SHUTE HARBOUR MARINA DEVELOPMENTS PTY LTD

SHUTE HARBOUR MARINA

REPORT ON ACID SULPHATE SOILS AND SEDIMENT CONTAMINATION INVESTIGATION

JANUARY 2005

ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD

SHUTE HARBOUR MARINA DEVELOPMENT PTY LTD

REPORT ON ACID SULPHATE SOILS AND SEDIMENT CONTAMINATION INVESTIGATION FOR THE PROPOSED SHUTE HARBOUR MARINA PROJECT, SHUTE HARBOUR

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Prepared by ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD

January 2005

ULLMAN & NOLAN
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31 January, 2005

1.0 LETTER OF TRANSMITTAL

Shute Harbour Marina Development Pty Ltd
c/- P.O. Box 6133
HALIFAX STREET SA 5000

Attention: Mr G Betros

Dear Greg

REPORT ON ACID SULPHATE SOILS AND SEDIMENT CONTAMINATION INVESTIGATION, PROPOSED MARINA DREDGING, SHUTE HARBOUR MARINA PROJECT, SHUTE HARBOUR

We are pleased to present our report on the acid sulphate soils (ASS) and sediment contamination investigation for the proposed Shute Harbour development. The investigation has met the requirements of the terms of reference for the environmental impact statement for this project.

The results are consistent for sediments (marine sands and muds) with a potential for acid generation that also have significant excess acid neutralising capacity. The natural buffering material derives from particles of calcium carbonate in the marine muds derived from reef and shell debris.

Our recommendations for the management of the dredge spoil are as follows:

- Based on the investigation test results, liming is not required for the dredge spoil.
- However, in accordance with QASSIT guidelines, we recommend that verification testing of this material be undertaken during construction. A verification program/management plan should be approved by the appropriate regulators.
- The dredge material should be stored in a manageable and contained area until the results of the verification testing are available.
- As a conservative precaution, we recommend continuous pH monitoring of any clear tailwater prior to environmental discharge.

- The results indicate that there evidence of limited TBT contamination in the upper level sediments in some parts of the site.
- There was no evidence of contamination from hydrocarbons or heavy metals in the upper level sediments.
- Water quality sampling and assessment should be undertaken before and during dredging to ensure that turbidity and nutrient levels are within acceptable limits.

Should you have any queries please do not hesitate to contact the undersigned.

Yours faithfully

Andrew Williams
For ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD

2.0 SCOPE OF WORK

The site is located at Shute Harbour, Lot 2 on CP 866441 and is proposed for a marina development.

The total proposed area of dredging is the marina basin, 17.66ha, with an entrance channel understood to be 400m total length by 50m. There is also 6.4ha of spoil disposal area.

The scope of works and quantum of testing was determined from the client's brief and the terms of reference (TOR) for the EIS.

The investigation was designed to be QASSIT[1] compliant and meet the requirements of the TOR through:

- Boreholes drilled to -6.2m AHD or refusal, which corresponds to 1.0m below the proposed disturbance depth of -5.2m AHD in the proposed dredge areas, and to 2.0m depth or refusal in the spoil disposal areas.
- Two boreholes per hectare over the site.
- Boreholes at 100m spacings in the linear dredge channel (five in total).
- Boreholes logged to AS 1726-1993.
- Boreholes located by GPS.

This sampling intensity is as per the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland* (1998).

Consideration was also given to data from a previous 2001 geotechnical survey undertaken by Ullman & Nolan at the site. This previous survey included ASS screening, which gave good correlation with the results of this investigation.

Sediment contamination sampling and analysis was undertaken with consideration to the *National Ocean Disposal Guidelines for Dredged material, Environment Australia,* May 2002, the ANZECC *Guidelines for Fresh and Marine Water Quality* 2000.

[1] QASSIT. Queensland Acid Sulfate Soils Investigation Team

Most analytes were selected from the upper 1.0m of sediment, as the potential contamination was most likely to be derived from boating activities and recent developments in the catchment.

3.0 SITE HISTORY

Part of the site has been used as a recreational boat mooring area for many years. To the west of the site is an old boatyard. There is also an existing mooring pontoon on the eastern side of the site, below a motel. The main Shute Harbour ferry terminal is located east around the point. The adjoining land use includes some residential and commercial/light industrial sites, mainly associated with the Shute Harbour terminal facilities.

4.0 FIELDWORK

The fieldwork was carried out on 12th July to 10th August 2004, with some final boreholes drilled on the 18th October 2004.

Fifty-four boreholes in total were drilled over the site by manual techniques. Refer to the Borehole Locality Plan and colour aerial photo of the site in Appendix A. Samples were recovered from push-tubes or hollow-stem hand-augers.

The depth of sampling was 1.0m below the disturbance depth or refusal in the proposed dredge areas, and to 2.0m depth or refusal in the spoil disposal areas.

Field screening was undertaken at 0.25m intervals as per the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils in Queensland* (1998). This involved using a handheld pH meter, plastic test tubes, distilled water and pH adjusted hydrogen peroxide solution.

Refer to Appendix B for borehole logs and field screening results.

Laboratory samples were taken at every 0.50m or change in material strata. Samples were immediately sealed in airtight polyurethane bags and placed on ice. Samples were stored in a deep freeze at Shute Harbour and in our Mackay laboratory prior to dispatch.

Soil sampling, handling, preparation and storage of ASS samples as outlined above were consistent with Ahern CR, Sullivan LA, McElnea AE (2004). Laboratory Methods Guidelines 2004—Acid Sulfate Soils. In *Queensland Acid Sulfate Soil Technical Manual*. Department of Natural Resources, Mines and Energy, Indooroopilly, Queensland, Australia.

5.0 LABORATORY ANALYSIS

5.1 ACID SULFATE SOILS

Table 5.1 is a summary table showing the borehole depths, which were dictated by the dimensions of the disturbance at each location, and the laboratory samples collected and analysed.

TABLE 5.1
SUMMARY OF ASS FIELD SAMPLING

Borehole	Borehole Depth (AHD)	Comments	No of Laboratory Samples Analysed
A1	-1.00	FILL SITE	4
A2	-2.00	FILL SITE	4
A3	-1.89	FILL SITE	4
A4	-5.00	DREDGE SITE	7
A5	-3.80	FILL SITE	4
A6	-3.57	FILL SITE	3
A7	1.00	FILL SITE	2
A8	-6.20	DREDGE SITE	8
A9	-6.15	DREDGE SITE	8
A10	-4.00	DREDGE SITE	4
A11	-4.15	FILL SITE	5
A12	-6.25	DREDGE SITE	8
A13	-6.35	DREDGE SITE	8
A14	-8.20	DREDGE SITE	6

Borehole	Borehole Depth (AHD)	Comments	No of Laboratory Samples Analysed
A15	-6.20	DREDGE SITE	7
A16	-6.40	DREDGE SITE	8
A17	-6.40	DREDGE SITE	7
A18	-6.35	DREDGE SITE	8
A19	-6.20	DREDGE SITE	7
A20	-6.30	DREDGE SITE	7
A21	-6.40	DREDGE SITE	7
A22	-6.30	DREDGE SITE	7
A23	-5.00	DREDGE SITE	9
A24	-6.22	DREDGE SITE	7
A25	-6.36	DREDGE SITE	7
A26	-6.05	DREDGE SITE	7
A27	-6.30	DREDGE SITE	7
A28	-6.60	DREDGE SITE	7
A29	-6.35	DREDGE SITE	8
A30	-6.20	DREDGE SITE	7
A31	-5.95	DREDGE SITE	7
A32	-6.30	DREDGE SITE	7
A33	-6.35	DREDGE SITE	7
A34	-6.40	DREDGE SITE	8
A35	-6.25	DREDGE SITE	8
A36	-6.20	DREDGE SITE	7
A37	-6.30	DREDGE SITE	7
A38	-6.30	DREDGE SITE	7
A39	-6.25	DREDGE SITE	7
A40	-6.40	DREDGE SITE	6
A41	-6.35	DREDGE SITE	8
A42	-6.35	DREDGE SITE	8
A43	-6.55	DREDGE SITE	7
A44	-6.20	DREDGE SITE	7
A45	-6.20	DREDGE SITE	7
A46	-6.30	DREDGE SITE	8
A47	-6.35	DREDGE SITE	8
A48	-6.69	ACCESS CHANNEL	8
A49	-6.79	ACCESS CHANNEL	8
A50	-6.84	ACCESS CHANNEL	8
A51	-6.64	ACCESS CHANNEL	7

Borehole	Borehole Depth (AHD)	Comments	No of Laboratory Samples Analysed
A52	3.45	FILL SITE	1
A53	2.25	FILL SITE	1
A54	2.30	FILL SITE	1

Three hundred and fifty samples were sent to Biotrack in Brisbane for ASS testing comprising Chromium suite analysis. Two boreholes (A22 and A25) were also tested for electrical conductivity (EC) down their profile, the results of which are included in the descriptive logs.

The Chromium (S_{CR}) suite is a collection of independent analytical methods each of which determines a component of the acid base account. As this method is not subject to sulfur interference (false positives) from organic matter or sulfate compounds (eg. gypsum), it is more suited to marine sediment samples than the alternative SPOCAS analysis.

Acid neutralisation capacity was estimated through back titration and dissolved carbonate methods. $ANC_{(CARB)}$ uses strong hydrochloric acid to dissolve carbonate and then measures the evolved carbon dioxide. Calibration is based on a calcium carbonate standard.

The ANC back titration results are likely to underestimate neutralising capacity, despite repeated titrations over several days. Further, the exclusion by mechanical means of coarse shell fragments from the samples by Biotrack will also have lead to a more conservative interpretation of ANC.

Samples and paperwork were received in good order and within recommended holding times.

5.2 SEDIMENT CONTAMINATION

Based on the site history, sediments were analysed for the following quantum of analytes.

Heavy metals are likely to be sourced from marine/light industry. Hydrocarbons and PAH's, if any, would mainly be sourced from commercial/industrial sites and road runoff. TBT's have historically been an active ingredient in anti-fouling paints for marine applications.

TABLE 5.2
QUANTUM OF ANALYTES

Analyte	Number
Base 8 heavy metals	12
TPH/BTEX	12
PAH	6
TBT	6
TOC	6

Samples and paperwork were received in good order and within recommended holding times.

6.0 ANZECC SEDIMENT QUALITY GUIDELINES

The ANZECC sediment quality guidelines are intended to reflect levels of contaminants in sediment that might be harmful to aquatic ecosystems. While not absolute, the guidelines provide a basis for identifying contaminant concentrations of concern. Trigger values represent a conservative value that indicates that further investigation or special management measures may be appropriate to ensure that adverse impacts on ecosystems do not occur. Exceedence of trigger values does not necessarily mean that ecosystem damage is occurring or will occur if the sediments are disturbed, but that the likely threat to the ecosystem needs to be assessed on a case by case basis.

