BG# 40

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315750°**S** 7370459°**E**

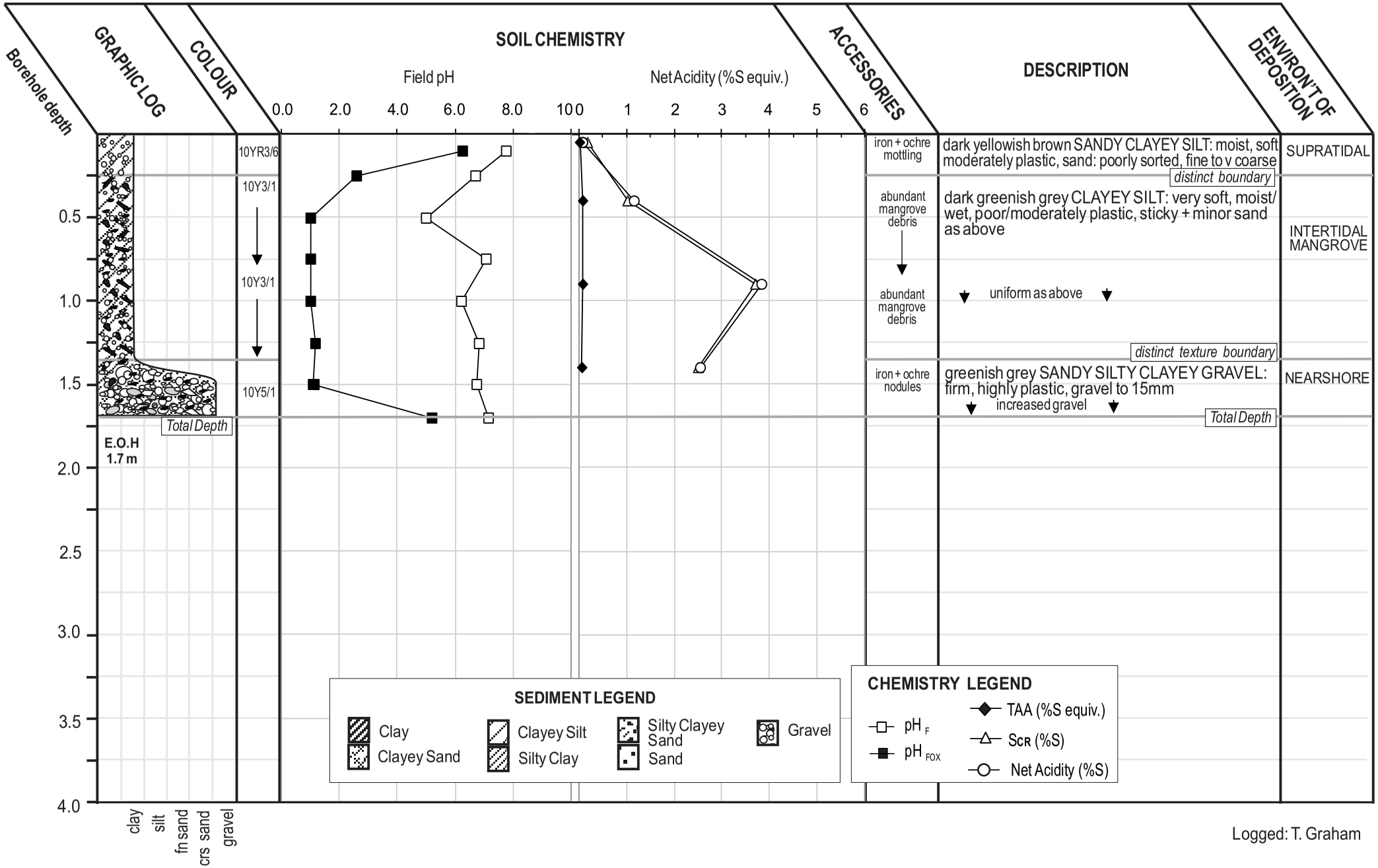
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 8/11/08

GeoCoastal Australia

Borehole #40



Logged: T. Graham

SITE: GC/ BG# 41

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315743°**S** 7370562°**E**

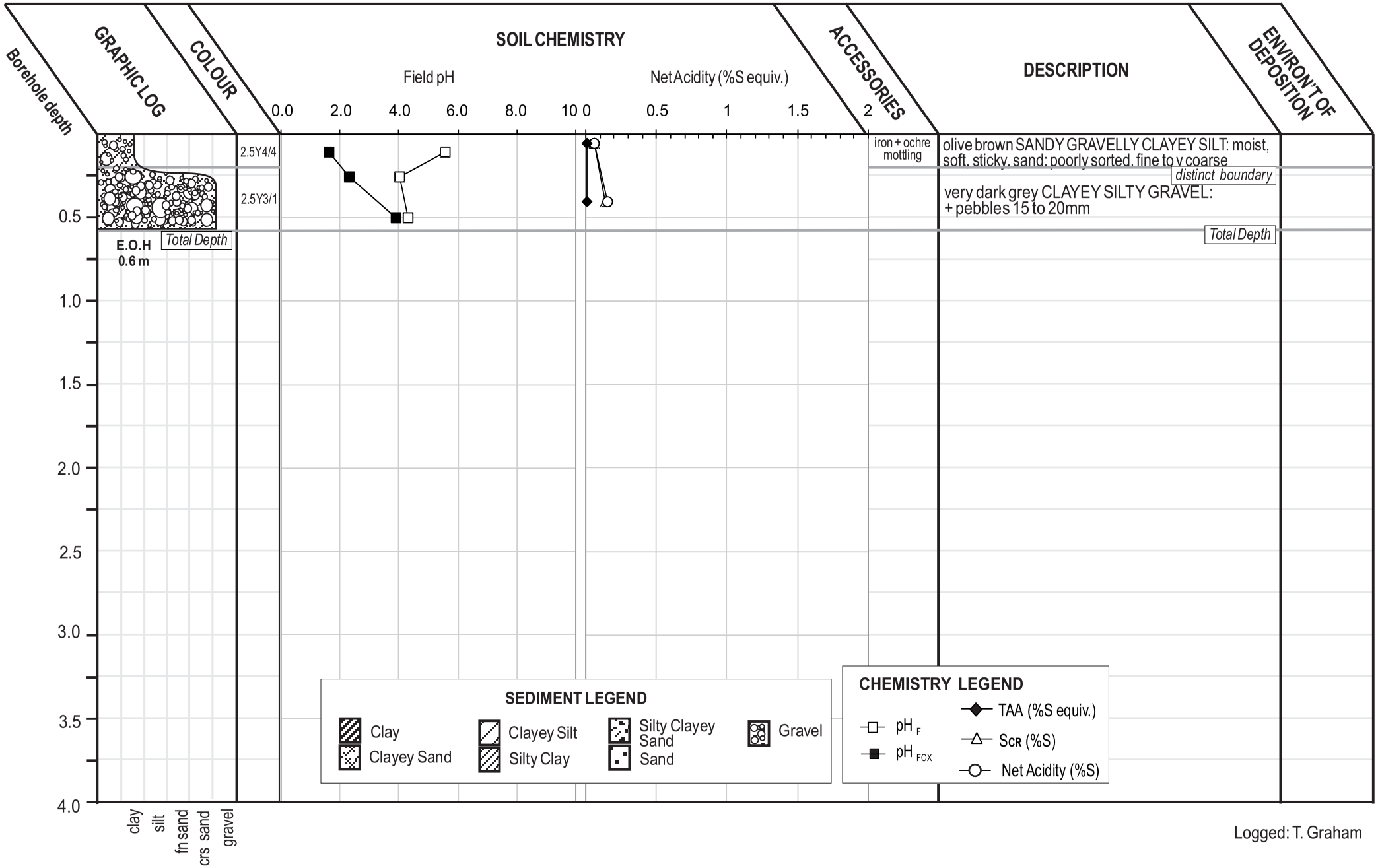
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 7/11/ 08

GeoCoastal Australia

Borehole #41



Logged: T. Graham

SITE: GC/ BG# 42

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315743°**S** 7370562°**E**

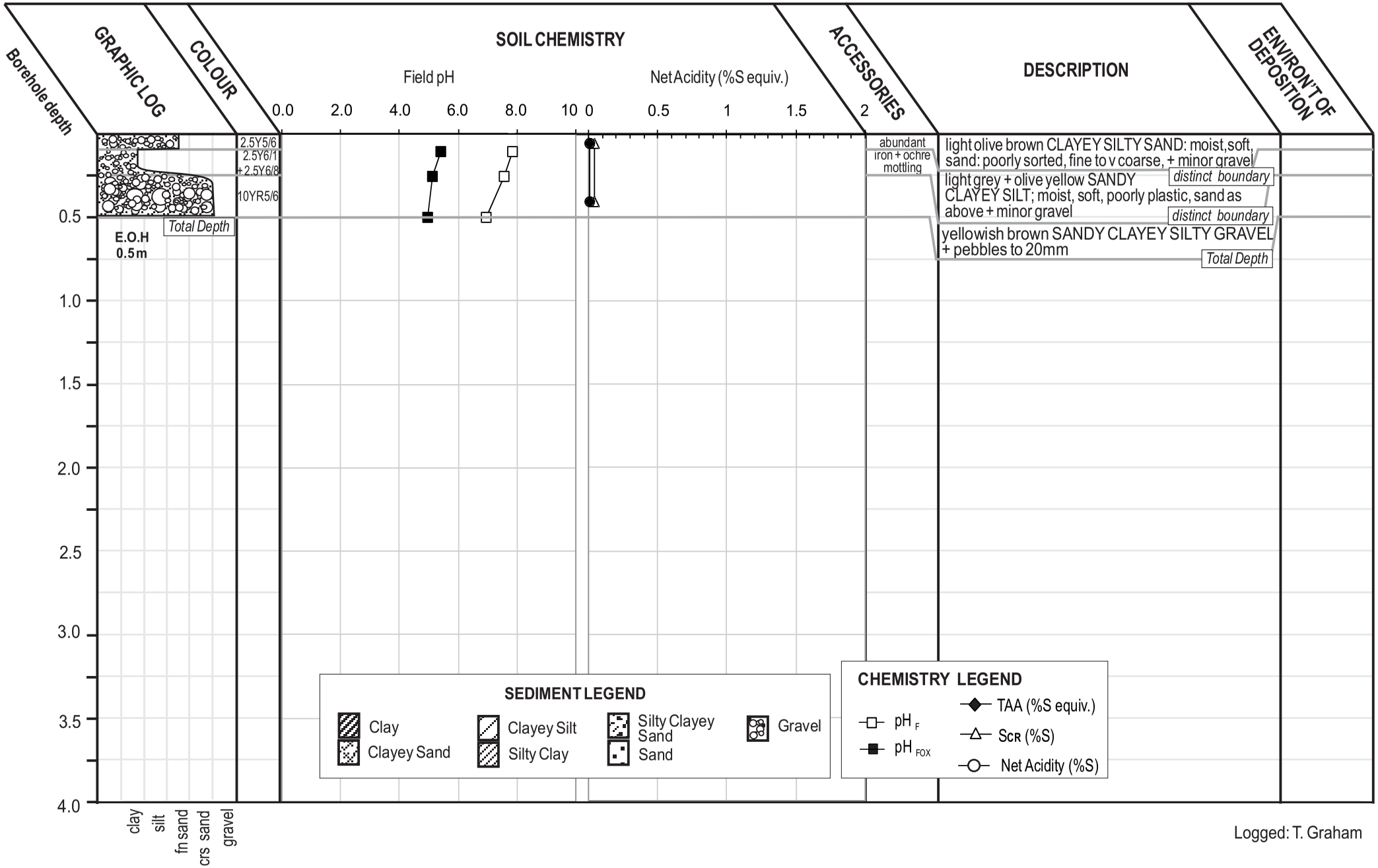
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 7/11/ 08

GeoCoastal Australia

Borehole #42



Logged: T. Graham

SITE: GC/ BG# 43

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315528°**S** 7370734°**E**

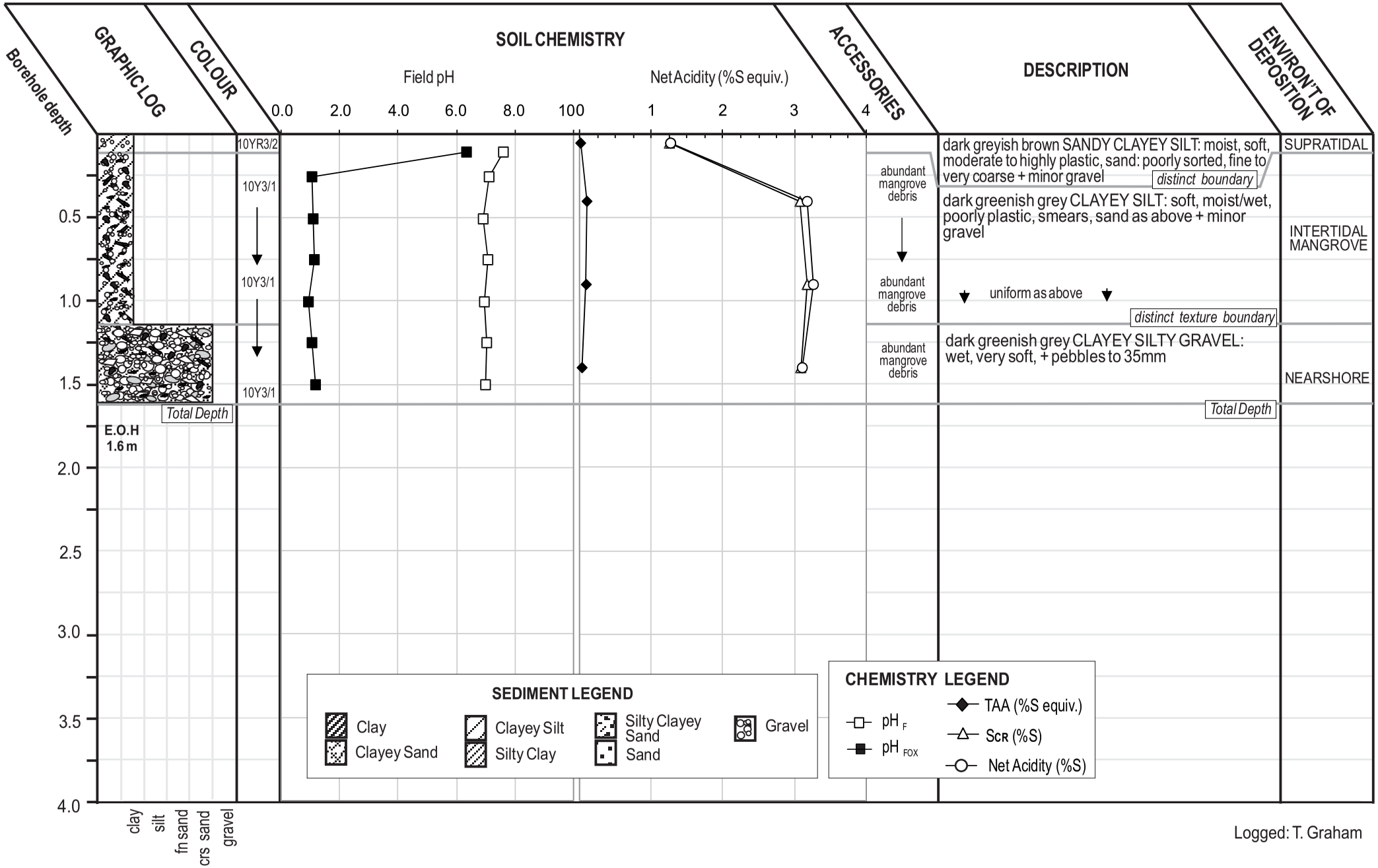
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 7/11/ 08

GeoCoastal Australia

Borehole #43



Logged: T. Graham

SITE: GC/ BG# 44

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315569°**S** 7370632°**E**

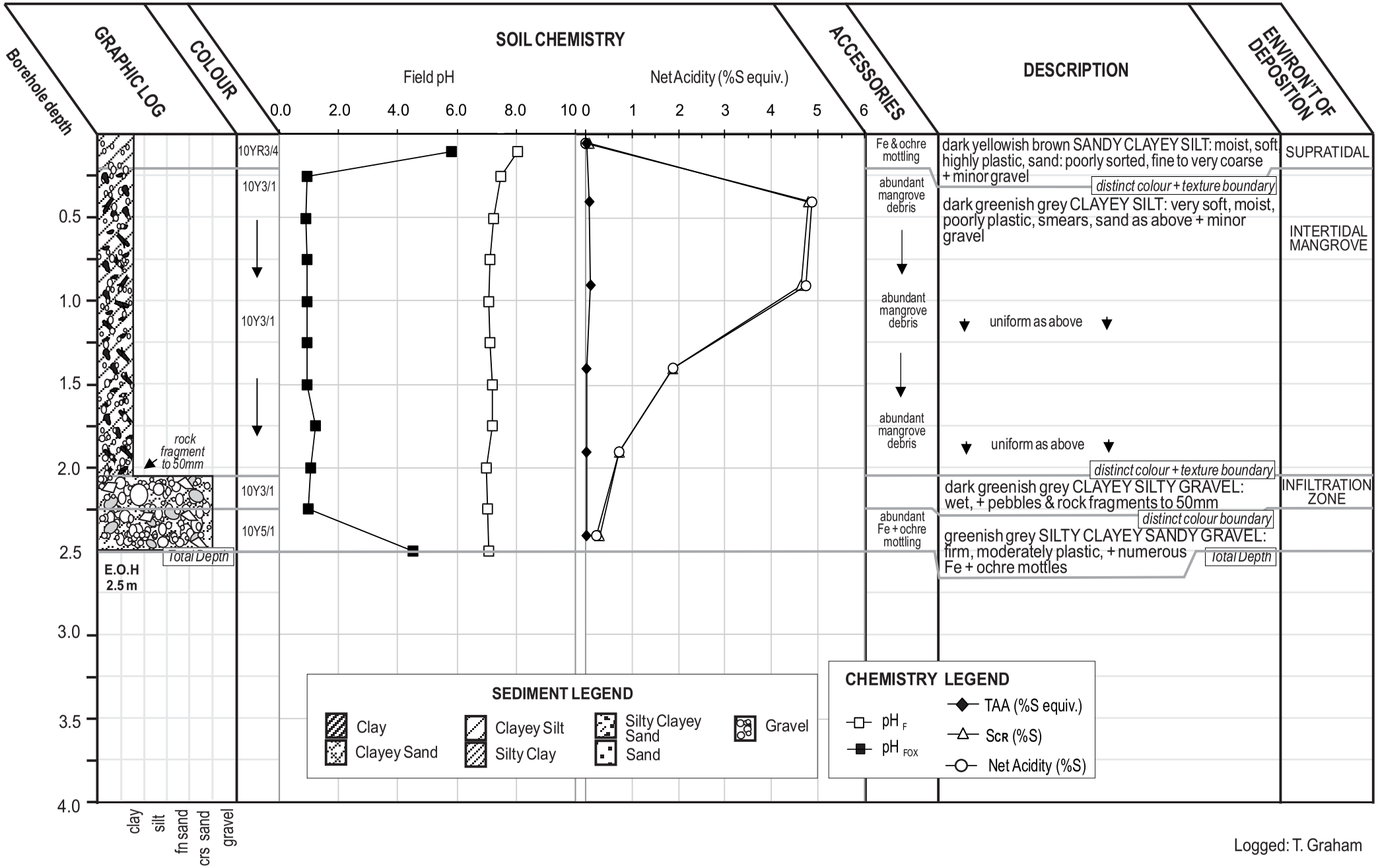
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 7/11/ 08

GeoCoastal Australia

Borehole #44



Logged: T. Graham

SITE: GC/ BG# 45

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315648°**S** 7370566°**E**

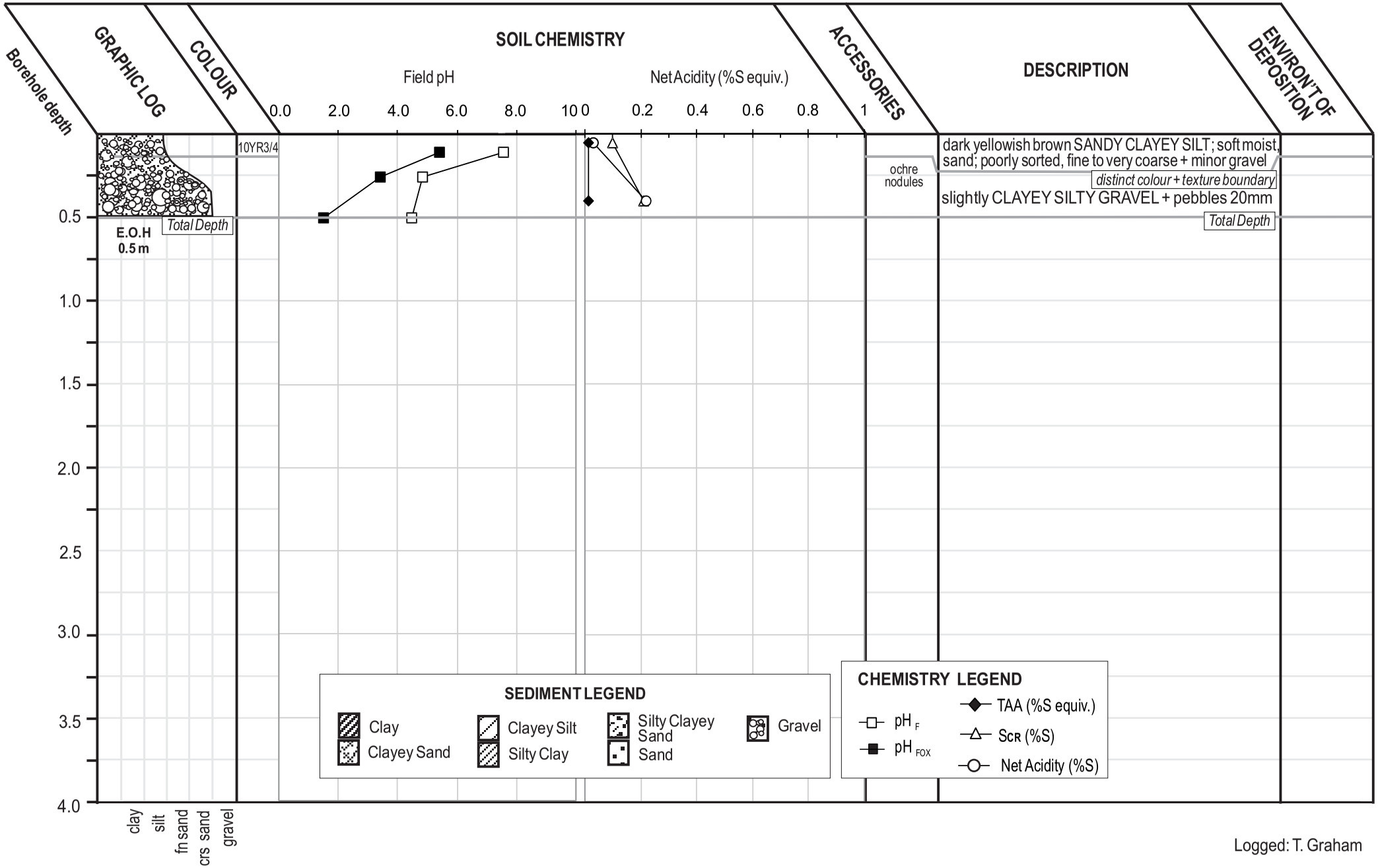
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 7/11/ 08

GeoCoastal Australia

Borehole #45



Logged: T. Graham

SITE: GC/ BG# 46

LOCATION: Curtis Island, Gladstone, QLD
WGS 84 315641°**S** 7370360°**E**

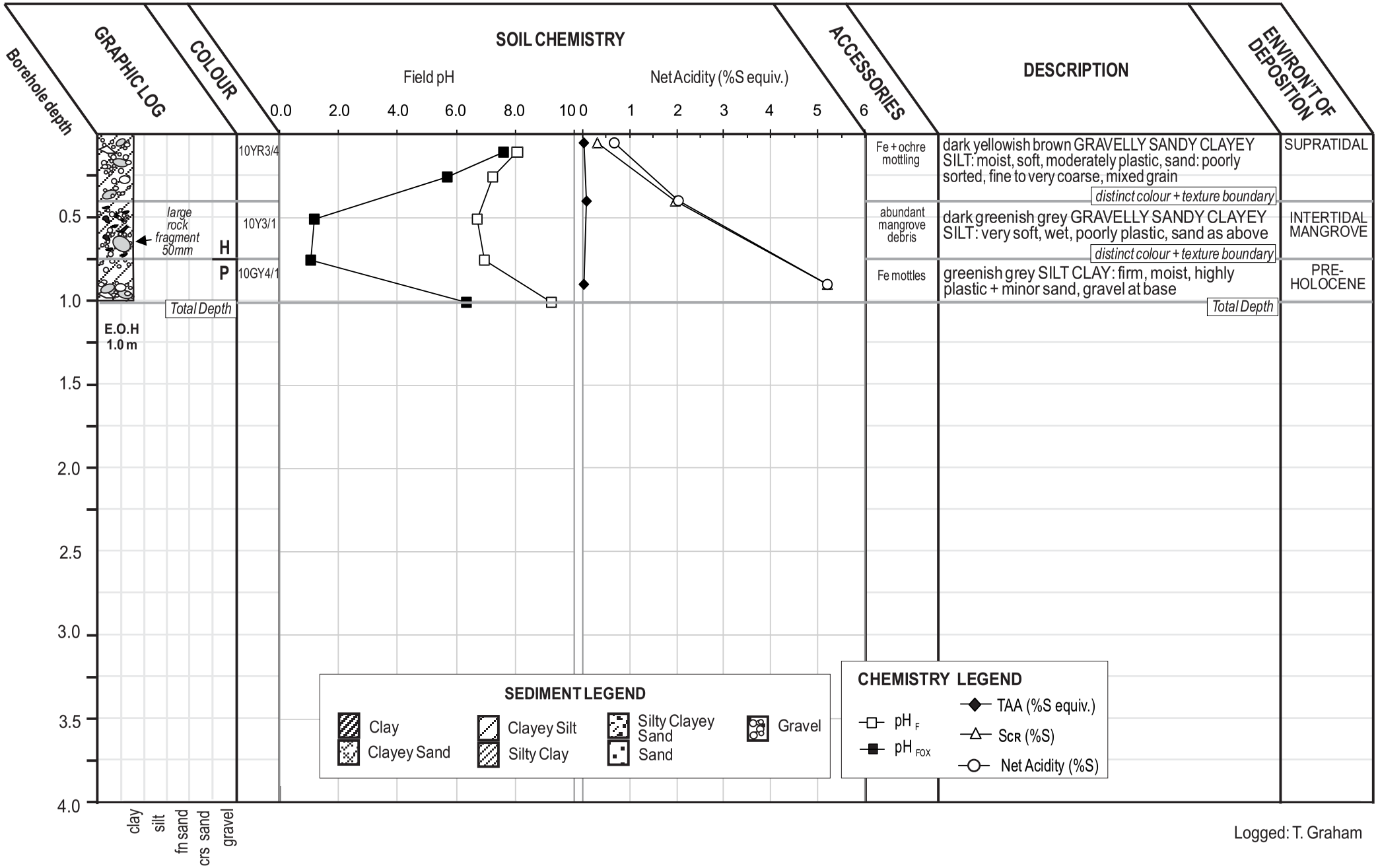
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 7/11/ 08

GeoCoastal Australia

Borehole #46



Logged: T. Graham

SITE: GC/ BG# 47

LOCATION: Friend Point, Gladstone, QLD
WGS 84 309951°**S** 7371734°**E**

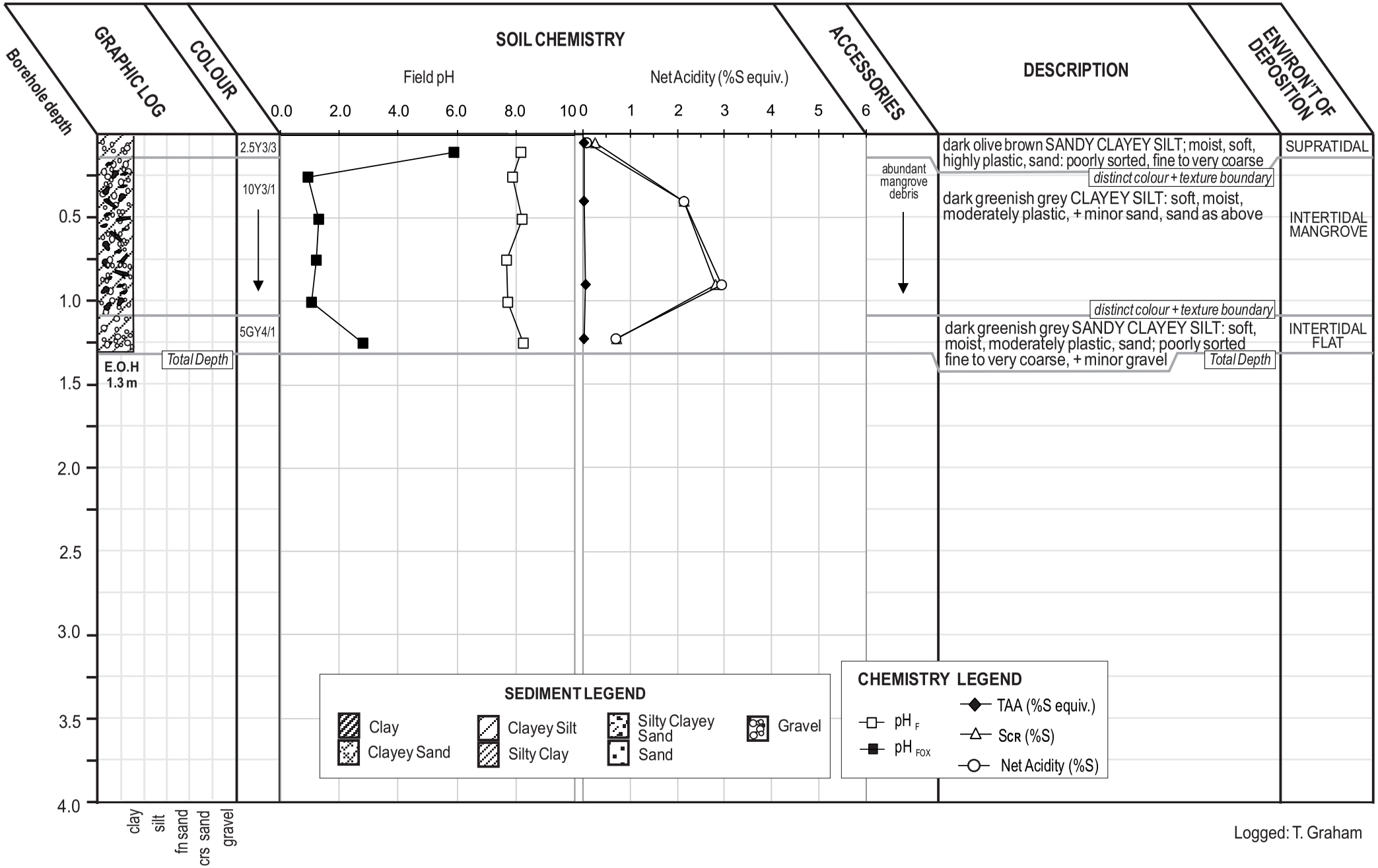
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 10/11/ 08

GeoCoastal Australia

Borehole #47



Logged: T. Graham

SITE: GC/ BG# 48

LOCATION: Friend Point, Gladstone, QLD
WGS 84 309642°**S** 7371719°**E**

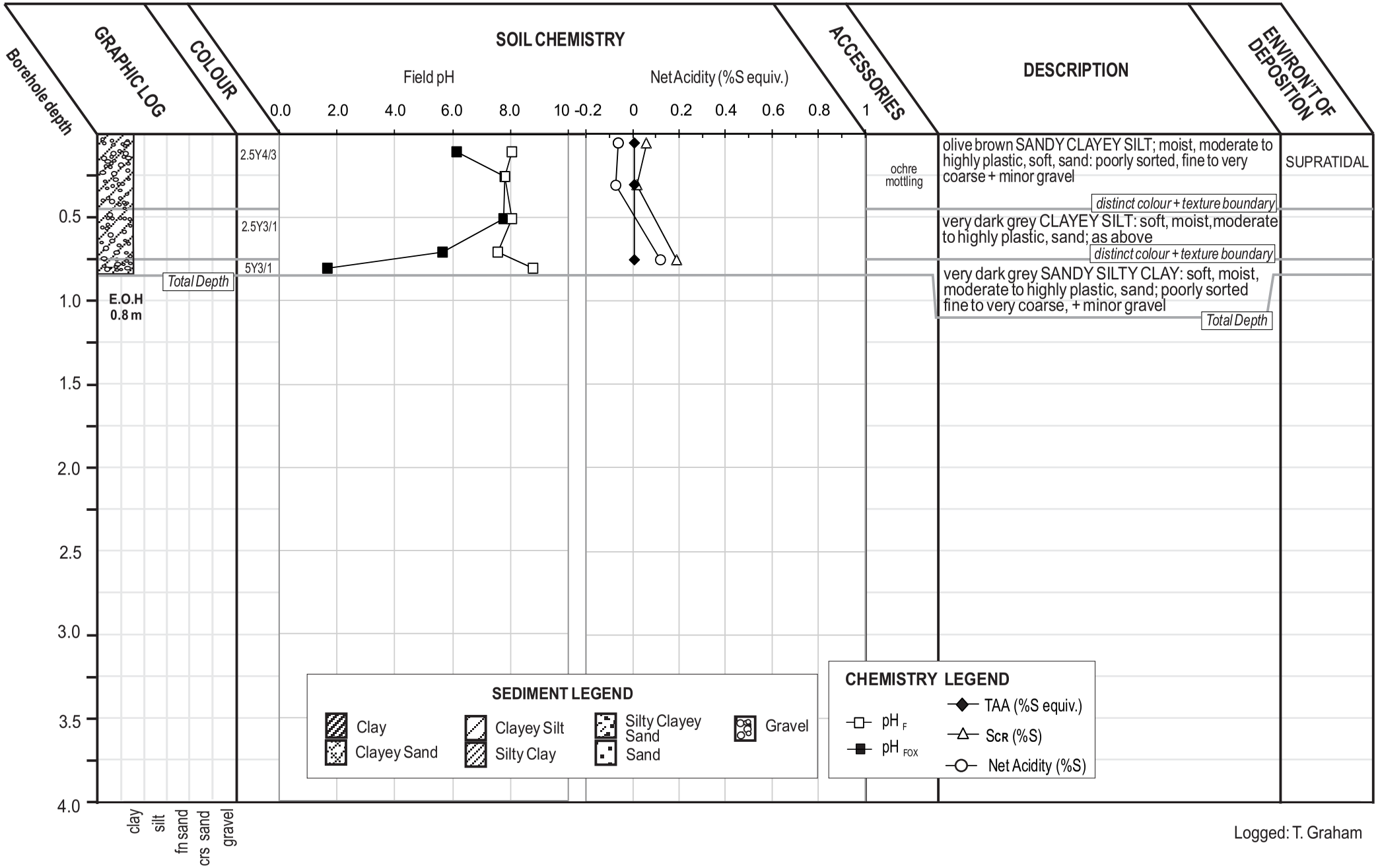
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 10/11/ 08