The guideline values for metals, metalloids, organometallic and organic compounds are expressed on a dry weight basis to ensure that varying moisture contents are accounted for. For organic compounds, values are normalised to 1% organic carbon as additional available carbon binding potential in sediments reduces the contaminant bioavailability. That is, the more carbon, the less likely contaminants will be released to the environment.

It should be noted these guidelines have a degree of uncertainty, and should not be regarded as absolute numbers. They were developed from tests against one or two marine species, and do not consider synergistic or antagonistic interactions at all. They are also based on likely potential marine biological impact, not impacts on human health.

ANZECC sediment guidelines do not include nutrient limits. Also, no current overseas databases include this information. One reason is that the sediment quality guidelines seek to protect against direct marine animal species impacts, and nutrients generally have an effect on algal or macrophyte blooms. Another major reason is that the scientific community considers the development of such guidelines too difficult at this stage, partly due to the significant natural variation in nutrient levels in different locations and ecosystems which makes it hard to specify a particular trigger level.

If the sediments in the bay are resuspended, it is possible that organic nutrients might break down into more bioavaliable forms which might then cause ecological changes. However, the pathway by which this process occurs is complex, and cannot be predicted just from the concentrations of nutrients in the sediments.

Therefore, the most effective and appropriate means to monitor effects of nutrients is to include them in a water quality monitoring program.

7.0 RESULTS

7.1 ACID SULFATE SOILS

The QASSIT texture based Action Criteria of oxidisable sulphur for fine textured soils is 0.03% Net Acidity if more than 1000 tonnes is disturbed. The Action Criteria for equivalent Total Potential Acidity (TPA) is 18 mol H^+/tonne.

The relevant net acidity calculations for the fifty-one boreholes south of the Shute Harbour road indicate excess neutralising capacity to the maximum depth tested. i.e.: the net result was below the Action Criteria of 0.03% equivalent sulfur – with all of them being negative, indicating excess neutralising capacity. These calculations include a safety division factor of 1.5.

The field screening results north of the road indicated the potential for slightly acidic upper horizons (0.0 - 0.3). This is suspected on the basis of our local knowledge and experience to be a result of natural acidity in these horizons rather than the presence of pyritic material.

This assessment was confirmed by laboratory test results, which indicated that there were negligible levels of sulfides in the upper horizons, with all the acidity being actual rather than potential acidity.

In all but three boreholes south of the road the achieved depth was one metre below the proposed dredge level of -5.2m AHD. North of the road the three boreholes refused on rock at shallow depths of 0.1-0.3m.

A summary of results is shown in Table 7.1. Full laboratory results are given in Appendix D.

A legend of acronyms used in the table is given below.

Table 7.1 Legend

Measures of Potential Acidity

S_{CR}	Chromium Reducible Sulfur (from S_{CR} method)

Measures of Existing Acidity

s-TAA	Titratable Actual Acidity (converted to equivalent %S)
s-RAS	Residual Acid Soluble Sulfur (converted to equipment %S)

SPOCAS Results

pH_{KCL}	pH of soil in potassium chloride extract

ANC Results

$s\text{-}ANC_{BK}$	ANC via back titration method (converted to equivalent %S)
$s\text{-}ANC_{CARB}$	ANC via carbonate method (converted to equivalent %S)

SHUTE HARBOUR LABORATORY ASS RESULTS SUMMARY

3rd November 2004

	ID	TESTING	pH KCl	s-TAA %S	S Cr %S	s-RAS %S	ANC BT %S	ANC CARB %S	ABA (1) Net Acid %S	ABA (1) Liming (kg lime/m3)
A1	A1 0-0.5 m	CHROMIUM SUITE	8.41	0	0.11		0.59		-0.28	NA
	A1 0.5-0.9 m	CHROMIUM SUITE	8.41	0	0.11		0.85		-0.46	NA
	A1 0.9-1.4 m	CHROMIUM SUITE	8.74	0	0.19		2.08		-1.20	NA
	A1 1.4-2.0 m	CHROMIUM SUITE	8.75	0	0.18		2.05		-1.19	NA
A2	A2 0-0.5 m	CHROMIUM SUITE + ANCcarb	8.77	0	<0.01		1.44	3.74	-0.95	NA
	A2 0.5-0.8 m	CHROMIUM SUITE + ANCcarb	9.09	0	0.04		1.37	3.23	-0.87	NA
	A2 0.8-1.3 m	CHROMIUM SUITE + ANCcarb	8.99	0	0.15		2.25	3.47	-1.35	NA
	A2 1.3-1.8 m	CHROMIUM SUITE + ANCcarb	9.02	0	0.07		1.10	2.52	-0.66	NA
A3	A3 0-0.5 m	CHROMIUM SUITE + ANCcarb	9.23	0	0.06		3.61	9.86	-2.35	NA
	A3 0.5-0.9 m	CHROMIUM SUITE + ANCcarb	8.86	0	0.24		8.49	13.57	-5.42	NA
	A3 0.9-1.3 m	CHROMIUM SUITE + ANCcarb	8.84	0	0.28		2.15	8.82	-1.15	NA
	A3 1.3-1.35 m	CHROMIUM SUITE + ANCcarb	8.27	0	0.14		0.62	1.59	-0.27	NA
A4	A 4 0.6-1.1 m	Scr + ANCcarb			0.08			15.33	-10.14	NA
	A 4 1.1-1.6 m	Scr			0.11			*14.11*	-9.29	NA
	A 4 1.6-2.1 m	Scr + ANCcarb			0.18			12.88	-8.41	NA
	A 4 2.1-2.6 m	Scr			0.25			*9.95*	-6.38	NA
	A 4 2.6-3.1 m	Scr + ANCcarb			0.34			7.01	-4.33	NA
	A 4 3.0-3.5 m	Scr + ANCcarb			0.19			10.54	-6.84	NA
	A 4 3.5-3.75 m	Scr + ANCcarb			0.16			1.58	-0.89	NA
A5	A5 0-0.5 m	CHROMIUM SUITE + ANCcarb	9.08	0	0.04		4.02	11.78	-2.64	NA
	A5 0.5-1.2 m	CHROMIUM SUITE + ANCcarb	9.08	0	0.06		4.03	13.57	-2.63	NA
	A5 1.2-1.7 m	CHROMIUM SUITE + ANCcarb	9.04	0	0.09		5.02	15.61	-3.26	NA
	A5 1.7-2.0 m	CHROMIUM SUITE + ANCcarb	8.82	0	0.15		5.94	14.62	-3.81	NA
A6	A6 0-0.5 m	CHROMIUM SUITE + ANCcarb	9.07	0	0.06		3.92	18.91	-2.55	NA
	A6 0.5-1.0 m	CHROMIUM SUITE + ANCcarb	8.9	0	0.13		4.71	19.46	-3.01	NA
	A6 1.0-1.6 m	CHROMIUM SUITE + ANCcarb	8.72	0	0.21		3.75	17.05	-2.29	NA
A7	A 7 0-0.5 m	Scr + ANCcarb			0.11			13.97	-9.20	NA
	A 7 0.5-1.0 m	Scr + ANCcarb			0.18			12.20	-7.95	NA
A8	A 8 0-0.5 m	CHROMIUM SUITE	8.94	0	0.06		12.76		-8.45	NA
	A 8 0.5-1.0 m	Scr			0.11		*10.24*		-6.72	NA
	A 8 1.0-1.5 m	CHROMIUM SUITE	8.78	0	0.09		7.72		-5.06	NA
	A 8 1.5-2.0 m	CHROMIUM SUITE	8.43	0	0.17		4.51		-2.84	NA
	A 8 2.0-2.5 m	CHROMIUM SUITE	8.7	0	0.21		3.86		-2.36	NA
	A 8 2.5-3.0 m	CHROMIUM SUITE	8.5	0	0.22		3.71		-2.25	NA
	A 8 3.0-3.5 m	CHROMIUM SUITE	8.27	0	0.29		4.49		-2.70	NA
	A 8 3.5-3.8 m	CHROMIUM SUITE	8.18	0	0.3		3.37		-1.95	NA
A9	A 9 0-0.5 m	Scr			0.04			*9.20*	-6.09	NA
	A 9 0.5-1.0 m	Scr + ANCcarb			0.07			9.20	-6.06	NA
	A 9 1.0-1.5 m	Scr + ANCcarb			0.12			7.79	-5.07	NA
	A 9 1.5-2.0 m	Scr + ANCcarb			0.15			5.47	-3.50	NA
	A 9 2.0-2.5 m	Scr + ANCcarb			0.19			4.83	-3.03	NA
	A 9 2.5-3.0 m	Scr + ANCcarb			0.19			2.74	-1.64	NA
	A 9 3.0-3.5 m	Scr + ANCcarb			0.24			2.32	-1.31	NA
	A 9 3.5-4.15 m	Scr + ANCcarb			0.19			1.81	-1.02	NA
A10	A10 0-0.4 m	CHROMIUM SUITE	8.95	0	0.2		8.97		-5.78	NA
	A10 0.4-0.9 m	CHROMIUM SUITE	8.61	0	0.24		7.05		-4.46	NA
	A10 0.9-1.4 m	CHROMIUM SUITE	8.55	0	0.26		6.85		-4.31	NA
	A10 1.4-2.0 m	CHROMIUM SUITE	8.56	0	0.32		5.95		-3.65	NA
A11	A11 0-0.5 m	CHROMIUM SUITE + ANCcarb	9.07	0	0.17		5.81	17.13	-3.70	NA
	A11 0.5-0.7 m	CHROMIUM SUITE + ANCcarb	9.04	0	0.11		5.19	19.84	-3.35	NA
	A11 0.7-1.2 m	CHROMIUM SUITE + ANCcarb	8.71	0	0.22		4.07	14.50	-2.49	NA
	A11 1.2-1.7 m	CHROMIUM SUITE + ANCcarb	8.68	0	0.22		4.52	16.31	-2.79	NA
	A11 1.7-2.0 m	CHROMIUM SUITE + ANCcarb	8.54	0	0.33		6.81	11.40	-4.21	NA
A12	A 12 0-0.5 m	Scr + ANCcarb			0.07			18.14	-12.02	NA
	A 12 0.5-1.0 m	Scr			0.12			*11.85*	-7.78	NA
	A 12 1.0-1.5 m	Scr + ANCcarb			0.16			5.55	-3.54	NA
	A 12 1.5-2.0 m	Scr + ANCcarb			0.12			7.65	-4.98	NA
	A 12 2.0-2.5 m	Scr + ANCcarb			0.14			5.39	-3.45	NA
	A 12 2.5-3.0 m	Scr + ANCcarb			0.25			3.14	-1.84	NA
	A 12 3.0-3.5 m	Scr + ANCcarb			0.22			4.19	-2.57	NA
	A 12 3.5-3.75 m	Scr + ANCcarb			0.26			3.74	-2.23	NA

CHROMIUM SUITE ACID BASE ACCOUNTING

ANC figures in italics are extrapolated

ABA (1) = Scr - (ANCbt or ANCcarb/1.5)

SHUTE HARBOUR LABORATORY ASS RESULTS SUMMARY

3rd November 2004

	ID	TESTING	pH KCl	s-TAA %S	S Cr %S	s-RAS %S	ANC BT %S	ANC CARB %S	ABA (1) Net Acid %S	ABA (1) Liming (kg lime/m3)
A13	A 13 0-0.5 m	CHROMIUM SUITE	8.43	0	0.07		11.61		-7.67	NA
	A 13 0.5-1.0 m	Scr			0.11		*10.12*		-6.64	NA
	A 13 1.0-1.5 m	CHROMIUM SUITE	8.79	0	0.13		8.63		-5.62	NA
	A 13 1.5-2.0 m	CHROMIUM SUITE	8.67	0	0.19		5.95		-3.78	NA
	A 13 2.0-2.5 m	CHROMIUM SUITE	8.67	0	0.2		0.46		-0.11	NA
	A 13 2.5-3.0 m	CHROMIUM SUITE	8.42	0	0.16		3.16		-1.95	NA
	A 13 3.0-3.5 m	CHROMIUM SUITE	8.64	0	0.23		1.95		-1.07	NA
	A 13 3.5-3.75 m	CHROMIUM SUITE	8.59	0	0.22		2.55		-1.48	NA
A14	A14 0-0.6 m	CHROMIUM SUITE	8.61	0	0.08		12.46		-8.23	NA
	A14 0.6-1.1 m	CHROMIUM SUITE	8.53	0	0.15		7.75		-5.02	NA
	A14 1.1-1.6 m	CHROMIUM SUITE	8.48	0	0.18		7.20		-4.62	NA
	A14 1.6-2.1 m	CHROMIUM SUITE	8.61	0	0.34		5.68		-3.45	NA
	A14 2.1-2.6 m	CHROMIUM SUITE	8.32	0	0.18		3.74		-2.31	NA
	A14 2.6-3.1 m	CHROMIUM SUITE	8.39	0	0.52		2.78		-1.33	NA
A15	A 15 0-0.5 m	Scr			0.14			*8.10*	-5.26	NA
	A 15 0.5-1.0 m	Scr + ANCcarb			0.26			8.10	-5.14	NA
	A 15 1.0-1.5 m	Scr + ANCcarb			0.24			7.10	-4.49	NA
	A 15 1.5-2.0 m	Scr + ANCcarb			0.25			6.30	-3.95	NA
	A 15 2.0-2.5 m	Scr + ANCcarb			0.28			4.06	-2.43	NA
	A 15 2.5-3.0 m	Scr + ANCcarb			0.33			2.80	-1.54	NA
	A 15 3.0-3.5 m	Scr + ANCcarb			0.51			2.86	-1.40	NA
A16	A 16 0-0.5 m	Scr + ANCcarb			0.07			16.25	-10.76	NA
	A 16 0.5-1.0 m	Scr			0.15			*12.60*	-8.25	NA
	A 16 1.0-1.5 m	Scr + ANCcarb			<0.01			8.95	-5.96	NA
	A 16 1.5-2.0 m	Scr			0.21			*6.49*	-4.11	NA
	A 16 2.0-2.5 m	Scr + ANCcarb			0.43			4.02	-2.25	NA
	A 16 2.5-3.0 m	Scr			0.45			*3.10*	-1.61	NA
	A 16 3.0-3.5 m	Scr + ANCcarb			0.56			2.17	-0.89	NA
	A 16 3.5-3.75 m	Scr + ANCcarb			0.57			2.86	-1.34	NA
A17	A17 0-0.5 m	CHROMIUM SUITE	8.53	0	0.14		7.76		-5.03	NA
	A17 0.5-1.0 m	CHROMIUM SUITE	8.51	0	0.2		6.85		-4.37	NA
	A17 1.0-1.5 m	CHROMIUM SUITE	8.62	0	0.18		6.57		-4.20	NA
	A17 1.5-2.0 m	CHROMIUM SUITE	8.57	0	0.18		6.85		-4.39	NA
	A17 2.0-2.5 m	CHROMIUM SUITE	8.4	0	0.25		6.05		-3.78	NA
	A17 2.5-3.0 m	CHROMIUM SUITE	8.42	0	0.24		3.10		-1.83	NA
	A17 3.0-3.5 m	CHROMIUM SUITE	8.24	0	0.3		2.82		-1.58	NA
A18	A 18 0-0.5 m	CHROMIUM SUITE	8.94	0	0.24		12.50		-8.09	NA
	A 18 0.5-1.0 m	Scr			0.13		*9.38*		-6.12	NA
	A 18 1.0-1.5 m	CHROMIUM SUITE	8.6	0	0.16		6.26		-4.01	NA
	A 18 1.5-2.0 m	Scr			0.35		*4.74*		-2.81	NA
	A 18 2.0-2.5 m	CHROMIUM SUITE	8.3	0	0.27		3.21		-1.87	NA
	A 18 2.5-3.0 m	Scr			0.38		*2.61*		-1.36	NA
	A 18 3.0-3.5 m	CHROMIUM SUITE	8.29	0	0.19		2.01		-1.15	NA
	A 18 3.5-3.75 m	CHROMIUM SUITE	8.17	0	0.26		2.52		-1.42	NA
A19	A19 0-0.5 m	CHROMIUM SUITE	8.66	0	0.1		10.46		-6.87	NA
	A19 0.5-1.0 m	CHROMIUM SUITE	8.25	0	0.33		3.80		-2.20	NA
	A19 1.0-1.5 m	CHROMIUM SUITE	8.62	0	0.15		8.90		-5.78	NA
	A19 1.5-2.0 m	CHROMIUM SUITE	8.41	0	0.17		7.16		-4.60	NA
	A19 2.0-2.5 m	CHROMIUM SUITE	8.35	0	0.31		4.60		-2.76	NA
	A19 2.5-3.0 m	CHROMIUM SUITE	8.34	0	0.36		2.80		-1.51	NA
	A19 3.0-3.5 m	CHROMIUM SUITE	8.1	0	0.31		2.29		-1.22	NA
A20	A 20 0-0.5 m	Scr			0.09		*6.62*		-4.32	NA
	A 20 0.5-1.0 m	CHROMIUM SUITE	8.7	0	0.11		6.62		-4.30	NA
	A 20 1.0-1.5 m	Scr			0.29		*5.27*		-3.22	NA
	A 20 1.5-2.0 m	CHROMIUM SUITE	8.39	0	0.29		3.92		-2.32	NA
	A 20 2.0-2.5 m	Scr			0.46		*4.03*		-2.22	NA
	A 20 2.5-3.0 m	CHROMIUM SUITE	8.38	0	0.32		4.13		-2.43	NA
	A 20 3.0-3.5 m	CHROMIUM SUITE	7.9	0	0.33		2.09		-1.06	NA
A21	A 21 0-0.5 m	Scr + ANCcarb			0.07			19.10	-12.66	NA
	A 21 0.5-1.0 m	Scr			0.13			*13.11*	-8.61	NA
	A 21 1.0-1.5 m	Scr + ANCcarb			0.13			7.12	-4.62	NA
	A 21 1.5-2.0 m	Scr + ANCcarb			0.18			5.28	-3.34	NA
	A 21 2.0-2.5 m	Scr + ANCcarb			0.19			2.61	-1.55	NA
	A 21 2.5-3.0 m	Scr + ANCcarb			0.21			1.82	-1.00	NA
	A 21 3.0-3.5 m	Scr + ANCcarb			0.16			1.60	-0.91	NA

CHROMIUM SUITE ACID BASE ACCOUNTING

ANC figures in italics are extrapolated

ABA (1) = Scr - (ANCbt or ANCcarb/1.5)