GeoCoastal Australia

Borehole #48



Logged: T. Graham

SITE: GC/ BG# 49

LOCATION: Friend Point, Gladstone, QLD
WGS 84 309344°**S** 7371698°**E**

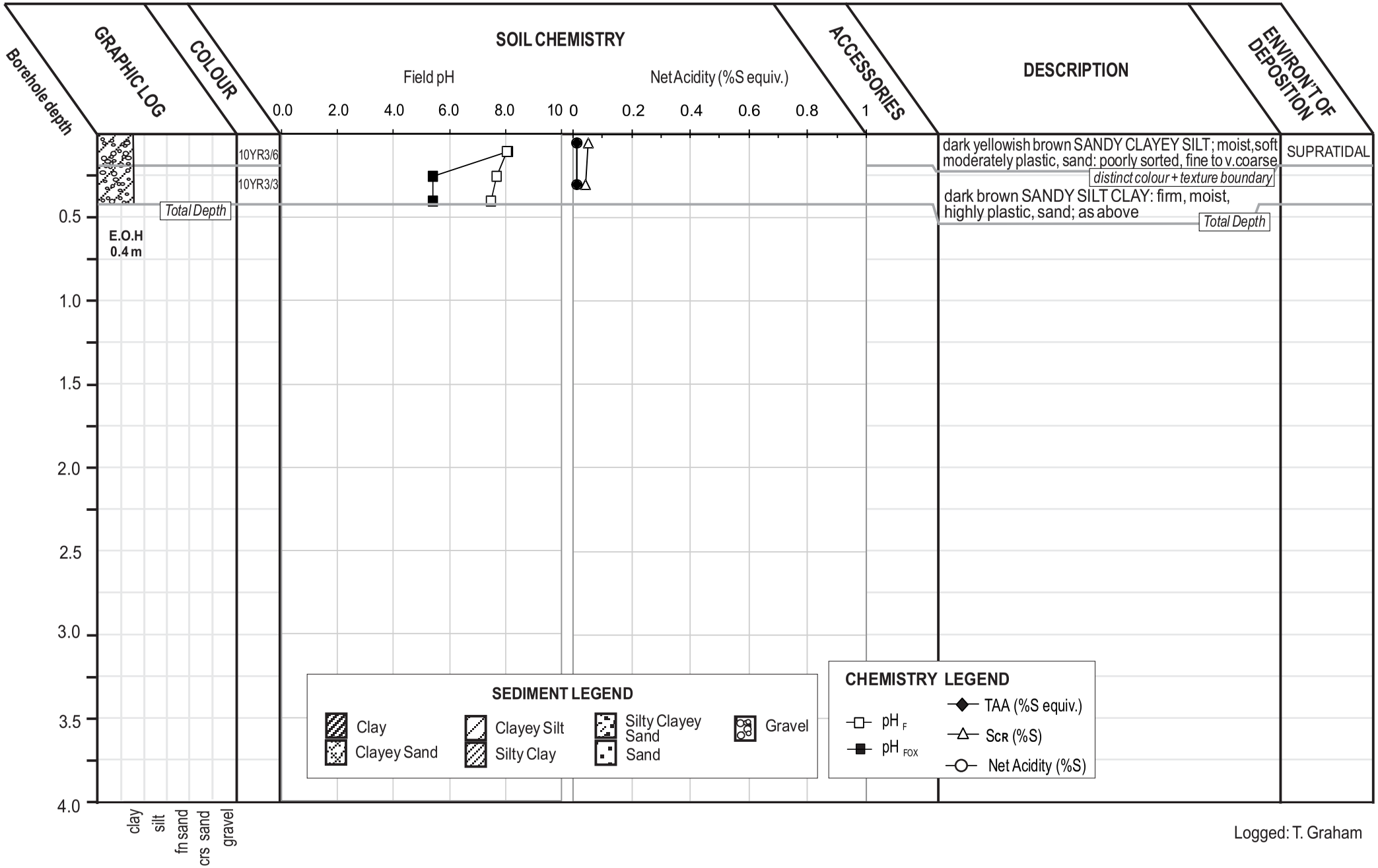
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 10/11/ 08

GeoCoastal Australia

Borehole #49



Logged: T. Graham

SITE: GC/ BG# 50

LOCATION: Friend Point, Gladstone, QLD
WGS 84 309043°**S** 7371694°**E**

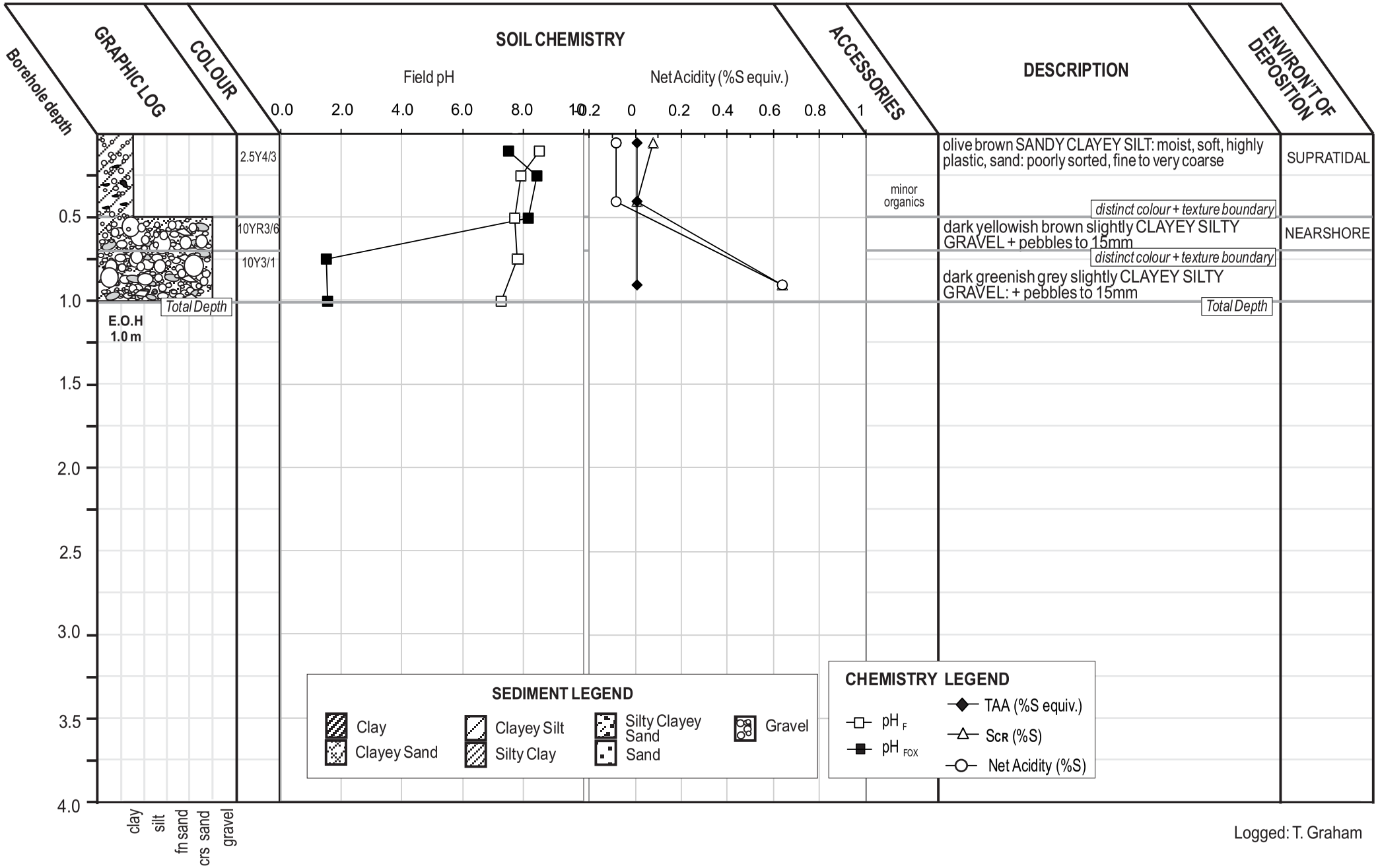
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 10/11/ 08

GeoCoastal Australia

Borehole #50



Logged: T. Graham

SITE: GC/ BG# 51

LOCATION: Friend Point, Gladstone, QLD
WGS 84 310736°**S** 7372085°**E**

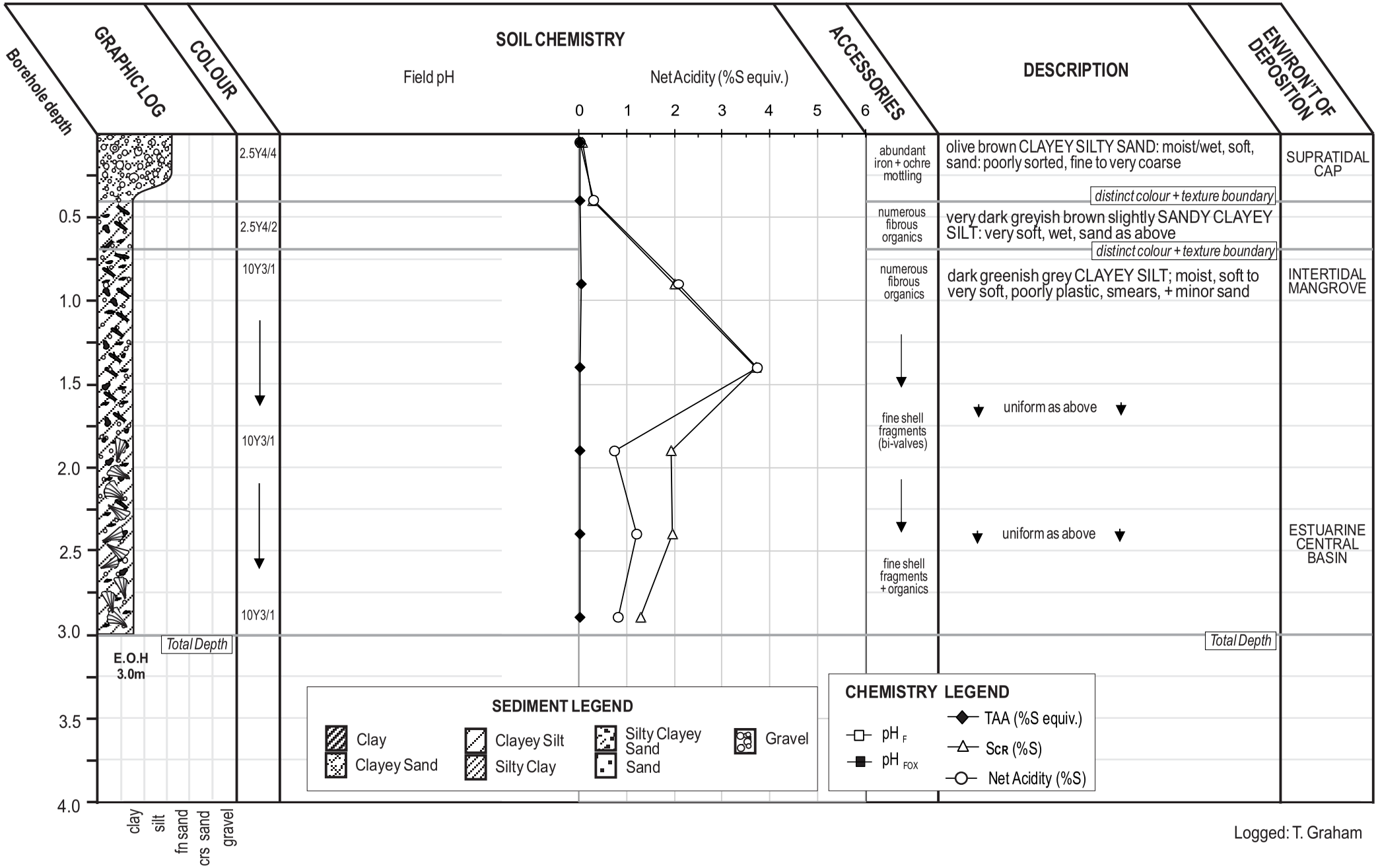
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 10/11/ 08

GeoCoastal Australia

Borehole #51



Logged: T. Graham

SITE: GC/ BG# 52

LOCATION: Friend Point, Gladstone, QLD
WGS 84 310531°**S** 7371869°**E**

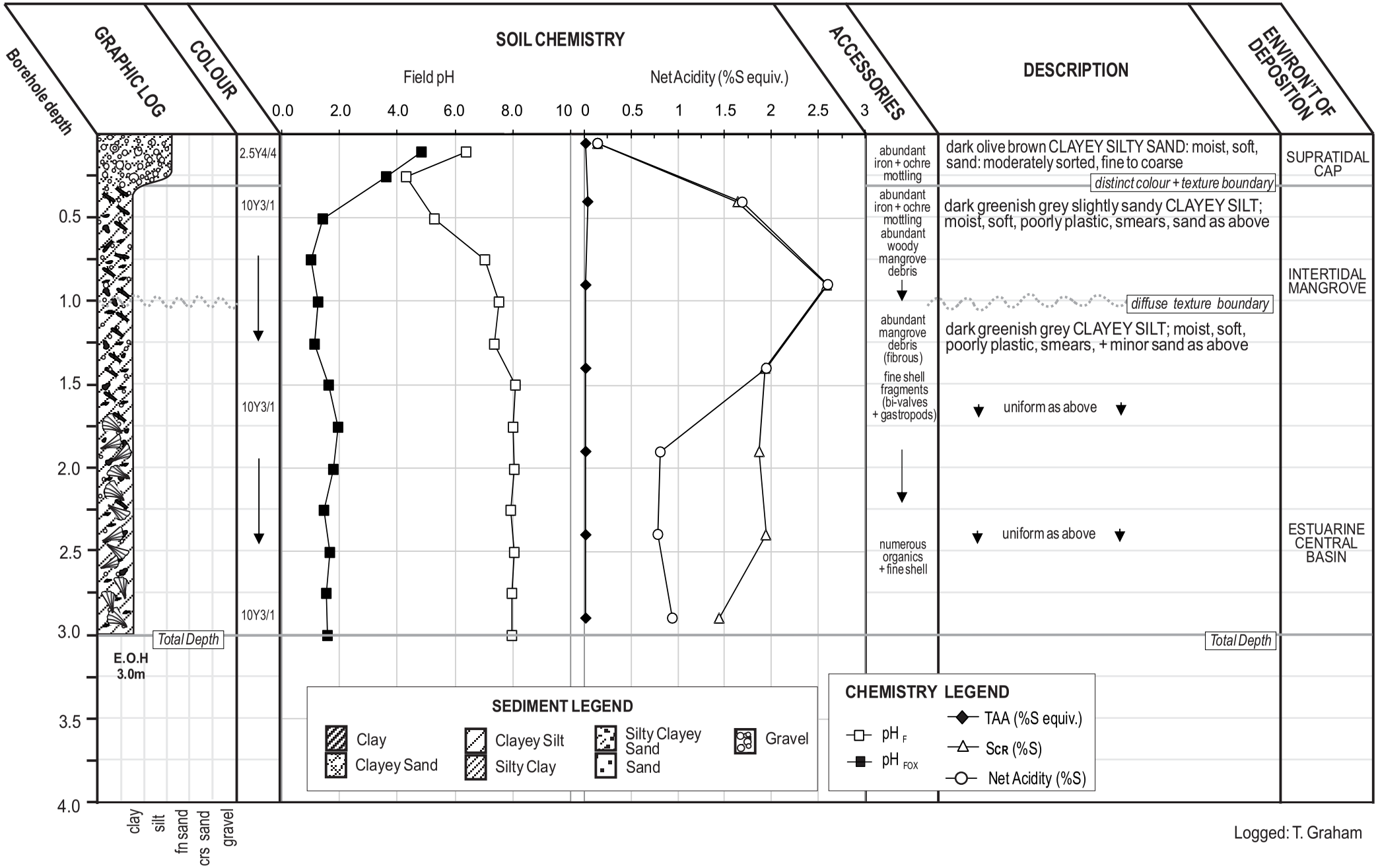
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 10/11/ 08

GeoCoastal Australia

Borehole #52



Logged: T. Graham

SITE: GC/ BG# 53

LOCATION: Friend Point, Gladstone, QLD
WGS 84 310249°**S** 7371766°**E**

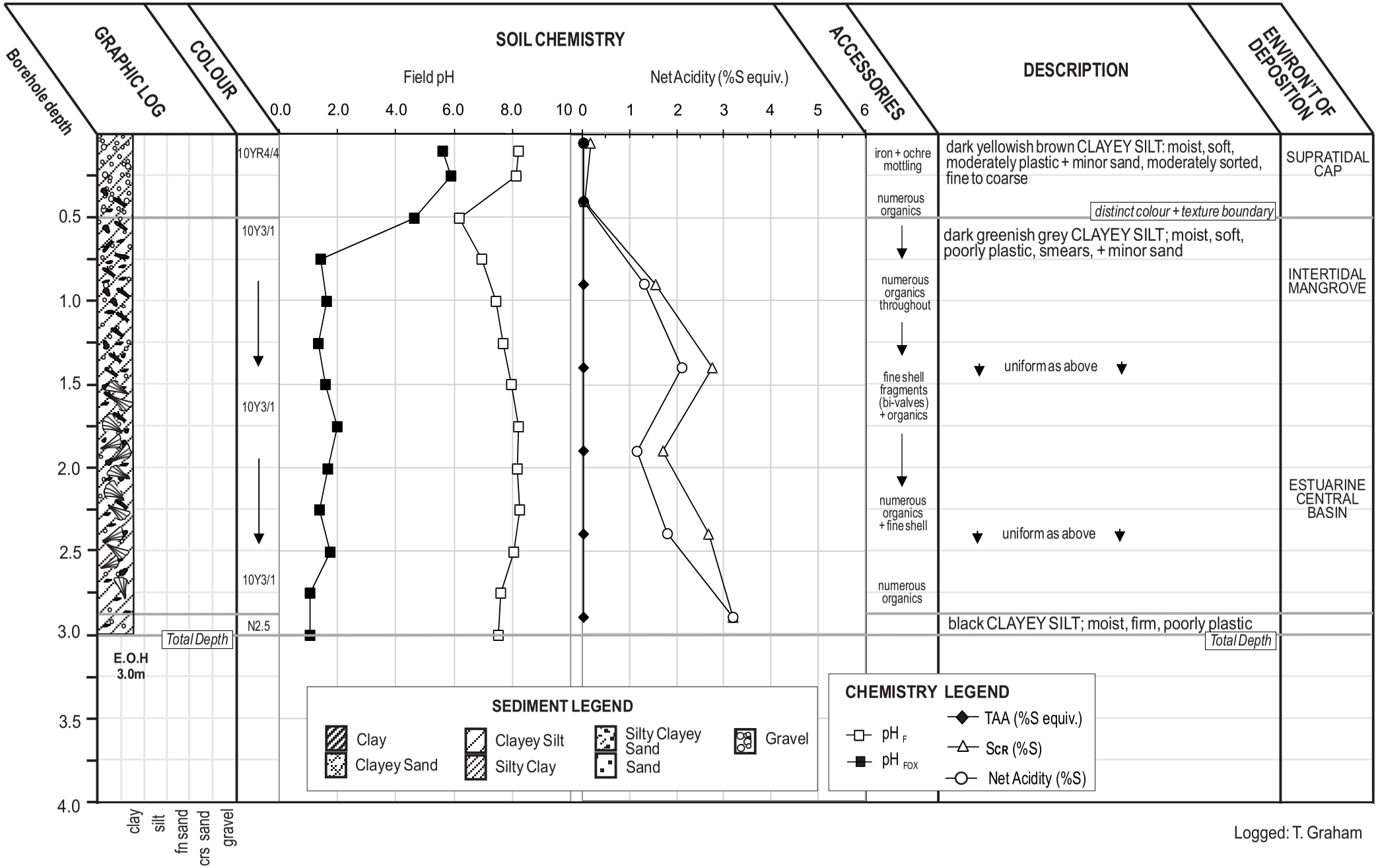
FEATURE: Mangrove fringed Supratidal Flat

SAMPLING METHOD: GeoCoastal Hydraulic Vibracore

DATE: 10/11/ 08

GeoCoastal Australia

Borehole #53



Logged: T. Graham

APPENDIX 2

Field pH screening data.

APPENDIX 2 Field pH screening tests on core samples.

Core 1						Core 2				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
8.25	6.10	2.15	0.1	xxx		7.27	5.53	1.74	0.1	xx
7.05	5.49	1.56	0.25	xxx		4.80	1.39	3.41	0.25	xxxx!
7.67	1.36	6.31	0.5	xxxx!		4.95	1.14	3.81	0.5	xx
7.90	1.78	6.12	0.75	xxxx!		7.46	1.77	5.69	0.75	xxxx!
8.06	1.70	6.36	1.0	xxxx!		7.44	1.58	5.86	1.0	xxxx!
8.47	1.90	6.57	1.25	xxxx!		7.89	1.37	6.52	1.25	xxxx!
8.75	1.87	6.88	1.5	xxxx!		8.35	2.54	5.81	1.5	xxxx!
8.64	1.86	6.78	1.75	xxxx!		8.52	1.91	6.61	1.75	xxxx!
8.36	1.91	6.45	2.0	xxxx!		8.19	2.06	6.13	2.0	xxxx!
8.46	1.75	6.71	2.25	xxxx!		8.23	1.78	6.45	2.25	xxxx!
8.47	2.10	6.37	2.5	xxx!		8.56	1.80	6.76	2.5	xxxx!
8.33	1.63	6.70	2.8	xxxx!		8.32	1.83	6.49	2.8	xxxx!
7.94	1.46	6.48	3	xxxx!		8.03	1.79	6.24	3	xxxx!
Core 3						Core 4				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.33	5.59	1.74	0.1	xx		7.82	5.76	2.06	0.1	xx
5.05	3.07	1.98	0.25	x		5.73	3.77	1.96	0.25	x
6.84	1.27	5.57	0.5	xxxx!		4.84	1.65	3.19	0.5	xxxx!
7.23	1.53	5.70	0.75	xxxx!		6.62	1.58	5.04	0.75	xxxx!
7.59	1.29	6.30	1.0	xxxx!		7.67	1.70	5.97	1.0	xxxx!
7.66	1.35	6.31	1.25	xxxx!		7.95	1.61	6.34	1.25	xxxx!
7.83	1.69	6.14	1.5	xxxx!		8.19	2.03	6.16	1.5	xxxx!
8.15	1.48	6.67	1.75	xxxx!		8.51	1.80	6.71	1.75	xxxx!
8.25	1.59	6.66	2.0	xxxx!		8.33	1.79	6.54	2.0	xxxx!
7.82	1.52	6.30	2.25	xxxx!		8.26	1.73	6.53	2.25	xxxx!
8.22	1.61	6.61	2.5	xxxx!		8.03	1.59	6.44	2.5	xxxx!
8.05	1.97	6.08	2.8	xxxx!		7.75	1.35	6.40	2.8	xxxx!
8.03	1.85	6.18	3	xxxx!		7.18	1.14	6.04	3	xxxx!
Core 5						Core 6				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.73	6.22	1.51	0.1	xx		6.35	4.60	1.75	0.1	x
4.04	2.33	1.71	0.25	x		4.81	3.21	1.60	0.25	x
5.35	1.11	4.24	0.5	xxxx!		5.15	1.16	3.99	0.5	xxxx!
5.31	1.32	3.99	0.75	xxxx!		6.30	1.19	5.11	0.75	xxxx!
6.54	1.17	5.37	1.0	xxxx!		6.79	0.98	5.81	1.0	xxxx!
7.64	1.42	6.22	1.25	xxxx!		7.62	1.12	6.50	1.25	xxxx!
7.82	1.30	6.52	1.5	xxxx!		7.66	1.50	6.16	1.5	xxxx!
8.23	2.31	5.92	1.75	xxxx!		8.02	1.59	6.43	1.75	xxxx!
8.17	1.56	6.61	2.0	xxxx!		8.24	1.44	6.80	2.0	xxxx!
8.15	1.87	6.28	2.25	xxxx!		7.86	1.32	6.54	2.25	xxxx!
8.09	1.67	6.42	2.5	xxxx!		7.83	1.60	6.23	2.5	xxxx!
7.94	1.77	6.17	2.8	xxxx!		8.08	2.25	5.83	2.8	xxxx!
8.06	1.67	6.39	3	xxxx!		8.02	1.80	6.22	3	xxxx!

Core 7						Core 8				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.45	5.52	1.93	0.1	xx		7.18	5.44	1.74	0.1	xx
5.34	3.94	1.40	0.25	x		6.78	5.28	1.50	0.25	x
7.28	3.73	3.55	0.5	xxx		6.44	4.92	1.52	0.5	x
7.07	1.11	5.96	0.75	xxxx!		7.70	5.43	2.27	0.75	x
7.51	1.35	6.16	1.0	xxxx!		7.35	1.16	6.19	1.0	xxxx!
7.53	0.91	6.62	1.25	xxx		7.16	1.27	5.89	1.25	xxxx!
7.66	1.40	6.26	1.5	xxxx!		7.34	1.28	6.06	1.5	xxxx!
8.02	1.95	6.07	1.75	xxxx!		7.50	1.36	6.14	1.75	xxxx!
7.72	1.16	6.56	2.0	xxxx!		7.62	1.26	6.36	2.0	xxxx!
7.67	2.06	5.61	2.25	xxxx!		7.39	1.20	6.19	2.25	xxxx!
7.83	2.07	5.76	2.5	xxxx!		7.73	1.54	6.19	2.5	xxxx!
7.81	2.27	5.54	2.8	xxxx!		7.85	1.96	5.89	2.8	xxxx!
7.59	1.65	5.94	3	xxxx!		7.93	2.29	5.64	3	xxxx!
Core 9						Core 10				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
8.32	7.07	1.25	0.1	xxxx!		8.23	7.50	0.73	0.1	xxxx!
8.02	5.84	2.18	0.25	xxx		8.19	1.90	6.29	0.25	xx
8.26	2.46	5.80	0.5	xx		7.87	1.33	6.54	0.5	xxxx!
7.76	1.50	6.26	0.75	xxxx!		7.74	1.29	6.45	0.75	xxxx!
8.09	1.60	6.49	1.0	xxxx!		7.68	1.25	6.43	1.0	xxxx!
7.80	1.41	6.39	1.25	xxxx!		7.73	1.26	6.47	1.25	xxxx!
7.83	1.25	6.58	1.5	xxxx!		7.94	1.22	6.72	1.5	xxxx!
7.78	1.41	6.37	1.75	xxxx!		7.79	1.54	6.25	1.75	xxxx!
7.67	1.36	6.31	2.0	xxxx!		7.72	1.90	5.82	2.0	xxxx!
7.68	1.45	6.23	2.25	xxxx!		7.80	1.88	5.92	2.25	xxxx!
7.80	1.32	6.48	2.5	xxxx!		7.77	1.68	6.09	2.5	xxxx!
7.98	1.99	5.99	2.8	xxxx!		7.84	1.85	5.99	2.8	xxxx!
7.89	1.52	6.37	3	xxxx!		8.05	2.58	5.47	3	xxxx!
Core 11						Core 12				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.89	6.87	1.02	0.1	xxxx!		7.71	5.95	1.76	0.1	xx
7.42	6.34	1.08	0.25	xxx!		7.63	5.54	2.09	0.25	x
6.87	5.58	1.29	0.5	xxx		7.29	5.60	1.69	0.5	x
6.95	5.46	1.49	0.75	x		7.07	5.38	1.69	0.75	x
7.66	3.11	4.55	1.0	xx		8.13	1.71	6.42	1.0	xxxx!
7.33	1.14	6.19	1.25	xxxx!		7.82	1.71	6.11	1.25	xxxx!
7.25	1.19	6.06	1.5	xxxx!		7.62	1.78	5.84	1.5	xxxx!
7.76	1.18	6.58	1.75	xxxx!		7.64	1.53	6.11	1.75	xxxx!
7.54	1.39	6.15	2.0	xxxx!		7.83	1.62	6.21	2.0	xxxx!
7.29	1.47	5.82	2.25	xxxx!		7.85	1.43	6.42	2.25	xxxx!
7.44	1.36	6.08	2.5	xxxx!		7.69	1.42	6.27	2.5	xxxx!
7.48	1.42	6.06	2.8	xxxx!		7.79	1.52	6.27	2.8	xxxx!
7.75	2.18	5.57	3	xxxx!		7.82	1.47	6.35	3	xxxx!

Core 13						Core 14				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
8.08	8.11	-0.03	0.1	xxxx!		8.15	7.30	0.85	0.1	xxxx!
7.82	7.96	-0.14	0.25	xxxx!		7.78	7.58	0.20	0.25	xxxx!
7.80	1.33	6.47	0.5	xx		7.69	1.43	6.26	0.5	xxxx!
7.69	1.38	6.31	0.75	xxxx!		7.56	1.13	6.43	0.75	xxxx!
7.72	1.70	6.02	1.0	xxx		7.60	1.02	6.58	1.0	xxxx!
7.56	1.45	6.11	1.25	xxxx!		7.64	1.22	6.42	1.25	xxxx!
7.59	1.12	6.47	1.5	xxxx!		7.94	1.28	6.66	1.5	xxxx!
7.66	1.40	6.26	1.75	xxxx!		7.72	1.44	6.28	1.75	xxxx!
7.54	1.45	6.09	2.0	xxxx!		7.64	1.49	6.15	2.0	xxxx!
7.63	1.29	6.34	2.25	xxxx!		7.72	1.25	6.47	2.25	xxxx!
7.72	1.52	6.20	2.5	xxxx!		7.41	1.97	5.44	2.5	xxxx!
7.73	1.74	5.99	2.8	xxxx!		7.67	2.38	5.29	2.8	xxxx!
7.97	2.44	5.53	3	xxxx!		7.41	1.73	5.68	3	xxxx!
Core 15						**Core 16**				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.73	6.09	1.64	0.1	xxx		8.18	7.42	0.76	0.1	xxxx!
6.34	4.60	1.74	0.25	xxxx!		7.13	6.45	0.68	0.25	xxx!
5.77	4.34	1.43	0.5	x		6.53	5.11	1.42	0.5	x
6.80	1.65	5.15	0.75	xxxx!		7.45	1.24	6.21	0.75	xxxx!
6.70	1.38	5.32	1.0	xxxx!		6.65	4.13	2.52	1.0	xx
6.60	1.14	5.46	1.25	xxxx!		7.49	1.68	5.81	1.25	xxxx!
6.76	1.11	5.65	1.5	xxxx!		7.65	1.28	6.37	1.5	xxxx!
7.13	1.43	5.70	1.75	xxxx!		8.26	1.67	6.59	1.75	xxxx!
7.54	1.50	6.04	2.0	xxxx!		7.81	1.46	6.35	2.0	xxxx!
6.77	1.25	5.52	2.25	xxxx!		7.88	1.68	6.20	2.25	xxxx!
7.31	1.44	5.87	2.5	xxxx!		8.05	2.30	5.75	2.5	xxxx!
7.64	3.55	4.09	2.8	xxxx!		8.30	2.13	6.17	2.8	xxx!
7.86	2.66	5.20	3	xxxx!		8.21	1.91	6.30	3	xxxx!
Core 17						**Core 18**				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
8.18	7.18	1.00	0.1	xxxx!		8.15	6.98	1.17	0.1	xxx!
7.57	6.24	1.33	0.25	xx		7.21	7.64	-0.43	0.25	xx
8.42	6.32	2.10	0.5	xx		7.98	1.31	6.67	0.5	xxxx!
7.93	1.57	6.36	0.75	xxxx!		8.11	1.24	6.87	0.75	xxxx!
7.47	1.18	6.29	1.0	xxxx!		7.62	2.30	5.32	1.0	xxxx!
7.72	1.27	6.45	1.25	xxxx!		7.61	1.72	5.89	1.25	xxxx!
7.96	1.61	6.35	1.5	xxxx!		7.67	1.49	6.18	1.5	xxxx!
8.06	1.92	6.14	1.75	xxxx!		7.57	1.60	5.97	1.75	xxxx!
7.81	1.49	6.32	2.0	xxxx!		7.76	1.89	5.87	2.0	xxxx!
7.78	2.03	5.75	2.25	xxxx!		7.91	1.80	6.11	2.25	xxxx!
7.85	1.95	5.90	2.5	xxxx!		7.95	3.10	4.85	2.5	xxxx!
8.07	2.17	5.90	2.8	xxxx!		7.88	2.50	5.38	2.8	xxxx!
8.52	1.88	6.64	3	xxx		8.06	2.01	6.05	3	xxxx!

Core 19						Core 20				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
8.19	6.29	1.90	0.1	xxx		7.61	5.35	2.26	0.1	xx
8.01	1.68	6.33	0.25	xxxx!		7.36	1.23	6.13	0.25	xxxx!
7.77	1.08	6.69	0.5	xxxx!		7.57	1.29	6.28	0.5	xxxx!
7.67	1.43	6.24	0.75	xxxx!		7.67	1.52	6.15	0.75	xxxx!
7.52	1.31	6.21	1.0	xxxx!		7.61	1.65	5.96	1.0	xxxx!
7.42	1.26	6.16	1.25	xxxx!		7.56	1.52	6.04	1.25	xxxx!
7.85	1.84	6.01	1.5	xxxx!		7.84	1.51	6.33	1.5	xxxx!
7.78	2.61	5.17	1.75	xxxx!		8.43	2.63	5.80	1.75	xxxx!
7.99	3.72	4.27	2.0	xxxx!		8.36	1.94	6.42	2.0	xxxx!
7.74	2.42	5.32	2.25	xxxx!		8.36	2.00	6.36	2.25	xxxx!
8.04	2.04	6.00	2.5	xxxx!		8.37	1.73	6.64	2.5	xxxx!
8.13	1.73	6.40	2.8	xxxx!		8.48	1.86	6.62	2.8	xxxx!
8.18	1.69	6.49	3	xxxx!		8.34	1.67	6.67	3	xxxx!
Core 21						Core 22				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
6.54	5.22	1.32	0.1	x		7.39	6.83	0.56	0.1	xxxx!
4.47	1.09	3.38	0.25	xx		6.44	1.47	4.97	0.25	xxxx!
6.87	1.07	5.80	0.5	xxxx!		4.94	1.41	3.53	0.5	xxxx!
8.22	1.68	6.54	0.75	xxxx!		7.95	1.65	6.30	0.75	xxxx!
8.17	1.62	6.55	1.0	xxxx!		8.24	1.30	6.94	1.0	xxxx!
7.87	1.64	6.23	1.25	xxxx!		8.31	2.07	6.24	1.25	xx
8.11	1.92	6.19	1.5	xxxx!		8.42	3.77	4.65	1.5	xx
8.20	1.66	6.54	1.75	xxxx!		8.10	1.19	6.91	1.75	xxxx!
8.29	2.15	6.14	2.0	xxxx!		7.97	1.23	6.74	2.0	xxxx!
8.21	1.82	6.39	2.25	xxxx!		7.71	1.07	6.64	2.25	xxxx!
8.23	2.21	6.02	2.5	xxxx!						
8.36	1.97	6.39	2.8	xxxx!						
8.42	1.90	6.52	3	xxxx!						
Core 23						Core 24				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.53	6.21	1.32	0.1	xxxx!		6.33	4.87	1.46	0.1	xx
4.76	1.25	3.51	0.25	xxxx!		3.84	2.83	1.01	0.25	x
5.68	1.30	4.38	0.5	xxxx!		4.48	2.23	2.25	0.5	xxx!
6.38	1.46	4.92	0.75	xxxx!		5.55	2.04	3.51	0.75	xxxx!
6.63	1.40	5.23	1.0	xxxx!		8.23	8.06	0.17	1.0	xxxx!
7.03	2.04	4.99	1.25	xxxx!		8.09	6.68	1.41	1.25	xxx
5.69	1.36	4.33	1.5	xxxx!		7.66	6.21	1.45	1.5	xx
						6.64	5.46	1.18	1.75	xx

Core 25						Core 26				
pHF	pHFOX		Depth	Peroxide Reaction		pHF	pHFOX		Depth	Peroxide Reaction
7.45	5.20	2.25	0.1	xx		7.81	5.85	1.96	0.1	xx
6.44	1.37	5.07	0.25	xxxx!		7.97	4.25	3.72	0.25	xxx!
6.66	1.31	5.35	0.5	xxxx!		7.67	1.35	6.32	0.5	xxxx!
6.83	1.45	5.38	0.75	xxxx!		7.44	1.46	5.98	0.75	xxxx!
7.27	1.37	5.90	1.0	xxxx!		7.40	1.61	5.79	1.0	xxxx!
7.16	1.43	5.73	1.25	xxxx!		7.63	1.85	5.78	1.25	xxxx!
7.46	1.64	5.82	1.5	xxxx!		7.36	1.54	5.82	1.5	xxxx!
8.28	5.93	2.35	1.75	x		7.22	1.48	5.74	1.75	xxxx!
8.86	6.16	2.70	2.0	x		7.28	1.60	5.68	2.0	xxxx!
9.32	1.99	7.33	2.25	xxxx!		7.38	1.55	5.83	2.25	xxxx!
8.42	6.20	2.22	2.5	x		7.37	1.48	5.89	2.5	xxxx!
8.79	6.10	2.69	2.8	x		7.93	5.89	2.04	2.8	x
8.05	6.15	1.90	3	x						
Core 27						**Core 28**				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.05	4.16	2.89	0.1	xxx!		8.22	7.03	1.19	0.1	xxxx!
7.14	1.48	5.66	0.25	xxxx!		7.13	0.71	6.42	0.25	xxxx!
7.03	1.03	6.00	0.5	xxxx!		7.16	0.85	6.31	0.5	xxxx!
7.10	1.05	6.05	0.75	xxxx!		7.41	0.94	6.47	0.75	xxxx!
6.74	0.90	5.84	1.0	xxxx!		7.58	0.99	6.59	1.0	xxxx!
7.07	1.05	6.02	1.25	xxxx!		8.11	1.57	6.54	1.25	xxxx!
7.12	1.26	5.86	1.5	xxxx!		7.57	1.19	6.38	1.5	xxxx!
7.24	1.27	5.97	1.75	xxxx!		7.75	1.62	6.13	1.75	xxxx!
						7.91	1.51	6.40	2.0	xxxx!
						7.76	1.47	6.29	2.25	xxxx!
						7.78	1.10	6.68	2.5	xxxx!
						7.91	4.50	3.41	2.8	xx
						8.27	6.60	1.67	3	xx
Core 29						**Core 30**				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.91	6.87	1.04	0.1	xxxx!		8.07	6.15	1.92	0.1	xxx!
6.71	0.96	5.75	0.25	xxxx!		7.11	1.23	5.88	0.25	xxxx!
7.08	1.03	6.05	0.5	xxxx!		6.68	0.91	5.77	0.5	xxxx!
7.22	0.98	6.24	0.75	xxxx!		6.94	0.97	5.97	0.75	xxxx!
7.32	0.99	6.33	1.0	xxxx!		7.14	1.07	6.07	1.0	xxxx!
8.01	1.11	6.90	1.25	xxxx!		7.38	5.61	1.77	1.25	xxxx!
8.44	2.17	6.27	1.5	xxxx!		7.01	4.66	2.35	1.5	x
8.49	1.67	6.82	1.75	xxxx!		7.19	5.37	1.82	1.7	x
8.56	1.82	6.74	2.0	xxxx!						
8.61	1.62	6.99	2.25	xxxx!						
8.18	1.41	6.77	2.5	xxxx!						
7.89	1.96	5.93	2.6	xxxx!						

Core 31						Core 32				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.26	5.49	1.77	0.1	xx		7.96	6.09	1.87	0.1	xxx
4.38	1.00	3.38	0.25	xx		6.87	1.02	5.85	0.25	xx
4.79	1.15	3.64	0.5	xxxx!		6.21	0.87	5.34	0.5	xxxx!
4.95	1.18	3.77	0.75	xxxx!		5.49	0.94	4.55	0.75	xxxx!
5.20	1.06	4.14	1.0	xxxx!		6.57	1.70	4.87	0.9	xxx!
6.59	3.54	3.05	1.25	xx						
8.20	7.50	0.70	1.5	xxxx!						
Core 33						Core 34				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.86	7.87	-0.01	0.1	xxxx!		8.03	7.41	0.62	0.1	xxxx!
6.39	0.97	5.42	0.25	xxxx!		6.50	0.91	5.59	0.25	xxxx!
6.54	0.93	5.61	0.5	xxxx!		6.62	0.97	5.65	0.5	xxxx!
6.71	1.05	5.66	0.75	xxxx!		7.16	0.92	6.24	0.75	xxxx!
6.94	1.07	5.87	1.0	xxxx!		7.25	1.08	6.17	1.0	xxxx!
6.76	0.97	5.79	1.25	xxxx!		7.17	1.11	6.06	1.25	xxxx!
6.85	1.02	5.83	1.5	xxxx!		7.44	1.28	6.16	1.5	xxxx!
7.08	1.23	5.85	1.75	xxxx!		7.60	1.42	6.18	1.75	xxxx!
						7.19	1.37	5.82	2.0	xxxx!
						8.28	1.12	7.16	2.25	xxxx!
						8.37	6.14	2.23	2.5	xx
						8.89	6.10	2.79	2.8	xx
Core 38						Core 39				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
8.31	6.06	2.25	0.1	xx		7.99	6.52	1.47	0.1	xx
7.93	1.22	6.71	0.25	xxxx!		6.10	1.22	4.88	0.25	xxxx!
7.42	1.31	6.11	0.5	xxxx!		7.18	1.28	5.90	0.5	xxxx!
7.22	1.18	6.04	0.75	xxxx!		6.95	1.13	5.82	0.75	xxxx!
7.32	1.16	6.16	1.0	xxxx!		6.87	1.16	5.71	1.0	xxxx!
7.26	1.52	5.74	1.25	xxxx!		7.30	1.32	5.98	1.25	xxxx!
7.29	1.37	5.92	1.5	xxxx!		7.18	1.26	5.92	1.5	xxxx!
7.07	1.28	5.79	1.75	xxxx!		6.94	1.55	5.39	1.75	xxxx!
7.00	1.53	5.47	2.0	xxxx!						
7.12	1.36	5.76	2.25	xxxx!						
7.35	5.64	1.71	2.5	x						

Core 40						Core 41				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.78	6.26	1.52	0.1	xxx!		5.58	1.64	3.94	0.1	xx
6.73	2.61	4.12	0.25	xx		4.04	2.34	1.70	0.25	xx
5.02	1.05	3.97	0.5	xxxx!		4.32	3.92	0.40	0.5	x
7.10	1.04	6.06	0.75	xxxx!						
6.24	1.04	5.20	1.0	xxxx!						
6.84	1.19	5.65	1.25	xxxx!						
6.76	1.14	5.62	1.5	xxxx!						
7.19	5.20	1.99	1.7	x						
Core 42						Core 43				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
7.85	5.42	2.43	0.1	x		7.61	6.34	1.27	0.1	xxxx!
7.55	5.15	2.40	0.25	x		7.13	1.07	6.06	0.25	xxxx!
6.95	4.99	1.96	0.5	x		6.92	1.13	5.79	0.5	xxxx!
						7.09	1.14	5.95	0.75	xxxx!
						6.97	0.95	6.02	1.0	xxxx!
						7.03	1.06	5.97	1.25	xxxx!
						6.99	1.19	5.80	1.5	xxxx!
Core 44						Core 45				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
8.05	5.83	2.22	0.1	xx		7.57	5.43	2.14	0.1	xx
7.49	0.97	6.52	0.25	xxxx!		4.85	3.44	1.41	0.25	x
7.25	0.92	6.33	0.5	xxxx!		4.47	1.53	2.94	0.5	xxxx!
7.12	0.96	6.16	0.75	xxxx!						
7.10	0.98	6.12	1.0	xxxx!						
7.15	0.95	6.20	1.25	xxxx!						
7.20	0.98	6.22	1.5	xxxx!						
7.22	1.25	5.97	1.75	xxx						
7.02	1.07	5.95	2.0	xxxx!						
7.06	0.99	6.07	2.25	xxxx!						
7.08	4.55	2.53	2.5	x						
Core 46						Core 47				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
8.08	7.63	0.45	0.1	xxxx!		8.21	5.92	2.29	0.1	xx
7.25	5.72	1.53	0.25	xxxx!		7.92	0.96	6.96	0.25	xx
6.73	1.18	5.55	0.5	xxxx!		8.24	1.33	6.91	0.5	xxxx!
6.98	1.05	5.93	0.75	xxxx!		7.72	1.26	6.46	0.75	xxxx!
9.23	6.36	2.87	1.0	xx		7.76	1.09	6.67	1.0	xxxx!
						8.28	2.83	5.45	1.25	x
Core 48						Core 49				
pHF	pHFOX	pH Change	Depth	Peroxide Reaction		pHF	pHFOX	pH Change	Depth	Peroxide Reaction
8.06	6.14	1.92	0.1	xx		8.05	8.10	-0.05	0.1	xxxx!
7.83	7.83	0.00	0.25	xxxx!		7.69	5.45	2.24	0.25	x
8.06	7.80	0.26	0.5	xxxx!		7.50	5.44	2.06	0.4	x
7.56	5.68	1.88	0.75	x						
8.81	1.68	7.13	1.0	xxxx!						

Core 50										
pHF	**pHFOX**	**pH Change**	**Depth**	**Peroxide Reaction**						
8.54	7.53	1.01	0.1	xxx!						
7.94	8.48	-0.54	0.25	xxx!						
7.75	8.20	-0.45	0.5	xxxx!						
7.84	1.53	6.31	0.75	xxxx!						
7.30	1.59	5.71	1.0	xxxx!						
Core 52						**Core 53**				
pHF	**pHFOX**	**pH Change**	**Depth**	**Peroxide Reaction**		**pHF**	**pHFOX**	**pH Change**	**Depth**	**Peroxide Reaction**
6.40	4.86	1.54	0.1	x		8.21	5.64	2.57	0.1	xx
4.33	3.63	0.70	0.25	x		8.13	5.91	2.22	0.25	xx
5.30	1.44	3.86	0.5	xxxx!		6.18	4.64	1.54	0.5	x
7.06	1.04	6.02	0.75	xxxx!		6.96	1.43	5.53	0.75	xxxx!
7.55	1.27	6.28	1.0	xxxx!		7.45	1.64	5.81	1.0	xxxx!
7.38	1.18	6.20	1.25	xxxx!		7.70	1.36	6.34	1.25	xxxx!
8.12	1.65	6.47	1.5	xxxx!		7.97	1.59	6.38	1.5	xxxx!
8.05	1.98	6.07	1.75	xxxx!		8.22	1.99	6.23	1.75	xxxx!
8.09	1.80	6.29	2.0	xxxx!		8.18	1.67	6.51	2.0	xxxx!
7.97	1.50	6.47	2.25	xxxx!		8.26	1.39	6.87	2.25	xxxx!
8.06	1.67	6.39	2.5	xxxx!		8.06	1.75	6.31	2.5	xxxx!
7.98	1.56	6.42	2.8	xxxx!		7.62	1.06	6.56	2.8	xxxx!
7.99	1.61	6.38	3	xxxx!		7.51	1.06	6.45	3	xx

APPENDIX 3

Laboratory Certificate of Analysis for Acid Sulfate Soil samples (ALS Environmental, Brisbane).

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0815181**	Page	: 1 of 40
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR GRAHAM OHMSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: graham.ohmsen@erm.com	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: 86165/11 BGLNG	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: 2646-2650	Date Samples Received	: 04-NOV-2008
Sampler	: Geocoastal	Issue Date	: 13-NOV-2008
Site	: Gladstone		
		No. of samples received	: 105
Quote number	: BN/561/08	No. of samples analysed	: 105

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.

WORLD RECOGNISED ACCREDITATION

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 performed, 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 ($CaCO_3$) 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			Client sample ID	GC/BG #1 0-0.1	GC/BG #1 0.3-0.5	GC/BG #1 0.8-1.0	GC/BG #1 1.3-1.5	GC/BG #1 1.8-2.0
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-001	EB0815181-002	EB0815181-003	EB0815181-004	EB0815181-005
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.6	5.6	4.9	8.2	8.3
pH OX (23B)	----	0.1	pH Unit	7.6	2.3	2.1	3.1	3.2
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	5	10	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	442	732	126	123
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	436	722	126	123
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	0.71	1.17	0.20	0.20
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	0.70	1.16	0.20	0.20
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.14	0.31	0.36	0.44	0.42
Peroxide Sulfur (23De)	----	0.02	% S	0.20	1.52	1.87	1.74	2.24
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.06	1.21	1.51	1.29	1.81
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	36	753	944	807	1130
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.05	0.07	0.08	0.42	0.41
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.06	0.09	0.10	1.24	1.82
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	0.81	1.41
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	406	704
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	0.65	1.13
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.25	0.37	0.35	0.32	0.33
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.48	0.51	0.36	0.38	0.39
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.23	0.14	<0.02	0.05	0.06
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	189	115	<10	44	50
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.30	0.18	<0.02	0.07	0.08
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.38	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	77	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.12	----	----	----	----
EA029-H: Acid Base Accounting								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #1 0-0.1	GC/BG #1 0.3-0.5	GC/BG #1 0.8-1.0	GC/BG #1 1.3-1.5	GC/BG #1 1.8-2.0
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-001	EB0815181-002	EB0815181-003	EB0815181-004	EB0815181-005
EA029-H: Acid Base Accounting - Continued								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	**1.22**	**1.53**	**0.56**	**0.74**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	**758**	**954**	**353**	**459**
Liming Rate	----	1	kg CaCO3/t	<1	**57**	**72**	**26**	**34**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	GC/BG #1 2.3-2.5	GC/BG #1 2.8-3.0	GC/BG #2 0-0.1	GC/BG #2 0.3-0.5	GC/BG #2 0.8-1.0
			Client sample ID	GC/BG #1 2.3-2.5	GC/BG #1 2.8-3.0	GC/BG #2 0-0.1	GC/BG #2 0.3-0.5	GC/BG #2 0.8-1.0
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
				EB0815181-006	EB0815181-007	EB0815181-008	EB0815181-009	EB0815181-010
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	0.89
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.3	5.6	6.6	5.1	5.2
pH OX (23B)	----	0.1	pH Unit	2.5	1.7	5.2	2.1	2.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	5	<2	14	7
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	157	1260	<2	447	652
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	157	1250	<2	433	645
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.25	2.02	<0.02	0.72	1.04
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.25	2.01	<0.02	0.69	1.03
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.29	0.33	0.28	0.33	0.42
Peroxide Sulfur (23De)	----	0.02	% S	1.68	2.86	0.32	1.11	1.74
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.39	2.52	0.04	0.78	1.31
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	868	1570	23	488	820
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.31	0.09	0.05	0.06	0.08
Peroxide Calcium (23Wh)	----	0.02	% Ca	1.26	0.09	0.06	0.06	0.09
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.95	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	474	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.76	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.36	0.34	0.49	0.51	0.47
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.45	0.34	0.46	0.44	0.45
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.09	<0.02	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	72	<10	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.12	<0.02	<0.02	<0.02	<0.02
EA029-H: 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	0.63	2.53	<0.02	0.80	1.32
Net Acidity (acidity units)	----	10	mole H+ / t	394	1580	<10	502	826
Liming Rate	----	1	kg CaCO3/t	30	118	<1	38	62

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #2 1.3-1.5	GC/BG #2 1.8-2.0	GC/BG #2 2.3-2.5	GC/BG #2 2.8-3.0	GC/BG #3 0-0.1
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-011	EB0815181-012	EB0815181-013	EB0815181-014	EB0815181-015
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.2	8.2	8.3	8.3	6.8
pH OX (23B)	----	0.1	pH Unit	2.7	2.3	2.5	2.5	5.6
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	352	393	342	300	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	352	393	342	300	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.56	0.63	0.55	0.48	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.56	0.63	0.55	0.48	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.56	0.44	0.47	0.33	0.31
Peroxide Sulfur (23De)	----	0.02	% S	2.65	2.10	2.05	1.19	0.40
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.10	1.66	1.58	0.86	0.08
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1310	1030	985	537	53
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.51	0.37	0.39	0.08	0.06
Peroxide Calcium (23Wh)	----	0.02	% Ca	1.59	0.85	0.99	0.10	0.07
Acid Reacted Calcium (23X)	----	0.02	% Ca	1.08	0.48	0.60	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	537	242	297	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.86	0.39	0.48	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.54	0.40	0.41	0.45	0.55
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.55	0.46	0.44	0.45	0.58
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.06	0.02	<0.02	0.04
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	50	21	<10	29
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.08	0.03	<0.02	0.05
EA029-H: 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	1.08	0.97	0.89	0.61	0.03
Net Acidity (acidity units)	----	10	mole H+ / t	671	606	556	379	18
Liming Rate	----	1	kg CaCO3/t	50	46	42	28	1

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	GC/BG #3 0.3-0.5	GC/BG #3 0.8-1.0	GC/BG #3 1.3-1.5	GC/BG #3 1.8-2.0	GC/BG #3 2.3-2.5
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
				EB0815181-016	EB0815181-017	EB0815181-018	EB0815181-019	EB0815181-020
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	0.92
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.5	5.0	5.2	7.4	8.3
pH OX (23B)	----	0.1	pH Unit	1.8	1.8	2.1	2.1	2.2
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	22	9	7	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	704	909	655	650	506
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	682	900	648	650	506
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.04	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.13	1.46	1.05	1.04	0.81
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.09	1.44	1.04	1.04	0.81
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.46	0.36	0.38	0.52	0.49
Peroxide Sulfur (23De)	----	0.02	% S	1.70	2.25	2.01	2.39	2.34
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.24	1.89	1.63	1.87	1.85
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	772	1180	1020	1160	1150
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.08	0.05	0.06	0.25	0.35
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.07	0.06	0.08	0.30	0.71
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.02	0.04	0.35
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	12	21	176
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	0.03	0.28
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.55	0.37	0.41	0.49	0.44
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.45	0.38	0.45	0.52	0.49
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.04	0.04	0.05
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	34	31	42
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.05	0.05	0.07
EA029-H: 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	1.27	1.90	1.64	1.32	1.16
Net Acidity (acidity units)	----	10	mole H+ / t	794	1190	1020	821	722
Liming Rate	----	1	kg CaCO3/t	60	89	77	62	54

Analytical Results

Sub-Matrix: **SOIL**

Client sample ID				GC/BG #3 2.8-3.0	GC/BG #4 0-0.1	GC/BG #4 0.3-0.5	GC/BG #4 0.8-1.0	GC/BG #4 1.3-1.5
Client sampling date / time				29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-021	EB0815181-022	EB0815181-023	EB0815181-024	EB0815181-025
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.4	7.7	4.5	4.3	7.9
pH OX (23B)	----	0.1	pH Unit	2.4	6.6	2.3	1.9	2.1
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	28	28	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	312	<2	550	730	561
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	312	<2	522	702	561
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.04	0.04	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.50	<0.02	0.88	1.17	0.90
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.50	<0.02	0.84	1.12	0.90
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.45	0.21	0.32	0.39	0.49
Peroxide Sulfur (23De)	----	0.02	% S	2.07	0.30	1.42	1.81	2.36
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.61	0.09	1.09	1.42	1.87
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1000	54	683	887	1170
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.32	0.04	0.05	0.06	0.37
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.78	0.05	0.04	0.05	0.49
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.46	<0.02	<0.02	<0.02	0.12
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	229	<10	<10	<10	59
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.37	<0.02	<0.02	<0.02	0.10
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.43	0.33	0.47	0.40	0.43
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.48	0.37	0.43	0.34	0.50
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.05	0.04	<0.02	<0.02	0.07
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	44	38	<10	<10	57
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.07	0.06	<0.02	<0.02	0.09
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	0.12	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	25	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	0.04	----	----	----
EA029-G: Retained Acidity								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #3 2.8-3.0	GC/BG #4 0-0.1	GC/BG #4 0.3-0.5	GC/BG #4 0.8-1.0	GC/BG #4 1.3-1.5
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-021	EB0815181-022	EB0815181-023	EB0815181-024	EB0815181-025
EA029-G: Retained Acidity - Continued								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	----	0.04	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	----	20	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	----	0.03	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	0.43	----
EA029-H: 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	0.87	<0.02	1.14	1.50	1.22
Net Acidity (acidity units)	----	10	mole H+ / t	543	<10	711	935	763
Liming Rate	----	1	kg CaCO3/t	41	<1	53	70	57

Analytical Results

Sub-Matrix: **SOIL**

Client sample ID				GC/BG #4 1.8-2.0	GC/BG #4 2.3-2.5	GC/BG #4 2.8-3.0	GC/BG #5 0-0.1	GC/BG #5 0.3-0.5
Client sampling date / time				29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-026	EB0815181-027	EB0815181-028	EB0815181-029	EB0815181-030
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	0.95
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.3	5.3	4.3	5.9	4.6
pH OX (23B)	----	0.1	pH Unit	2.6	1.7	1.8	4.0	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	8	26	3	21
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	258	885	822	8	640
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	258	877	797	4	619
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.04	<0.02	0.03
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.41	1.42	1.32	<0.02	1.03
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.41	1.41	1.28	<0.02	0.99
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.47	0.41	0.43	0.26	0.35
Peroxide Sulfur (23De)	----	0.02	% S	1.97	2.53	2.41	0.36	2.08
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.49	2.12	1.98	0.10	1.72
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	930	1320	1240	64	1080
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.42	0.08	0.07	0.05	0.05
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.95	0.08	0.07	0.06	0.06
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.53	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	263	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.42	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.38	0.45	0.41	0.39	0.40
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.42	0.43	0.40	0.41	0.42
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.05	<0.02	<0.02	0.02	0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	38	<10	<10	20	19
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.06	<0.02	<0.02	0.03	0.03
EA029-G: 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	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	0.44	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #4 1.8-2.0	GC/BG #4 2.3-2.5	GC/BG #4 2.8-3.0	GC/BG #5 0-0.1	GC/BG #5 0.3-0.5
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-026	EB0815181-027	EB0815181-028	EB0815181-029	EB0815181-030
EA029-H: 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	**0.77**	**2.13**	**2.03**	**0.11**	**1.76**
Net Acidity (acidity units)	----	10	mole H+ / t	**482**	**1330**	**1270**	**67**	**1100**
Liming Rate	----	1	kg CaCO3/t	**36**	**100**	**95**	**5**	**82**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #5 0.8-1.0	GC/BG #5 1.3-1.5	GC/BG #5 1.8-2.0	GC/BG #5 2.3-2.5	GC/BG #5 2.8-3.0
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-031	EB0815181-032	EB0815181-033	EB0815181-034	EB0815181-035
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.2	5.3	8.1	8.1	8.4
pH OX (23B)	----	0.1	pH Unit	1.8	1.9	1.9	2.4	2.2
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	42	8	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	950	780	695	422	1210
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	908	772	695	422	1210
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.07	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.52	1.25	1.11	0.68	1.94
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.46	1.24	1.11	0.68	1.94
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.62	0.51	0.64	<0.02	0.64
Peroxide Sulfur (23De)	----	0.02	% S	2.95	2.33	2.56	2.96	2.07
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.33	1.82	1.92	2.96	1.42
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1460	1130	1200	1850	887
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.09	0.09	0.44	<0.02	0.47
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.09	0.10	0.72	1.46	0.48
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.28	1.46	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	142	731	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.23	1.17	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.58	0.50	0.55	<0.02	0.50
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.56	0.50	0.51	0.60	0.50
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	<0.02	0.60	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	<10	493	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	<0.02	0.79	<0.02
EA029-G: 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	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.60	----	----	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #5 0.8-1.0	GC/BG #5 1.3-1.5	GC/BG #5 1.8-2.0	GC/BG #5 2.3-2.5	GC/BG #5 2.8-3.0
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-031	EB0815181-032	EB0815181-033	EB0815181-034	EB0815181-035
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	**2.40**	**1.83**	**1.38**	**1.44**	**1.77**
Net Acidity (acidity units)	----	10	mole H+ / t	**1500**	**1140**	**863**	**897**	**1100**
Liming Rate	----	1	kg CaCO3/t	**112**	**86**	**65**	**67**	**83**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	GC/BG #6 0-0.1	GC/BG #6 0.3-0.5	GC/BG #6 0.8-1.0	GC/BG #6 1.3-1.5	GC/BG #6 1.8-2.0
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
				EB0815181-036	EB0815181-037	EB0815181-038	EB0815181-039	EB0815181-040
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	1.50
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.6	4.4	4.8	6.4	8.1
pH OX (23B)	----	0.1	pH Unit	5.7	1.8	1.8	1.9	2.5
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	24	16	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	955	995	1010	342
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	930	978	1010	342
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.04	0.03	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	1.53	1.60	1.62	0.55
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	1.49	1.57	1.62	0.55
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.32	0.64	0.63	0.81	0.85
Peroxide Sulfur (23De)	----	0.02	% S	0.29	2.36	2.50	3.11	3.02
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	1.72	1.87	2.30	2.17
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	1080	1160	1440	1350
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.05	0.09	0.11	0.24	0.56
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.05	0.08	0.10	0.24	2.02
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	1.46
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	729
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	1.17
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.42	0.74	0.67	0.74	0.69
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.38	0.67	0.58	0.66	0.63
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-G: 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	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.59	----	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #6 0-0.1	GC/BG #6 0.3-0.5	GC/BG #6 0.8-1.0	GC/BG #6 1.3-1.5	GC/BG #6 1.8-2.0
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-036	EB0815181-037	EB0815181-038	EB0815181-039	EB0815181-040
EA029-H: 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	**1.76**	**1.90**	**2.30**	**1.09**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	**1100**	**1180**	**1440**	**679**
Liming Rate	----	1	kg CaCO3/t	<1	**82**	**89**	**108**	**51**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #6 2.3-2.5	GC/BG #6 2.8-3.0	GC/BG #7 0-0.1	GC/BG #7 0.3-0.5	GC/BG #7 0.8-1.0
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-041	EB0815181-042	EB0815181-043	EB0815181-044	EB0815181-045
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.0	8.5	6.7	6.1	6.7
pH OX (23B)	----	0.1	pH Unit	2.2	2.7	6.6	2.2	2.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	592	250	<2	462	595
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	592	250	<2	462	595
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.95	0.40	<0.02	0.74	0.95
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.95	0.40	<0.02	0.74	0.95
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.52	0.59	0.27	0.64	0.74
Peroxide Sulfur (23De)	----	0.02	% S	2.43	2.32	0.32	1.80	2.42
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.91	1.73	0.05	1.16	1.68
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1190	1080	32	725	1050
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.26	0.32	0.04	0.10	0.12
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.44	1.37	0.08	0.11	0.15
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.18	1.04	0.03	<0.02	0.03
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	88	521	17	<10	15
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.14	0.84	0.03	<0.02	0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.50	0.59	0.50	0.80	0.90
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.61	0.61	0.49	0.73	0.98
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.11	<0.02	<0.02	<0.02	0.08
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	89	16	<10	<10	69
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.14	0.02	<0.02	<0.02	0.11
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	0.16	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	32	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	0.05	----	----
EA029-H: Acid Base Accounting								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #6 2.3-2.5	GC/BG #6 2.8-3.0	GC/BG #7 0-0.1	GC/BG #7 0.3-0.5	GC/BG #7 0.8-1.0
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-041	EB0815181-042	EB0815181-043	EB0815181-044	EB0815181-045
EA029-H: Acid Base Accounting - Continued								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**1.27**	**0.84**	<0.02	**1.16**	**1.20**
Net Acidity (acidity units)	----	10	mole H+ / t	**792**	**527**	<10	**725**	**746**
Liming Rate	----	1	kg CaCO3/t	**59**	**40**	<1	**54**	**56**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	GC/BG #7 1.3-1.5	GC/BG #7 1.8-2.0	GC/BG #7 2.3-2.5	GC/BG #7 2.8-3.0	GC/BG #8 0-0.1
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	31-OCT-2008 15:00
				EB0815181-046	EB0815181-047	EB0815181-048	EB0815181-049	EB0815181-050
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	<0.02
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.4	8.3	8.6	8.4	5.8
pH OX (23B)	----	0.1	pH Unit	1.9	2.3	7.5	2.4	5.7
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	3
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	650	325	<2	322	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	650	325	<2	322	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.04	0.52	<0.02	0.52	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.04	0.52	<0.02	0.52	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.54	0.69	0.71	0.73	0.35
Peroxide Sulfur (23De)	----	0.02	% S	2.07	2.34	2.26	2.56	0.34
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.53	1.65	1.55	1.84	<0.02
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	955	1030	966	1150	<10
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.11	0.35	0.45	0.42	0.05
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.13	1.18	2.56	1.20	0.05
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.02	0.82	2.11	0.78	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	12	412	1060	389	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.66	1.69	0.62	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.54	0.63	0.61	0.66	0.48
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.56	0.61	0.84	0.70	0.46
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.24	0.04	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	12	<10	195	30	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.31	0.05	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	0.62	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	125	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #7 1.3-1.5	GC/BG #7 1.8-2.0	GC/BG #7 2.3-2.5	GC/BG #7 2.8-3.0	GC/BG #8 0-0.1
			Client sampling date / time	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	29-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-046	EB0815181-047	EB0815181-048	EB0815181-049	EB0815181-050
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	0.20	----	----
EA029-H: 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	1.53	0.90	0.38	0.96	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	955	560	239	597	<10
Liming Rate	----	1	kg CaCO3/t	72	42	18	45	<1

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #8 0.3-0.5	GC/BG #8 0.8-1.0	GC/BG #8 1.3-1.5	GC/BG #8 1.8-2.0	GC/BG #8 2.3-2.5
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-051	EB0815181-052	EB0815181-053	EB0815181-054	EB0815181-055
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.3	5.4	5.0	5.5	8.0
pH OX (23B)	----	0.1	pH Unit	5.8	2.0	2.0	2.1	7.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	7	10	7	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	660	605	540	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	653	595	533	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	1.06	0.97	0.86	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	1.05	0.95	0.85	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.35	0.41	0.48	0.31	0.13
Peroxide Sulfur (23De)	----	0.02	% S	0.41	1.84	1.66	1.68	0.27
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.06	1.43	1.18	1.38	0.14
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	36	894	735	860	88
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.06	0.07	0.12	0.08	0.15
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.07	0.11	0.09	0.22
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.02	<0.02	<0.02	<0.02	0.07
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	11	<10	<10	<10	37
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.06
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.62	0.59	0.57	0.40	0.30
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.58	0.56	0.52	0.42	0.42
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	<0.02	0.02	0.11
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	<10	19	94
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	<0.02	0.03	0.15
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	----	0.38
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	----	75
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	----	0.12
EA029-H: Acid Base Accounting								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #8 0.3-0.5	GC/BG #8 0.8-1.0	GC/BG #8 1.3-1.5	GC/BG #8 1.8-2.0	GC/BG #8 2.3-2.5
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-051	EB0815181-052	EB0815181-053	EB0815181-054	EB0815181-055
EA029-H: Acid Base Accounting - Continued								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.06**	**1.44**	**1.19**	**1.39**	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	**36**	**901**	**745**	**866**	<10
Liming Rate	----	1	kg CaCO3/t	**3**	**68**	**56**	**65**	<1

Analytical Results

Sub-Matrix: **SOIL**

Client sample ID				GC/BG #8 2.8-3.0	GC/BG #9 0-0.1	GC/BG #9 0.3-0.5	GC/BG #9 0.8-1.0	GC/BG #9 1.3-1.5
Client sampling date / time				31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-056	EB0815181-057	EB0815181-058	EB0815181-059	EB0815181-060
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	1.57
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.5	8.3	7.3	5.8	5.0
pH OX (23B)	----	0.1	pH Unit	4.0	6.6	2.9	2.1	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	3	18
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	25	<2	152	495	1120
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	25	<2	152	492	1110
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	0.03
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.04	<0.02	0.24	0.79	1.80
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.04	<0.02	0.24	0.79	1.77
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.41	0.18	0.14	0.22	0.37
Peroxide Sulfur (23De)	----	0.02	% S	2.99	0.43	0.63	1.50	2.92
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.58	0.25	0.49	1.28	2.54
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1610	155	307	797	1590
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.45	0.23	0.10	0.11	0.15
Peroxide Calcium (23Wh)	----	0.02	% Ca	2.87	0.28	0.17	0.12	0.18
Acid Reacted Calcium (23X)	----	0.02	% Ca	2.42	0.05	0.07	<0.02	0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	1200	26	35	<10	12
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	1.93	0.04	0.06	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.31	0.35	0.23	0.22	0.34
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.37	0.54	0.29	0.23	0.38
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.05	0.20	0.06	<0.02	0.03
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	44	161	49	<10	24
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.07	0.26	0.08	<0.02	0.04
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	0.75	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	150	----	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #8 2.8-3.0	GC/BG #9 0-0.1	GC/BG #9 0.3-0.5	GC/BG #9 0.8-1.0	GC/BG #9 1.3-1.5
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-056	EB0815181-057	EB0815181-058	EB0815181-059	EB0815181-060
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	0.24	----	----	----
EA029-H: 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	0.89	<0.02	0.33	1.28	2.57
Net Acidity (acidity units)	----	10	mole H+ / t	553	<10	204	801	1600
Liming Rate	----	1	kg CaCO3/t	41	<1	15	60	120

Analytical Results

Sub-Matrix: **SOIL**

Client sample ID				GC/BG #9 1.8-2.0	GC/BG #9 2.3-2.5	GC/BG #9 2.8-3.0	GC/BG #10 0-0.1	GC/BG #10 0.3-0.5
Client sampling date / time				31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-061	EB0815181-062	EB0815181-063	EB0815181-064	EB0815181-065
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.9	4.1	8.4	8.2	6.6
pH OX (23B)	----	0.1	pH Unit	1.9	1.8	2.3	7.1	2.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	15	50	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	1020	1200	275	<2	965
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	1010	1150	275	<2	965
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02	0.08	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.64	1.93	0.44	<0.02	1.55
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.62	1.85	0.44	<0.02	1.55
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.41	0.49	0.34	0.21	0.44
Peroxide Sulfur (23De)	----	0.02	% S	2.78	3.11	2.74	0.33	2.78
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.37	2.62	2.40	0.12	2.34
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1480	1640	1500	76	1460
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.17	0.16	0.44	0.04	0.13
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.19	0.18	2.25	0.10	0.18
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	1.81	0.05	0.05
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	901	27	27
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	1.44	0.04	0.04
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.38	0.36	0.23	0.42	0.79
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.41	0.37	0.30	0.60	0.84
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	<0.02	0.07	0.18	0.05
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	22	<10	55	144	40
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	<0.02	0.09	0.23	0.06
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	0.50	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	100	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	0.16	----
EA029-G: Retained Acidity								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #9 1.8-2.0	GC/BG #9 2.3-2.5	GC/BG #9 2.8-3.0	GC/BG #10 0-0.1	GC/BG #10 0.3-0.5
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-061	EB0815181-062	EB0815181-063	EB0815181-064	EB0815181-065
EA029-G: Retained Acidity - Continued								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	0.04	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	21	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	0.03	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.54	----	----	----
EA029-H: 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	2.39	2.74	1.09	<0.02	1.81
Net Acidity (acidity units)	----	10	mole H+ / t	1490	1710	682	<10	1130
Liming Rate	----	1	kg CaCO3/t	112	128	51	<1	85

Analytical Results

Sub-Matrix: **SOIL**

Client sample ID				GC/BG #10 0.8-1.0	GC/BG #10 1.3-1.5	GC/BG #10 1.8-2.0	GC/BG #10 2.3-2.5	GC/BG #10 2.8-3.0
Client sampling date / time				31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-066	EB0815181-067	EB0815181-068	EB0815181-069	EB0815181-070
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	1.31
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.3	5.5	6.5	6.6	8.7
pH OX (23B)	----	0.1	pH Unit	2.0	2.0	2.1	2.1	7.5
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	7	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	905	825	625	685	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	905	818	625	685	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.45	1.32	1.00	1.10	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.45	1.31	1.00	1.10	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.44	0.40	0.32	0.31	0.24
Peroxide Sulfur (23De)	----	0.02	% S	2.50	2.35	1.92	2.43	2.50
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.05	1.95	1.59	2.12	2.25
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1280	1220	993	1320	1400
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.14	0.12	0.16	0.12	0.35
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.17	0.14	0.18	0.16	2.86
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.04	<0.02	0.02	0.04	2.51
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	18	<10	10	22	1250
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.03	<0.02	<0.02	0.04	2.01
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.80	0.60	0.38	0.49	0.25
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.81	0.61	0.40	0.61	0.38
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	<0.02	0.12	0.12
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	10	16	95	103
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.02	0.15	0.16
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	----	0.62
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	----	125