SHUTE HARBOUR LABORATORY ASS RESULTS SUMMARY

3rd November 2004

	ID	TESTING	pH KCl	s-TAA %S	S Cr %S	s-RAS %S	ANC BT %S	ANC CARB %S	ABA (1) Net Acid %S	ABA (1) Liming (kg lime/m3)
A22	A 22 0-0.5 m	Scr			0.09		*6.56*		-4.28	NA
	A 22 0.5-1.0 m	CHROMIUM SUITE	8.5	0	0.18		6.56		-4.19	NA
	A 22 1.0-1.5 m	CHROMIUM SUITE	8.71	0	0.25		5.81		-3.62	NA
	A 22 1.5-2.0 m	CHROMIUM SUITE	8.4	0	0.21		3.84		-2.35	NA
	A 22 2.0-2.5 m	CHROMIUM SUITE	8.31	0	0.24		3.17		-1.87	NA
	A 22 2.5-3.0 m	CHROMIUM SUITE	8.27	0	0.09		3.08		-1.96	NA
	A 22 3.0-3.5 m	CHROMIUM SUITE	8.24	0	0.21		2.40		-1.39	NA
A23	A 23 0-0.5 m	CHROMIUM SUITE	8.84	0	0.08		8.01		-5.26	NA
	A 23 0.5-1.0 m	Scr			0.18		*7.21*		-4.62	NA
	A 23 1.0-1.5 m	CHROMIUM SUITE	8.6	0	0.19		6.40		-4.08	NA
	A 23 1.5-2.0 m	Scr			0.28		*5.16*		-3.16	NA
	A 23 2.0-2.5 m	CHROMIUM SUITE	8.43	0	0.43		3.92		-2.18	NA
	A 23 2.5-3.0 m	Scr			0.31		*3.27*		-1.87	NA
	A 23 3.0-3.5 m	CHROMIUM SUITE	8.3	0	0.33		2.62		-1.42	NA
	A 23 3.5-4.0 m	Scr			0.36		*2.45*		-1.27	NA
	A 23 4.0-4.25 m	CHROMIUM SUITE	8.11	0	0.34		2.27		-1.17	NA
A24	A 24 0-0.5 m	CHROMIUM SUITE	8.95	0	0.08		10.52		-6.93	NA
	A 24 0.5-1.0 m	Scr			0.15		*7.22*		-4.66	NA
	A 24 1.0-1.5 m	CHROMIUM SUITE	8.48	0	0.2		3.92		-2.41	NA
	A 24 1.5-2.0 m	Scr			0.24		*3.64*		-2.18	NA
	A 24 2.0-2.5 m	CHROMIUM SUITE	8.48	0	0.23		3.35		-2.00	NA
	A 24 2.5-3.0 m	Scr			0.36		*3.02*		-1.65	NA
	A 24 3.0-3.5 m	CHROMIUM SUITE	8.4	0	0.16		2.68		-1.63	NA
A25	A 25 0-0.5 m	Scr + ANCcarb			0.12			13.29	-8.74	NA
	A 25 0.5-1.0 m	Scr			0.17			*10.31*	-6.70	NA
	A 25 1.0-1.5 m	Scr + ANCcarb			0.32			7.32	-4.56	NA
	A 25 1.5-2.0 m	Scr			0.35			*5.90*	-3.58	NA
	A 25 2.0-2.5 m	Scr + ANCcarb			0.42			4.47	-2.56	NA
	A 25 2.5-3.0 m	Scr + ANCcarb			0.47			2.66	-1.30	NA
	A 25 3.0-3.5 m	Scr + ANCcarb			0.53			2.77	-1.32	NA
A26	A 26 0-0.5 m	Scr + ANCcarb			0.12			15.81	-10.42	NA
	A 26 0.5-1.0 m	Scr			0.34			*10.92*	-6.94	NA
	A 26 1.0-1.5 m	Scr + ANCcarb			0.64			6.03	-3.38	NA
	A 26 1.5-2.0 m	Scr			0.67			*4.62*	-2.41	NA
	A 26 2.0-2.5 m	Scr + ANCcarb			0.83			3.20	-1.30	NA
	A 26 2.5-3.0 m	Scr + ANCcarb			0.84			3.16	-1.27	NA
	A 26 3.0-3.25 m	Scr + ANCcarb			0.79			2.99	-1.20	NA
A27	A 27 0-0.5 m	Scr + ANCcarb			0.05			14.34	-9.51	NA
	A 27 0.5-1.0 m	Scr			0.16			*10.91*	-7.11	NA
	A 27 1.0-1.5 m	Scr + ANCcarb			0.34			7.48	-4.65	NA
	A 27 1.5-2.0 m	Scr			0.39			*5.51*	-3.28	NA
	A 27 2.0-2.5 m	Scr + ANCcarb			0.36			3.53	-1.99	NA
	A 27 2.5-3.0 m	Scr			0.48			*2.94*	-1.48	NA
	A 27 3.0-3.5 m	Scr + ANCcarb			0.42			2.34	-1.14	NA
A28	A 28 0-0.5 m	Scr			0.18			10.44	-6.78	NA
	A 28 0.5-1.0 m	Scr + ANCcarb			0.19			10.44	-6.77	NA
	A 28 1.0-1.5 m	Scr			0.24			*8.43*	-5.38	NA
	A 28 1.5-2.0 m	Scr + ANCcarb			0.28			6.42	-4.00	NA
	A 28 2.0-2.5 m	Scr			0.59			*4.98*	-2.73	NA
	A 28 2.5-3.0 m	Scr + ANCcarb			0.62			3.53	-1.73	NA
	A 28 3.0-3.5 m	Scr + ANCcarb			0.72			3.01	-1.29	NA
A29	A 29 0-0.5 m	Scr			0.23		*6.03*		-3.79	NA
	A 29 0.5-1.0 m	CHROMIUM SUITE	8.08	0	0.12		6.03		-3.90	NA
	A 29 1.0-1.5 m	Scr			0.36		*5.22*		-3.12	NA
	A 29 1.5-2.0 m	CHROMIUM SUITE	8.28	0	0.19		4.40		-2.74	NA
	A 29 2.0-2.5 m	Scr			0.55		*3.82*		-1.99	NA
	A 29 2.5-3.0 m	CHROMIUM SUITE	7.88	0	0.93		3.23		-1.22	NA
	A 29 3.0-3.5 m	CHROMIUM SUITE	7.83	0	1.01		2.88		-0.91	NA
	A 29 3.5-3.75 m	CHROMIUM SUITE	8.01	0	0.94		2.56		-0.77	NA
A30	A 30 0-0.5 m	CHROMIUM SUITE	8.48	0	0.19		4.88		-3.06	NA
	A 30 0.5-1.0 m	Scr			0.13		*5.16*		-3.31	NA
	A 30 1.0-1.5 m	CHROMIUM SUITE	8.21	0	0.39		5.43		-3.23	NA
	A 30 1.5-2.0 m	Scr			0.23		*4.98*		-3.09	NA
	A 30 2.0-2.5 m	CHROMIUM SUITE	7.68	0	0.56		4.52		-2.45	NA
	A 30 2.5-3.0 m	CHROMIUM SUITE	7.9	0	0.61		3.81		-1.93	NA
	A 30 3.0-3.5 m	CHROMIUM SUITE	8.06	0	0.62		3.40		-1.65	NA

CHROMIUM SUITE ACID BASE ACCOUNTING

ANC figures in italics are extrapolated

ABA (1) = Scr - (ANCbt or ANCcarb/1.5)

SHUTE HARBOUR LABORATORY ASS RESULTS SUMMARY

3rd November 2004

	ID	TESTING	pH KCl	s-TAA %S	S Cr %S	s-RAS %S	ANC BT %S	ANC CARB %S	ABA (1) Net Acid %S	ABA (1) Liming (kg lime/m3)
A31	A 31 0-0.5 m	Scr			0.12			*11.29*	-7.41	NA
	A 31 0.5-1.0 m	Scr + ANCcarb			0.15			11.29	-7.38	NA
	A 31 1.0-1.5 m	Scr			0.27			*8.80*	-5.59	NA
	A 31 1.5-2.0 m	Scr + ANCcarb			0.32			6.30	-3.88	NA
	A 31 2.0-2.5 m	Scr			0.41			*5.47*	-3.24	NA
	A 31 2.5-3.0 m	Scr + ANCcarb			0.44			4.64	-2.65	NA
	A 31 3.0-3.5 m	Scr + ANCcarb			0.5			3.84	-2.06	NA
A32	A 32 0-0.5 m	CHROMIUM SUITE	8.67	0	0.15		5.18		-3.30	NA
	A 32 0.5-1.0 m	Scr			0.24		*4.99*		-3.09	NA
	A 32 1.0-1.5 m	CHROMIUM SUITE	8.3	0	0.49		4.80		-2.71	NA
	A 32 1.5-2.0 m	Scr			0.39		*3.76*		-2.12	NA
	A 32 2.0-2.5 m	CHROMIUM SUITE	8.1	0	0.63		2.72		-1.18	NA
	A 32 2.5-3.0 m	CHROMIUM SUITE	7.72	0	0.67		5.47		-2.98	NA
	A 32 3.0-3.5 m	CHROMIUM SUITE	7.71	0	0.81		1.98		-0.51	NA
A33	A 33 0-0.5 m	Scr			0.1		8.54		-5.59	NA
	A 33 0.5-1.0 m	CHROMIUM SUITE	8.67	0	0.26		8.54		-5.43	NA
	A 33 1.0-1.5 m	Scr			0.27		*6.66*		-4.17	NA
	A 33 1.5-2.0 m	CHROMIUM SUITE	8.43	0	0.55		4.77		-2.63	NA
	A 33 2.0-2.5 m	Scr			0.44		*3.71*		-2.03	NA
	A 33 2.5-3.0 m	CHROMIUM SUITE	8.27	0	0.29		2.64		-1.47	NA
	A 33 3.0-3.25 m	CHROMIUM SUITE	8.16	0	0.12		2.20		-1.35	NA
A34	A 34 0-0.5 m	Scr + ANCcarb			0.24			9.26	-5.93	NA
	A 34 0.5-1.0 m	Scr			0.28			*8.55*	-5.42	NA
	A 34 1.0-1.5 m	Scr + ANCcarb			0.41			7.83	-4.81	NA
	A 34 1.5-2.0 m	Scr			0.6			*6.18*	-3.52	NA
	A 34 2.0-2.5 m	Scr + ANCcarb			0.72			4.53	-2.30	NA
	A 34 2.5-3.0 m	Scr + ANCcarb			0.87			3.36	-1.37	NA
	A 34 3.0-3.5 m	Scr + ANCcarb			0.57			1.90	-0.70	NA
	A 34 3.5-4.0 m	Scr + ANCcarb			0.82			2.61	-0.92	NA
A35	A 35 0-0.5 m	Scr			0.24			10.20	-6.56	NA
	A 35 0.5-1.0 m	Scr + ANCcarb			0.22			10.20	-6.58	NA
	A 35 1.0-1.5 m	Scr			0.41			*8.07*	-4.97	NA
	A 35 1.5-2.0 m	Scr + ANCcarb			0.44			5.93	-3.51	NA
	A 35 2.0-2.5 m	Scr + ANCcarb			0.65			4.48	-2.34	NA
	A 35 2.5-3.0 m	Scr + ANCcarb			0.55			3.90	-2.05	NA
	A 35 3.0-3.5 m	Scr + ANCcarb			0.78			3.17	-1.33	NA
	A 35 3.5-3.75 m	Scr + ANCcarb			0.88			3.48	-1.44	NA
A36	A 36 0-0.5 m	Scr			0.07			10.18	-6.72	NA
	A 36 0.5-1.0 m	Scr + ANCcarb			0.18			10.18	-6.61	NA
	A 36 1.0-1.5 m	Scr			0.22			*6.90*	-4.38	NA
	A 36 1.5-2.0 m	Scr + ANCcarb			0.2			3.61	-2.21	NA
	A 36 2.0-2.5 m	Scr + ANCcarb			0.45			5.23	-3.04	NA
	A 36 2.5-3.0 m	Scr + ANCcarb			0.42			4.80	-2.78	NA
	A 36 3.0-3.5 m	Scr + ANCcarb			0.43			4.60	-2.64	NA
A37	A 37 0-0.5 m	Scr			0.12		*4.82*		-3.09	NA
	A37 0.5-1.0 m	CHROMIUM SUITE	7.98	0	0.2		4.82		-3.01	NA
	A 37 1.0-1.5 m	Scr			0.28		*4.23*		-2.54	NA
	A 37 1.5-2.0 m	CHROMIUM SUITE	7.87	0	0.19		3.63		-2.23	NA
	A 37 2.0-2.5 m	CHROMIUM SUITE	7.74	0	0.25		3.29		-1.94	NA
	A 37 2.5-3.0 m	CHROMIUM SUITE	7.74	0	0.35		3.28		-1.84	NA
	A 37 3.0-3.5 m	CHROMIUM SUITE	7.62	0	0.84		2.62		-0.91	NA
A38	A 38 0-0.5 m	CHROMIUM SUITE	8.06	0	0.19		4.73		-2.96	NA
	A 38 0.5-1.0 m	Scr			0.4		*4.85*		-2.83	NA
	A 38 1.0-1.5 m	CHROMIUM SUITE	8.01	0	0.2		4.96		-3.11	NA
	A 38 1.5-2.0 m	Scr			0.37		*4.48*		-2.62	NA
	A 38 2.0-2.5 m	CHROMIUM SUITE	7.78	0	0.58		4.00		-2.09	NA
	A 38 2.5-3.0 m	CHROMIUM SUITE	7.21	0	0.35		2.23		-1.14	NA
	A 38 3.0-3.5 m	CHROMIUM SUITE	7.94	0	0.46		2.79		-1.40	NA
A39	A 39 0-0.5 m	Scr			0.07			10.99	-7.26	NA
	A 39 0.5-1.0 m	Scr + ANCcarb			0.16			10.99	-7.17	NA
	A 39 1.0-1.5 m	Scr			0.29			*8.41*	-5.31	NA
	A 39 1.5-2.0 m	Scr + ANCcarb			0.36			5.82	-3.52	NA
	A 39 2.0-2.5 m	Scr			0.27			*4.96*	-3.03	NA
	A 39 2.5-3.0 m	Scr + ANCcarb			0.46			4.09	-2.27	NA
	A 39 3.0-3.25 m	Scr + ANCcarb			0.27			3.21	-1.87	NA