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #10 0.8-1.0	GC/BG #10 1.3-1.5	GC/BG #10 1.8-2.0	GC/BG #10 2.3-2.5	GC/BG #10 2.8-3.0
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-066	EB0815181-067	EB0815181-068	EB0815181-069	EB0815181-070
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	----	0.20
EA029-H: 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	2.05	1.96	1.20	1.44	0.62
Net Acidity (acidity units)	----	10	mole H+ / t	1280	1220	748	897	385
Liming Rate	----	1	kg CaCO3/t	96	92	56	67	29

Analytical Results

Sub-Matrix: **SOIL**

Client sample ID				GC/BG #11 0-0.1	GC/BG #11 0.3-0.5	GC/BG #11 0.8-1.0	GC/BG #11 1.3-1.5	GC/BG #11 1.8-2.0
Client sampling date / time				31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-071	EB0815181-072	EB0815181-073	EB0815181-074	EB0815181-075
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.7	7.5	7.1	4.2	4.9
pH OX (23B)	----	0.1	pH Unit	7.0	6.8	2.6	1.9	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	46	13
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	150	915	905
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	150	869	892
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.07	0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.24	1.47	1.45
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.24	1.39	1.43
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.06	0.38	0.25	0.66	0.51
Peroxide Sulfur (23De)	----	0.02	% S	0.32	0.42	0.76	2.50	2.49
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.26	0.04	0.51	1.84	1.98
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	163	28	316	1150	1230
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.22	0.08	0.04	0.10	0.09
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.09	0.10	0.08	0.10	0.08
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.04	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	18	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.03	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.43	0.59	0.45	0.74	0.68
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.52	0.61	0.46	0.68	0.61
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.09	0.02	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	75	18	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.12	0.03	<0.02	<0.02	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.25	0.25	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	50	50	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.08	0.08	----	----	----
EA029-G: Retained Acidity								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #11 0-0.1	GC/BG #11 0.3-0.5	GC/BG #11 0.8-1.0	GC/BG #11 1.3-1.5	GC/BG #11 1.8-2.0
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-071	EB0815181-072	EB0815181-073	EB0815181-074	EB0815181-075
EA029-G: Retained Acidity - Continued								
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	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	**0.66**	----
EA029-H: 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**	<0.02	**0.33**	**1.92**	**2.00**
Net Acidity (acidity units)	----	10	mole H+ / t	**21**	<10	**205**	**1200**	**1240**
Liming Rate	----	1	kg CaCO3/t	**2**	<1	**15**	**90**	**93**

Analytical Results

Sub-Matrix: **SOIL**

Client sample ID				GC/BG #11 2.3-2.5	GC/BG #11 2.8-3.0	GC/BG #12 0-0.1	GC/BG #12 0.3-0.5	GC/BG #12 0.8-1.0
Client sampling date / time				31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-076	EB0815181-077	EB0815181-078	EB0815181-079	EB0815181-080
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	0.04
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.3	8.0	7.4	6.7	7.4
pH OX (23B)	----	0.1	pH Unit	2.0	2.1	6.8	6.5	5.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	740	680	<2	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	740	680	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.19	1.09	<0.02	<0.02	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.19	1.09	<0.02	<0.02	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.49	0.49	0.18	0.20	0.21
Peroxide Sulfur (23De)	----	0.02	% S	2.08	2.31	0.26	0.26	0.28
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.59	1.81	0.08	0.06	0.08
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	990	1130	47	41	48
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.10	0.44	0.04	0.06	0.06
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.09	0.52	0.07	0.07	0.07
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.07	0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	37	13	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.06	0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.72	0.45	0.39	0.39	0.38
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.62	0.42	0.42	0.39	0.34
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.03	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	23	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.04	<0.02	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	0.25	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	50	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #11 2.3-2.5	GC/BG #11 2.8-3.0	GC/BG #12 0-0.1	GC/BG #12 0.3-0.5	GC/BG #12 0.8-1.0
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-076	EB0815181-077	EB0815181-078	EB0815181-079	EB0815181-080
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	0.08	----	----
EA029-H: 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	1.59	1.33	<0.02	0.02	0.02
Net Acidity (acidity units)	----	10	mole H+ / t	990	830	<10	14	16
Liming Rate	----	1	kg CaCO3/t	74	62	<1	1	1

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #12 1.3-1.5	GC/BG #12 1.8-2.0	GC/BG #12 2.3-2.5	GC/BG #12 2.8-3.0	GC/BG #13 0-0.1
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-081	EB0815181-082	EB0815181-083	EB0815181-084	EB0815181-085
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	5.0	5.6	4.8	7.9	8.0
pH OX (23B)	----	0.1	pH Unit	2.2	2.1	2.0	7.4	3.8
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	6	5	13	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	240	382	725	<2	95
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	234	377	712	<2	95
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.38	0.61	1.16	<0.02	0.15
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.37	0.60	1.14	<0.02	0.15
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.27	0.30	0.46	0.21	0.46
Peroxide Sulfur (23De)	----	0.02	% S	0.85	1.31	1.98	0.30	3.49
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.59	1.01	1.52	0.09	3.04
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	367	632	948	56	1890
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.06	0.08	0.14	0.10	0.55
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.10	0.12	0.14	3.08
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.02	<0.02	<0.02	0.04	2.53
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	20	1260
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	0.03	2.03
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.30	0.36	0.49	0.39	0.41
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.29	0.36	0.42	0.44	0.48
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	<0.02	0.05	0.07
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	<10	43	59
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	<0.02	0.07	0.09
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	0.38	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	75	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	0.12	----
EA029-H: Acid Base Accounting								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #12 1.3-1.5	GC/BG #12 1.8-2.0	GC/BG #12 2.3-2.5	GC/BG #12 2.8-3.0	GC/BG #13 0-0.1
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-081	EB0815181-082	EB0815181-083	EB0815181-084	EB0815181-085
EA029-H: Acid Base Accounting - Continued								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.60**	**1.02**	**1.54**	<0.02	**1.11**
Net Acidity (acidity units)	----	10	mole H+ / t	**373**	**637**	**961**	<10	**695**
Liming Rate	----	1	kg CaCO3/t	**28**	**48**	**72**	<1	**52**

Analytical Results

Sub-Matrix: **SOIL**

Client sample ID				GC/BG #13 0.3-0.5	GC/BG #13 0.8-1.0	GC/BG #13 1.3-1.5	GC/BG #13 1.8-2.0	GC/BG #13 2.3-2.5
Client sampling date / time				31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-086	EB0815181-087	EB0815181-088	EB0815181-089	EB0815181-090
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	1.38
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.0	5.6	4.9	6.3	5.5
pH OX (23B)	----	0.1	pH Unit	3.5	2.2	1.8	2.0	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	3	23	<2	6
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	32	385	1400	715	865
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	32	382	1370	715	859
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.04	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.05	0.62	2.24	1.15	1.39
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.05	0.61	2.20	1.15	1.38
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.23	0.34	0.60	0.42	0.43
Peroxide Sulfur (23De)	----	0.02	% S	0.59	1.18	3.59	1.93	2.38
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.36	0.84	2.98	1.51	1.95
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	224	522	1860	944	1220
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.07	0.08	0.13	0.13	0.11
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.13	0.06	0.14	0.13	0.12
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.06	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	28	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.04	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.41	0.47	0.77	0.58	0.56
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.54	0.42	0.76	0.50	0.54
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.13	<0.02	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	106	<10	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.17	<0.02	<0.02	<0.02	<0.02
EA029-H: 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	0.15	0.84	3.02	1.51	1.96
Net Acidity (acidity units)	----	10	mole H+ / t	96	524	1880	944	1220
Liming Rate	----	1	kg CaCO3/t	7	39	141	71	92

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #13 2.8-3.0	GC/BG #14 0-0.1	GC/BG #14 0.3-0.5	GC/BG #14 0.8-1.0	GC/BG #14 1.3-1.5
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-091	EB0815181-092	EB0815181-093	EB0815181-094	EB0815181-095
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.4	8.3	6.8	6.8	5.7
pH OX (23B)	----	0.1	pH Unit	2.1	7.4	2.1	1.9	2.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	6
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	342	<2	600	1220	935
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	342	<2	600	1220	929
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.55	<0.02	0.96	1.95	1.50
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.55	<0.02	0.96	1.95	1.49
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.49	0.16	0.41	0.59	0.56
Peroxide Sulfur (23De)	----	0.02	% S	3.16	0.21	2.04	3.68	2.82
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.67	0.05	1.63	3.09	2.26
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1660	29	1020	1930	1410
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.45	0.04	0.08	0.17	0.12
Peroxide Calcium (23Wh)	----	0.02	% Ca	1.92	0.07	0.10	0.23	0.12
Acid Reacted Calcium (23X)	----	0.02	% Ca	1.47	0.02	<0.02	0.06	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	734	12	<10	29	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	1.18	<0.02	<0.02	0.05	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.43	0.32	0.60	0.92	0.81
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.55	0.44	0.68	1.01	0.77
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.12	0.12	0.08	0.08	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	96	96	67	70	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.15	0.15	0.11	0.11	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	0.38	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	75	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	0.12	----	----	----
EA029-H: Acid Base Accounting								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #13 2.8-3.0	GC/BG #14 0-0.1	GC/BG #14 0.3-0.5	GC/BG #14 0.8-1.0	GC/BG #14 1.3-1.5
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-091	EB0815181-092	EB0815181-093	EB0815181-094	EB0815181-095
EA029-H: Acid Base Accounting - Continued								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**1.25**	<0.02	**1.18**	**2.33**	**2.27**
Net Acidity (acidity units)	----	10	mole H+ / t	**782**	<10	**739**	**1450**	**1410**
Liming Rate	----	1	kg CaCO3/t	**59**	<1	**55**	**109**	**106**

Analytical Results

Sub-Matrix: **SOIL**

Client sample ID				GC/BG #14 1.8-2.0	GC/BG #14 2.3-2.5	GC/BG #14 2.8-3.0	GC/BG #15 0-0.1	GC/BG #15 0.3-0.5
Client sampling date / time				31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-096	EB0815181-097	EB0815181-098	EB0815181-099	EB0815181-100
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	----	----	----	----	<0.02
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.8	8.2	8.5	6.7	6.1
pH OX (23B)	----	0.1	pH Unit	2.0	2.2	2.4	6.7	6.6
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	655	485	375	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	655	485	375	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.05	0.78	0.60	<0.02	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.05	0.78	0.60	<0.02	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.46	0.53	0.44	0.21	0.21
Peroxide Sulfur (23De)	----	0.02	% S	2.18	1.95	2.02	0.27	0.28
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.72	1.43	1.59	0.06	0.07
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1070	890	991	39	42
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.14	0.36	0.37	0.04	0.05
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.17	0.57	0.90	0.07	0.09
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.03	0.21	0.54	0.03	0.04
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	15	106	267	14	21
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.02	0.17	0.43	0.02	0.03
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.64	0.60	0.53	0.39	0.40
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.62	0.56	0.57	0.41	0.41
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.04	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	31	15	13
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.05	0.02	0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	0.25	0.22
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	50	45

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #14 1.8-2.0	GC/BG #14 2.3-2.5	GC/BG #14 2.8-3.0	GC/BG #15 0-0.1	GC/BG #15 0.3-0.5
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-096	EB0815181-097	EB0815181-098	EB0815181-099	EB0815181-100
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	0.08	0.07
EA029-H: 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	1.27	0.99	0.93	<0.02	0.07
Net Acidity (acidity units)	----	10	mole H+ / t	794	620	580	<10	42
Liming Rate	----	1	kg CaCO3/t	60	46	44	<1	3

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #15 0.8-1.0	GC/BG #15 1.3-1.5	GC/BG #15 1.8-2.0	GC/BG #15 2.3-2.5	GC/BG #15 2.8-3.0
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-101	EB0815181-102	EB0815181-103	EB0815181-104	EB0815181-105
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.2	4.4	5.4	4.9	8.3
pH OX (23B)	----	0.1	pH Unit	2.1	2.2	2.2	2.2	7.4
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	30	8	15	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	378	1070	874	1030	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	378	1040	866	1020	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.05	<0.02	0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.60	1.71	1.40	1.66	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.60	1.66	1.39	1.63	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.37	0.57	0.46	0.54	0.50
Peroxide Sulfur (23De)	----	0.02	% S	1.38	2.79	2.43	2.62	2.05
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.01	2.22	1.97	2.08	1.55
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	629	1380	1230	1300	968
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.11	0.12	0.16	0.16	0.57
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.15	0.12	0.16	0.15	2.88
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.04	<0.02	<0.02	<0.02	2.30
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	19	<10	<10	<10	1150
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.03	<0.02	<0.02	<0.02	1.84
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.51	0.66	0.49	0.58	0.29
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.57	0.57	0.45	0.51	0.30
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.06	<0.02	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	52	<10	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.08	<0.02	<0.02	<0.02	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	----	1.54
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	----	307
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	----	0.49
EA029-G: Retained Acidity								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG #15 0.8-1.0	GC/BG #15 1.3-1.5	GC/BG #15 1.8-2.0	GC/BG #15 2.3-2.5	GC/BG #15 2.8-3.0
			Client sampling date / time	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00	31-OCT-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815181-101	EB0815181-102	EB0815181-103	EB0815181-104	EB0815181-105
EA029-G: Retained Acidity - Continued								
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	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.51	----	----	----
EA029-H: 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	2.27	1.98	2.10	0.19
Net Acidity (acidity units)	----	10	mole H+ / t	629	1410	1240	1310	118
Liming Rate	----	1	kg CaCO3/t	47	106	93	98	9

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0815726**	Page	: 1 of 31
Client	: **ENVIRO RESOURCES MANAGEMENT**	Laboratory	: Environmental Division Brisbane
Contact	: MR GRAHAM OHMSEN	Contact	: Tim Kilmister
Address	: PO BOX 1400 SPRING HILL QLD, AUSTRALIA 4004	Address	: 32 Shand Street Stafford QLD Australia 4053
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Telephone	: +61 07 3839 8393	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3839 8381	Facsimile	: +61-7-3243 7218
Project	: 86165-11	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 12-NOV-2008
Sampler	: Geocoastal	Issue Date	: 26-NOV-2008
Site	: Gladstone		
		No. of samples received	: 71
Quote number	: EN/009/08	No. of samples analysed	: 71

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

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Signatories

This document has been electronically signed by the authorized signatories indicated below.

Signatories	*Position*	*Accreditation Category*
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General Comments

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

Where moisture determination has been performed, 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 ($CaCO_3$) 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			Client sample ID	GC/BG# 19 0-0.1	GC/BG# 19 0.3-0.5	GC/BG# 19 0.8-1.0	GC/BG# 19 1.3-1.5	GC/BG# 19 1.8-2.0
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-001	EB0815726-002	EB0815726-003	EB0815726-004	EB0815726-005
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	<0.02	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.1	5.6	5.0	5.3	8.1
pH OX (23B)	----	0.1	pH Unit	7.3	2.0	2.1	2.1	3.4
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	8	15	12	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	1730	1240	966	149
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	1720	1230	954	149
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	2.77	1.99	1.55	0.24
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	2.76	1.97	1.53	0.24
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.15	0.41	0.55	0.48	0.49
Peroxide Sulfur (23De)	----	0.02	% S	0.20	4.11	3.30	2.07	2.56
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.05	3.70	2.75	1.59	2.08
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	31	2310	1720	990	1290
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.09	0.15	0.19	0.20	0.58
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.11	0.19	0.23	0.16	2.41
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.04	0.04	<0.02	1.83
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	20	20	<10	912
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.03	0.03	<0.02	1.46
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.31	0.51	0.63	0.53	0.40
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.48	0.56	0.65	0.47	0.48
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.16	0.05	0.02	<0.02	0.08
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	136	38	19	<10	62
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.22	0.06	0.03	<0.02	0.10
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.56	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	113	----	----	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 19 0-0.1	GC/BG# 19 0.3-0.5	GC/BG# 19 0.8-1.0	GC/BG# 19 1.3-1.5	GC/BG# 19 1.8-2.0
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-001	EB0815726-002	EB0815726-003	EB0815726-004	EB0815726-005
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.18	----	----	----	----
EA029-H: 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	3.71	2.78	1.61	0.85
Net Acidity (acidity units)	----	10	mole H+ / t	<10	2320	1730	1000	531
Liming Rate	----	1	kg CaCO3/t	<1	174	130	75	40

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 19 2.3-2.5	GC/BG# 19 2.8-3.0	GC/BG# 18 0-0.1	GC/BG# 18 0.3-0.5	GC/BG# 18 0.8-1.0
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-006	EB0815726-007	EB0815726-008	EB0815726-009	EB0815726-010
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.3	8.1	7.9	5.5	5.7
pH OX (23B)	----	0.1	pH Unit	5.7	2.4	6.9	2.1	2.1
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	7	3
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	509	<2	848	802
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	509	<2	841	799
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	0.82	<0.02	1.36	1.28
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	0.82	<0.02	1.35	1.28
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.43	0.35	0.20	0.57	0.41
Peroxide Sulfur (23De)	----	0.02	% S	2.02	1.94	0.25	2.22	1.99
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.59	1.58	0.05	1.64	1.58
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	992	989	32	1020	986
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.50	0.39	0.05	0.58	0.08
Peroxide Calcium (23Wh)	----	0.02	% Ca	2.05	0.79	0.07	0.11	0.08
Acid Reacted Calcium (23X)	----	0.02	% Ca	1.55	0.40	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	774	197	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	1.24	0.32	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.36	0.32	0.38	0.52	0.57
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.48	0.40	0.53	0.64	0.52
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.12	0.08	0.15	0.13	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	98	69	125	107	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.16	0.11	0.20	0.17	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	0.44	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	87	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	0.14	----	----
EA029-H: Acid Base Accounting								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 19 2.3-2.5	GC/BG# 19 2.8-3.0	GC/BG# 18 0-0.1	GC/BG# 18 0.3-0.5	GC/BG# 18 0.8-1.0
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-006	EB0815726-007	EB0815726-008	EB0815726-009	EB0815726-010
EA029-H: Acid Base Accounting - Continued								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.53**	**1.07**	<0.02	**1.66**	**1.58**
Net Acidity (acidity units)	----	10	mole H+ / t	**330**	**669**	<10	**1030**	**989**
Liming Rate	----	1	kg CaCO3/t	**25**	**50**	<1	**77**	**74**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 18 1.3-1.5	GC/BG# 18 1.8-2.0	GC/BG# 18 2.3-2.5	GC/BG# 18 2.8-3.0	GC/BG# 16 0-0.1
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-011	EB0815726-012	EB0815726-013	EB0815726-014	EB0815726-015
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	1.14	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	5.7	4.8	8.2	7.9	8.1
pH OX (23B)	----	0.1	pH Unit	2.1	2.1	6.2	2.4	7.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	4	18	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	720	915	<2	439	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	715	897	<2	439	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.03	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.15	1.47	<0.02	0.70	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.15	1.44	<0.02	0.70	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.40	0.57	0.58	0.45	0.30
Peroxide Sulfur (23De)	----	0.02	% S	1.86	2.37	2.29	1.74	0.34
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.46	1.80	1.72	1.29	0.03
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	913	1120	1070	806	21
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.11	0.16	0.63	0.43	0.09
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.12	0.17	2.43	0.63	0.11
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	1.80	0.20	0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	899	99	11
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	1.44	0.16	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.49	0.64	0.52	0.45	0.46
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.53	0.66	0.60	0.51	0.65
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	<0.02	0.09	0.06	0.19
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	28	13	74	52	154
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	0.02	0.12	0.08	0.25
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	----	0.69
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	----	138

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 18 1.3-1.5	GC/BG# 18 1.8-2.0	GC/BG# 18 2.3-2.5	GC/BG# 18 2.8-3.0	GC/BG# 16 0-0.1
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-011	EB0815726-012	EB0815726-013	EB0815726-014	EB0815726-015
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	----	0.22
EA029-H: 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	1.47	1.83	0.57	0.90	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	917	1140	357	562	<10
Liming Rate	----	1	kg CaCO3/t	69	86	27	42	<1

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 16 0.3-0.5	GC/BG# 16 0.8-1.0	GC/BG# 16 1.3-1.5	GC/BG# 16 1.8-2.0	GC/BG# 16 2.3-2.5
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-016	EB0815726-017	EB0815726-018	EB0815726-019	EB0815726-020
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.7	4.6	5.0	7.3	8.1
pH OX (23B)	----	0.1	pH Unit	6.1	2.1	2.1	2.1	5.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	35	13	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	761	1020	727	26
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	725	1010	727	26
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.06	0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	1.22	1.64	1.17	0.04
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	1.16	1.62	1.17	0.04
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.32	0.72	0.59	0.51	0.59
Peroxide Sulfur (23De)	----	0.02	% S	0.46	4.11	2.57	2.24	2.43
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.14	3.39	1.98	1.72	1.84
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	86	2110	1230	1070	1150
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.06	0.12	0.14	0.36	0.60
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.14	0.15	0.43	2.42
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.02	<0.02	0.07	1.81
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	33	904
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	0.05	1.45
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.57	0.90	0.74	0.55	0.53
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.67	0.96	0.79	0.61	0.63
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.10	0.05	0.05	0.06	0.10
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	82	43	41	52	87
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.13	0.07	0.07	0.08	0.14
EA029-H: 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	0.05	3.45	2.00	1.35	0.64
Net Acidity (acidity units)	----	10	mole H+ / t	29	2150	1240	843	400
Liming Rate	----	1	kg CaCO3/t	2	161	93	63	30

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 16 2.8-3.0	GC/BG# 17 0-0.1	GC/BG# 17 0.3-0.5	GC/BG# 17 0.8-1.0	GC/BG# 17 1.3-1.5
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-021	EB0815726-022	EB0815726-023	EB0815726-024	EB0815726-025
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.99	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.2	7.0	7.9	5.4	5.5
pH OX (23B)	----	0.1	pH Unit	2.5	3.6	7.0	2.2	2.1
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	7	8
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	321	98	<2	956	1080
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	321	98	<2	949	1070
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.52	0.16	<0.02	1.53	1.73
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.52	0.16	<0.02	1.52	1.72
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.44	0.30	0.16	0.59	0.54
Peroxide Sulfur (23De)	----	0.02	% S	1.66	0.62	0.21	2.55	2.89
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.22	0.32	0.05	1.96	2.34
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	760	199	32	1220	1460
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.44	0.10	0.06	0.17	0.17
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.88	0.12	0.07	0.17	0.17
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.45	0.03	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	224	14	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.36	0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.40	0.51	0.34	0.76	0.66
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.47	0.55	0.46	0.76	0.66
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.07	0.04	0.12	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	55	32	100	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.09	0.05	0.16	<0.02	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	0.26	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	51	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 16 2.8-3.0	GC/BG# 17 0-0.1	GC/BG# 17 0.3-0.5	GC/BG# 17 0.8-1.0	GC/BG# 17 1.3-1.5
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-021	EB0815726-022	EB0815726-023	EB0815726-024	EB0815726-025
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	0.08	----	----
EA029-H: 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	0.75	0.21	<0.02	1.97	2.36
Net Acidity (acidity units)	----	10	mole H+ / t	468	131	<10	1230	1470
Liming Rate	----	1	kg CaCO3/t	35	10	<1	92	110

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 17 1.8-2.0	GC/BG# 17 2.3-2.5	GC/BG# 17 2.8-3.0	GC/BG# 33 0-0.1	GC/BG# 33 0.3-0.5
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-026	EB0815726-027	EB0815726-028	EB0815726-029	EB0815726-030
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.6	8.1	8.0	8.3	3.6
pH OX (23B)	----	0.1	pH Unit	2.1	3.5	2.3	7.7	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	98
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	771	141	504	<2	2300
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	771	141	504	<2	2200
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	0.16
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.24	0.23	0.81	<0.02	3.69
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.24	0.23	0.81	<0.02	3.53
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.52	0.57	0.43	0.12	0.68
Peroxide Sulfur (23De)	----	0.02	% S	2.38	2.39	2.12	0.13	5.35
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.86	1.82	1.68	<0.02	4.67
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1160	1130	1050	<10	2910
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.44	0.66	0.51	0.06	0.14
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.56	2.23	0.92	0.06	0.13
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.12	1.57	0.42	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	61	786	207	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.10	1.26	0.33	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.46	0.48	0.39	0.26	0.64
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.53	0.53	0.48	0.43	0.63
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.07	0.05	0.09	0.17	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	56	41	72	143	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.09	0.06	0.12	0.23	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	<0.02	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	<10	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	<0.02	----
EA029-G: Retained Acidity								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 17 1.8-2.0	GC/BG# 17 2.3-2.5	GC/BG# 17 2.8-3.0	GC/BG# 33 0-0.1	GC/BG# 33 0.3-0.5
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-026	EB0815726-027	EB0815726-028	EB0815726-029	EB0815726-030
EA029-G: Retained Acidity - Continued								
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
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	----	**0.64**
EA029-H: 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	**1.44**	**0.76**	**1.10**	<0.02	**4.80**
Net Acidity (acidity units)	----	10	mole H+ / t	**900**	**472**	**686**	<10	**2990**
Liming Rate	----	1	kg CaCO3/t	**68**	**35**	**51**	<1	**224**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 33 0.8-1.0	GC/BG# 33 1.3-1.5	GC/BG# 40 0-0.1	GC/BG# 40 0.3-0.5	GC/BG# 40 0.8-1.0
			Client sampling date / time	06-NOV-2008 15:00	06-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-031	EB0815726-032	EB0815726-033	EB0815726-034	EB0815726-035
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	1.99	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.0	4.4	7.0	4.1	4.4
pH OX (23B)	----	0.1	pH Unit	2.0	2.0	4.5	2.2	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	63	22	<2	49	50
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	1540	1100	20	612	1780
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	1470	1080	20	563	1730
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.10	0.04	<0.02	0.08	0.08
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	2.46	1.76	0.03	0.98	2.85
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	2.36	1.73	0.03	0.90	2.77
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.54	0.19	0.15	0.32	0.54
Peroxide Sulfur (23De)	----	0.02	% S	3.84	2.41	0.33	1.35	4.24
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	3.30	2.22	0.18	1.02	3.70
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	2060	1390	110	639	2310
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.12	0.03	0.04	0.07	0.11
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.10	<0.02	0.05	0.07	0.11
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.58	0.15	0.26	0.43	0.64
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.60	0.11	0.33	0.43	0.69
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.02	<0.02	0.07	<0.02	0.05
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	18	<10	57	<10	43
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.03	<0.02	0.09	<0.02	0.07
EA029-G: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	0.08	0.03	----	0.08	0.09
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	38	13	----	38	44
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	0.06	0.02	----	0.06	0.07
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.62	0.21	----	0.40	0.63

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 33 0.8-1.0	GC/BG# 33 1.3-1.5	GC/BG# 40 0-0.1	GC/BG# 40 0.3-0.5	GC/BG# 40 0.8-1.0
			Client sampling date / time	06-NOV-2008 15:00	06-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-031	EB0815726-032	EB0815726-033	EB0815726-034	EB0815726-035
EA029-H: 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	**3.46**	**2.28**	**0.08**	**1.16**	**3.85**
Net Acidity (acidity units)	----	10	mole H+ / t	**2160**	**1420**	**50**	**726**	**2400**
Liming Rate	----	1	kg CaCO3/t	**162**	**107**	**4**	**54**	**180**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 40 1.3-1.5	GC/BG# 30 0-0.1	GC/BG# 30 0.3-0.5	GC/BG# 30 0.8-1.0	GC/BG# 30 1.3-1.5
			Client sampling date / time	07-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-036	EB0815726-037	EB0815726-038	EB0815726-039	EB0815726-040
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.3	8.1	4.0	4.2	7.1
pH OX (23B)	----	0.1	pH Unit	2.0	6.0	1.9	1.9	6.4
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	37	<2	83	37	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	1250	<2	2040	1610	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	1220	<2	1960	1570	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.06	<0.02	0.13	0.06	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	2.01	<0.02	3.28	2.58	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.95	<0.02	3.15	2.52	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.40	0.16	0.61	0.40	0.05
Peroxide Sulfur (23De)	----	0.02	% S	2.90	0.42	4.90	3.61	0.10
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.50	0.26	4.29	3.21	0.04
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1560	166	2670	2000	27
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.08	0.07	0.13	0.10	0.04
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.06	0.09	0.12	0.08	0.05
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.42	0.31	0.58	0.41	0.10
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.40	0.55	0.58	0.39	0.12
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.24	<0.02	<0.02	0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	200	<10	<10	17
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.32	<0.02	<0.02	0.03
EA029-G: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	0.03	0.02	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	12	11	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	<0.02	<0.02	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.40	----	0.64	0.42	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 40 1.3-1.5	GC/BG# 30 0-0.1	GC/BG# 30 0.3-0.5	GC/BG# 30 0.8-1.0	GC/BG# 30 1.3-1.5
			Client sampling date / time	07-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-036	EB0815726-037	EB0815726-038	EB0815726-039	EB0815726-040
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	**2.56**	**0.09**	**4.44**	**3.29**	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	**1600**	**55**	**2770**	**2050**	<10
Liming Rate	----	1	kg CaCO3/t	**120**	**4**	**208**	**154**	<1

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 46 0-0.1	GC/BG# 46 0.3-0.5	GC/BG# 46 0.8-1.0	GC/BG# 43 0-0.1	GC/BG# 43 0.3-0.5
			Client sampling date / time	07-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-041	EB0815726-042	EB0815726-043	EB0815726-044	EB0815726-045
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.19	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.4	4.4	4.9	5.8	4.0
pH OX (23B)	----	0.1	pH Unit	4.5	2.1	1.9	2.1	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	42	7	3	60
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	537	1050	2560	627	1930
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	537	1010	2550	624	1870
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.07	<0.02	<0.02	0.10
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.86	1.68	4.10	1.00	3.10
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.86	1.61	4.09	1.00	3.00
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.17	0.48	0.20	0.22	0.63
Peroxide Sulfur (23De)	----	0.02	% S	0.47	2.44	5.40	1.48	3.71
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.30	1.96	5.20	1.26	3.08
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	187	1220	3240	788	1920
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.07	0.14	0.04	0.08	0.15
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.09	0.12	0.02	0.09	0.11
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.25	0.50	0.16	0.27	0.58
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.42	0.45	0.15	0.32	0.45
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.17	<0.02	<0.02	0.05	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	140	<10	<10	44	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.22	<0.02	<0.02	0.07	<0.02
EA029-G: 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
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.44	----	----	0.52

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 46 0-0.1	GC/BG# 46 0.3-0.5	GC/BG# 46 0.8-1.0	GC/BG# 43 0-0.1	GC/BG# 43 0.3-0.5
			Client sampling date / time	07-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-041	EB0815726-042	EB0815726-043	EB0815726-044	EB0815726-045
EA029-H: 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	**0.67**	**2.03**	**5.21**	**1.27**	**3.18**
Net Acidity (acidity units)	----	10	mole H+ / t	**420**	**1270**	**3250**	**791**	**1980**
Liming Rate	----	1	kg CaCO3/t	**32**	**95**	**244**	**59**	**149**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 43 0.8-1.0	GC/BG# 43 1.3-1.5	GC/BG# 34 1.3-1.5	GC/BG# 34 1.8-2.0	GC/BG# 34 2.3-2.5
			Client sampling date / time	07-NOV-2008 15:00	07-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-046	EB0815726-047	EB0815726-048	EB0815726-049	EB0815726-050
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	3.9	4.7	4.4	5.2	7.7
pH OX (23B)	----	0.1	pH Unit	1.9	1.9	2.0	2.1	4.7
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	55	18	25	5	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	1770	1810	1300	1100	10
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	1710	1790	1280	1100	10
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.09	0.03	0.04	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	2.83	2.90	2.09	1.77	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	2.75	2.87	2.05	1.76	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.46	0.35	0.45	0.41	0.07
Peroxide Sulfur (23De)	----	0.02	% S	3.64	3.44	3.04	2.47	0.20
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	3.18	3.09	2.59	2.06	0.14
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1980	1930	1610	1280	86
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.12	0.10	0.11	0.11	0.03
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.07	0.04	0.09	0.09	0.04
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.42	0.37	0.47	0.48	0.12
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.36	0.27	0.45	0.44	0.17
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	<0.02	<0.02	0.05
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	<10	<10	40
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.06
EA029-G: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	----	0.06	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	----	31	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	----	0.05	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.47	----	0.52	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 43 0.8-1.0	GC/BG# 43 1.3-1.5	GC/BG# 34 1.3-1.5	GC/BG# 34 1.8-2.0	GC/BG# 34 2.3-2.5
			Client sampling date / time	07-NOV-2008 15:00	07-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-046	EB0815726-047	EB0815726-048	EB0815726-049	EB0815726-050
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	**3.27**	**3.12**	**2.68**	**2.07**	**0.06**
Net Acidity (acidity units)	----	10	mole H+ / t	**2040**	**1950**	**1670**	**1290**	**35**
Liming Rate	----	1	kg CaCO3/t	**153**	**146**	**125**	**97**	**3**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 42 0-0.1	GC/BG# 42 0.3-0.5	GC/BG# 31 0-0.1	GC/BG# 31 0.3-0.5	GC/BG# 31 0.8-1.0
			Client sampling date / time	07-NOV-2008 15:00	07-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-051	EB0815726-052	EB0815726-053	EB0815726-054	EB0815726-055
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.03	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.0	7.2	4.8	4.3	4.4
pH OX (23B)	----	0.1	pH Unit	6.0	6.0	2.5	2.0	2.1
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	9	27	15
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	249	1060	797
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	240	1040	782
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.04	0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.40	1.70	1.28
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.38	1.66	1.25
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.06	0.03	0.10	0.10	0.05
Peroxide Sulfur (23De)	----	0.02	% S	0.11	0.07	0.48	2.21	1.64
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.04	0.04	0.38	2.10	1.59
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	27	25	238	1310	990
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.02	<0.02	0.04	0.03	<0.02
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.02	0.02	0.03	<0.02	0.02
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.11	0.05	0.15	0.10	0.06
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.14	0.08	0.14	0.08	0.07
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	0.03	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	28	25	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	0.04	<0.02	<0.02	<0.02
EA029-G: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	----	0.16	0.05
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	----	74	22
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	----	0.12	0.04
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	0.26	0.10

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 42 0-0.1	GC/BG# 42 0.3-0.5	GC/BG# 31 0-0.1	GC/BG# 31 0.3-0.5	GC/BG# 31 0.8-1.0
			Client sampling date / time	07-NOV-2008 15:00	07-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-051	EB0815726-052	EB0815726-053	EB0815726-054	EB0815726-055
EA029-H: 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	**0.40**	**2.27**	**1.65**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	**247**	**1410**	**1030**
Liming Rate	----	1	kg CaCO3/t	<1	<1	**18**	**106**	**77**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 31 1.3-1.5	GC/BG# 32 0-0.1	GC/BG# 32 0.3-0.5	GC/BG# 32 0.75-0.85	GC/BG# 45 0-0.1
			Client sampling date / time	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	07-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-056	EB0815726-057	EB0815726-058	EB0815726-059	EB0815726-060
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.3	7.9	4.2	5.7	6.6
pH OX (23B)	----	0.1	pH Unit	5.1	7.0	1.8	2.4	4.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	51	2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	10	<2	2700	293	10
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	10	<2	2650	290	10
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.08	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	4.33	0.47	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	4.24	0.46	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.04	0.15	0.33	0.07	0.09
Peroxide Sulfur (23De)	----	0.02	% S	0.09	0.22	5.41	0.66	0.20
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.05	0.06	5.08	0.60	0.10
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	33	41	3170	372	66
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.03	0.08	0.07	0.02	0.03
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.03	0.13	<0.02	<0.02	0.03
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.05	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	25	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.04	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.10	0.24	0.29	0.09	0.16
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.11	0.39	0.23	0.09	0.21
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.15	<0.02	<0.02	0.04
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	125	<10	<10	35
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.20	<0.02	<0.02	0.06
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	0.46	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	92	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	0.15	----	----	----
EA029-G: Retained Acidity								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 31 1.3-1.5	GC/BG# 32 0-0.1	GC/BG# 32 0.3-0.5	GC/BG# 32 0.75-0.85	GC/BG# 45 0-0.1
			Client sampling date / time	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	07-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-056	EB0815726-057	EB0815726-058	EB0815726-059	EB0815726-060
EA029-G: Retained Acidity - Continued								
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	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	0.31	----	----
EA029-H: 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	0.05	<0.02	5.16	0.60	0.05
Net Acidity (acidity units)	----	10	mole H+ / t	33	<10	3220	374	29
Liming Rate	----	1	kg CaCO3/t	2	<1	242	28	2

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 45 0.3-0.5	GC/BG# 28 0-0.1	GC/BG# 28 0.3-0.5	GC/BG# 28 0.8-1.0	GC/BG# 28 1.3-1.5
			Client sampling date / time	07-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-061	EB0815726-062	EB0815726-063	EB0815726-064	EB0815726-065
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.19	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	5.2	5.2	4.6	4.2	7.0
pH OX (23B)	----	0.1	pH Unit	2.3	2.2	2.0	2.0	2.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	4	9	21	37	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	98	678	1150	1170	951
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	94	669	1130	1130	951
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.03	0.06	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.16	1.09	1.85	1.88	1.52
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.15	1.07	1.81	1.82	1.52
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.04	0.30	0.36	0.30	0.46
Peroxide Sulfur (23De)	----	0.02	% S	0.25	2.28	3.12	2.93	3.45
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.21	1.98	2.76	2.63	2.98
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	134	1230	1720	1640	1860
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	0.09	0.11	0.06	0.46
Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	0.12	0.12	0.08	0.57
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.03	<0.02	<0.02	0.11
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	16	<10	<10	56
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.02	<0.02	<0.02	0.09
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.04	0.36	0.40	0.24	0.35
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.05	0.46	0.42	0.25	0.44
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.10	<0.02	<0.02	0.09
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	80	16	15	72
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.13	0.02	0.02	0.12
EA029-G: 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	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	0.32	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 45 0.3-0.5	GC/BG# 28 0-0.1	GC/BG# 28 0.3-0.5	GC/BG# 28 0.8-1.0	GC/BG# 28 1.3-1.5
			Client sampling date / time	07-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-061	EB0815726-062	EB0815726-063	EB0815726-064	EB0815726-065
EA029-H: 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	**0.22**	**1.99**	**2.79**	**2.70**	**2.01**
Net Acidity (acidity units)	----	10	mole H+ / t	**138**	**1240**	**1740**	**1680**	**1250**
Liming Rate	----	1	kg CaCO3/t	**10**	**93**	**131**	**126**	**94**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 28 1.8-2.0	GC/BG# 28 2.3-2.5	GC/BG# 28 2.8-3.0	GC/BG# 34 0-0.1	GC/BG# 34 0.3-0.5
			Client sampling date / time	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-066	EB0815726-067	EB0815726-068	EB0815726-069	EB0815726-070
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	5.8	7.0	8.5	4.8	3.9
pH OX (23B)	----	0.1	pH Unit	2.0	2.0	7.0	2.2	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	5	<2	<2	17	102
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	997	1120	<2	612	1590
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	992	1120	<2	594	1480
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.03	0.16
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.60	1.80	<0.02	0.98	2.55
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.59	1.80	<0.02	0.95	2.38
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.44	0.23	0.14	0.41	0.80
Peroxide Sulfur (23De)	----	0.02	% S	3.30	3.26	0.29	1.73	4.78
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.85	3.03	0.16	1.32	3.98
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1780	1890	97	826	2480
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.27	0.10	0.25	0.10	0.17
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.33	0.12	0.29	0.12	0.20
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.06	0.02	0.04	0.03	0.04
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	29	12	21	13	18
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.05	<0.02	0.03	0.02	0.03
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.34	0.36	0.14	0.49	0.80
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.41	0.41	0.18	0.55	0.90
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.07	0.05	0.04	0.06	0.10
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	59	44	36	48	81
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.10	0.07	0.06	0.08	0.13
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	0.31	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	61	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	0.10	----	----
EA029-G: Retained Acidity								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 28 1.8-2.0	GC/BG# 28 2.3-2.5	GC/BG# 28 2.8-3.0	GC/BG# 34 0-0.1	GC/BG# 34 0.3-0.5
			Client sampling date / time	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00	06-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815726-066	EB0815726-067	EB0815726-068	EB0815726-069	EB0815726-070
EA029-G: Retained Acidity - Continued								
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
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	----	**0.74**
EA029-H: 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**	**2.21**	<0.02	**1.35**	**4.14**
Net Acidity (acidity units)	----	10	mole H+ / t	**1780**	**1380**	<10	**843**	**2580**
Liming Rate	----	1	kg CaCO3/t	**134**	**103**	<1	**63**	**194**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 34 0.8-1.0	----	----	----	----
			Client sampling date / time	06-NOV-2008 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB0815726-071	----	----	----	----
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	3.22	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.0	----	----	----	----
pH OX (23B)	----	0.1	pH Unit	1.8	----	----	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	58	----	----	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	2180	----	----	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	2120	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.09	----	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	3.49	----	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	3.40	----	----	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.64	----	----	----	----
Peroxide Sulfur (23De)	----	0.02	% S	5.93	----	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	5.28	----	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	3300	----	----	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.14	----	----	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.16	----	----	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.65	----	----	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.68	----	----	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	----	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	28	----	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	----	----	----	----
EA029-G: 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	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.60	----	----	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 34 0.8-1.0	----	----	----	----
			Client sampling date / time	06-NOV-2008 15:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB0815726-071	----	----	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	**5.38**	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	**3350**	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	**252**	----	----	----	----

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0815732**	Page	: 1 of 17
Client	: **ENVIRO RESOURCES MANAGEMENT**	Laboratory	: Environmental Division Brisbane
Contact	: MR GRAHAM OHMSEN	Contact	: Tim Kilmister
Address	: PO BOX 1400 SPRING HILL QLD, AUSTRALIA 4004	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: graham.ohmsen@erm.com	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3839 8393	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3839 8381	Facsimile	: +61-7-3243 7218
Project	: 86165 -11	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 12-NOV-2008
Sampler	: Geocoastal	Issue Date	: 26-NOV-2008
Site	: Gladstone		
		No. of samples received	: 54
Quote number	: EN/009/08	No. of samples analysed	: 54

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.

WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below.

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

General Comments

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

Where moisture determination has been performed, 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 ($CaCO_3$) 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			Client sample ID	GC/BG# 22 1.8-2.0	GC/BG# 22 2.0-2.2	GC/BG# 21 0-0.1	GC/BG# 21 0.3-0.5	GC/BG# 21 0.8-1.0
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-001	EB0815732-002	EB0815732-003	EB0815732-004	EB0815732-005
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	1.72	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.6	7.5	6.4	6.4	8.4
pH OX (23B)	----	0.1	pH Unit	2.1	2.1	3.3	2.2	3.7
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	851	758	67	887	103
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	851	758	67	887	103
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.36	1.22	0.11	1.42	0.16
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.36	1.22	0.11	1.42	0.16
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.30	0.34	0.17	0.56	0.45
Peroxide Sulfur (23De)	----	0.02	% S	2.22	2.16	0.31	1.97	1.55
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.92	1.82	0.14	1.40	1.10
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1200	1130	86	874	684
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.29	0.28	0.09	0.25	0.43
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.37	0.37	0.09	0.22	1.39
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.08	0.10	<0.02	<0.02	0.96
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	39	47	<10	<10	478
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.06	0.08	<0.02	<0.02	0.77
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.34	0.38	0.26	0.60	0.46
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.42	0.48	0.27	0.55	0.45
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.08	0.10	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	68	81	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.11	0.13	<0.02	<0.02	<0.02
EA029-H: 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	1.42	0.14	1.40	0.48
Net Acidity (acidity units)	----	10	mole H+ / t	966	884	86	874	297
Liming Rate	----	1	kg CaCO3/t	72	66	6	66	22

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 21 1.3-1.5	GC/BG# 21 1.8-2.0	GC/BG# 21 2.3-2.5	GC/BG# 21 2.8-3.0	GC/BG# 38 2.3-2.5
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	08-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-006	EB0815732-007	EB0815732-008	EB0815732-009	EB0815732-010
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.5	8.6	8.6	7.5	6.3
pH OX (23B)	----	0.1	pH Unit	6.8	6.1	6.2	2.6	2.2
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	460	658
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	460	658
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.74	1.05
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.74	1.05
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.47	0.43	0.37	0.28	0.05
Peroxide Sulfur (23De)	----	0.02	% S	1.50	1.99	1.49	1.23	1.43
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.04	1.55	1.11	0.95	1.38
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	647	969	694	592	858
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.48	0.44	0.40	0.09	<0.02
Peroxide Calcium (23Wh)	----	0.02	% Ca	3.06	1.98	1.55	0.12	0.03
Acid Reacted Calcium (23X)	----	0.02	% Ca	2.58	1.54	1.14	0.02	0.03
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	1290	770	571	12	15
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	2.06	1.24	0.92	<0.02	0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.41	0.40	0.32	0.43	0.07
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.44	0.52	0.37	0.48	0.10
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	0.12	0.05	0.05	0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	28	100	40	38	20
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	0.16	0.06	0.06	0.03
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	3.91	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	780	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	1.25	----	----	----	----
EA029-H: Acid Base Accounting								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 21 1.3-1.5	GC/BG# 21 1.8-2.0	GC/BG# 21 2.3-2.5	GC/BG# 21 2.8-3.0	GC/BG# 38 2.3-2.5
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	08-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-006	EB0815732-007	EB0815732-008	EB0815732-009	EB0815732-010
EA029-H: Acid Base Accounting - Continued								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	**0.52**	**0.37**	**0.81**	**1.38**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	**323**	**231**	**504**	**858**
Liming Rate	----	1	kg CaCO3/t	<1	**24**	**17**	**38**	**64**

Analytical Results

Sub-Matrix: **SOIL**

Compound	CAS Number	LOR	Unit	GC/BG# 20 0-0.1	GC/BG# 20 0.3-0.5	GC/BG# 20 0.8-1.0	GC/BG# 20 1.3-1.5	GC/BG# 20 1.8-2.0
			Client sample ID	GC/BG# 20 0-0.1	GC/BG# 20 0.3-0.5	GC/BG# 20 0.8-1.0	GC/BG# 20 1.3-1.5	GC/BG# 20 1.8-2.0
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
				EB0815732-011	EB0815732-012	EB0815732-013	EB0815732-014	EB0815732-015
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.64	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.6	6.4	6.8	8.1	8.2
pH OX (23B)	----	0.1	pH Unit	2.4	1.7	1.9	2.2	6.4
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	470	1480	1300	784	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	470	1480	1300	784	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.75	2.37	2.08	1.26	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.75	2.37	2.08	1.26	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.33	0.52	0.54	0.50	0.39
Peroxide Sulfur (23De)	----	0.02	% S	1.23	3.27	3.85	2.18	1.50
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.90	2.74	3.31	1.68	1.10
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	562	1710	2070	1050	690
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.10	0.24	0.30	0.49	0.54
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.12	0.27	0.31	0.54	1.82
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.02	<0.02	0.06	1.28
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	12	<10	29	637
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	0.05	1.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.48	0.63	0.67	0.46	0.32
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.55	0.62	0.65	0.44	0.28
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.06	<0.02	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	54	<10	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.09	<0.02	<0.02	<0.02	<0.02
EA029-H: 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	2.74	2.49	1.40	0.37
Net Acidity (acidity units)	----	10	mole H+ / t	501	1710	1560	872	230
Liming Rate	----	1	kg CaCO3/t	38	128	117	65	17

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 20 2.3-2.5	GC/BG# 20 2.8-3.0	GC/BG# 22 0-0.1	GC/BG# 22 0.3-0.5	GC/BG# 22 0.8-1.0
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-016	EB0815732-017	EB0815732-018	EB0815732-019	EB0815732-020
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.5	8.1	4.6	5.7	4.3
pH OX (23B)	----	0.1	pH Unit	2.7	2.2	1.9	2.1	2.2
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	14	<2	40
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	398	830	1080	974	912
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	398	830	1060	974	873
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.02	<0.02	0.06
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.64	1.33	1.73	1.56	1.46
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.64	1.33	1.71	1.56	1.40
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.40	0.41	0.31	0.26	0.23
Peroxide Sulfur (23De)	----	0.02	% S	2.15	1.83	3.34	1.74	2.13
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.75	1.42	3.03	1.48	1.90
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1090	885	1890	923	1180
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.42	0.31	0.11	0.11	0.10
Peroxide Calcium (23Wh)	----	0.02	% Ca	1.40	0.29	0.12	0.09	0.12
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.98	<0.02	<0.02	<0.02	0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	490	<10	<10	<10	11
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.79	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.38	0.42	0.38	0.38	0.36
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.45	0.38	0.39	0.32	0.40
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.06	<0.02	<0.02	<0.02	0.03
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	52	<10	12	<10	28
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.08	<0.02	<0.02	<0.02	0.04
EA029-G: 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
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	----	0.20
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 20 2.3-2.5	GC/BG# 20 2.8-3.0	GC/BG# 22 0-0.1	GC/BG# 22 0.3-0.5	GC/BG# 22 0.8-1.0
			Client sampling date / time	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00	01-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-016	EB0815732-017	EB0815732-018	EB0815732-019	EB0815732-020
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	**1.01**	**1.36**	**3.05**	**1.48**	**1.96**
Net Acidity (acidity units)	----	10	mole H+ / t	**629**	**848**	**1900**	**923**	**1220**
Liming Rate	----	1	kg CaCO3/t	**47**	**64**	**143**	**69**	**92**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 22 1.3-1.5	GC/BG# 41 0-0.1	GC/BG# 41 0.3-0.5	GC/BG# 39 0-0.1	GC/BG# 39 0.3-0.5
			Client sampling date / time	01-NOV-2008 15:00	07-NOV-2008 15:00	07-NOV-2008 15:00	08-NOV-2008 15:00	08-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-021	EB0815732-022	EB0815732-023	EB0815732-024	EB0815732-025
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.44	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.9	5.1	4.8	7.4	4.7
pH OX (23B)	----	0.1	pH Unit	2.9	3.2	2.8	5.7	1.7
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	3	7	<2	10
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	175	51	87	<2	1740
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	175	48	80	<2	1730
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.28	0.08	0.14	<0.02	2.78
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.28	0.08	0.13	<0.02	2.77
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.18	0.16	0.05	0.09	0.33
Peroxide Sulfur (23De)	----	0.02	% S	0.69	0.22	0.19	0.13	4.27
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.51	0.06	0.14	0.05	3.93
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	320	37	86	30	2450
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.19	0.03	<0.02	0.05	0.11
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.22	0.02	<0.02	0.06	0.12
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.03	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	13	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.24	0.27	0.08	0.19	0.37
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.27	0.27	0.08	0.21	0.36
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.04	<0.02	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	30	<10	<10	16	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.05	<0.02	<0.02	0.02	<0.02
EA029-H: 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	0.36	0.06	0.15	<0.02	3.95
Net Acidity (acidity units)	----	10	mole H+ / t	223	41	94	<10	2460
Liming Rate	----	1	kg CaCO3/t	17	3	7	<1	185

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 39 0.8-1.0	GC/BG# 39 1.3-1.5	GC/BG# 39 1.7-1.8	GC/BG# 38 0-0.1	GC/BG# 38 0.3-0.5
			Client sampling date / time	08-NOV-2008 15:00	08-NOV-2008 15:00	08-NOV-2008 15:00	08-NOV-2008 15:00	08-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-026	EB0815732-027	EB0815732-028	EB0815732-029	EB0815732-030
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	5.2	5.8	5.0	8.4	5.3
pH OX (23B)	----	0.1	pH Unit	1.7	2.0	1.8	1.7	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	4	<2	2	<2	9
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	1880	617	910	<2	3230
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	1870	617	907	<2	3220
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	3.01	0.99	1.46	<0.02	5.18
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	3.00	0.99	1.45	<0.02	5.17
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.35	0.17	0.09	0.09	0.56
Peroxide Sulfur (23De)	----	0.02	% S	4.86	1.40	2.67	0.16	7.73
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	4.51	1.23	2.58	0.07	7.16
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	2810	765	1610	46	4470
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.13	0.07	0.02	0.06	0.19
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.14	0.08	0.03	0.08	0.26
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	0.06
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	31
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.05
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.44	0.22	0.10	0.19	0.72
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.45	0.23	0.13	0.28	0.72
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.03	0.08	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	22	68	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.04	0.11	<0.02
EA029-H: 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	4.52	1.23	2.58	<0.02	7.18
Net Acidity (acidity units)	----	10	mole H+ / t	2820	765	1610	<10	4480
Liming Rate	----	1	kg CaCO3/t	211	57	121	<1	336

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 38 0.8-1.0	GC/BG# 38 1.3-1.5	GC/BG# 38 1.8-2.0	GC/BG# 24 0-0.1	GC/BG# 24 0.3-0.5
			Client sampling date / time	08-NOV-2008 15:00	08-NOV-2008 15:00	08-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-031	EB0815732-032	EB0815732-033	EB0815732-034	EB0815732-035
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	5.54	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	5.2	5.2	5.5	5.5	4.8
pH OX (23B)	----	0.1	pH Unit	1.6	1.7	2.0	3.3	2.4
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	8	5	<2	<2	4
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	3270	2200	601	23	249
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	3260	2200	601	23	245
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	5.25	3.54	0.96	0.04	0.40
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	5.24	3.53	0.96	0.04	0.39
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.44	0.38	0.14	0.12	0.08
Peroxide Sulfur (23De)	----	0.02	% S	7.64	5.10	1.57	0.17	0.55
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	7.20	4.72	1.43	0.05	0.47
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	4490	2940	892	33	295
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.18	0.14	0.05	0.02	<0.02
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.16	0.14	0.06	0.03	<0.02
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.53	0.46	0.17	0.22	0.12
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.53	0.48	0.16	0.23	0.13
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	13	<10	11	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.02	<0.02	<0.02	<0.02
EA029-H: 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	7.21	4.73	1.43	0.05	0.48
Net Acidity (acidity units)	----	10	mole H+ / t	4500	2950	892	33	300
Liming Rate	----	1	kg CaCO3/t	338	221	67	2	22

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 24 0.8-1.0	GC/BG# 24 1.3-1.5	GC/BG# 24 1.6-1.8	GC/BG# 25 0-0.1	GC/BG# 25 0.3-0.5
			Client sampling date / time	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-036	EB0815732-037	EB0815732-038	EB0815732-039	EB0815732-040
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.2	7.0	6.3	6.7	5.8
pH OX (23B)	----	0.1	pH Unit	5.9	5.9	5.1	2.3	1.6
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	8	370	3140
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	8	370	3140
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.59	5.03
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.59	5.03
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.05	0.05	0.06	0.16	0.47
Peroxide Sulfur (23De)	----	0.02	% S	0.06	0.08	0.08	1.07	7.26
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	0.02	0.02	0.91	6.79
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	14	16	570	4240
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	<0.02	<0.02	0.06	0.14
Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	<0.02	<0.02	0.08	0.16
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.11	0.12	0.10	0.24	0.53
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.12	0.13	0.10	0.34	0.54
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	<0.02	0.10	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	<10	85	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	<0.02	0.14	<0.02
EA029-H: 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	0.70	6.79
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	16	437	4240
Liming Rate	----	1	kg CaCO3/t	<1	<1	1	33	318

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 25 0.8-1.0	GC/BG# 25 1.3-1.5	GC/BG# 25 1.8-2.0	GC/BG# 26 0-0.1	GC/BG# 26 0.3-0.5
			Client sampling date / time	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-041	EB0815732-042	EB0815732-043	EB0815732-044	EB0815732-045
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	5.15	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.3	4.7	7.7	7.4	4.9
pH OX (23B)	----	0.1	pH Unit	1.6	1.7	3.7	4.9	1.6
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	39	26	19	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	2740	1830	41	<2	2700
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	2700	1810	22	<2	2700
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.06	0.04	0.03	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	4.39	2.94	0.06	<0.02	4.33
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	4.33	2.90	0.04	<0.02	4.33
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.49	0.44	0.06	0.10	0.66
Peroxide Sulfur (23De)	----	0.02	% S	5.40	4.33	0.20	0.25	5.90
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	4.91	3.88	0.14	0.15	5.25
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	3060	2420	89	92	3270
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.12	0.13	0.03	0.05	0.17
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.11	0.14	0.04	0.07	0.16
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	11	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.44	0.47	0.12	0.19	0.62
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.36	0.47	0.14	0.23	0.55
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.02	0.04	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	18	36	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.03	0.06	<0.02
EA029-G: 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	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.42	----	----	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 25 0.8-1.0	GC/BG# 25 1.3-1.5	GC/BG# 25 1.8-2.0	GC/BG# 26 0-0.1	GC/BG# 26 0.3-0.5
			Client sampling date / time	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-041	EB0815732-042	EB0815732-043	EB0815732-044	EB0815732-045
EA029-H: 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	**4.97**	**3.92**	**0.07**	<0.02	**5.25**
Net Acidity (acidity units)	----	10	mole H+ / t	**3100**	**2450**	**44**	<10	**3270**
Liming Rate	----	1	kg CaCO3/t	**233**	**184**	**3**	<1	**246**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 26 0.8-1.0	GC/BG# 26 1.3-1.5	GC/BG# 26 1.8-2.0	GC/BG# 26 2.3-2.5	GC/BG# 26 2.7-2.8
			Client sampling date / time	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00
Compound	CAS Number	LOR	Unit	EB0815732-046	EB0815732-047	EB0815732-048	EB0815732-049	EB0815732-050
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.6	6.4	5.2	6.0	6.0
pH OX (23B)	----	0.1	pH Unit	1.8	2.0	1.8	2.0	1.8
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	15	23	<2	6	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	2080	930	1450	802	1170
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	2060	908	1450	796	1170
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02	0.04	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	3.33	1.49	2.32	1.28	1.88
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	3.30	1.46	2.32	1.28	1.88
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.45	0.25	0.31	0.10	0.06
Peroxide Sulfur (23De)	----	0.02	% S	5.06	2.64	3.88	2.23	3.10
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	4.61	2.39	3.57	2.14	3.04
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	2870	1490	2220	1330	1900
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.12	0.09	0.10	0.03	<0.02
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.13	0.12	0.11	0.04	0.03
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.03	<0.02	<0.02	0.03
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	16	<10	<10	13
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.02	<0.02	<0.02	0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.40	0.34	0.33	0.12	0.06
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.45	0.40	0.37	0.17	0.09
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.05	0.06	0.04	0.05	0.03
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	40	50	30	41	22
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.06	0.08	0.05	0.06	0.04
EA029-H: 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	4.63	2.42	3.57	2.15	3.04
Net Acidity (acidity units)	----	10	mole H+ / t	2890	1510	2220	1340	1900
Liming Rate	----	1	kg CaCO3/t	217	114	167	100	142

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 23 0-0.1	GC/BG# 23 0.3-0.5	GC/BG# 23 0.8-1.0	GC/BG# 23 1.3-1.5	----
			Client sampling date / time	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	----
Compound	CAS Number	LOR	Unit	EB0815732-051	EB0815732-052	EB0815732-053	EB0815732-054	----
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.03	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.4	4.0	5.2	4.8	----
pH OX (23B)	----	0.1	pH Unit	2.2	1.6	2.0	1.8	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	81	5	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	450	1520	498	1370	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	450	1520	418	1370	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.13	<0.02	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.72	2.43	0.80	2.20	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.72	2.43	0.67	2.19	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.23	0.46	0.07	0.38	----
Peroxide Sulfur (23De)	----	0.02	% S	1.29	7.33	1.68	3.44	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.06	6.87	1.61	3.07	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	664	4290	1000	1910	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.07	0.10	<0.02	0.10	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.12	0.02	0.11	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.03	0.02	<0.02	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	14	10	<10	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.02	<0.02	<0.02	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.30	0.43	0.06	0.43	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.48	0.52	0.07	0.44	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.19	0.08	<0.02	<0.02	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	153	70	<10	11	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.24	0.11	<0.02	<0.02	----
EA029-G: 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	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.47	----	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GC/BG# 23 0-0.1	GC/BG# 23 0.3-0.5	GC/BG# 23 0.8-1.0	GC/BG# 23 1.3-1.5	----
			Client sampling date / time	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	05-NOV-2008 15:00	----
Compound	CAS Number	LOR	Unit	EB0815732-051	EB0815732-052	EB0815732-053	EB0815732-054	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	----
Net Acidity (sulfur units)	----	0.02	% S	**1.06**	**6.88**	**1.74**	**3.07**	----
Net Acidity (acidity units)	----	10	mole H+ / t	**664**	**4290**	**1080**	**1920**	----
Liming Rate	----	1	kg CaCO3/t	**50**	**322**	**81**	**144**	----

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EB0815825**	Page	: 1 of 20
Client	: **ENVIRO RESOURCES MANAGEMENT**	Laboratory	: Environmental Division Brisbane
Contact	: MR GRAHAM OHMSEN	Contact	: Tim Kilmister
Address	: PO BOX 1400 SPRING HILL QLD, AUSTRALIA 4004	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: graham.ohmsen@erm.com	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3839 8393	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3839 8381	Facsimile	: +61-7-3243 7218
Project	: 86165-11	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 13-NOV-2008
Sampler	: Geocoastal	Issue Date	: 26-NOV-2008
Site	: Gladstone		
		No. of samples received	: 50
Quote number	: EN/009/08	No. of samples analysed	: 50

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

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This document is issued in accordance with NATA accreditation requirements.

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

This document has been electronically signed by the authorized signatories indicated below.

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

General Comments

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

Where moisture determination has been performed, 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 ($CaCO_3$) 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			Client sample ID	GCBG# 52 0-0.1	GCBG# 52 0.3-0.5	GCBG# 52 0.8-1.0	GCBG# 52 1.3-1.5	GCBG# 52 1.8-2.0
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-001	EB0815825-002	EB0815825-003	EB0815825-004	EB0815825-005
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.06	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	5.5	4.5	4.8	5.6	8.4
pH OX (23B)	----	0.1	pH Unit	3.0	2.2	2.1	2.1	3.2
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	2	20	9	5	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	87	740	1180	943	170
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	85	720	1170	938	170
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	0.03	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.14	1.19	1.90	1.51	0.27
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.14	1.15	1.88	1.50	0.27
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.18	0.31	0.48	0.54	0.42
Peroxide Sulfur (23De)	----	0.02	% S	0.31	1.95	3.08	2.47	2.29
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.14	1.64	2.59	1.93	1.87
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	85	1020	1620	1200	1170
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.04	0.06	0.12	0.14	0.45
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.04	0.06	0.11	0.11	1.67
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	1.22
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	608
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	0.97
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.42	0.52	0.78	0.86	0.48
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.36	0.52	0.81	0.75	0.54
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.02	<0.02	0.06
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	21	<10	46
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.03	<0.02	0.07
EA029-H: 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	0.14	1.68	2.60	1.94	0.81
Net Acidity (acidity units)	----	10	mole H+ / t	87	1040	1620	1210	503
Liming Rate	----	1	kg CaCO3/t	6	78	122	91	38

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 52 2.3-2.5	GCBG# 52 2.8-3.0	GCBG# 47 0-0.1	GCBG# 47 0.3-0.5	GCBG# 47 0.8-1.0
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-006	EB0815825-007	EB0815825-008	EB0815825-009	EB0815825-010
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.4	8.2	8.3	5.6	4.3
pH OX (23B)	----	0.1	pH Unit	3.0	2.4	6.4	2.2	1.8
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	4	34
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	128	437	<2	869	3090
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	128	437	<2	865	3060
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	0.05
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.21	0.70	<0.02	1.39	4.95
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.21	0.70	<0.02	1.39	4.90
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.40	0.40	0.08	0.27	0.42
Peroxide Sulfur (23De)	----	0.02	% S	2.34	1.84	0.32	2.41	3.23
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.94	1.44	0.24	2.14	2.81
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1210	896	147	1330	1750
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.44	0.37	0.08	0.14	0.16
Peroxide Calcium (23Wh)	----	0.02	% Ca	1.68	0.62	0.09	0.14	0.07
Acid Reacted Calcium (23X)	----	0.02	% Ca	1.24	0.25	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	617	126	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.99	0.20	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.49	0.54	0.22	0.49	0.56
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.54	0.54	0.32	0.49	0.26
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.04	<0.02	0.11	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	35	<10	88	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.06	<0.02	0.14	<0.02	<0.02
EA029-G: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	----	----	0.08
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	----	----	38
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	----	----	0.06
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	----	0.50
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 52 2.3-2.5	GCBG# 52 2.8-3.0	GCBG# 47 0-0.1	GCBG# 47 0.3-0.5	GCBG# 47 0.8-1.0
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-006	EB0815825-007	EB0815825-008	EB0815825-009	EB0815825-010
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	**0.78**	**0.94**	**0.08**	**2.14**	**2.93**
Net Acidity (acidity units)	----	10	mole H+ / t	**489**	**590**	**49**	**1340**	**1820**
Liming Rate	----	1	kg CaCO3/t	**37**	**44**	**4**	**100**	**137**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 47 1.15-1.3	GCBG# 44 0-0.1	GCBG# 44 0.3-0.5	GCBG# 44 0.8-1.0	GCBG# 44 1.3-1.5
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-011	EB0815825-012	EB0815825-013	EB0815825-014	EB0815825-015
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.44	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.3	8.0	4.3	3.9	4.9
pH OX (23B)	----	0.1	pH Unit	2.5	7.0	1.6	1.7	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	50	70	10
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	270	<2	5600	4160	1800
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	270	<2	5550	4090	1790
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.08	0.11	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.43	<0.02	8.98	6.68	2.88
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.43	<0.02	8.90	6.56	2.87
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.11	0.06	0.55	0.53	0.36
Peroxide Sulfur (23De)	----	0.02	% S	0.81	0.13	5.34	5.16	2.23
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.70	0.07	4.79	4.63	1.87
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	434	43	2990	2890	1170
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.05	0.04	0.17	0.14	0.12
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.04	0.04	0.06	0.07	0.05
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.19	0.17	0.76	0.62	0.51
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.19	0.22	0.34	0.32	0.24
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.05	<0.02	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	41	<10	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.07	<0.02	<0.02	<0.02
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	0.13	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	26	----	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 47 1.15-1.3	GCBG# 44 0-0.1	GCBG# 44 0.3-0.5	GCBG# 44 0.8-1.0	GCBG# 44 1.3-1.5
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-011	EB0815825-012	EB0815825-013	EB0815825-014	EB0815825-015
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	0.04	----	----	----
EA029-G: 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	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	0.56	0.55	----
EA029-H: 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	<0.02	4.88	4.76	1.89
Net Acidity (acidity units)	----	10	mole H+ / t	434	<10	3050	2970	1180
Liming Rate	----	1	kg CaCO3/t	32	<1	228	223	88

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 44 1.8-2.0	GCBG# 44 2.3-2.5	GCBG# 29 0-0.1	GCBG# 29 0.3-0.5	GCBG# 29 0.8-1.0
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-016	EB0815825-017	EB0815825-018	EB0815825-019	EB0815825-020
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	5.3	6.6	7.6	4.6	4.4
pH OX (23B)	----	0.1	pH Unit	2.1	2.4	4.0	2.1	1.9
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	4	<2	<2	20	27
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	874	123	64	1030	1810
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	870	123	64	1010	1780
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	0.03	0.04
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.40	0.20	0.10	1.65	2.90
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.39	0.20	0.10	1.62	2.86
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.19	0.03	0.10	0.26	0.30
Peroxide Sulfur (23De)	----	0.02	% S	0.90	0.32	0.57	2.57	1.99
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.72	0.29	0.46	2.31	1.70
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	446	181	289	1440	1060
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.08	<0.02	0.07	0.11	0.11
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.03	<0.02	0.08	0.09	0.04
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.31	0.07	0.27	0.40	0.40
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.12	0.06	0.42	0.36	0.18
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.14	<0.02	<0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	118	<10	<10
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.19	<0.02	<0.02
EA029-G: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	----	----	0.05
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	----	----	24
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	----	----	0.04
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	----	0.35
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 44 1.8-2.0	GCBG# 44 2.3-2.5	GCBG# 29 0-0.1	GCBG# 29 0.3-0.5	GCBG# 29 0.8-1.0
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-016	EB0815825-017	EB0815825-018	EB0815825-019	EB0815825-020
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	**0.72**	**0.23**	**0.22**	**2.34**	**1.78**
Net Acidity (acidity units)	----	10	mole H+ / t	**450**	**142**	**139**	**1460**	**1110**
Liming Rate	----	1	kg CaCO3/t	**34**	**11**	**10**	**110**	**83**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 29 1.3-1.5	GCBG# 29 1.8-2.0	GCBG# 29 2.3-2.5	GCBG# 27 0-0.1	GCBG# 27 0.3-0.5
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-021	EB0815825-022	EB0815825-023	EB0815825-024	EB0815825-025
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.55	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.6	8.5	8.2	7.3	4.2
pH OX (23B)	----	0.1	pH Unit	7.6	6.3	2.5	6.6	1.8
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	45
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	447	<2	1770
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	447	<2	1730
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	0.07
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.72	<0.02	2.84
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.72	<0.02	2.77
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.15	0.24	0.33	0.10	0.40
Peroxide Sulfur (23De)	----	0.02	% S	1.12	1.41	2.10	0.22	4.40
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.97	1.16	1.77	0.12	4.00
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	605	726	1100	72	2490
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.33	0.42	0.43	0.12	0.13
Peroxide Calcium (23Wh)	----	0.02	% Ca	1.36	1.15	0.60	0.13	0.15
Acid Reacted Calcium (23X)	----	0.02	% Ca	1.03	0.73	0.18	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	514	364	88	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.82	0.58	0.14	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.18	0.26	0.38	0.25	0.46
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.24	0.29	0.46	0.27	0.50
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.05	0.03	0.08	0.02	0.04
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	43	26	63	19	30
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.07	0.04	0.10	0.03	0.05
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.64	----	----	0.26	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	128	----	----	51	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 29 1.3-1.5	GCBG# 29 1.8-2.0	GCBG# 29 2.3-2.5	GCBG# 27 0-0.1	GCBG# 27 0.3-0.5
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-021	EB0815825-022	EB0815825-023	EB0815825-024	EB0815825-025
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.20	----	----	0.08	----
EA029-G: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	----	----	0.06
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	----	----	26
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	----	----	0.04
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	----	----	0.45
EA029-H: 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	0.19	0.39	1.07	<0.02	4.11
Net Acidity (acidity units)	----	10	mole H+ / t	116	242	666	<10	2560
Liming Rate	----	1	kg CaCO3/t	9	18	50	<1	192