CHROMIUM SUITE ACID BASE ACCOUNTING

ANC figures in italics are extrapolated

ABA (1) = Scr - (ANCbt or ANCcarb/1.5)

SHUTE HARBOUR LABORATORY ASS RESULTS SUMMARY

3rd November 2004

	ID	TESTING	pH KCl	s-TAA %S	S Cr %S	s-RAS %S	ANC BT %S	ANC CARB %S	ABA (1) Net Acid %S	ABA (1) Liming (kg lime/m3)
A40	A 40 0-0.5 m	CHROMIUM SUITE	9.13	0	0.05		6.30		-4.15	NA
	A 40 0.5-1.0 m	Scr			0.06		*11.44*		-7.57	NA
	A 40 1.0-1.5 m	CHROMIUM SUITE	8.77	0	0.15		16.58		-10.90	NA
	A 40 1.5-2.0 m	CHROMIUM SUITE	9.23	0	0.14		8.23		-5.35	NA
	A 40 2.0-2.5 m	CHROMIUM SUITE	8.52	0	0.17		2.48		-1.48	NA
	A 40 2.5-3.0 m	CHROMIUM SUITE	8.35	0	0.24		2.60		-1.49	NA
A41	A 41 0-0.5 m	Scr			0.11			7.84	-5.12	NA
	A 41 0.5-1.0 m	Scr + ANCcarb			0.2			7.84	-5.03	NA
	A 41 1.0-1.5 m	Scr			0.39			*6.79*	-4.13	NA
	A 41 1.5-2.0 m	Scr + ANCcarb			0.31			5.73	-3.51	NA
	A 41 2.0-2.5 m	Scr			0.35			*5.08*	-3.03	NA
	A 41 2.5-3.0 m	Scr + ANCcarb			0.38			4.42	-2.57	NA
	A 41 3.0-3.5 m	Scr			0.56			*3.51*	-1.78	NA
	A 41 3.5-3.75 m	Scr + ANCcarb			0.67			2.60	-1.06	NA
A42	A 42 0-0.5 m	CHROMIUM SUITE	8.37	0	0.25		4.89		-3.01	NA
	A 42 0.5-1.0 m	Scr			0.26		*4.87*		-2.99	NA
	A 42 1.0-1.5 m	CHROMIUM SUITE	8.8	0	0.46		4.85		-2.77	NA
	A 42 1.5-2.0 m	Scr			0.28		*4.18*		-2.51	NA
	A 42 2.0-2.5 m	CHROMIUM SUITE	8.02	0	0.66		3.51		-1.68	NA
	A 42 2.5-3.0 m	Scr			0.48		*3.16*		-1.63	NA
	A 42 3.0-3.5 m	CHROMIUM SUITE	7.73	0	0.8		2.81		-1.07	NA
	A 42 3.5-3.75 m	CHROMIUM SUITE	7.96	0	0.85		2.38		-0.74	NA
A43	A 43 0-0.5 m	Scr + ANCcarb			0.09			10.96	-7.22	NA
	A 43 0.5-1.0 m	Scr			0.12			*9.55*	-6.24	NA
	A 43 1.0-1.5 m	Scr + ANCcarb			0.25			8.13	-5.17	NA
	A 43 1.5-2.0 m	Scr			0.24			*6.29*	-3.95	NA
	A 43 2.0-2.5 m	Scr + ANCcarb			0.31			4.45	-2.66	NA
	A 43 2.5-3.0 m	Scr			0.45			*3.98*	-2.20	NA
	A 43 3.0-3.5 m	Scr + ANCcarb			0.45			3.50	-1.88	NA
A44	A 44 0-0.5 m	Scr			0.11		*8.48*		-5.54	NA
	A 44 0.5-1.0 m	CHROMIUM SUITE	7.94	0	0.14		8.48		-5.51	NA
	A 44 1.0-1.5 m	CHROMIUM SUITE	8.52	0	0.34		6.94		-4.29	NA
	A 44 1.5-2.0 m	CHROMIUM SUITE	8.7	0	0.37		5.98		-3.62	NA
	A 44 2.0-2.5 m	CHROMIUM SUITE	8.36	0	0.48		4.40		-2.45	NA
	A 44 2.5-3.0 m	CHROMIUM SUITE	8.38	0	0.39		3.76		-2.12	NA
	A 44 3.0-3.5 m	CHROMIUM SUITE	8.43	0	0.54		3.91		-2.07	NA
A45	A 45 0-0.5 m	Scr + ANCcarb			0.04			12.49	-8.29	NA
	A 45 0.5-1.0 m	Scr + ANCcarb			0.15			12.20	-7.98	NA
	A 45 1.0-1.5 m	Scr + ANCcarb			0.22			6.94	-4.41	NA
	A 45 1.5-2.0 m	Scr + ANCcarb			0.35			5.51	-3.32	NA
	A 45 2.0-2.5 m	Scr + ANCcarb			0.41			4.21	-2.40	NA
	A 45 2.5-3.0 m	Scr + ANCcarb			0.46			4.80	-2.74	NA
	A 45 3.0-3.25 m	Scr + ANCcarb			0.32			3.48	-2.00	NA
A46	A 46 0-0.5 m	Scr			0.15		*7.24*		-4.68	NA
	A 46 0.5-1.0 m	CHROMIUM SUITE	8.71	0	0.17		7.24		-4.66	NA
	A 46 1.0-1.5 m	Scr			0.23		*6.27*		-3.95	NA
	A 46 1.5-2.0 m	CHROMIUM SUITE	8.25	0	0.18		5.30		-3.35	NA
	A 46 2.0-2.5 m	Scr			0.39		*4.29*		-2.47	NA
	A 46 2.5-3.0 m	CHROMIUM SUITE	8.33	0	0.41		3.28		-1.78	NA
	A 46 3.0-3.5 m	CHROMIUM SUITE	8.27	0	0.27		2.97		-1.71	NA
	A 46 3.5-4.0 m	CHROMIUM SUITE	8.4	0	0.25		2.46		-1.39	NA
A47	A 47 0-0.5 m	CHROMIUM SUITE	8.64	0	0.07		8.06		-5.30	NA
	A 47 0.5-1.0 m	CHROMIUM SUITE	8.63	0	0.11		8.37		-5.47	NA
	A 47 1.0-1.5 m	CHROMIUM SUITE	8.47	0	0.19		6.69		-4.27	NA
	A 47 1.5-2.0 m	CHROMIUM SUITE	8.56	0	0.38		6.16		-3.73	NA
	A 47 2.0-2.5 m	CHROMIUM SUITE	8.39	0	0.3		4.20		-2.50	NA
	A 47 2.5-3.0 m	CHROMIUM SUITE	8.33	0	0.52		3.27		-1.66	NA
	A 47 3.0-3.5 m	CHROMIUM SUITE	8.29	0	0.58		2.68		-1.21	NA
	A 47 3.5-3.75 m	CHROMIUM SUITE	8.31	0	0.64		2.31		-0.90	NA
A48	A 48 0-0.5 m	Scr			0.1		*5.59*		-3.63	NA
	A 48 0.5-1.0 m	CHROMIUM SUITE	8.56	0	0.28		5.59		-3.45	NA
	A 48 1.0-1.5 m	Scr			0.4		*4.58*		-2.65	NA
	A 48 1.5-2.0 m	CHROMIUM SUITE	8.29	0	0.48		3.57		-1.90	NA
	A 48 2.0-2.5 m	CHROMIUM SUITE	8.2	0	0.54		2.97		-1.44	NA
	A 48 2.5-3.0 m	CHROMIUM SUITE	8.21	0	0.55		2.92		-1.40	NA
	A 48 3.0-3.5 m	CHROMIUM SUITE	8.19	0	0.6		2.41		-1.01	NA
	A 48 3.5-3.75 m	CHROMIUM SUITE	8.07	0	0.59		2.39		-1.00	NA

CHROMIUM SUITE ACID BASE ACCOUNTING

ANC figures in italics are extrapolated

ABA (1) = Scr - (ANCbt or ANCcarb/1.5)