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 27 0.8-1.0	GCBG# 27 1.3-1.5	GCBG# 27 1.7-1.8	GCBG# 50 0-0.1	GCBG# 50 0.3-0.5
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-026	EB0815825-027	EB0815825-028	EB0815825-029	EB0815825-030
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.4	4.6	5.3	8.9	7.7
pH OX (23B)	----	0.1	pH Unit	1.8	1.9	1.8	7.7	7.8
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	43	26	5	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	2550	1440	1520	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	2510	1410	1520	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.07	0.04	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	4.09	2.31	2.44	<0.02	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	4.02	2.26	2.43	<0.02	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.42	0.34	0.11	0.08	0.05
Peroxide Sulfur (23De)	----	0.02	% S	5.20	3.38	3.59	0.16	0.07
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	4.77	3.04	3.48	0.08	<0.02
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	2980	1890	2170	51	12
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.14	0.11	0.05	0.10	0.04
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.11	0.11	0.04	0.12	0.05
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	12	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.51	0.40	0.16	0.17	0.16
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.40	0.43	0.17	0.48	0.18
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.03	<0.02	0.31	0.03
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	24	<10	252	23
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.04	<0.02	0.40	0.04
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	0.51	0.38
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	102	77
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	0.16	0.12
EA029-G: Retained Acidity								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 27 0.8-1.0	GCBG# 27 1.3-1.5	GCBG# 27 1.7-1.8	GCBG# 50 0-0.1	GCBG# 50 0.3-0.5
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-026	EB0815825-027	EB0815825-028	EB0815825-029	EB0815825-030
EA029-G: Retained Acidity - Continued								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	0.07	----	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	32	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	0.05	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.49	----	----	----	----
EA029-H: 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	4.89	3.08	3.49	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	3050	1920	2180	<10	<10
Liming Rate	----	1	kg CaCO3/t	229	144	163	<1	<1

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 50 0.8-1.0	GCBG# 48 0-0.1	GCBG# 48 0.3-0.5	GCBG# 48 0.7-0.8	GCBG# 49 0-0.1
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-031	EB0815825-032	EB0815825-033	EB0815825-034	EB0815825-035
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	0.52	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	6.3	8.7	7.7	7.7	7.3
pH OX (23B)	----	0.1	pH Unit	2.4	7.3	7.3	3.5	6.3
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	321	<2	<2	49	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	321	<2	<2	49	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.52	<0.02	<0.02	0.08	<0.02
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.52	<0.02	<0.02	0.08	<0.02
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.05	0.10	0.08	0.07	0.11
Peroxide Sulfur (23De)	----	0.02	% S	0.68	0.16	0.11	0.27	0.16
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.64	0.06	0.02	0.19	0.05
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	397	37	16	121	33
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.03	0.05	0.04	0.03	0.04
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.04	0.06	0.04	0.03	0.05
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.10	0.27	0.26	0.19	0.25
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.10	0.44	0.28	0.22	0.32
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.17	0.02	0.04	0.07
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	141	20	31	60
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.23	0.03	0.05	0.10
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	0.38	0.33	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	77	66	----	----

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 50 0.8-1.0	GCBG# 48 0-0.1	GCBG# 48 0.3-0.5	GCBG# 48 0.7-0.8	GCBG# 49 0-0.1
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-031	EB0815825-032	EB0815825-033	EB0815825-034	EB0815825-035
EA029-F: Excess Acid Neutralising Capacity - Continued								
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	0.12	0.11	----	----
EA029-H: 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	0.64	<0.02	<0.02	0.12	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	397	<10	<10	73	11
Liming Rate	----	1	kg CaCO3/t	30	<1	<1	5	<1

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 49 0.2-0.4	GCBG# 53 0-0.1	GCBG# 53 0.3-0.5	GCBG# 53 0.8-1.0	GCBG# 53 1.3-1.5
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-036	EB0815825-037	EB0815825-038	EB0815825-039	EB0815825-040
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.3	8.2	7.1	6.6	6.7
pH OX (23B)	----	0.1	pH Unit	6.4	7.0	6.6	2.2	2.1
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	740	1120
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	740	1120
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	1.19	1.80
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	1.19	1.80
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.07	0.04	0.15	0.24	0.35
Peroxide Sulfur (23De)	----	0.02	% S	0.11	0.21	0.20	1.78	3.10
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.04	0.17	0.05	1.55	2.75
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	27	105	33	966	1720
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.06	<0.02	0.04	0.06	0.14
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.06	0.06	0.07	0.17
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.06	<0.02	<0.02	0.04
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	28	<10	<10	18
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.04	<0.02	<0.02	0.03
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.20	0.07	0.35	0.43	0.54
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.22	0.45	0.42	0.44	0.62
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.38	0.07	<0.02	0.08
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	16	315	57	<10	66
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.03	0.50	0.09	<0.02	0.11
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	0.26	0.06	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	51	13	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	0.08	0.02	----	----
EA029-H: Acid Base Accounting								

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 49 0.2-0.4	GCBG# 53 0-0.1	GCBG# 53 0.3-0.5	GCBG# 53 0.8-1.0	GCBG# 53 1.3-1.5
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-036	EB0815825-037	EB0815825-038	EB0815825-039	EB0815825-040
EA029-H: Acid Base Accounting - Continued								
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	**1.31**	**2.12**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	**815**	**1320**
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	**61**	**99**

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 53 1.8-2.0	GCBG# 53 2.3-2.5	GCBG# 53 2.8-3.0	GCBG# 51 0-0.1	GCBG# 51 0.3-0.5
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-041	EB0815825-042	EB0815825-043	EB0815825-044	EB0815825-045
EA026 : Chromium Reducible Sulphur								
Chromium Reducible Sulphur	----	0.02	%	1.12	----	----	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.9	7.9	6.0	7.2	4.6
pH OX (23B)	----	0.1	pH Unit	2.2	2.2	1.9	5.8	2.6
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	2	<2	10
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	552	848	1380	2	167
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	552	848	1380	2	157
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.88	1.36	2.21	<0.02	0.27
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.88	1.36	2.20	<0.02	0.25
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.37	0.44	0.40	0.12	0.18
Peroxide Sulfur (23De)	----	0.02	% S	2.07	3.12	3.60	0.18	0.46
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.71	2.67	3.19	0.06	0.28
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1060	1670	1990	40	177
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.35	0.39	0.12	0.03	0.04
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.56	0.60	0.15	0.04	0.05
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.20	0.21	0.03	<0.02	<0.02
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	101	106	17	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.16	0.17	0.03	<0.02	<0.02
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.35	0.54	0.68	0.25	0.33
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.40	0.66	0.81	0.29	0.36
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.05	0.13	0.13	0.04	0.02
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	42	105	105	31	21
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.07	0.17	0.17	0.05	0.03
EA029-H: 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	1.16	1.80	3.20	0.02	0.30
Net Acidity (acidity units)	----	10	mole H+ / t	724	1120	1990	15	187
Liming Rate	----	1	kg CaCO3/t	54	84	150	1	14

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 51 0.8-1.0	GCBG# 51 1.3-1.5	GCBG# 51 1.8-2.0	GCBG# 51 2.3-2.5	GCBG# 51 2.8-3.0
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-046	EB0815825-047	EB0815825-048	EB0815825-049	EB0815825-050
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.4	5.1	8.6	8.1	8.2
pH OX (23B)	----	0.1	pH Unit	2.1	1.9	3.2	2.4	2.5
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	28	12	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	815	1280	103	532	360
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	786	1270	103	532	360
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.04	<0.02	<0.02	<0.02	<0.02
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.31	2.06	0.16	0.85	0.58
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.26	2.04	0.16	0.85	0.58
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.36	0.44	0.40	0.48	0.31
Peroxide Sulfur (23De)	----	0.02	% S	2.37	4.17	2.32	2.44	1.59
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.01	3.72	1.93	1.96	1.29
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1250	2320	1200	1220	803
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.10	0.09	0.42	0.44	0.30
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.12	0.14	1.67	0.70	0.48
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.05	1.25	0.26	0.17
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	23	626	129	87
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.04	1.00	0.21	0.14
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.44	0.63	0.39	0.48	0.38
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.46	0.86	0.52	0.59	0.46
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.02	0.24	0.13	0.11	0.08
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	18	194	105	88	65
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.03	0.31	0.17	0.14	0.10
EA029-G: Retained Acidity								
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	0.04	----	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	21	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	0.03	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S	0.40	----	----	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5

Analytical Results

Sub-Matrix: SOIL			Client sample ID	GCBG# 51 0.8-1.0	GCBG# 51 1.3-1.5	GCBG# 51 1.8-2.0	GCBG# 51 2.3-2.5	GCBG# 51 2.8-3.0
			Client sampling date / time	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]	[13-NOV-2008]
Compound	CAS Number	LOR	Unit	EB0815825-046	EB0815825-047	EB0815825-048	EB0815825-049	EB0815825-050
EA029-H: Acid Base Accounting - Continued								
Net Acidity (sulfur units)	----	0.02	% S	**2.09**	**3.74**	**0.75**	**1.22**	**0.81**
Net Acidity (acidity units)	----	10	mole H+ / t	**1300**	**2330**	**469**	**763**	**508**
Liming Rate	----	1	kg CaCO3/t	**98**	**175**	**35**	**57**	**38**

APPENDIX 4

Laboratory QC reports and Chain of Custody documentation for Acid Sulfate Soil samples (ALS Environmental, Brisbane).

ERM

- ☐ Sydney: Grnd Floor, 33 Saunders Street, Pyrmont, NSW 2009. (ph) 02 8584 8888 (fax) 02 8584 8800
- ☐ Melbourne: Level 1, 151 Clarendon Street, South Melbourne VIC, 3205. (ph) 9696 8011 (fax) 03 9696 8022
- ☑ Brisbane: Level 1, 60 Leichhardt Street, Spring Hill, QLD, 4004. (ph) 07 3839 8393 (fax) 07 3839 8381
- ☐ Perth: Level 6, Grain Pool Bld,172 St Georges Tce, WA, 6850. (ph) 08 9321 5200 (fax) 08 9321 5262
- ☐ Hunter Valley: 21 Waterloo Ave, Thornton NSW, 2322. (ph) 02 4964 2150 (fax) 02 4964 2152
- ☐ North Coast: Suite 3, 146 Gordon Street, Port Maquarie, NSW, 2444. (ph) 02 6584 7155 (fax) 02 6584 7160
- ☐ Other:

Project No: 8616J/11
Project Name: BG INC
Project Location: Gladstone
Project Manager: G. Johnson
Sampler: Geocoastal

COC Number: 2646
Laboratory: ALS

General Analysis Requirements	Yes (tick)
1. Turn Around Time (please tick: ☐ 1 Day ☐ 2 Days ☐ 3 Days ☑ Normal TAT)	✓
2. Do you wish any sediment layers in water to be excluded from extractions ?	
3. Additional QA/QC reported where sample batches are < 10 samples ?	
4. % of extraneous material removed from samples to be reported as per NEPM 5.1.1?	

Laboratory Number	Sample ID	Sample Depth	Sample Date	Sample Time	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: acid	Preservation: filter	Preservation: Other	Containers (number/type)	BTEX	TPH (C6-C9 P & T) + TPH (C10-C36)	Speciated TPH	VOC Scan (USEPA 8260 List)	SVOC Scan (USEPA 8270 List)	OC OP Pesticides	PAH	Phenols	PCB	metals* (dissolved / total)	Other comments on sample (eg: high voc, highly contaminated, special detection limits etc etc)
1	GC/BG #1	0-0.1		29/10/08	✓																		SPOCAS
2		0.3-0.5		"																			
3		0.8-1.0		"																			
4		1.3-1.5		"																			
5		1.8-2.0		"																			
6		2.3-2.5		"																			
7		2.8-3.0		"																			
8	GC/BG #2	0-0.1		"																			
9		0.3-0.5		"																			
10		0.8-1.0		"																			
11		1.3-1.5		"																			
12		1.8-2.0		"																			
13		2.3-2.5		"																			
14		2.8-3.0		"																			
15	GC/BG #3	0-0.1		"																			
16		0.3-0.5		"																			
17		0.8-1.0		"																			

Environmental Division Brisbane
Work Order
EB0815181
Telephone : +61-7-3243 7222

Comments:

* Metals (circle) As Cd Cr Cu Hg Ni Pb Zn

Relinquished by: G. Johnson	Signed:	Date/Time: 3/11/8	Received by: TNT GLADSTONE	Date/Time:	
~~Relinquished~~ by: MIA VOOIN	Signed:	Date/Time: 4/11/08	Received by: ALS	Date/Time: 9:00	

ERM

- ☐ Sydney: Grnd Floor, 33 Saunders Street, Pyrmont, NSW 2009. (ph) 02 8584 8888 (fax) 02 8584 8800
- ☐ Melbourne: Level 1, 151 Clarendon Street, South Melbourne VIC, 3205. (ph) 9696 8011 (fax) 03 9696 8022
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- ☐ Perth: Level 6, Grain Pool Bld,172 St Georges Tce, WA, 6850. (ph) 08 9321 5200 (fax) 08 9321 5262
- ☐ Hunter Valley: 21 Waterloo Ave, Thornton NSW, 2322. (ph) 02 4964 2150 (fax) 02 4964 2152
- ☐ North Coast: Suite 3, 146 Gordon Street, Port Maquarie, NSW, 2444. (ph) 02 6584 7155 (fax) 02 6584 7160
- ☐ Other:

Project No:
Project Name:
Project Location:
Project Manager:
Sampler:

COC Number: 2647

Laboratory:

General Analysis Requirements	Yes (tick)
1. Turn Around Time (please tick: ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ Normal TAT)	
2. Do you wish any sediment layers in water to be excluded from extractions ?	
3. Additional QA/QC reported where sample batches are < 10 samples ?	
4. % of extraneous material removed from samples to be reported as per NEPM 5.1.1?	

Laboratory Number	Sample ID	Sample Depth	Sample Date	Sample Time	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: acid	Preservation: filter	Preservation: Other	Containers (number/type)	BTEX	TPH (C6-C9 P & T) + TPH (C10-C36)	Speciated TPH	VOC Scan (USEPA 8260 List)	SVOC Scan (USEPA 8270 List)	OC OP Pesticides	PAH	Phenols	PCB	metals* (dissolved / total)	Other comments on sample (eg: high voc, highly contaminated, special detection limits etc etc)
18	GC/BG #3	1.3-1.5	29/10/08																				
19		1.8-2.0	"																				
20		2.3-2.5	"																				
21		2.8-3.0	"																				
22	GC/BG #4	0-0.1	"																				
23		0.3-0.5	"																				
24		0.8-1.0	"																				
25		1.3-1.5	"																				
26		1.8-2.0	"																				
27		2.3-2.5	"																				
28		2.8-3.0	"																				
29	GC/BG #5	0-0.1	"																				
30		0.3-0.5	"																				
31		0.8-1.0	"																				
32		1.3-1.5	"																				
33		1.8-2.0	"																				
34		2.3-2.5	"																				

Comments:

* Metals (circle) *As Cd Cr Cu Hg Ni Pb Zn*

Relinquished by: Signed: Date/Time: Received by: MIA YOOIU ALS Date/Time: 4.NOV.08 9:00

Relinquished by: Signed: Date/Time: Received by: Date/Time:

ERM

- ☐ Sydney: Grnd Floor, 33 Saunders Street, Pyrmont, NSW 2009. (ph) 02 8584 8888 (fax) 02 8584 8800
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- ☐ Brisbane: Level 1, 60 Leichhardt Street, Spring Hil, QLD, 4004. (ph) 07 3839 8393 (fax) 07 3839 8381
- ☐ Perth: Level 6, Grain Pool Bld,172 St Georges Tce, WA, 6850. (ph) 08 9321 5200 (fax) 08 9321 5262
- ☐ Hunter Valley: 21 Waterloo Ave, Thornton NSW, 2322. (ph) 02 4964 2150 (fax) 02 4964 2152
- ☐ North Coast: Suite 3, 146 Gordon Street, Port Maquarie, NSW, 2444. (ph) 02 6584 7155 (fax) 02 6584 7160
- ☐ Other:

Project No:
Project Name:
Project Location:
Project Manager:
Sampler:

COC Number: 2648

Laboratory:

General Analysis Requirements	Yes (tick)
1. Turn Around Time (please tick: ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ Normal TAT)	
2. Do you wish any sediment layers in water to be excluded from extractions ?	
3. Additional QA/QC reported where sample batches are < 10 samples ?	
4. % of extraneous material removed from samples to be reported as per NEPM 5.1.1?	

Laboratory Number	Sample ID	Sample Depth	Sample Date	Sample Time	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: acid	Preservation: filter	Preservation: Other	Containers (number/type)	BTEX	TPH (C6-C9 P & T) + TPH (C10-C36)	Speciated TPH	VOC Scan (USEPA 8260 List)	SVOC Scan (USEPA 8270 List)	OC OP Pesticides	PAH	Phenols	PCB	metals* (dissolved / total)											Other comments on sample (eg: high voc, highly contaminated, special detection limits etc etc)
35	GC/BG #5	2.8-3.0	29/10/08																														
36	GC/BG #6	0-0.1	"																														
37		0.3-0.5	"																														
38		0.8-1.0	"																														
39		1.3-1.5	"																														
40		1.8-2.0	"																														
41		2.3-2.5	"																														
42		2.8-3.0	"																														
43	GC/BG #7	0-0.1	"																														
44		0.3-0.5	"																														
45		0.8-1.0	"																														
46		1.3-1.5	"																														
47		1.8-2.0	"																														
48		2.3-2.5	"																														
49		2.8-3.0	"																														
50	GC/BG #8	0-0.1	31/10/08																														
51		0.3-0.5	"																														

Comments:

* Metals (circle)
As Cd Cr Cu Hg Ni Pb Zn

Relinquished by: Signed: Date/Time: Received by: MIA. Y ACS Date/Time: 4. Nov. 08 9:00

Relinquished by: Signed: Date/Time: Received by: Date/Time:

ERM

- ☐ Sydney: Grnd Floor, 33 Saunders Street, Pyrmont, NSW 2009. (ph) 02 8584 8888 (fax) 02 8584 8800
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- ☐ Hunter Valley: 21 Waterloo Ave, Thornton NSW, 2322. (ph) 02 4964 2150 (fax) 02 4964 2152
- ☐ North Coast: Suite 3, 146 Gordon Street, Port Maquarie, NSW, 2444. (ph) 02 6584 7155 (fax) 02 6584 7160
- ☐ Other:

Project No:
Project Name:
Project Location:
Project Manager:
Sampler:

COC Number: 2649

Laboratory:

General Analysis Requirements	Yes (tick)
1. Turn Around Time (please tick: ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ Normal TAT)	
2. Do you wish any sediment layers in water to be excluded from extractions ?	
3. Additional QA/QC reported where sample batches are < 10 samples ?	
4. % of extraneous material removed from samples to be reported as per NEPM 5.1.1?	

Laboratory Number	Sample ID	Sample Depth	Sample Date	Sample Time	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: acid	Preservation: filter	Preservation: Other	Containers (number/type)	BTEX	TPH (C6-C9 P & T) + TPH (C10-C36)	Speciated TPH	VOC Scan (USEPA 8260 List)	SVOC Scan (USEPA 8270 List)	OC OP Pesticides	PAH	Phenols	PCB	metals* (dissolved / total)	Other comments on sample (eg: high voc, highly contaminated, special detection limits etc etc)
52	GC/BG #8	0.8-1.0	31/10/08																				
53		1.3-1.5	"																				
54		1.8-2.0	"																				
55		2.3-2.5	"																				
56		2.8-3.0	"																				
57	GC/BG #9	0-0.1	"																				
58		0.3-0.5	"																				
59		0.8-1.0	"																				
60		1.3-1.5	"																				
61		1.8-2.0	"																				
62		2.3-2.5	"																				
63		2.8-3.0	"																				
64	GC/BG #10	0-0.1	"																				
65		0.3-0.5	"																				
66		0.5-1.0	"																				
67		1.3-1.5	"																				
68		1.8-2.0	"																				

Comments:

* Metals (circle) As Cd Cr Cu Hg Ni Pb Zn

Relinquished by:	Signed:	Date/Time:	Received by: MIA .V ALS	Date/Time: 4.11.08 9:00	
Relinquished by:	Signed:	Date/Time:	Received by:	Date/Time:	

ERM

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- ☐ Brisbane: Level 1, 60 Leichhardt Street, Spring Hil, QLD, 4004. (ph) 07 3839 8393 (fax) 07 3839 8381
- ☐ Perth: Level 6, Grain Pool Bld,172 St Georges Tce, WA, 6850. (ph) 08 9321 5200 (fax) 08 9321 5262
- ☐ Hunter Valley: 21 Waterloo Ave, Thornton NSW, 2322. (ph) 02 4964 2150 (fax) 02 4964 2152
- ☐ North Coast: Suite 3, 146 Gordon Street, Port Maquarie, NSW, 2444. (ph) 02 6584 7155 (fax) 02 6584 7160
- ☐ Other:

Project No:
Project Name:
Project Location:
Project Manager:
Sampler:

COC Number: 2650

Laboratory:

General Analysis Requirements	Yes (tick)
1. Turn Around Time (please tick: ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ Normal TAT)	
2. Do you wish any sediment layers in water to be excluded from extractions ?	
3. Additional QA/QC reported where sample batches are < 10 samples ?	
4. % of extraneous material removed from samples to be reported as per NEPM 5.1.1?	

Laboratory Number	Sample ID	Sample Depth	Sample Date	Sample Time	Matrix: Soil	Matrix: Water	Matrix: Other	Preservation: Ice	Preservation: acid	Preservation: filter	Preservation: Other	Containers (number/type)	BTEX	TPH (C6-C9 P & T) + TPH (C10-C36)	Speciated TPH	VOC Scan (USEPA 8260 List)	SVOC Scan (USEPA 8270 List)	OC OP Pesticides	PAH	Phenols	PCB	metals* (dissolved / total)	Other comments on sample (eg: high voc, highly contaminated, special detection limits etc etc)
69	GC/BG#10	2.3-2.5	31/10/08																				
70		2.8-3.0	"																				
71	GC/BG #11	0-0.1	"																				
72		0.3-0.5	"																				
73		0.8-1.0	"																				
74		1.3-1.5	"																				
75		1.8-2.0	"																				
76		2.3-2.5	"																				
77		2.8-3.0	"																				
78	GC/BG #12	0-0.1	"																				
79		0.3-0.5	"																				
80		0.8-1.0	"																				
81		1.3-1.5	"																				
82		1.8-2.0	"																				
83		2.3-2.5	"																				
84		2.8-3.0	"																				
85	GC/BG #13	0-0.1	"																				

Comments:

* Metals (circle) *As Cd Cr Cu Hg Ni Pb Zn*

Relinquished by: Signed: Date/Time: Received by: MIA Y Date/Time: 4.11.08 9:00

Relinquished by: Signed: Date/Time: Received by: Date/Time:

CHAIN OF CUSTODY DOCUMENTATION

ALS
Australian Laboratory Services Pty Ltd

CLIENT:	SAMPLER:
ADDRESS / OFFICE:	MOBILE:
PROJECT MANAGER (PM):	PHONE
PROJECT ID:	EMAIL REPORT TO:
SITE: P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (**Date**): QUOTE NO.:	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION	
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles
86	GC/BG #13		31/10/08		0.3-0.5	
87			"		0.8-1.0	
88			"		1.3-1.5	
89			"		1.8-2.0	
90			"		2.3-2.5	
91			"		2.8-3.0	
92	GC/BG #14		"		0-0.1	
93			"		0.3-0.5	
94			"		0.8-1.0	
95			"		1.3-1.5	
96			"		1.8-2.0	
97			"		2.3-2.5	

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: MIA Y	Date: 4.11.08	Con' Note No:
Of:	Time:	Of: ALS	Time: 9:00	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT:	SAMPLER:
ADDRESS / OFFICE:	MOBILE:
PROJECT MANAGER (PM):	PHONE
PROJECT ID:	EMAIL REPORT TO:
SITE: P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	**ANALYSIS REQUIRED including SUITES** (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water) / CONTAINER INFORMATION

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles
98	GC/BG # 14		31/10/08		2.8-3.0	
99	GC/BG # 15		"		0.-0.1	
100			"		0.3-0.5	
101			"		0.8-1.0	
102			"		1.3-1.5	
103			"		1.8-2.0	
104			"		2.3-2.5	
105			"		2.8-3.0	

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: NIA Yoon	Date: 4.11.08	Con' Note No:
Of:	Time:	Of: ALS	Time: 9:00	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0815181**	Page	: 1 of 17
Client	: **GEOCOASTAL (AUSTRALIA) PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR GRAHAM OHMSEN	Contact	: Tim Kilmister
Address	: P O BOX 4051 GUMDALE QLD, AUSTRALIA 4154	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: graham.ohmsen@erm.com	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 38907392	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 38907599	Facsimile	: +61-7-3243 7218
Project	: 86165/11 BGLNG	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Gladstone		
C-O-C number	: 2646-2650	Date Samples Received	: 04-NOV-2008
Sampler	: Geocoastal	Issue Date	: 13-NOV-2008
Order number	: ----		
		No. of samples received	: 105
Quote number	: BN/561/08	No. of samples analysed	: 105

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
WORLD RECOGNISED ACCREDITATION

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 performed, 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 (%)*
EA026 : Chromium Reducible Sulphur (QC Lot: 805336)									
EB0815181-010	GC/BG #2 0.8-1.0	EA026: Chromium Reducible Sulphur	----	0.02	%	0.89	0.97	9.4	0% - 20%
EA029-A: pH Measurements (QC Lot: 805335)									
EB0815181-001	GC/BG #1 0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	8.6	8.6	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	7.6	7.5	1.3	0% - 20%
EB0815181-011	GC/BG #2 1.3-1.5	EA029: pH KCl (23A)	----	0.1	pH Unit	8.2	8.2	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.7	2.8	3.6	0% - 20%
EA029-A: pH Measurements (QC Lot: 805337)									
EB0815181-021	GC/BG #3 2.8-3.0	EA029: pH KCl (23A)	----	0.1	pH Unit	8.4	8.4	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.4	2.4	0.0	0% - 20%
EB0815181-031	GC/BG #5 0.8-1.0	EA029: pH KCl (23A)	----	0.1	pH Unit	4.2	4.2	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	1.8	1.8	0.0	0% - 50%
EA029-A: pH Measurements (QC Lot: 805338)									
EB0815181-041	GC/BG #6 2.3-2.5	EA029: pH KCl (23A)	----	0.1	pH Unit	8.0	8.0	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.2	2.1	4.6	0% - 20%
EB0815181-051	GC/BG #8 0.3-0.5	EA029: pH KCl (23A)	----	0.1	pH Unit	6.3	6.3	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	5.8	5.7	1.7	0% - 20%
EA029-A: pH Measurements (QC Lot: 805339)									
EB0815181-061	GC/BG #9 1.8-2.0	EA029: pH KCl (23A)	----	0.1	pH Unit	4.9	4.9	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	1.9	1.9	0.0	0% - 50%
EB0815181-071	GC/BG #11 0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	7.7	7.7	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	7.0	7.0	0.0	0% - 20%
EA029-A: pH Measurements (QC Lot: 805340)									
EB0815181-081	GC/BG #12 1.3-1.5	EA029: pH KCl (23A)	----	0.1	pH Unit	5.0	5.2	2.7	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.2	2.2	0.0	0% - 20%
EB0815181-091	GC/BG #13 2.8-3.0	EA029: pH KCl (23A)	----	0.1	pH Unit	8.4	8.4	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.1	2.1	0.0	0% - 20%
EA029-A: pH Measurements (QC Lot: 805341)									
EB0815181-101	GC/BG #15 0.8-1.0	EA029: pH KCl (23A)	----	0.1	pH Unit	6.2	6.2	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.1	2.1	0.0	0% - 20%
EA029-B: Acidity Trail (QC Lot: 805335)									
EB0815181-001	GC/BG #1 0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	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	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EA029-B: Acidity Trail (QC Lot: 805335) - continued									
EB0815181-001	GC/BG #1 0-0.1	EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EB0815181-011	GC/BG #2 1.3-1.5	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.56	0.57	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.56	0.57	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	352	354	0.7	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	352	354	0.7	0% - 20%
EA029-B: Acidity Trail (QC Lot: 805337)									
EB0815181-021	GC/BG #3 2.8-3.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.50	0.51	2.4	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.50	0.51	2.4	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	312	320	2.4	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	312	320	2.4	0% - 20%
EB0815181-031	GC/BG #5 0.8-1.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.07	0.07	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.52	1.55	1.6	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.46	1.48	1.6	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	42	42	0.0	0% - 20%
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	950	965	1.6	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	908	923	1.6	0% - 20%
EA029-B: Acidity Trail (QC Lot: 805338)									
EB0815181-041	GC/BG #6 2.3-2.5	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.95	0.94	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.95	0.94	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	592	588	0.8	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	592	588	0.8	0% - 20%
EB0815181-051	GC/BG #8 0.3-0.5	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	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 (%)
EA029-B: Acidity Trail (QC Lot: 805338) - continued									
EB0815181-051	GC/BG #8 0.3-0.5	EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-B: Acidity Trail (QC Lot: 805339)									
EB0815181-061	GC/BG #9 1.8-2.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.02	0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.64	1.60	2.5	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.62	1.58	2.5	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	15	15	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	1020	1000	2.5	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	1010	985	2.5	0% - 20%
EB0815181-071	GC/BG #11 0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-B: Acidity Trail (QC Lot: 805340)									
EB0815181-081	GC/BG #12 1.3-1.5	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.38	0.38	0.0	0% - 50%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.37	0.37	0.0	0% - 50%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	6	6	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	240	238	1.0	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	234	232	0.8	0% - 20%
EB0815181-091	GC/BG #13 2.8-3.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.55	0.54	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.55	0.54	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	342	338	1.5	0% - 20%

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 (%)
EA029-B: Acidity Trail (QC Lot: 805340) - continued									
EB0815181-091	GC/BG #13 2.8-3.0	EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	342	338	1.5	0% - 20%
EA029-B: Acidity Trail (QC Lot: 805341)									
EB0815181-101	GC/BG #15 0.8-1.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.60	0.61	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.60	0.61	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	378	383	1.4	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	378	383	1.4	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 805335)									
EB0815181-001	GC/BG #1 0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.14	0.15	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.20	0.20	0.0	0% - 50%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.06	0.05	0.0	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	36	31	14.5	No Limit
EB0815181-011	GC/BG #2 1.3-1.5	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.56	0.49	11.7	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	2.65	2.62	1.1	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.10	2.13	1.6	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1310	1330	1.6	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 805337)									
EB0815181-021	GC/BG #3 2.8-3.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.45	0.44	2.6	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	2.07	2.02	2.1	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.61	1.58	2.0	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1000	986	2.0	0% - 20%
EB0815181-031	GC/BG #5 0.8-1.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.62	0.64	3.1	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	2.95	2.92	1.1	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.33	2.28	2.2	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1460	1420	2.2	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 805338)									
EB0815181-041	GC/BG #6 2.3-2.5	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.52	0.60	14.2	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	2.43	2.53	4.2	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.91	1.94	1.3	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1190	1210	1.3	0% - 20%
EB0815181-051	GC/BG #8 0.3-0.5	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.35	0.35	0.0	0% - 50%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.41	0.43	4.0	0% - 20%

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EA029-C: Sulfur Trail (QC Lot: 805338) - continued									
EB0815181-051	GC/BG #8 0.3-0.5	EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.06	0.08	27.5	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	36	48	27.5	No Limit
EA029-C: Sulfur Trail (QC Lot: 805339)									
EB0815181-061	GC/BG #9 1.8-2.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.41	0.39	6.2	0% - 50%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	2.78	2.61	6.2	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.37	2.22	6.2	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1480	1390	6.2	0% - 20%
EB0815181-071	GC/BG #11 0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.06	0.06	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.32	0.28	13.3	0% - 50%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.26	0.22	16.6	0% - 50%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	163	138	16.6	0% - 50%
EA029-C: Sulfur Trail (QC Lot: 805340)									
EB0815181-081	GC/BG #12 1.3-1.5	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.27	0.28	6.9	0% - 50%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.85	0.88	2.6	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.59	0.59	0.0	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	367	369	0.7	0% - 20%
EB0815181-091	GC/BG #13 2.8-3.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.49	0.54	9.9	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	3.16	3.06	3.0	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	2.67	2.52	5.5	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1660	1570	5.5	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 805341)									
EB0815181-101	GC/BG #15 0.8-1.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.37	0.39	5.4	0% - 50%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	1.38	1.42	2.8	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.01	1.03	1.9	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	629	641	1.9	0% - 20%
EA029-D: Calcium Values (QC Lot: 805335)									
EB0815181-001	GC/BG #1 0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.05	0.05	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.06	0.05	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815181-011	GC/BG #2 1.3-1.5	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.51	0.45	13.6	0% - 20%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	1.59	1.68	5.7	0% - 20%

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 (%)
EA029-D: Calcium Values (QC Lot: 805335) - continued									
EB0815181-011	GC/BG #2 1.3-1.5	EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	1.08	1.24	13.8	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.86	0.99	13.8	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	537	617	13.8	0% - 20%
EA029-D: Calcium Values (QC Lot: 805337)									
EB0815181-021	GC/BG #3 2.8-3.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.32	0.32	0.0	0% - 50%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.78	0.79	0.0	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.46	0.46	0.0	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.37	0.37	0.0	0% - 50%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	229	232	1.2	0% - 20%
EB0815181-031	GC/BG #5 0.8-1.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.09	0.09	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.09	0.09	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 805338)									
EB0815181-041	GC/BG #6 2.3-2.5	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.26	0.28	8.6	0% - 50%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.44	0.44	0.0	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.18	0.16	10.8	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.14	0.13	10.8	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	88	79	10.8	No Limit
EB0815181-051	GC/BG #8 0.3-0.5	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.06	0.05	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.08	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.02	0.03	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	11	13	19.4	No Limit
EA029-D: Calcium Values (QC Lot: 805339)									
EB0815181-061	GC/BG #9 1.8-2.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.17	0.16	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.19	0.18	7.4	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815181-071	GC/BG #11 0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.22	0.21	0.0	0% - 50%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.09	0.07	22.8	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 805340)									
EB0815181-081	GC/BG #12 1.3-1.5	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.06	0.06	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.08	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 (%)
EA029-D: Calcium Values (QC Lot: 805340) - continued									
EB0815181-081	GC/BG #12 1.3-1.5	EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815181-091	GC/BG #13 2.8-3.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.45	0.49	8.2	0% - 20%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	1.92	1.82	5.6	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	1.47	1.33	10.2	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	1.18	1.06	10.2	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	734	662	10.2	0% - 20%
EA029-D: Calcium Values (QC Lot: 805341)									
EB0815181-101	GC/BG #15 0.8-1.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.11	0.12	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.15	0.15	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.04	0.03	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.03	0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	19	15	23.9	No Limit
EA029-E: Magnesium Values (QC Lot: 805335)									
EB0815181-001	GC/BG #1 0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.25	0.25	0.0	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.48	0.41	17.2	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.23	0.15	38.9	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.30	0.20	38.9	0% - 50%
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	189	127	38.9	0% - 50%
EB0815181-011	GC/BG #2 1.3-1.5	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.54	0.48	12.4	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.55	0.55	0.0	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	0.08	116	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	0.10	133	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	62	145	No Limit
EA029-E: Magnesium Values (QC Lot: 805337)									
EB0815181-021	GC/BG #3 2.8-3.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.43	0.42	2.6	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.48	0.47	4.0	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.05	0.04	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.07	0.06	16.8	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	44	37	16.8	No Limit
EB0815181-031	GC/BG #5 0.8-1.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.58	0.60	3.5	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.56	0.55	0.0	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<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 (%)
EA029-E: Magnesium Values (QC Lot: 805337) - continued									
EB0815181-031	GC/BG #5 0.8-1.0	EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 805338)									
EB0815181-041	GC/BG #6 2.3-2.5	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.50	0.57	12.7	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.61	0.63	3.4	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.11	0.06	55.2	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.14	0.08	55.2	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	89	51	55.2	No Limit
EB0815181-051	GC/BG #8 0.3-0.5	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.62	0.62	0.0	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.58	0.61	4.5	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 805339)									
EB0815181-061	GC/BG #9 1.8-2.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.38	0.37	3.5	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.41	0.38	6.4	0% - 50%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	0.02	57.3	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	22	12	57.3	No Limit
EB0815181-071	GC/BG #11 0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.43	0.42	0.0	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.52	0.46	11.5	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.09	0.04	71.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.12	0.06	71.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	75	36	71.0	No Limit
EA029-E: Magnesium Values (QC Lot: 805340)									
EB0815181-081	GC/BG #12 1.3-1.5	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.30	0.32	7.4	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.29	0.30	0.0	0% - 50%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% 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 (%)
EA029-E: Magnesium Values (QC Lot: 805340) - continued									
EB0815181-081	GC/BG #12 1.3-1.5	EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815181-091	GC/BG #13 2.8-3.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.43	0.47	7.3	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.55	0.52	4.8	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.12	0.06	66.6	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.15	0.08	66.6	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	96	48	66.6	No Limit
EA029-E: Magnesium Values (QC Lot: 805341)									
EB0815181-101	GC/BG #15 0.8-1.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.51	0.54	6.9	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.57	0.58	2.4	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.06	0.04	42.2	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.08	0.05	42.2	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	52	34	42.2	No Limit
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 805339)									
EB0815181-071	GC/BG #11 0-0.1	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.25	0.25	0.0	0% - 50%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.08	0.08	0.0	No Limit
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	50	50	0.0	No Limit
EA029-G: Retained Acidity (QC Lot: 805337)									
EB0815181-031	GC/BG #5 0.8-1.0	EA029: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.60	0.58	3.9	0% - 20%
		EA029: 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
EA026 : Chromium Reducible Sulphur (QCLot: 805336)								
EA026: Chromium Reducible Sulphur	----	0.02	%	<0.02	.23 %	100	79.6	126
EA029-B: Acidity Trail (QCLot: 805335)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 805337)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 805338)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 805339)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 805340)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----

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
EA029-B: Acidity Trail (QCLot: 805340) - continued								
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 805341)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 805335)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 805337)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 805338)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 805339)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 805340)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 805341)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----

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
EA029-C: Sulfur Trail (QCLot: 805341) - continued								
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 805335)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 805337)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 805338)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 805339)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 805340)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 805341)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 805335)								

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
EA029-E: Magnesium Values (QCLot: 805335) - continued								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 805337)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 805338)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 805339)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 805340)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 805341)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity (QCLot: 805335)								
EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	<0.02	----	----	----	----
EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	<10	----	----	----	----

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
EA029-F: Excess Acid Neutralising Capacity (QCLot: 805335) - continued								
EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	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.**

(2)

CHAIN OF CUSTODY DOCUMENTATION

ALS
Australian Laboratory Services Pty Ltd

CLIENT: ERM
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill
PROJECT MANAGER (PM): Graham Ohmsen
PROJECT ID: 86165/11
SITE: Gladstone P.O. NO.:
RESULTS REQUIRED (Date): QUOTE NO.:

SAMPLER: Geocoastal
MOBILE: 0411 484 167
PHONE (07) 3839 8393
EMAIL REPORT TO: graham.ohmsen@erm.com / rlarsen@geocoastal.com.au
EMAIL INVOICE TO: (if different to report)

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water) / CONTAINER INFORMATION

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	SPOCAS	CRS	[redacted]	[redacted]	Iron
1	GC/BG# 19	S	1-11-08		0-0.1		✓	✓	✓	✓	✓
2					0.3-0.5						
3					0.8-1.0						
4					1.3-1.5						
5					1.8-2.0						
6					2.3-2.5						
7					2.8-3.0						
8	GC/BG# 18		1-11-08		0-0.1						
9					0.3-0.5						
10					0.8-1.0						
11					1.3-1.5						
12					1.8-2.0						

Environmental Division
Brisbane
Work Order
EB0815726
Telephone : +61-7-3243 7222

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: D. Kandy	Date: 2/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 8:15	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmsen	PHONE (07) 3839 8393
PROJECT ID: 86165/11	EMAIL REPORT TO: graham.ohmsen@erm.com / rlursen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water) / CONTAINER INFORMATION

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	SPOCAS	CRS 1 in 10 ~~Chromic Suite~~	[redacted]	[redacted]	Iron								
13	GC/BG# 18	S	1-11-08		2.3 - 2.5		✓	✓	[redacted]	[redacted]	✓								
14					2.8 - 3.0				[redacted]	[redacted]									
15	GC/BG# 16		1-11-08		0 - 0.1				[redacted]	[redacted]									
16					0.3 - 0.5				[redacted]	[redacted]									
17					0.8 - 1.0				[redacted]	[redacted]									
18					1.3 - 1.5				[redacted]	[redacted]									
19					1.8 - 2.0				[redacted]	[redacted]									
20					2.3 - 2.5				[redacted]	[redacted]									
21					2.8 - 3.0				[redacted]	[redacted]									
22	GC/BG# 17		1-11-08		0 - 0.1				[redacted]	[redacted]									
23					0.3 - 0.5				[redacted]	[redacted]									
24					0.8 - 1.0				[redacted]	[redacted]									

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: D. Kang	Date: 12/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 8:15	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmsen	PHONE (07) 3839 8393
PROJECT ID: 86165/11	EMAIL REPORT TO: graham.ohmsen@erm.com / rlarsen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION													
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	SPOCAS	CRS	[redacted]	[redacted]	Iron							
48	GC/BG# 34	S	6-11-08		1.3-1.5													
49					1.8-2.0													
50					2.3-2.5													
51	GC/BG# 42		7-11-08		0-0.1													
52					0.3-0.5													
53	GC/BG# 31		6-11-08		0-0.1													
54					0.3-0.5													
55					0.8-1.0													
56					1.3-1.5													
57	GC/BG# 32		6-11-08		0-0.1													
58					0.3-0.5													
59					0.75-0.85													

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: R. Kang	Date: 12/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 8:15	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmsen	PHONE (07) 3839 8393
PROJECT ID: 86165/11	EMAIL REPORT TO: graham.ohmsen@erm.com / rlarsen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	SPOCAS	CRS	[redacted]	[redacted]	Iron								
60	GC/BG # 45	S	7-11-08		0-0.1		✓	✓	✓	✓	✓								
61					0.3-0.5														
62	GC/BG # 28		6-11-08		0-0.1														
63					0.3-0.5														
64					0.8-1.0														
65					1.3-1.5														
66					1.8-2.0														
67					2.3-2.5														
68					2.8-3.0														
69	GC/BG # 34		6-11-08		0-0.1														
70					0.3-0.5														
71					0.8-1.0		✓	✓	✓	✓	✓								

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: R. Kang	Date: 12/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 8:15	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

WORK ORDER No: EB081 5726

SAMPLE RECEIPT INFORMATION & BOTTLE MAP

Lab of Origin:

Packaging & Carrier Details				Temperature Details	Work Order Login Details	Sample Login	Committal
No.	Type	Description	Company: TNT	Seal: (Y) N	Date / Time Received: 12 /11/08 8:15		
	Foam Esky		Con Note: 956 662 762	Ice Bricks: Y / (N)	Date/Time Sorting Commenced: 10:15	Completed (Date / Time)	Completed (Date / Time)
2	Hardcased Esky	L	Client delivery	Ice: (Y) N	Time First Logged: 10:32		
	Other		ALS Pick Up	Temp. °C 5.6 3.2	Time Placed in Cold Room 10:45	Person:	Person:
				Signature:	Sorting to Fridge – Total Time: 30 (min)		
			On Hand (rebatch)		Log In Signature:		

Sample Receipt Advice Comments – To be Completed by Sorting Staff	Tick
Volatile organic compound analysis may be compromised as sample containers contained headspace. Detail of breaches provided below. Please contact ALSE for further information.	
Recommended holding times exceeded during transit. Detail of breaches provided below. Please contact ALSE for further information.	
Sample(s) damaged during transit. Detail of damages provided below. Please contact ALSE for further information.	
Analysis has been split due to varying TAT. Your results will be reported under the following Work Orders: EB_____ & EB _____	
(Manually Entered Comments)	

	-S		-G				-O		-P				-R			-RG		-B	-M						
Lab No.	Soil Jar	Bag Plastic	1L Nat Green	0.5L Nat Green	0.25L Nat Green	1L Nat White	1L Glass Orange	0.5L Glass Orange	1L Glass Purple	0.5L Plastic Purple	0.25L Plastic Purple	Bacto Black / Thio Grey	125mL Nitric Red			125mL Lab Acidified		CN Blue	1L Glass Brown	Sulfide Fluoro Yellow	HCl Fe^{2+} Maroon	Vial H_2SO_4 Purple	Vial HCl Maroon	H.S Y/N	Other
	Frozen	Wet/Dry											Filt	Total	Unsp.	Filt	Total								
1		1																							
2																									
3		1																							
4																									
5																									
6																									
7																									
8																									
9																									
10																									

Signature:

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0815726**	Page	: 1 of 13
Client	: **ENVIRO RESOURCES MANAGEMENT**	Laboratory	: Environmental Division Brisbane
Contact	: MR GRAHAM OHMSEN	Contact	: Tim Kilmister
Address	: PO BOX 1400 SPRING HILL QLD, AUSTRALIA 4004	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: graham.ohmsen@erm.com	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3839 8393	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3839 8381	Facsimile	: +61-7-3243 7218
Project	: 86165-11	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Gladstone		
C-O-C number	: ----	Date Samples Received	: 12-NOV-2008
Sampler	: Geocoastal	Issue Date	: 26-NOV-2008
Order number	: ----		
		No. of samples received	: 71
Quote number	: EN/009/08	No. of samples analysed	: 71

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
WORLD RECOGNISED ACCREDITATION

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.

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

General Comments

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

Where moisture determination has been performed, 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 internal method 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 (%)*
EA026 : Chromium Reducible Sulphur (QC Lot: 816059)									
EB0815726-001	GC/BG# 19 0-0.1	EA026: Chromium Reducible Sulphur	----	0.02	%	<0.02	0.02	0.0	No Limit
EA029-A: pH Measurements (QC Lot: 816060)									
EB0815726-001	GC/BG# 19 0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	8.1	8.2	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	7.3	7.3	0.0	0% - 20%
EB0815726-011	GC/BG# 18 1.3-1.5	EA029: pH KCl (23A)	----	0.1	pH Unit	5.7	5.8	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.1	2.1	0.0	0% - 20%
EA029-A: pH Measurements (QC Lot: 816061)									
EB0815726-021	GC/BG# 16 2.8-3.0	EA029: pH KCl (23A)	----	0.1	pH Unit	8.2	8.2	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.5	2.5	0.0	0% - 20%
EB0815726-031	GC/BG# 33 0.8-1.0	EA029: pH KCl (23A)	----	0.1	pH Unit	4.0	4.0	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.0	2.0	0.0	0% - 20%
EA029-A: pH Measurements (QC Lot: 816062)									
EB0815726-041	GC/BG# 46 0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	7.4	7.4	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	4.5	4.5	0.0	0% - 20%
EB0815726-051	GC/BG# 42 0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	8.0	8.0	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	6.0	6.1	1.6	0% - 20%
EA029-A: pH Measurements (QC Lot: 816063)									
EB0815726-061	GC/BG# 45 0.3-0.5	EA029: pH KCl (23A)	----	0.1	pH Unit	5.2	5.0	3.3	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.3	2.3	0.0	0% - 20%
EB0815726-071	GC/BG# 34 0.8-1.0	EA029: pH KCl (23A)	----	0.1	pH Unit	4.0	4.0	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	1.8	1.8	0.0	0% - 50%
EA029-B: Acidity Trail (QC Lot: 816060)									
EB0815726-001	GC/BG# 19 0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EB0815726-011	GC/BG# 18 1.3-1.5	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.15	1.17	1.4	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.15	1.16	1.5	0% - 20%

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EA029-B: Acidity Trail (QC Lot: 816060) - continued									
EB0815726-011	GC/BG# 18 1.3-1.5	EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	4	4	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	720	730	1.4	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	715	726	1.5	0% - 20%
EA029-B: Acidity Trail (QC Lot: 816061)									
EB0815726-021	GC/BG# 16 2.8-3.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.52	0.53	2.4	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.52	0.53	2.4	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	321	329	2.4	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	321	329	2.4	0% - 20%
EB0815726-031	GC/BG# 33 0.8-1.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.10	0.10	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	2.46	2.47	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	2.36	2.37	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	63	62	0.0	0% - 20%
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	1540	1540	0.3	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	1470	1480	0.4	0% - 20%
EA029-B: Acidity Trail (QC Lot: 816062)									
EB0815726-041	GC/BG# 46 0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.86	0.87	1.4	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.86	0.87	1.4	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	537	545	1.4	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	537	545	1.4	0% - 20%
EB0815726-051	GC/BG# 42 0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-B: Acidity Trail (QC Lot: 816063)									
EB0815726-061	GC/BG# 45 0.3-0.5	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	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 (%)
EA029-B: Acidity Trail (QC Lot: 816063) - continued									
EB0815726-061	GC/BG# 45 0.3-0.5	EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.16	0.18	12.3	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.15	0.17	11.6	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	4	5	29.5	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	98	110	12.3	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	94	105	11.6	0% - 20%
EB0815726-071	GC/BG# 34 0.8-1.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.09	0.11	18.9	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	3.49	3.49	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	3.40	3.37	0.8	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	58	70	18.9	0% - 20%
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	2180	2170	0.2	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	2120	2100	0.8	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 816060)									
EB0815726-001	GC/BG# 19 0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.15	0.12	22.6	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.20	0.18	11.0	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.05	0.06	0.0	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	31	37	17.9	No Limit
EB0815726-011	GC/BG# 18 1.3-1.5	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.40	0.39	0.0	0% - 50%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	1.86	1.86	0.0	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.46	1.47	0.0	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	913	919	0.7	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 816061)									
EB0815726-021	GC/BG# 16 2.8-3.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.44	0.46	3.9	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	1.66	1.68	1.4	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.22	1.22	0.0	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	760	764	0.5	0% - 20%
EB0815726-031	GC/BG# 33 0.8-1.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.54	0.60	11.7	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	3.84	3.52	8.8	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	3.30	2.91	12.6	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	2060	1820	12.6	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 816062)									
EB0815726-041	GC/BG# 46 0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.17	0.17	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.47	0.48	2.4	0% - 20%

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EA029-C: Sulfur Trail (QC Lot: 816062) - continued									
EB0815726-041	GC/BG# 46 0-0.1	EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.30	0.31	4.2	0% - 50%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	187	195	4.2	0% - 50%
EB0815726-051	GC/BG# 42 0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.06	0.06	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.11	0.14	30.2	No Limit
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.04	0.08	64.1	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	27	52	64.1	No Limit
EA029-C: Sulfur Trail (QC Lot: 816063)									
EB0815726-061	GC/BG# 45 0.3-0.5	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.04	0.04	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.25	0.24	0.0	0% - 50%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.21	0.20	0.0	0% - 50%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	134	128	4.3	0% - 50%
EB0815726-071	GC/BG# 34 0.8-1.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.64	0.67	4.3	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	5.93	6.07	2.4	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	5.28	5.40	2.2	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	3300	3370	2.2	0% - 20%
EA029-D: Calcium Values (QC Lot: 816060)									
EB0815726-001	GC/BG# 19 0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.09	0.07	21.4	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.11	0.10	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.03	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	14	32.3	No Limit
EB0815726-011	GC/BG# 18 1.3-1.5	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.11	0.10	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.12	0.12	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 816061)									
EB0815726-021	GC/BG# 16 2.8-3.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.44	0.45	2.4	0% - 20%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.88	0.91	2.5	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.45	0.46	2.6	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.36	0.37	0.0	0% - 50%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	224	230	2.6	0% - 20%
EB0815726-031	GC/BG# 33 0.8-1.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.12	0.13	10.3	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.10	0.10	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EA029-D: Calcium Values (QC Lot: 816061) - continued									
EB0815726-031	GC/BG# 33 0.8-1.0	EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 816062)									
EB0815726-041	GC/BG# 46 0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.07	0.07	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.09	0.09	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	11	0.0	No Limit
EB0815726-051	GC/BG# 42 0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.02	0.02	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.02	0.04	36.8	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 816063)									
EB0815726-061	GC/BG# 45 0.3-0.5	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815726-071	GC/BG# 34 0.8-1.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.14	0.15	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.16	0.16	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 816060)									
EB0815726-001	GC/BG# 19 0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.31	0.26	16.4	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.48	0.50	5.4	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.16	0.24	36.4	0% - 50%
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.22	0.32	36.4	0% - 50%
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	136	197	36.4	0% - 50%
EB0815726-011	GC/BG# 18 1.3-1.5	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.49	0.48	0.0	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.53	0.53	0.0	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	0.05	35.4	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	0.06	35.4	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	28	41	35.4	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 (%)
EA029-E: Magnesium Values (QC Lot: 816061)									
EB0815726-021	GC/BG# 16 2.8-3.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.40	0.42	4.7	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.47	0.47	0.0	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.07	0.05	33.9	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.09	0.06	33.9	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	55	39	33.9	No Limit
EB0815726-031	GC/BG# 33 0.8-1.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.58	0.65	10.1	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.60	0.56	7.2	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.03	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	18	<10	55.1	No Limit
EA029-E: Magnesium Values (QC Lot: 816062)									
EB0815726-041	GC/BG# 46 0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.25	0.25	0.0	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.42	0.42	0.0	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.17	0.17	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.22	0.23	0.0	0% - 50%
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	140	143	1.9	0% - 50%
EB0815726-051	GC/BG# 42 0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.11	0.11	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.14	0.17	19.6	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	0.07	63.2	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	0.09	63.2	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	28	55	63.2	No Limit
EA029-E: Magnesium Values (QC Lot: 816063)									
EB0815726-061	GC/BG# 45 0.3-0.5	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.04	0.04	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.05	0.04	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815726-071	GC/BG# 34 0.8-1.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.65	0.66	2.0	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.68	0.70	3.0	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.03	0.04	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 (%)
EA029-E: Magnesium Values (QC Lot: 816063) - continued									
EB0815726-071	GC/BG# 34 0.8-1.0	EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.04	0.06	20.6	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	28	34	20.6	No Limit
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 816060)									
EB0815726-001	GC/BG# 19 0-0.1	EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.18	0.18	0.0	No Limit
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	113	113	0.0	0% - 50%
EA029-G: Retained Acidity (QC Lot: 816061)									
EB0815726-031	GC/BG# 33 0.8-1.0	EA029: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	0.06	<0.02	102	No Limit
		EA029: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	0.08	<0.02	121	No Limit
		EA029: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.62	0.61	0.0	0% - 20%
		EA029: acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	38	<10	117	No Limit
EA029-G: Retained Acidity (QC Lot: 816063)									
EB0815726-071	GC/BG# 34 0.8-1.0	EA029: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.60	0.61	2.8	0% - 20%
		EA029: 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
EA026 : Chromium Reducible Sulphur (QCLot: 816059)								
EA026: Chromium Reducible Sulphur	----	0.02	%	<0.02	.23 %	96.8	79.6	126
EA029-B: Acidity Trail (QCLot: 816060)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 816061)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 816062)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 816063)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 816060)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	High
EA029-C: Sulfur Trail (QCLot: 816061)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 816062)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 816063)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 816060)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 816061)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 816062)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 816063)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----

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
EA029-E: Magnesium Values (QCLot: 816060)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 816061)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 816062)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 816063)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	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.**

CHAIN OF CUSTODY DOCUMENTATION

ALS
Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmson	PHONE (07) 3839 8393
PROJECT ID: 86165/11	EMAIL REPORT TO: graham.ohmson@erm.com / rlarsen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water) / CONTAINER INFORMATION

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	SPOCAS	1 in 10 (CRS)	Calcium	Magnesium	Iron
1	GC/BG# 22	S	1-11-08		1.8-2.0		✓	✓			✓
2		S			2.0-2.2						
3	GC/BG# 21	S	1-11-08		0-0.1						
4					0.3-0.5						
5					0.8-1.0						
6					1.3-1.5						
7					1.8-2.0						
8					2.3-2.5						
9					2.8-3.0						

Environmental Division
Brisbane
Work Order
EB0815732
Telephone : +61-7-3243 7222

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: D. Kang	Date: 12/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 8:15	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmsen	PHONE (07) 3839 8393
PROJECT ID: 86165/11	EMAIL REPORT TO: graham.ohmsen@erm.com / rlarsen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: ~~Yes~~ No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		SPOCAS	Lime (CRS)	[redacted]	[redacted]	Trace								
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles													
10	GC/BG # 38	S	5-11-08		2.3 - 2.5		✓	✓	✓	✓	✓								
11	GC/BG # 20	S	1-11-08		0 - 0.1														
12					0.3 - 0.5														
13					0.8 - 1.0														
14					1.3 - 1.5														
15					1.8 - 2.0														
16					2.3 - 2.5														
17					2.8 - 3.0														
18	GC/BG # 22	S	1-11-08		0 - 0.1														
19					0.3 - 0.5														
20					0.8 - 1.0														
21					1.3 - 1.5		✓	✓	✓	✓									

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: D Lang	Date: 12/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 8:15	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmsen	PHONE (07) 3839 8393
PROJECT ID: 86.165/11	EMAIL REPORT TO: graham.ohmsen@erm.com / rlarsen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		SPECIAS	Lab (ALS)	[redacted]	[redacted]	Trace								
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles													
22	GC/BG # 41	S	7-11-08		0-0.1		✓	✓	✓	✓	✓								
23		↓			0.3-0.5		↓	↓	↓	↓	↓								
24	GC/BG # 39	S	8-11-08		0-0.1														
25		↓			0.3-0.5														
26					0.8-1.0														
27					1.3-1.5														
28		↓			1.7-1.8														
29	GC/BG # 38	S	8-11-08		0-0.1														
30		↓			0.3-0.5														
31					0.8-1.0														
32		↓			1.3-1.5														
33					1.8-2.0														

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: D. Kandy	Date: 17/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 8:15	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

CHAIN OF CUSTODY DOCUMENTATION

ALS
Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmsen	PHONE (07) 3839 8393
PROJECT ID: 86165/11	EMAIL REPORT TO: graham.ohmsen@erm.com / rlarsen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	OPOCAS	1 into ~~[illegible]~~ (OPS)	[redacted]	[redacted]	Trees
34	GC/BG #24	S	5-11-08		0-0.1		✓	✓			✓
35					0.3-0.5						
36					0.8-1.0						
37					1.3-1.5						
38					1.6-1.8						
39	GC/BG #25		5-11-08		0-0.1						
40					0.3-0.5						
41					0.8-1.0						
42					1.3-1.5						
43					1.8-2.0						
~~39~~											

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: D. Kang	Date: 12/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 8:15	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

1

CHAIN OF CUSTODY DOCUMENTATION

ALS
Australian Laboratory Services Pty Ltd

CLIENT: [redacted] ERM	SAMPLER: GEOCOASTAL
ADDRESS / OFFICE: 60 LEICHHARDT STREET, SPRING HILL	MOBILE: [redacted]
PROJECT MANAGER (PM): GRAHAM OHMSEN	PHONE (07) 3839 8393
PROJECT ID: [redacted] 86165/11	EMAIL REPORT TO: GRAHAM.OHMSEN@ERM.COM / RLARSEN@GEOCOASTAL.COM.A
SITE: GLADSTONE P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water) / CONTAINER INFORMATION

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	SPOCAS	1 NIO (CRS)	[redacted]	[redacted]	IRON								
44	GC/BG# 26	S	5-11-08		0-0.1		✓	✓	[redacted]	✓	✓								
45					0.3-0.5				[redacted]	[redacted]									
46					0.8-1.0				[redacted]	[redacted]									
47					1.3-1.5				[redacted]	[redacted]									
48					1.8-2.0				[redacted]	[redacted]									
49					2.3-2.5				[redacted]	[redacted]									
50					2.7-2.8				[redacted]	[redacted]									
51	GC/BG# 23		5-11-08		0-0.1				[redacted]	[redacted]									
52					0.3-0.5				[redacted]	[redacted]									
53					0.8-1.0				[redacted]	[redacted]									
54					1.3-1.5				[redacted]	[redacted]									

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: D. Kang	Date: 12/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 8:45	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0815732**	Page	: 1 of 11
Client	: **ENVIRO RESOURCES MANAGEMENT**	Laboratory	: Environmental Division Brisbane
Contact	: MR GRAHAM OHMSEN	Contact	: Tim Kilmister
Address	: PO BOX 1400 SPRING HILL QLD, AUSTRALIA 4004	Address	: 32 Shand Street Stafford QLD Australia 4053
E-mail	: graham.ohmsen@erm.com	E-mail	: Services.Brisbane@alsenviro.com
Telephone	: +61 07 3839 8393	Telephone	: +61-7-3243 7222
Facsimile	: +61 07 3839 8381	Facsimile	: +61-7-3243 7218
Project	: 86165 -11	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Gladstone		
C-O-C number	: ----	Date Samples Received	: 12-NOV-2008
Sampler	: Geocoastal	Issue Date	: 26-NOV-2008
Order number	: ----		
		No. of samples received	: 54
Quote number	: EN/009/08	No. of samples analysed	: 54

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
WORLD RECOGNISED ACCREDITATION

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.

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

General Comments

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

Where moisture determination has been performed, 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 internal method 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 (%)*
EA026 : Chromium Reducible Sulphur (QC Lot: 817212)									
EB0815732-001	GC/BG# 22 1.8-2.0	EA026: Chromium Reducible Sulphur	----	0.02	%	1.72	1.79	4.1	0% - 20%
EA029-A: pH Measurements (QC Lot: 817213)									
EB0815732-001	GC/BG# 22 1.8-2.0	EA029: pH KCl (23A)	----	0.1	pH Unit	7.6	7.6	# 0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.1	2.1	0.0	0% - 20%
EB0815732-011	GC/BG# 20 0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	6.6	6.6	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.4	2.4	0.0	0% - 20%
EA029-A: pH Measurements (QC Lot: 817214)									
EB0815732-021	GC/BG# 22 1.3-1.5	EA029: pH KCl (23A)	----	0.1	pH Unit	7.9	7.9	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.9	2.9	0.0	0% - 20%
EB0815732-031	GC/BG# 38 0.8-1.0	EA029: pH KCl (23A)	----	0.1	pH Unit	5.2	5.2	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	1.6	1.6	0.0	0% - 50%
EA029-A: pH Measurements (QC Lot: 817215)									
EB0815732-041	GC/BG# 25 0.8-1.0	EA029: pH KCl (23A)	----	0.1	pH Unit	4.3	4.3	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	1.6	1.6	0.0	0% - 50%
EB0815732-051	GC/BG# 23 0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	6.4	6.4	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.2	2.3	4.4	0% - 20%
EA029-B: Acidity Trail (QC Lot: 817213)									
EB0815732-001	GC/BG# 22 1.8-2.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	1.36	1.36	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	1.36	1.36	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	851	846	0.6	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	851	846	0.6	0% - 20%
EB0815732-011	GC/BG# 20 0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.75	0.73	2.8	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.75	0.73	2.8	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	470	457	2.8	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	470	457	2.8	0% - 20%
EA029-B: Acidity Trail (QC Lot: 817214)									
EB0815732-021	GC/BG# 22 1.3-1.5	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	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 (%)
EA029-B: Acidity Trail (QC Lot: 817214) - continued									
EB0815732-021	GC/BG# 22 1.3-1.5	EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.28	0.28	0.0	0% - 50%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.28	0.28	0.0	0% - 50%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	175	175	0.0	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	175	175	0.0	0% - 20%
EB0815732-031	GC/BG# 38 0.8-1.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	5.25	5.32	1.2	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	5.24	5.30	1.3	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	8	7	17.3	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	3270	3320	1.2	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	3260	3310	1.3	0% - 20%
EA029-B: Acidity Trail (QC Lot: 817215)									
EB0815732-041	GC/BG# 25 0.8-1.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.06	0.05	29.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	4.39	4.42	0.7	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	4.33	4.38	1.1	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	39	29	29.0	0% - 50%
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	2740	2760	0.7	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	2700	2730	1.1	0% - 20%
EB0815732-051	GC/BG# 23 0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.72	0.72	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.72	0.72	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	450	450	0.0	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	450	450	0.0	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 817213)									
EB0815732-001	GC/BG# 22 1.8-2.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.30	0.32	7.2	0% - 50%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	2.22	2.09	6.0	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.92	1.77	8.3	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	1200	1100	8.3	0% - 20%
EB0815732-011	GC/BG# 20 0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.33	0.32	0.0	0% - 50%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	1.23	1.21	1.6	0% - 20%

Sub-Matrix: **SOIL**

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
				Laboratory Duplicate (DUP) Report					
EA029-C: Sulfur Trail (QC Lot: 817213) - continued									
EB0815732-011	GC/BG# 20 0-0.1	EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.90	0.89	1.4	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	562	554	1.4	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 817214)									
EB0815732-021	GC/BG# 22 1.3-1.5	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.18	0.18	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.69	0.70	0.0	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.51	0.52	0.0	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	320	324	1.4	0% - 20%
EB0815732-031	GC/BG# 38 0.8-1.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.44	0.43	0.0	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	7.64	7.36	3.7	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	7.20	6.93	3.8	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	4490	4320	3.8	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 817215)									
EB0815732-041	GC/BG# 25 0.8-1.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.49	0.44	10.8	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	5.40	5.24	3.1	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	4.91	4.80	2.3	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	3060	2990	2.3	0% - 20%
EB0815732-051	GC/BG# 23 0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.23	0.23	0.0	0% - 50%
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	1.29	1.36	5.0	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	1.06	1.12	5.4	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	664	701	5.4	0% - 20%
EA029-D: Calcium Values (QC Lot: 817213)									
EB0815732-001	GC/BG# 22 1.8-2.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.29	0.31	7.1	0% - 50%
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.37	0.34	7.9	0% - 50%
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.08	0.03	94.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.06	0.02	94.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	39	14	94.0	No Limit
EB0815732-011	GC/BG# 20 0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.10	0.10	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.12	0.11	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 817214)									
EB0815732-021	GC/BG# 22 1.3-1.5	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.19	0.19	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.22	0.22	0.0	0% - 50%

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 (%)
EA029-D: Calcium Values (QC Lot: 817214) - continued									
EB0815732-021	GC/BG# 22 1.3-1.5	EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	0.03	0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.02	0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	13	12	0.0	No Limit
EB0815732-031	GC/BG# 38 0.8-1.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.18	0.15	16.9	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.16	0.16	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 817215)									
EB0815732-041	GC/BG# 25 0.8-1.0	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.12	0.11	11.4	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.11	0.10	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815732-051	GC/BG# 23 0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.07	0.07	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	0.08	0.09	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	11	13.1	No Limit
EA029-E: Magnesium Values (QC Lot: 817213)									
EB0815732-001	GC/BG# 22 1.8-2.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.34	0.36	7.3	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.42	0.39	6.3	0% - 50%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.08	0.03	89.6	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.11	0.04	89.6	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	68	26	89.6	No Limit
EB0815732-011	GC/BG# 20 0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.48	0.47	0.0	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.55	0.53	3.4	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.06	0.06	16.6	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.09	0.07	16.6	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	54	46	16.6	No Limit
EA029-E: Magnesium Values (QC Lot: 817214)									
EB0815732-021	GC/BG# 22 1.3-1.5	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.24	0.24	0.0	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.27	0.27	0.0	0% - 50%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.04	0.04	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.05	0.05	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 (%)
EA029-E: Magnesium Values (QC Lot: 817214) - continued									
EB0815732-021	GC/BG# 22 1.3-1.5	EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	30	30	0.0	No Limit
EB0815732-031	GC/BG# 38 0.8-1.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.53	0.53	0.0	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.53	0.54	0.0	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 817215)									
EB0815732-041	GC/BG# 25 0.8-1.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.44	0.40	9.6	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.36	0.34	3.8	0% - 50%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815732-051	GC/BG# 23 0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.30	0.29	0.0	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.48	0.52	7.3	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.19	0.23	19.6	0% - 50%
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.24	0.30	19.6	0% - 50%
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	153	187	19.6	0% - 50%
EA029-G: Retained Acidity (QC Lot: 817215)									
EB0815732-041	GC/BG# 25 0.8-1.0	EA029: sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: HCl Extractable Sulfur (20Be)	----	0.02	% S	0.42	0.44	6.9	0% - 20%
		EA029: 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
EA026 : Chromium Reducible Sulphur (QCLot: 817212)								
EA026: Chromium Reducible Sulphur	----	0.02	%	<0.02	.23 %	104	79.6	126
EA029-B: Acidity Trail (QCLot: 817213)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	# <2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	# <2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	# <0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 817214)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 817215)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 817213)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	# <0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	# <0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 817214)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 817215)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----

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
EA029-C: Sulfur Trail (QCLot: 817215) - continued								
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 817213)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	# <0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 817214)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 817215)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 817213)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	# <0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 817214)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 817215)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----

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
EA029-E: Magnesium Values (QCLot: 817215) - continued								
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	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.**

CHAIN OF CUSTODY DOCUMENTATION

ALS
Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmsen	PHONE (07) 3839 8393
PROJECT ID: 86165/11	EMAIL REPORT TO: graham.ohmsen@erm.com/rlarsen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION														
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	SPOCAS (CRS)	1 in 10 [redacted]	[redacted]	[redacted]	Iron								
1	GCBG#52	S			0-0.1		✓	✓			✓								
2	"				0.3-0.5														
3	"				0.8-1.0														
4	"				1.3-1.5														
5	"				1.8-2.0														
6	"				2.3-2.5														
7	"				2.8-3.0														
8	GCBG#47	S			0-0.1														
9	"				0.3-0.5														
10	"				0.8-1.0														
11	"				1.15-1.3														
12	GC BG#44	S			0-0.1														

Environmental Division
Brisbane
Work Order
EB0815825
Telephone : +61-7-3243 7222

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: MIAY	Date: 13/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 15.40	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

CHAIN OF CUSTODY DOCUMENTATION

ALS
Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmsen	PHONE (07) 3839 8393
PROJECT ID: 86165/11	EMAIL REPORT TO: graham.ohmsen@erm.com / rlarsen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION														
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	SPOCAS (Ces)	1 in 10 [redacted]	[redacted]	[redacted]	Iron								
13	GCBG #44	S			0.3-0.5		✓	✓			✓								
14					0.8 - 1.0														
15					1.3 - 1.5														
16					1.8 - 2.0														
17					2.3 - 2.5														
18	GCBG #29	S			0 - 0.1														
19					0.3 - 0.5														
20					0.8 - 1.0														
21					1.3 - 1.5														
22					1.8 - 2.0														
23					2.3 - 2.5														
24	GCBG #27				0 - 0.1														

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: MIA Y	Date: 13/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 15:40	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: ERM
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill
PROJECT MANAGER (PM): Graham Ohmsen
PROJECT ID: 86165/11
SITE: Gladstone P.O. NO.:
RESULTS REQUIRED (Date): QUOTE NO.:

SAMPLER: Geocoastal
MOBILE: 0411 484 167
PHONE (07) 3839 8393
EMAIL REPORT TO: graham.ohmsen@erm.com / rlarsen@geocoastal.com.au
EMAIL INVOICE TO: (if different to report)

FOR LABORATORY USE ONLY
COOLER SEAL (circle appropriate)
Intact: Yes No N/A
SAMPLE TEMPERATURE
CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles	SPOCAS (CRS)	[redacted]	[redacted]	[redacted]	Iron								
25	GCBG#27	S	S		0.3-0.5		✓	✓			✓								
26					0.8-1.0														
27					1.3-1.5														
28					1.7-1.8														
29	GCBG#50	S			0-0.1														
30					0.3-0.5														
31					0.8-1.0														
32	GCBG#48	S			0-0.1														
33					0.3-0.5														
34					0.7-0.8														
35	GCBG#49	S			0-0.1														
36					0.2-0.4														

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT
Name:	Date:	Name: MIA Y	Date: 13/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 15.40	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

ENFM (204/4)

CHAIN OF CUSTODY DOCUMENTATION

Australian Laboratory Services Pty Ltd

CLIENT: ERM	SAMPLER: Geocoastal
ADDRESS / OFFICE: 60 Leichhardt St. Spring Hill	MOBILE: 0411 484 167
PROJECT MANAGER (PM): Graham Ohmsen	PHONE (07) 3839 8393
PROJECT ID: 861655/11	EMAIL REPORT TO: graham.ohmsen@erm.com / clarsen@geocoastal.com.au
SITE: Gladstone P.O. NO.:	EMAIL INVOICE TO: (if different to report)
RESULTS REQUIRED (Date): QUOTE NO.:	ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS / SPECIAL HANDLING / STORAGE OR DIPOSAL:

Notes: e.g. Highly contaminated samples, Extra volume for QC or trace LORs etc.