3rd November 2004

	ID	TESTING	pH KCl	s-TAA %S	S Cr %S	s-RAS %S	ANC BT %S	ANC CARB %S	ABA (1) Net Acid %S	ABA (1) Liming (kg lime/m3)
A49	A 49 0-0.5 m	CHROMIUM SUITE	8.9	0	0.1		4.18		-2.69	NA
	A 49 0.5-1.0 m	Scr			0.28		*3.93*		-2.34	NA
	A 49 1.0-1.5 m	CHROMIUM SUITE	8.5	0	0.41		3.68		-2.04	NA
	A 49 1.5-2.0 m	Scr			0.44		*4.74*		-2.72	NA
	A 49 2.0-2.5 m	CHROMIUM SUITE	8.28	0	0.44		5.80		-3.43	NA
	A 49 2.5-3.0 m	CHROMIUM SUITE	7.93	0	0.46		2.64		-1.30	NA
	A 49 3.0-3.5 m	CHROMIUM SUITE	8.21	0	0.55		2.29		-0.98	NA
	A 49 3.5-3.75 m	CHROMIUM SUITE	8.22	0	0.55		2.42		-1.06	NA
A50	A 50 0-0.5 m	Scr			0.1		*5.71*		-3.71	NA
	A 50 0.5-1.0 m	CHROMIUM SUITE	8.68	0	0.22		5.71		-3.59	NA
	A 50 1.0-1.5 m	Scr			0.3		*4.57*		-2.75	NA
	A 50 1.5-2.0 m	CHROMIUM SUITE	8.34	0	0.37		3.43		-1.92	NA
	A 50 2.0-2.5 m	Scr			0.46		*3.14*		-1.63	NA
	A 50 2.5-3.0 m	CHROMIUM SUITE	8.26	0	0.52		2.85		-1.38	NA
	A 50 3.0-3.5 m	CHROMIUM SUITE	8.27	0	0.5		2.96		-1.47	NA
	A 50 3.5-3.75 m	CHROMIUM SUITE	8.31	0	0.49		2.52		-1.19	NA
A51	A 51 0-0.5 m	CHROMIUM SUITE	8.85	0	0.09		4.92		-3.19	NA
	A 51 0.5-1.0 m	Scr			0.2		*4.41*		-2.74	NA
	A 51 1.0-1.5 m	CHROMIUM SUITE	8.44	0	0.33		3.89		-2.26	NA
	A 51 1.5-2.0 m	Scr			0.39		*3.71*		-2.08	NA
	A 51 2.0-2.5 m	CHROMIUM SUITE	8.31	0	0.47		3.53		-1.88	NA
	A 51 2.5-3.0 m	CHROMIUM SUITE	8.15	0	0.46		3.04		-1.57	NA
	A 51 3.0-3.5 m	CHROMIUM SUITE	8.2	0	0.5		3.09		-1.56	NA
A52	A 52 0.0-0.15 m	CHROMIUM SUITE	4.76	0.04	<0.01	<0.01			0.04	NA
A53	A 53 0.0-0.15 m	CHROMIUM SUITE	5.45	0.02	<0.01	<0.01			0.02	NA
A54	A 54 0.0-0.3 m	CHROMIUM SUITE	5.68	0.01	<0.01	<0.01			0.01	NA

CHROMIUM SUITE ACID BASE ACCOUNTING

ANC figures in italics are extrapolated

ABA (1) = Scr - (ANCbt or ANCcarb/1.5)

7.2 SEDIMENT CONTAMINATION

7.2.1 Metals

The 'base 8' metals analysis screens eight heavy metals that are key pollutant indicators. These are arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury. Twelve samples were analysed for total metals. While waters and high-moisture content soils such as sediments can be analysed for only dissolved metals, total metal analysis is more conservative. Total metals analysis includes both the dissolved (in the sediment pore water) and the bound metal components in the sediment soils and thus always returns a greater value than the dissolved metal analysis. However, the major toxic impact of metals comes from the dissolved fraction. This is because organisms are more likely to be exposed to metals in the water column rather than those bound in sediments.

TABLE 7.2

TOTAL METALS IN SEDIMENTS (mg/kg)

No	Sample	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury
1	A4 0 - 0.1	2	<1	3	<1	3	1	1	<0.1
2	A4 0.1 - 0.5	3	<1	4	<1	2	2	2	<0.1
3	A22 0 - 0.1	2	<1	5	2	3	2	2	<0.1
4	A22 0.1 - 0.5	6	<1	11	2	4	5	5	<0.1
5	A7 0 - 0.1	2	<1	3	<1	2	<1	<1	<0.1
6	A7 0.1 - 0.5	2	<1	3	<1	4	1	<1	<0.1
7	A23 0.1 - 0.5	7	<1	11	3	4	5	4	<0.1
8	A41 0.1 - 0.5	6	<1	13	3	4	6	6	<0.1
9	A43 0.1 - 0.5	6	<1	13	3	4	6	4	<0.1
10	A25 0.1 - 0.5	5	<1	11	2	3	5	1	<0.1
11	A16 0 - 0.5	3	<1	4	1	2	2	<1	<0.1
12	A39 0.1 - 0.5	5	<1	10	2	3	5	<1	<0.1
ANZECC Trigger		20	1.5	80	65	21	50	200	0.15

Notes:

1. Guideline Value: ANZECC *Guidelines for Fresh and Marine Water Quality* 2000. Sediment Quality Guidelines 'Low'.

None of the twelve samples displayed results above the 'low' threshold values of the ANZECC 2000 sediment quality guidelines.

Test results are included in Appendix D.

7.2.2 TPH/BTEX

Low surrogate recoveries due to matrix interference were reported for many of the hydrocarbon results. This likely was as a result of the high organic content of the sediment, and could potentially mask some hydrocarbon contamination. However, this would only be an issue if the samples displayed contamination results near significant thresholds, which they did not.

As none of the twelve samples analysed for TPH/BTEX returned results even above the limit of reporting (LOR) the low surrogate recoveries are not considered significant.

LOR for BTEX:	C_6-C_9 <2 C_{10}-C_{14} <50 C_{15}-C_{28} <100 C_{29}-C_{36} <100 BTEX <0.2

TABLE 7.3
TPH/BTEX TEST SCHEDULE

No	Sample Location	Depth Range (m)
1	A4	0.1 - 0.5
2	A22	0 - 0.1
3	A7	0 - 0.1
4	A23	0.1 - 0.5
5	A41	0.1 - 0.5
6	A43	0 - 0.1
7	A43	0.1 - 0.5
8	A25	0 - 0.1
9	A25	0.1 - 0.5
10	A16	0.1 - 0.5
11	A39	0 - 0.1
12	A39	0.1 - 0.5

Test results are included in Appendix D.

7.2.3 Polyaromatic Hydrocarbons (PAH)

None of the six samples analysed for PAH returned results above the limit of reporting (LOR). One sample, A41 (0 - 0.1) reported a low surrogate recovery due to matrix effects. This is not considered significant for the same reasons as outlined in Section 7.2.2.

TABLE 7.4
POLYAROMATIC HYDROCARBONS

No	Sample Location	Depth Range (m)	PAH (mg/kg)
1	A23	0 - 0.1	<0.50
2	A41	0 - 0.1	<0.50
3	A25	0 - 0.1	<0.50
4	A16	0 - 0.5	<0.50
5	A39	0.1 - 0.5	<0.50
6	A4	0 - 0.1	<0.50

Full results are included in Appendix D.

7.2.4 Tributyltin (TBT)

TBT is a tin-based organic compound that has historically been the active ingredient in marine ani-fouling paints. TBT compounds are extremely toxic to marine organisms.

The tributyltin (TBT) results are given in Table 7.5. No visible paint flecks were noted at the time of the investigation.

However, the laboratory quality control reported poor duplicate precision (sample A22 0 - 0.1) due to sample heterogeneity. This implies that the TBT in the samples is most likely present in paint flecks that may not be randomly distributed, rather than bound to the sediment. Therefore, the actual average, or 'true' TBT concentration in these seabed sediments will be very difficult to estimate.

TABLE 7.5
TRIBUTYLIN TIN RESULTS

No	Sample location (depth range in metres)	TBT (µgSn/kg) normalised to 1% TOC	Screening Level (Effect range low)[2]	Screening Level (Effect range median)[1]
1	A4 0.1 - 0.5	83	5	70
2	A22 0 - 0.1	10	5	70
3	A7 0.1 - 0.5	<0.2	5	70
4	A23 0.1 - 0.5	<0.2	5	70
5	A41 0 - 0.1	<0.2	5	70
6	A25 0.1 - 0.5	<0.2	5	70

When normalised to 1% total organic carbon, two samples displayed TBT results above ANZECC 2000 trigger guideline values. These samples, A4 (0.1 - 0.5m) and A22 (0 - 0.1m) are shown shaded in grey in Table 7.5, and are located in the northern and eastern areas of the site. A22 is proximate to the existing mooring pontoon. The area around A4 may have been used in the past for boat mooring, or paint flecks may have drifted in the current from the eastern areas.

The samples from the western side did not display any TBT above the LOR. While this may be a feature of the heterogeneous distribution of TBT in the sediments across this site, it is also possible that TBT contamination is concentrated to the north and east. The eastern area is the better mooring position for recreational boats; the western area is exposed more at low tides.

If the sediment TBT guidelines are exceeded, the potential impact of the sediments can be better resolved using elutriate testing. This involves diluting the sediment sample with seawater from the site and then analysing the seawater for the above contaminants. An appropriate 'dilution factor' is then used to further divide the result. This means the results from elutriate testing will always be lower than the test results undertaken on the sediment itself.

Utilising the above results without elutriate testing as the basis for an assessment is therefore a conservative assessment of TBT sediment contamination. This was justified due to the small quantum of TBT testing and the heterogeneous distribution of TBT.

[2] ANZECC 2000 Sediment Quality Guidelines

While the quantum of testing in this area did not allow for a full depth profile, given the source of the TBT's, the length of historical use of this area as a mooring zone, and typical deposition rates of sediment in similar regional bays, it is likely that TBT's will be concentrated in the upper layers of sediment (0 - 0.50m). This investigation tested a unit of 0 - 0.50m. The higher result in the lower horizons from A4 may indicate the fact that TBT was more historically prevalent.

Therefore, based on these results, and with consideration to the location of historical mooring areas, the sediments in at least the north eastern parts of the site are likely to be sporadically contaminated with TBT.

Full results are included in Appendix D.

7.3 ELECTRICAL CONDUCTIVITY

EC was tested down the profile of boreholes A22 and A25 in accordance with the TOR. The values ranged from 4.7 - 9.7 dS/m.

8.0 DISCUSSION

8.1 ACID SULFATE SOILS

The State Planning Policy (SPP) 2/02 will apply for this proposed development as the proposed dredge area is below 5 metres AHD and well in excess of $100m^3$.

The results are consistent for sediments (marine sands and muds) with a potential for acid generation that also have significant excess acid neutralising capacity. The natural buffering material derives from particles of calcium carbonate in the marine muds derived from reef and shell debris.

The surficial silty gravels north of the road are naturally slightly acidic, but do not contain any pyritic material. One result, A52 0 - 0.15, gave a net acidity result of 0.04% equivalent S, (based on TAA result only). However, given that this is naturally occurring acidity and that this site is proposed for filling, no special management is recommended.

Cross-sectional diagrams across the site are shown in Figures 2 - 4 in Appendix C.

8.2 SEDIMENT CONTAMINATION

The results indicate that, for the analytes tested, the only potentially significant result is TBT in the shallow sediments, especially in the north eastern portion of the site, which has been used historically for boat mooring and maintenance. The results suggest there is less or no TBT contamination on the western side. However, given the heterogeneous nature of the TBT in the sediment, it is difficult to conclusively rule out any areas of this site from having TBT contamination.