SAMPLE INFORMATION (note: S = Soil, W=Water)					CONTAINER INFORMATION		SPOCAS (OS)	[redacted]	[redacted]	[redacted]	Trace								
ALS ID	SAMPLE ID	MATRIX	DATE	Time	Type / Code	Total bottles													
37	GCBG#53	S			0-0.1		✓	✓			✓								
38					0.3-0.5		↓	↓			↓								
39					0.8-1.0														
40					1.3-1.5														
41					1.8-2.0														
42					2.3-2.5														
43					2.8-3.0														
EXTRA 44	GCBG#51	S			0-0.1														
45					0.3-0.5														
46					0.8-1.0														
47					1.3-1.5														
48					1.8-2.0														

RELINQUISHED BY: 49 2.3-2.5		RECEIVED BY		METHOD OF SHIPMENT
Name: 50	Date: 2.8-3.0	Name: MIA Y	Date: 13/11/08	Con' Note No:
Of:	Time:	Of: ALS	Time: 15.40	
Name:	Date:	Name:	Date:	Transport Co:
Of:	Time:	Of:	Time:	

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserveed Plastic; AG = Amber Glass Unpreserved; V = VOA Vial HCl Preserved; VS = VOA Vial Sulphuric Preserved; SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bad for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Enviromental

ENFM (204/4)

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

QUALITY CONTROL REPORT

Work Order	: **EB0815825**	Page	: 1 of 11
Client	: **ENVIRO RESOURCES MANAGEMENT**	Laboratory	: Environmental Division Brisbane
Contact	: MR RUNDI LARSEN	Contact	: Tim Kilmister
Address	: C/- GEOCOASTAL (AUSTRALIA) PTY LTD 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 7 3890 7392	Telephone	: +61-7-3243 7222
Facsimile	: +61 7 3890 7599	Facsimile	: +61-7-3243 7218
Project	: 86165-11	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: Gladstone		
C-O-C number	: ----	Date Samples Received	: 13-NOV-2008
Sampler	: Geocoastal	Issue Date	: 26-NOV-2008
Order number	: ----		
		No. of samples received	: 50
Quote number	: EN/009/08	No. of samples analysed	: 50

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
WORLD RECOGNISED ACCREDITATION

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.

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

General Comments

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

Where moisture determination has been performed, 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 internal method 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 (%)*
EA026 : Chromium Reducible Sulphur (QC Lot: 815487)									
EB0815825-001	GCBG# 52 0-0.1	EA026: Chromium Reducible Sulphur	----	0.02	%	0.06	0.06	0.0	No Limit
EA029-A: pH Measurements (QC Lot: 815488)									
EB0815825-001	GCBG# 52 0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	5.5	5.5	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	3.0	3.0	0.0	0% - 20%
EB0815825-011	GCBG# 47 1.15-1.3	EA029: pH KCl (23A)	----	0.1	pH Unit	6.3	6.4	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.5	2.5	0.0	0% - 20%
EA029-A: pH Measurements (QC Lot: 815489)									
EB0815825-021	GCBG# 29 1.3-1.5	EA029: pH KCl (23A)	----	0.1	pH Unit	8.6	8.7	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	7.6	7.6	0.0	0% - 20%
EB0815825-031	GCBG# 50 0.8-1.0	EA029: pH KCl (23A)	----	0.1	pH Unit	6.3	6.3	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.4	2.3	4.2	0% - 20%
EA029-A: pH Measurements (QC Lot: 815490)									
EB0815825-041	GCBG# 53 1.8-2.0	EA029: pH KCl (23A)	----	0.1	pH Unit	7.9	7.9	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	2.2	2.2	0.0	0% - 20%
EA029-B: Acidity Trail (QC Lot: 815488)									
EB0815825-001	GCBG# 52 0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.14	0.13	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.14	0.13	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	2	3	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	87	82	6.1	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	85	80	6.6	0% - 20%
EB0815825-011	GCBG# 47 1.15-1.3	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.43	0.43	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.43	0.43	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	270	270	0.0	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	270	270	0.0	0% - 20%
EA029-B: Acidity Trail (QC Lot: 815489)									
EB0815825-021	GCBG# 29 1.3-1.5	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	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 (%)
EA029-B: Acidity Trail (QC Lot: 815489) - continued									
EB0815825-021	GCBG# 29 1.3-1.5	EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EB0815825-031	GCBG# 50 0.8-1.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.52	0.52	0.0	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.52	0.52	0.0	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	321	321	0.0	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	321	321	0.0	0% - 20%
EA029-B: Acidity Trail (QC Lot: 815490)									
EB0815825-041	GCBG# 53 1.8-2.0	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.88	0.90	1.4	0% - 20%
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.88	0.90	1.4	0% - 20%
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	552	560	1.4	0% - 20%
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	552	560	1.4	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 815488)									
EB0815825-001	GCBG# 52 0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.18	0.17	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.31	0.36	13.3	0% - 50%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.14	0.18	29.9	No Limit
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	85	115	29.9	0% - 50%
EB0815825-011	GCBG# 47 1.15-1.3	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.11	0.12	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	0.81	0.77	4.3	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.70	0.66	5.7	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	434	410	5.7	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 815489)									
EB0815825-021	GCBG# 29 1.3-1.5	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.15	0.14	0.0	No Limit
		EA029: Peroxide Sulfur (23De)	----	0.02	% S	1.12	1.30	14.4	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	0.97	1.15	17.3	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	605	720	17.3	0% - 20%
EB0815825-031	GCBG# 50 0.8-1.0	EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.05	0.05	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 (%)
EA029-C: Sulfur Trail (QC Lot: 815489) - continued									
EB0815825-031	GCBG# 50 0.8-1.0	EA029: Peroxide Sulfur (23De)	---	0.02	% S	0.68	0.71	3.9	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	---	0.02	% S	0.64	0.66	3.8	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	---	10	mole H+ / t	397	413	3.8	0% - 20%
EA029-C: Sulfur Trail (QC Lot: 815490)									
EB0815825-041	GCBG# 53 1.8-2.0	EA029: KCl Extractable Sulfur (23Ce)	---	0.02	% S	0.37	0.35	5.2	0% - 50%
		EA029: Peroxide Sulfur (23De)	---	0.02	% S	2.07	2.04	1.6	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	---	0.02	% S	1.71	1.69	0.9	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	---	10	mole H+ / t	1060	1060	0.9	0% - 20%
EA029-D: Calcium Values (QC Lot: 815488)									
EB0815825-001	GCBG# 52 0-0.1	EA029: KCl Extractable Calcium (23Vh)	---	0.02	% Ca	0.04	0.04	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	---	0.02	% Ca	0.04	0.04	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	---	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	---	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	---	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815825-011	GCBG# 47 1.15-1.3	EA029: KCl Extractable Calcium (23Vh)	---	0.02	% Ca	0.05	0.05	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	---	0.02	% Ca	0.04	0.04	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	---	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	---	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	---	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 815489)									
EB0815825-021	GCBG# 29 1.3-1.5	EA029: KCl Extractable Calcium (23Vh)	---	0.02	% Ca	0.33	0.32	4.6	0% - 50%
		EA029: Peroxide Calcium (23Wh)	---	0.02	% Ca	1.36	1.39	2.2	0% - 20%
		EA029: Acid Reacted Calcium (23X)	---	0.02	% Ca	1.03	1.08	4.2	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	---	0.02	% S	0.82	0.86	4.2	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	---	10	mole H+ / t	514	537	4.2	0% - 20%
EB0815825-031	GCBG# 50 0.8-1.0	EA029: KCl Extractable Calcium (23Vh)	---	0.02	% Ca	0.03	0.03	0.0	No Limit
		EA029: Peroxide Calcium (23Wh)	---	0.02	% Ca	0.04	0.04	0.0	No Limit
		EA029: Acid Reacted Calcium (23X)	---	0.02	% Ca	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	---	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	---	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-D: Calcium Values (QC Lot: 815490)									
EB0815825-041	GCBG# 53 1.8-2.0	EA029: KCl Extractable Calcium (23Vh)	---	0.02	% Ca	0.35	0.35	0.0	0% - 50%
		EA029: Peroxide Calcium (23Wh)	---	0.02	% Ca	0.56	0.53	4.6	0% - 20%
		EA029: Acid Reacted Calcium (23X)	---	0.02	% Ca	0.20	0.18	10.0	No Limit
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	---	0.02	% S	0.16	0.15	10.0	No Limit
		EA029: acidity - Acid Reacted Calcium (a-23X)	---	10	mole H+ / t	101	91	10.0	No Limit
EA029-E: Magnesium Values (QC Lot: 815488)									

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 (%)
EA029-E: Magnesium Values (QC Lot: 815488) - continued									
EB0815825-001	GCBG# 52 0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.42	0.42	0.0	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.36	0.39	8.1	0% - 50%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EB0815825-011	GCBG# 47 1.15-1.3	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.19	0.19	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.19	0.19	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 815489)									
EB0815825-021	GCBG# 29 1.3-1.5	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.18	0.18	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.24	0.26	9.2	0% - 50%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.05	0.08	45.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.07	0.11	45.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	43	68	45.0	No Limit
EB0815825-031	GCBG# 50 0.8-1.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.10	0.09	0.0	No Limit
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.10	0.10	0.0	No Limit
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	<0.02	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA029-E: Magnesium Values (QC Lot: 815490)									
EB0815825-041	GCBG# 53 1.8-2.0	EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.35	0.34	0.0	0% - 50%
		EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.40	0.40	0.0	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.05	0.06	0.0	No Limit
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.07	0.08	0.0	No Limit
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	42	47	11.4	No Limit
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 815489)									
EB0815825-021	GCBG# 29 1.3-1.5	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.64	0.64	0.0	0% - 20%

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 (%)
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 815489) - continued									
EB0815825-021	GCBG# 29 1.3-1.5	EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.20	0.20	0.0	0% - 50%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	128	128	0.0	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
EA026 : Chromium Reducible Sulphur (QCLot: 815487)								
EA026: Chromium Reducible Sulphur	----	0.02	%	<0.02	.23 %	98.5	79.6	126
EA029-B: Acidity Trail (QCLot: 815488)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 815489)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-B: Acidity Trail (QCLot: 815490)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	----	----	----	----
EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	----	----	----	----
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 815488)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 815489)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 815490)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.02	----	----	----	----

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low	Recovery Limits (%) High
EA029-C: Sulfur Trail (QCLot: 815490) - continued								
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.02	----	----	----	----
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.02	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 815488)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 815489)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-D: Calcium Values (QCLot: 815490)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.02	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 815488)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 815489)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----
EA029-E: Magnesium Values (QCLot: 815490)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.02	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----

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
EA029-E: Magnesium Values (QCLot: 815490) - continued								
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.02	----	----	----	----

Matrix Spike (MS) Report

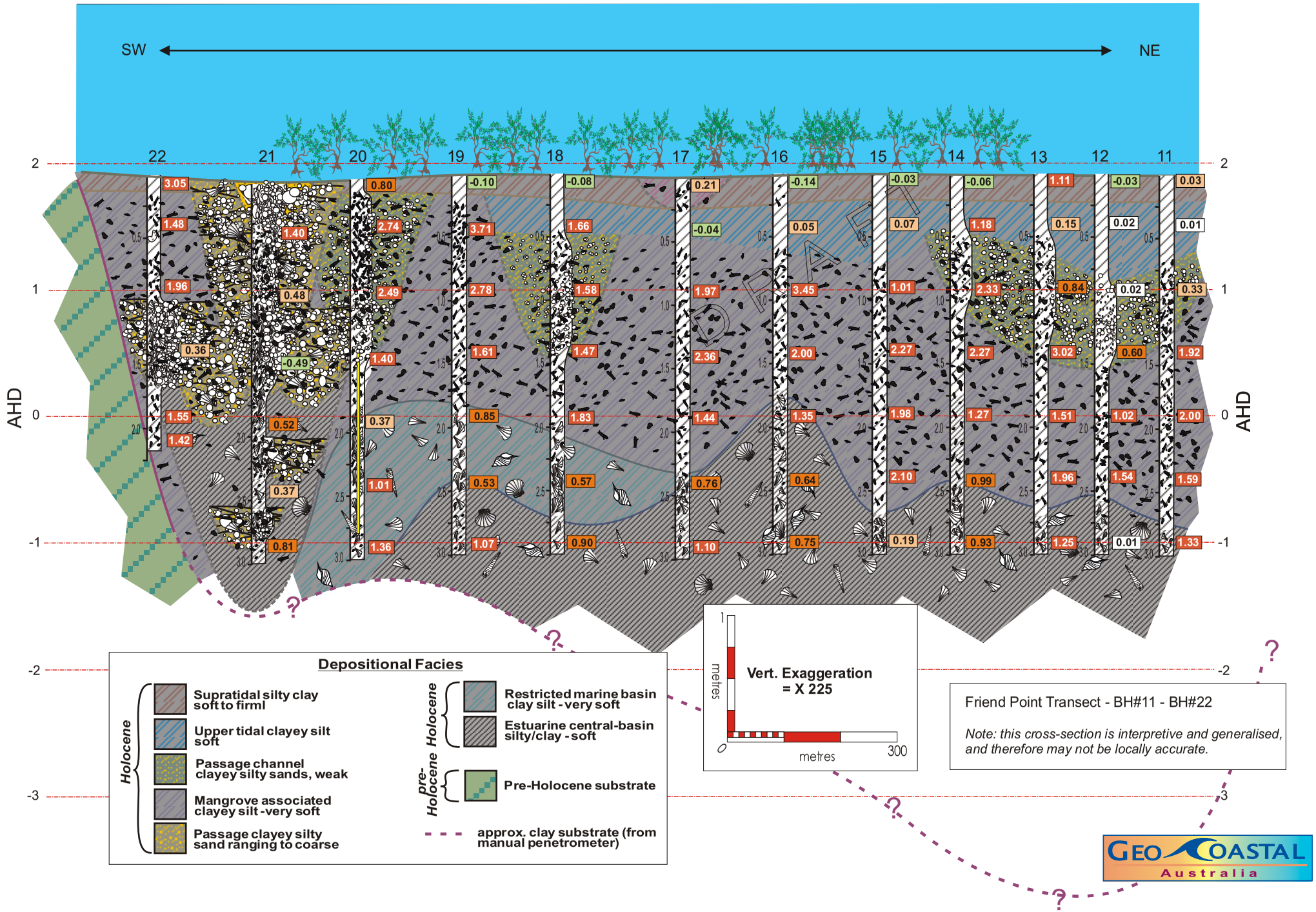
The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs).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

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

APPENDIX 5

Stratigraphic Transects of sedimentary facies and Net Acidity results (Figures 5-1 to 5-5).

BG - QCLNG Friend Point BH#11 - BH#22 Stratigraphic Cross-section



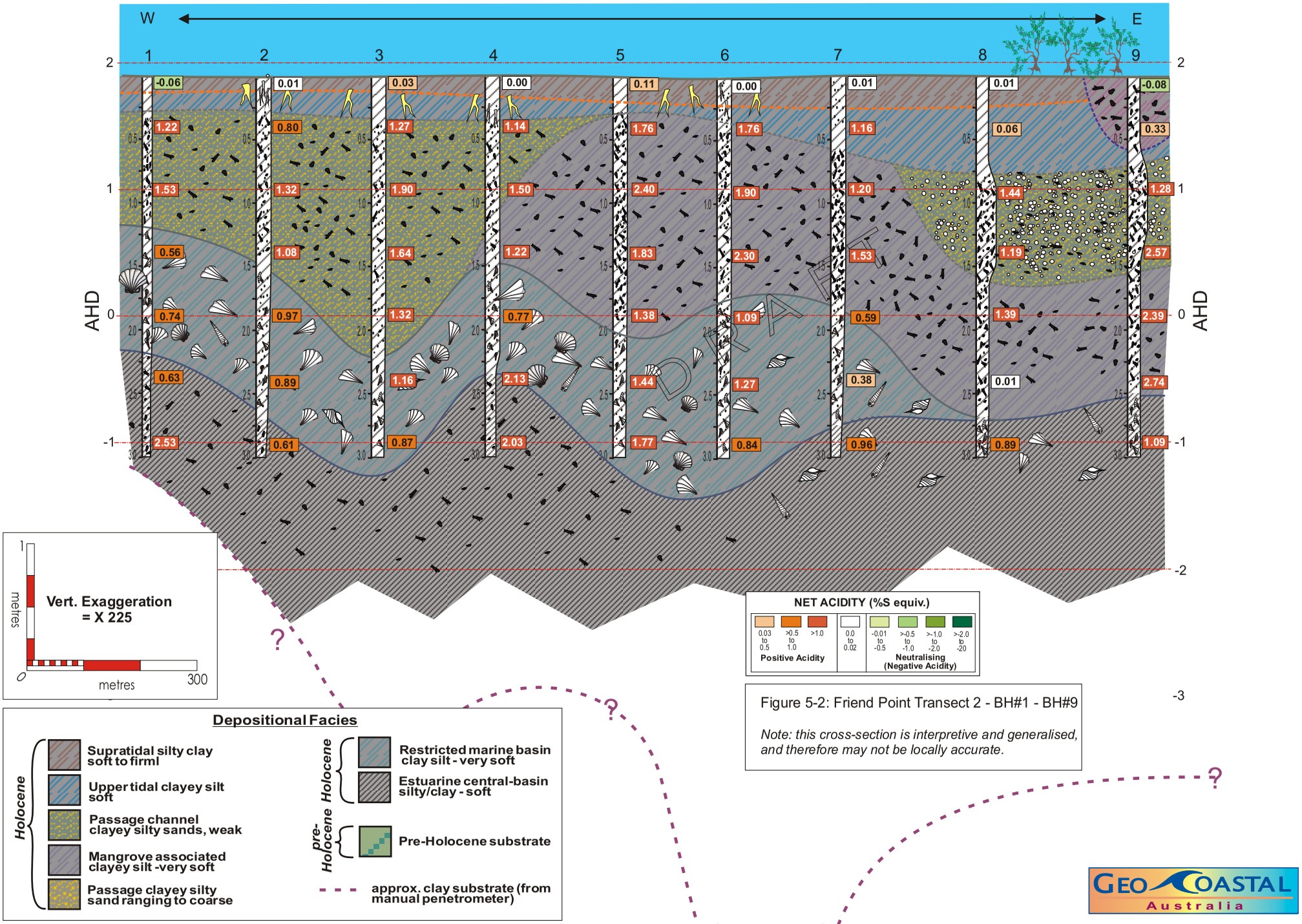


Figure 5-2: Friend Point Transect 2 - BH#1 - BH#9

Note: this cross-section is interpretive and generalised, and therefore may not be locally accurate.

BG - QCLNG Curtis Island BH#40-BH#46 Stratigraphic Cross-section

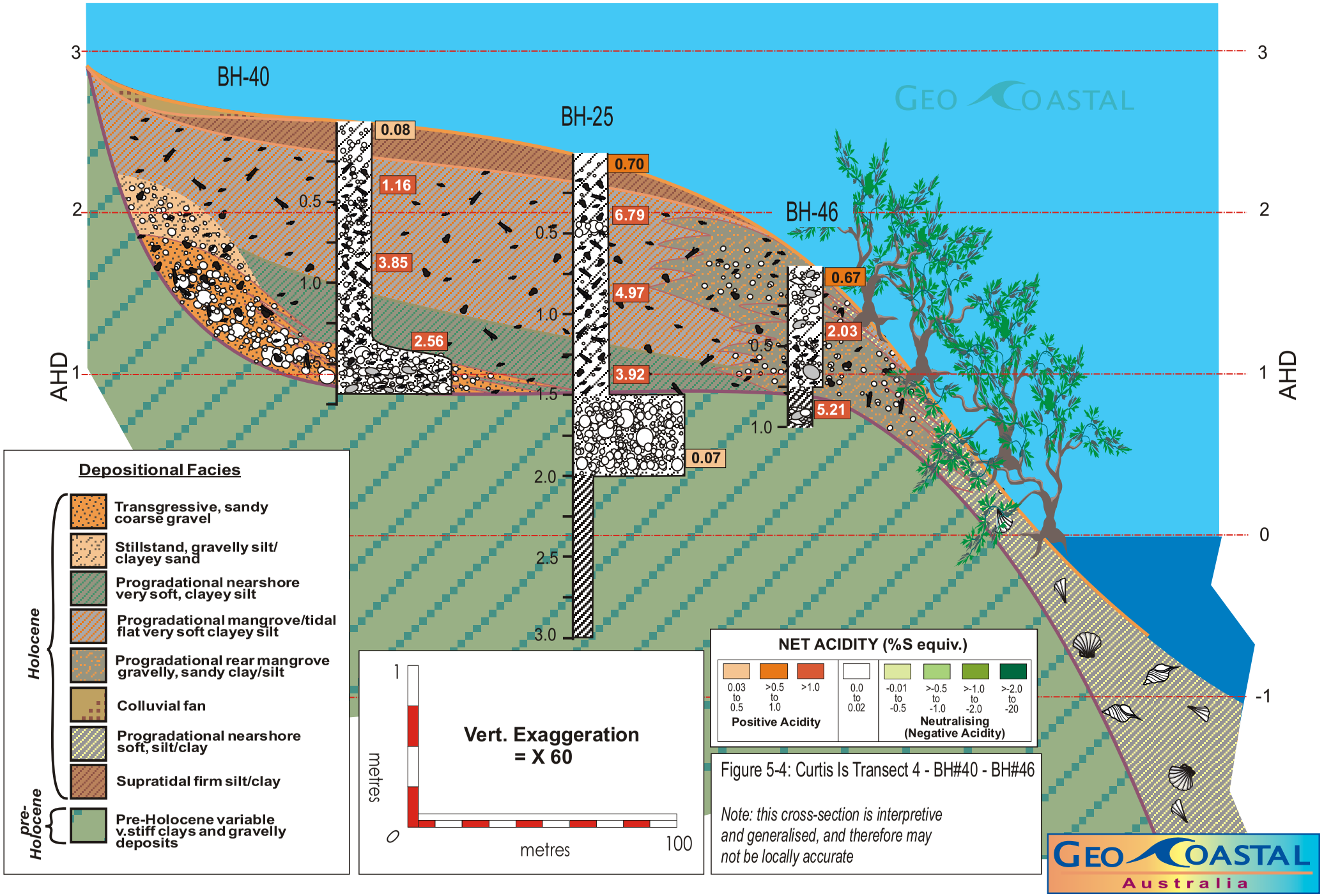


Figure 5-4: Curtis Is Transect 4 - BH#40 - BH#46

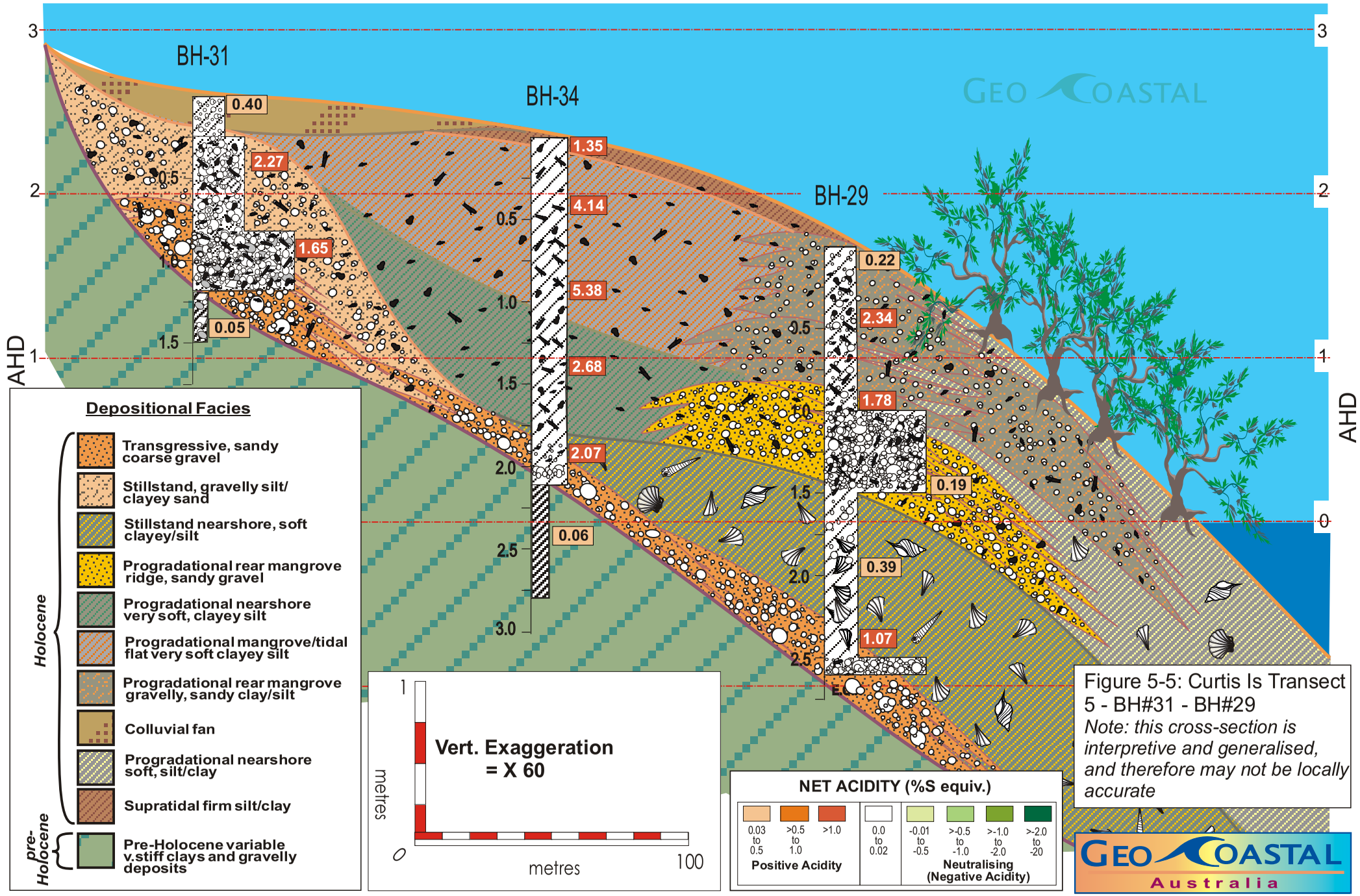


Figure 5-5: Curtis Is Transect 5 - BH#31 - BH#29

Note: this cross-section is interpretive and generalised, and therefore may not be locally accurate

APPENDIX 6

Distribution of Net Acidity and Titratable Actual Acidity at depths of 1, 2 and 3 metres below surface across the Friend Point and Curtis Island investigation areas (Figures 1 to 12).

Legend

Monitoring Locations

Net Acidity (%S)

- 0 - 0.03
- 0.031 - 0.45
- 0.46 - 2.5
- 2.6 - 2.7
- 2.8 - 2.9
- 3 - 3.2
- 3.3 - 3.4
- 3.5 - 3.6
- 3.7 - 3.9
- 4 - 4.1
- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 1

Net Acidity for Friend Point at One Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

N

0 45 90 180 270 360 m

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Legend

- Monitoring Locations
- Not Sampled

Net Acidity (%S)

- 0 - 0.03
- 0.031 - 0.45
- 0.46 - 2.5
- 2.6 - 2.7
- 2.8 - 2.9
- 3 - 3.2
- 3.3 - 3.4
- 3.5 - 3.6
- 3.7 - 3.9
- 4 - 4.1
- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 2

Net Acidity for Friend Point at Two Metre Depth

Client:	BG		
Project:	Queensland Curtis LNG Project		
Drawing No:	0096422s_GIS01_R0		
Date:	07/03/2009	Drawing size: A3	
Drawn by:	TH	Reviewed by: TG	
Scale:	Refer to Scale Bar		

N

0 45 90 180 270 360 m

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Monitoring Location

Not Sampled

Net Acidity (%S)

- 0 - 0.03
- 0.031 - 0.45
- 0.46 - 2.5
- 2.6 - 2.7
- 2.8 - 2.9
- 3 - 3.2
- 3.3 - 3.4
- 3.5 - 3.6
- 3.7 - 3.9
- 4 - 4.1
- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 3

Net Acidity for Friend Point at Three Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

N

0 40 80 160 240 320 m

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Monitoring Location

Not Sampled

Titratable Actual Acidity (%S)

- 0 - 0.03
- 0.031 - 0.45
- 0.46 - 2.5
- 2.6 - 2.7
- 2.8 - 2.9
- 3 - 3.2
- 3.3 - 3.4
- 3.5 - 3.6
- 3.7 - 3.9
- 4 - 4.1
- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 4

Titratable Actual Acidity for Friend Point at One Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

N

0 40 80 160 240 320 m

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Legend

Monitoring Location

Not Sampled

Titratable Actual Acidity (%S)

- 0 - 0.03
- 0.031 - 0.45
- 0.46 - 2.5
- 2.6 - 2.7
- 2.8 - 2.9
- 3 - 3.2
- 3.3 - 3.4
- 3.5 - 3.6
- 3.7 - 3.9
- 4 - 4.1
- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 5

Titratable Actual Acidity for Friend Point at Two Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

N

0 45 90 180 270 360 m

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- Monitoring Locations
- Not Sampled

Titratable Actual Acidity (%S)

- 0 - 0.03
- 0.031 - 0.45
- 0.46 - 2.5
- 2.6 - 2.7
- 2.8 - 2.9
- 3 - 3.2
- 3.3 - 3.4
- 3.5 - 3.6
- 3.7 - 3.9
- 4 - 4.1
- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 6

Titratable Actual Acidity for Friend Point at Three Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

N

0 45 90 180 270 360 m

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Monitoring Locations

Not Sampled

Net Acidity (%S)

- 0 - 0.029
- 0.03 - 0.45
- 0.46 - 2.5
- 2.6 - 2.7
- 2.8 - 2.9
- 3 - 3.2
- 3.3 - 3.4
- 3.5 - 3.6
- 3.7 - 3.9
- 4 - 4.1
- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 7

Net Acidity for Curtis Island at One Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

N

0 15 30 60 90 120 m

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Legend

Monitoring Location

Not Sampled

Net Acidity (%S)

- 0 - 0.03
- 0.031 - 0.45
- 0.46 - 2.5
- 2.6 - 2.7
- 2.8 - 2.9
- 3 - 3.2
- 3.3 - 3.4
- 3.5 - 3.6
- 3.7 - 3.9
- 4 - 4.1
- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 8

Net Acidity for Curtis Island at Two Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

N

0 15 30 60 90 120 m

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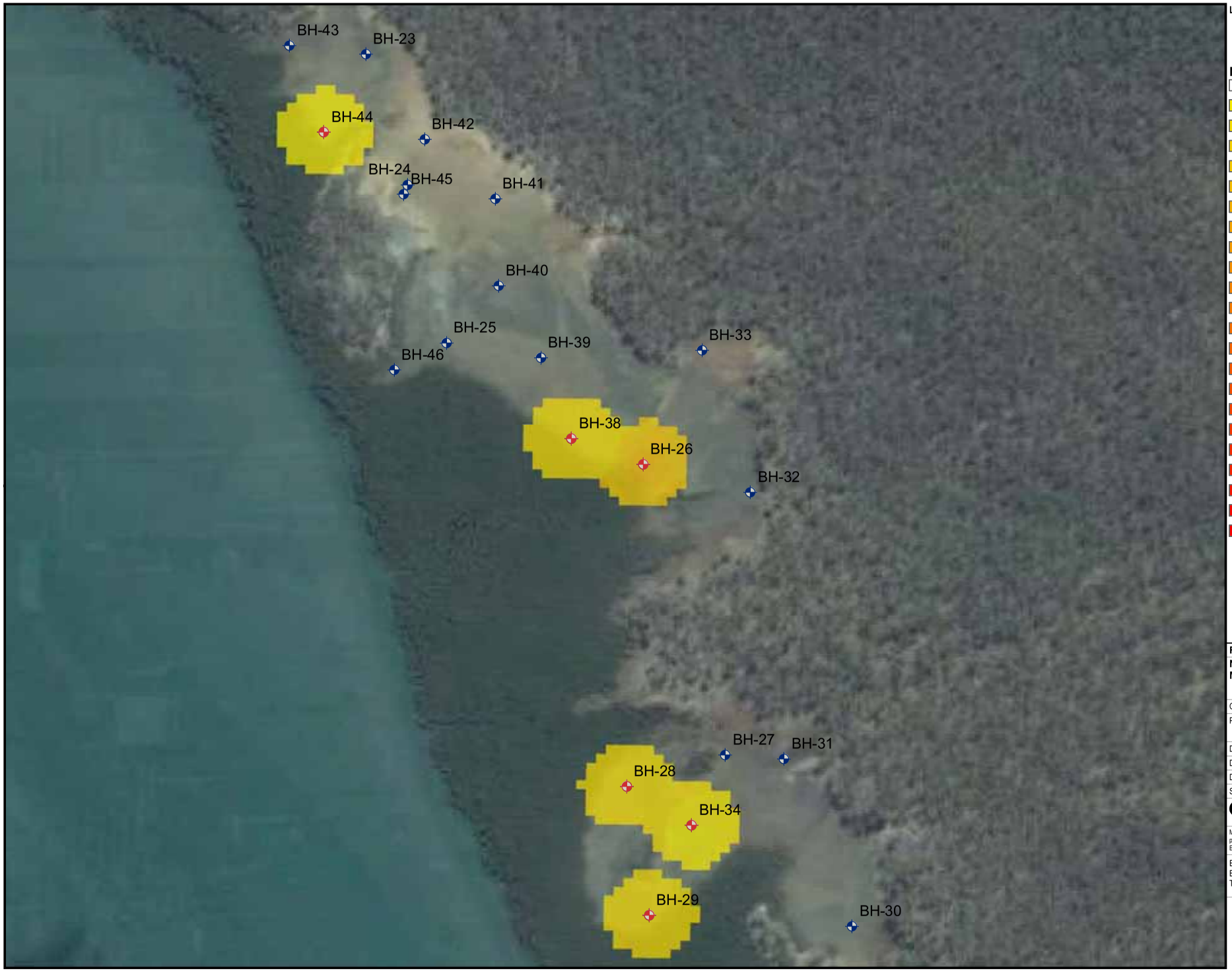

Legend

Monitoring Locations

Not Sampled

Net Acidity (%S)

- 0 - 0.03
- 0.031 - 0.45
- 0.46 - 2.5
- 2.6 - 2.7
- 2.8 - 2.9
- 3 - 3.2
- 3.3 - 3.4
- 3.5 - 3.6
- 3.7 - 3.9
- 4 - 4.1
- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 9

Net Acidity for Curtis Island at Three Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

N

0 15 30 60 90 120 m

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Monitoring Location

Not Sampled

Titratable Actual Acidity (%S)

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- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 10

Titratable Actual Acidity for Curtis Island at One Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

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Monitoring Location

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- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
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- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 11

Titratable Actual Acidity for Curtis Island at Two Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

N

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Legend

Monitoring Location

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Titratable Actual Acidity (%S)

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- 3.5 - 3.6
- 3.7 - 3.9
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- 4.2 - 4.4
- 4.5 - 4.6
- 4.7 - 4.8
- 4.9 - 5
- 5.1 - 5.3
- 5.4 - 5.5
- 5.6 - 5.7
- 5.8 - 6
- 6.1 - 6.2
- 6.3 - 6.5
- 6.6 - 6.7
- 6.8 - 6.9
- 7 - 7.2

Figure 12

Titratable Actual Acidity for Curtis Island at Three Metre Depth

Client:	BG	
Project:	Queensland Curtis LNG Project	
Drawing No:	0096422s_GIS01_R0	
Date:	07/03/2009	Drawing size: A3
Drawn by:	TH	Reviewed by: TG
Scale:	Refer to Scale Bar	

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