In general however, we would expect the TBT contamination to reduce away from the north eastern area. We would also expect the contamination to be concentrated in the top 0.50m of sediment, although the results indicate that upper 0-0.1m may be less contaminated, given the declining use of TBT in recent years.

A conservative management strategy should therefore be applied to all upper level (top 0.5m depth) sediments from the marina basin. This would involve segregating and controlling the material through a specific management program. This material and any potential run-off should be contained so that it poses minimal risk of release to the marine environment. If the sediment is confirmed as contaminated with TBT above screening levels, run-off water should be tested for total TBT (soluble plus particulate TBT in the water sample) before any release to the environment. We are also aware of various potential treatment processes for TBT contaminated sediments that the client may wish to evaluate on a cost-benefit basis.

8.3 ENVIRONMENTAL MANAGEMENT PLAN

Checking for and the handling of acid sulphate soils and contaminated soils during construction will be covered by the Environmental Management Plan.

9.0 RECOMMENDATIONS FOR MANAGEMENT

Our recommendations for the management of the dredge spoil are as follows:

- Based on the investigation test results, liming is not required for the dredge spoil.
- However, in accordance with QASSIT guidelines, we recommend that verification testing of this material be undertaken during construction. A verification program/management plan should be approved by the appropriate regulators.
- The dredge material should be stored in a manageable and contained area until the results of the verification testing are available.
- As a conservative precaution, we recommend continuous pH monitoring of any clear tailwater prior to environmental discharge.
- The results indicate that there evidence of limited TBT contamination in the upper level sediments in some parts of the site.
- Water quality sampling and assessment should be undertaken before and during dredging to ensure that turbidity and nutrient levels are within acceptable limits.

10.0 LIMITATIONS

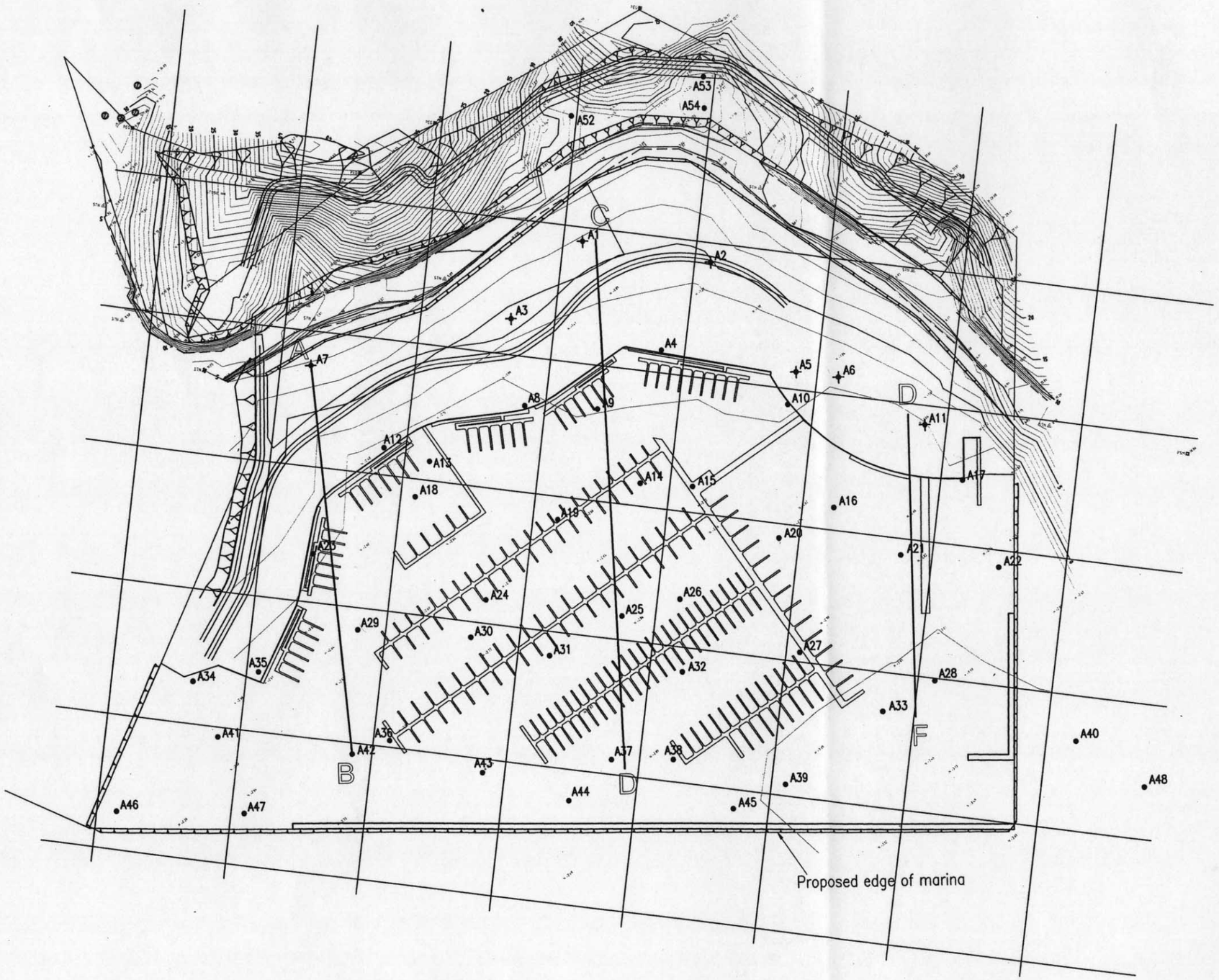
The findings presented in this report have been based on the investigation described herein. Analysis of results is based on the samples obtained and the parameters analysed.

It is recommended that if any conditions other than those described herein are encountered during excavation, further advice should be immediately sought from Ullman & Nolan Technical Services.

This report has been prepared specifically for use by the project designers. It may not contain information appropriate for other purposes or other users.

Appendix A

Figure 1 – Borehole Locality Plan, Acid Sulfate Soils
Figure 5 – Borehole Locality Plan, Sediment Contamination
Colour Aerial Locality Photograph



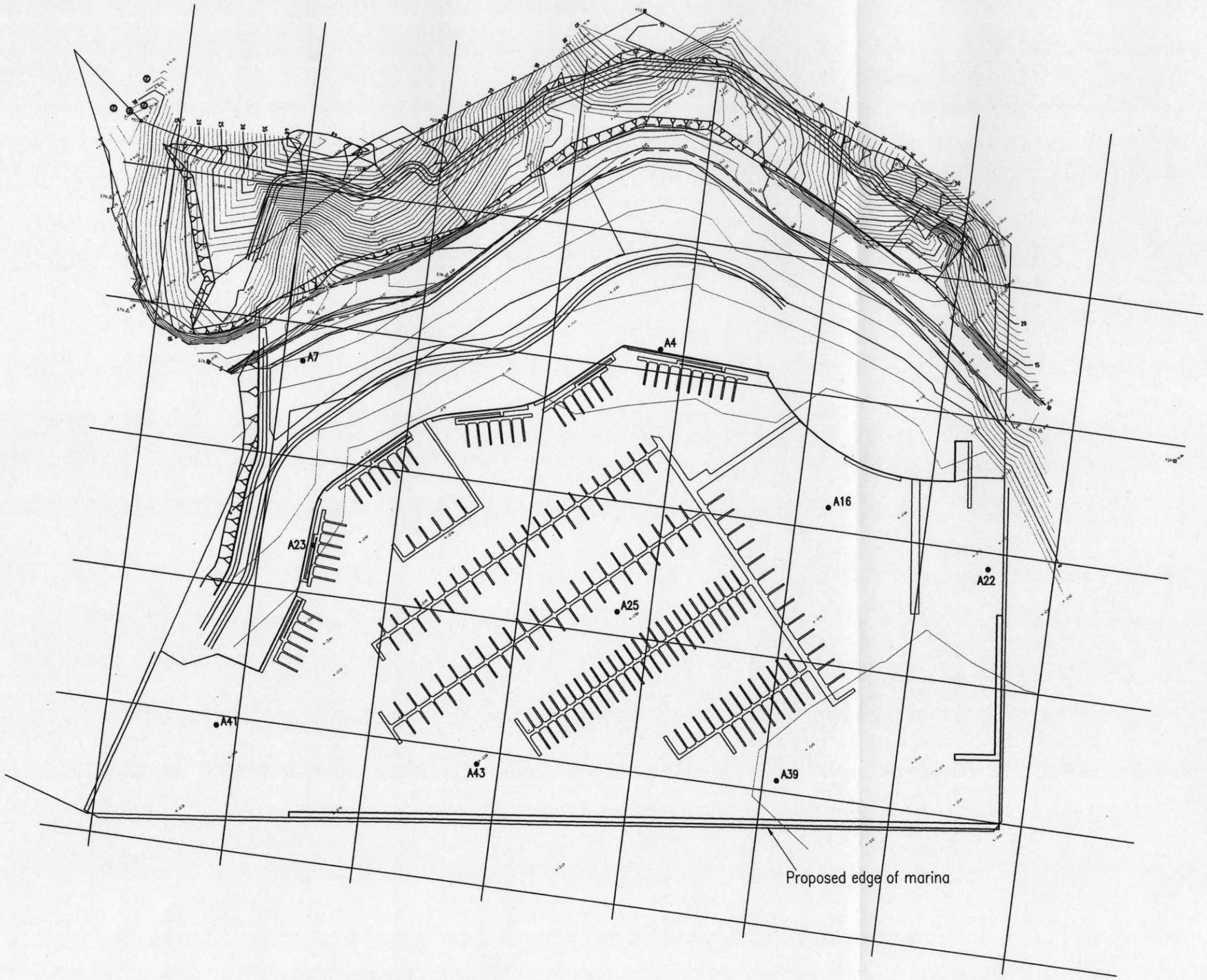
A50 Approximate borehole location – dredge sites

A3 Approximate borehole location – fill sites

0 20 40 60 80 100m
SCALE

NOTE: GRID AREA IS ONE HECTARE

JOB No. 21024.1	DWG No. 10473.3–1 A	DATE 11/04	Checked by Date	NOTES This plan was adapted from client's drawing 'Whitsunday Passage, AUS 253'	ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD MACKAY PO BOX 5630 MACKAY 4741 PH (07) 49525255 FAX (07) 49525455 A.C.N. 103 205 205	Shute Harbour Marina Development Pty Ltd Shute Harbour Marina Borehole Locality Plan Acid Sulfate Soils Investigation	SCALE at A3 AS SHOWN DRAWING No. Figure 1

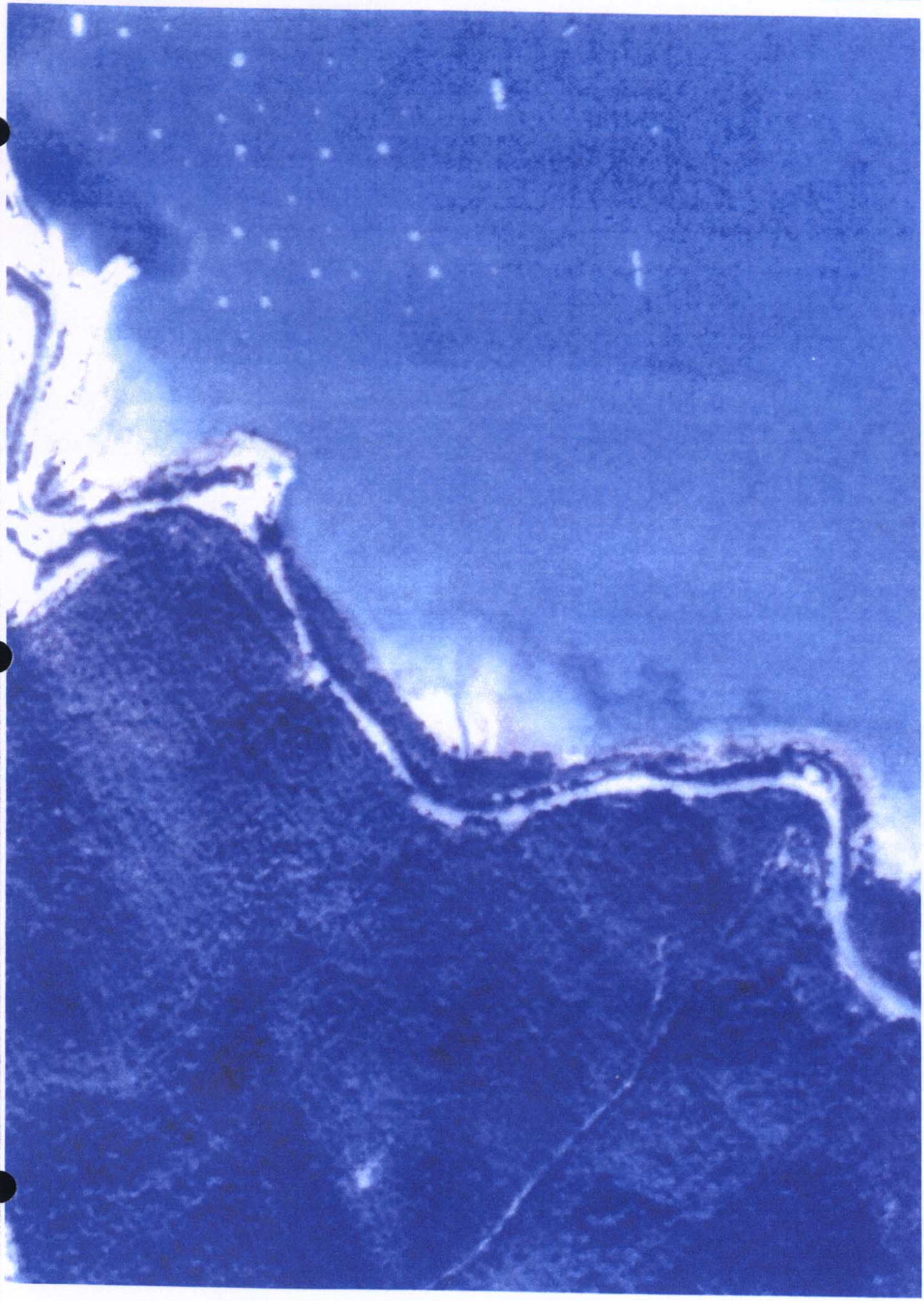


A4 Approximate borehole location sediment contamination samples

0 20 40 60 80 100m
SCALE

NOTE: GRID AREA IS ONE HECTARE

JOB No. 21024.1	UN DWG No. 10473.3-1A	DATE 11/04	Checked by Date	NOTES This plan was adapted from client's drawing 'Whitsunday Passage, AUS 253'	ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD PO BOX 5630 MACKAY 4741 PH (07) 49525255 FAX (07) 49525455 A.C.N. 103 205 205 MACKAY	Shute Harbour Marina Development Pty Ltd Shute Harbour Marina Borehole Locality Plan Sediment Contamination Investigation	SCALE at A3 AS SHOWN DRAWING No. Figure 5



Appendix B

Descriptive Borehole Logs
pH_f and pH_{ox} Field Screening Results

ULLMAN & NOLAN

Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A1
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 12.7.04 Job No: 21024.1/10474.3
Location: E550685742 N7755451
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: 1.00 Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	**Fill Site**
			GP/ GM	A T		Field screening at 0.25m intervals ASS and environmental sampling at 0.5m intervals	8.0	6.1	W	Loose	**Sandy Silty Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained (Marine/Colluvium) MPS 200 LL NP P75 15
							8.0	5.8			
							8.2	5.9			
0.90							8.5	5.9			
1			GC				8.3	5.9			**Clayey Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained (Marine) MPS 20 LL 20 P75 30
							8.4	5.7			
							8.2	5.9			
2							8.1	5.8			
											Borehole complete at 2.00m
3											
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

ULLMAN & NOLAN

Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A2
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 12.7.04 Job No: 21024.1/10474.3
Location: E550685838 N7755434
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: 0.00 Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Fill Site
			GP	A T		Field screening at 0.25m intervals	8.5	6.1	W	Loose	**Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained, with silt (Colluvium/Marine) MPS 10 LL NP P75 10
						ASS and environmental sampling at 0.5m intervals	8.5	6.0			
							8.7	6.1			
0.80											
1			SC				8.8	6.2			**Clayey Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular (Colluvium/Marine) MPS 20 LL 30 P75 30
							8.2	6.0			
							8.6	6.1			
							8.4	6.1			
2							8.4	6.0			
											Borehole complete at 2.00m
3											
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle si
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

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BOREHOLE LOG

Borehole No. A3
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 12.7.04 Job No: 21024.1/10474.3
Location: E550685686 N7755395
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -0.50 m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Fill Site
			SP/SM	A T		Field screening at 0.25m intervals	8.5	5.9	W	Loose	**Gravelly Silty Sand;** fine to coarse grained, gravel is fine to coarse grained, angular (Colluvium/Marine) MPS 20 LL 15 P75 15
						ASS and environmental sampling at 0.5m intervals	8.4	5.9			
							8.3	5.8			
0.90											
1			SC				8.5	5.8			**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular (Colluvium/Marine) MPS 10 LL 30 P75 30
							8.5	6.0			
1.30							7.6	6.3			
1.39											**Clayey Sand;** grey, fine to coarse grained (Residual) MPS 2 LL 30 P75 30
											Hand Auger refusal at 1.39m
2											
3											
4											

METHOD
auger
washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

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BOREHOLE LOG

Borehole No. A4
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 17.7.04 Job No: 21024.1/10474.3
Location: E550685799 N7755370
Surface R.L.: -1.50m Datum: AHD
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			GP	A T		Field screening at 0.25m intervals	8.6	5.8	W	Loose	**Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained (Colluvium/Marine) MPS 200 LL NP P75 5
						ASS and environmental sampling at 0.5m intervals	8.7	5.8			
0.60			SC				8.7	6.0			**Clayey Sand;** grey, fine to coarse grained, with fine to medium grained gravel, angular (Marine) MPS 10 LL 25 P75 30
1							8.7	5.9			
							8.8	5.8			
							8.8	5.8			
							8.8	5.9			
2							8.9	5.9			
							9.0	6.1			
							9.1	6.2			
							9.0	6.3			
3							9.1	6.3			
							No sample recovery				**Clayey Sand;** purple-brown, fine to coarse grained (Residual) MPS 2 LL 20 P75 25
3.40											
3.50											**Hand Auger refusal at 3.50m**
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle si
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 3.7m depth in this borehole.
No sample recovery 3.0m

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BOREHOLE LOG

Borehole No. A5
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 15.7.04 Job No: 21024.1/10474.3
Location: E550685899 N7755352
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -1.80m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Fill Site
			GP	A T		Field screening at 0.25m intervals	9.0	6.3	W	Loose	**Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained (Colluvium/Marine) MPS 40 LL NP P75 5
						ASS and environmental sampling at 0.5m intervals	8.9	6.6			
							8.9	6.5			
1							8.6	6.6			
1.20			SC				8.7	6.5		Very Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine grained gravel, angular (Marine) MPS 5 LL 45 P75 30
							8.6	6.3			
							8.6	6.5			
2							8.5	6.5			
											Borehole complete at 2.00m
3											
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

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BOREHOLE LOG

Borehole No. A6
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 15.7.04 Job No: 21024.1/10474.3
Location: E550685931 N7755348
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -1.90m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Fill Site
			GP	A T		Field screening at 0.25m intervals	8.7	6.1	W	Loose	**Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained, with silt (Colluvium/Marine) MPS 200 LL NP P75 10
0.20						ASS and environmental sampling at 0.5m intervals	8.8	6.3			**Clayey Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained (Colluvium/Marine) MPS 40 LL 20 P75 30
							8.9	6.2			
							9.1	6.3			**Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained, with silt (Colluvium/Marine) MPS 100 LL 30 P75 10
1											
1.10							9.2	6.4			**Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained, with silt (Colluvium/Marine) MPS 40 LL 15 P75 10
1.40							9.1	6.5			
1.50											
1.60							No sample recovery				
			SC						M	Very Stiff	**Clayey Sand;** purple-brown, fine to coarse grained (Residual) MPS 2 LL 25 P75 20
1.67											
2											**Hand Auger Refusal at 1.67m**
3											
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle s
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

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BOREHOLE LOG

Borehole No. A7
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 6.8.04 Job No: 21024.1/10474.3
Location: E550685536 N7755363
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: 2.00 m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Fill Site
			SP	A T		Field screening at 0.25m intervals	8.9	6.3	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular to rounded, trace of silt (Colluvium/Marine) MPS 100 LL NP P75 5
0.20			SC			ASS and environmental sampling at 0.5m intervals	9.1	6.3			**Clayey Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, shells and coral (Marine) MPS 20 LL 20 P75 20
							9.0	6.3			
1							8.8	6.1			
											Hand Auger Refusal at 1.0m
2											
3											
4											

METHOD
auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

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BOREHOLE LOG

Borehole No. A8
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 12.7.04 Job No: 21024.1/10474.3
Location: E550685695 N7755331
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.20m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SC	A T		Field screening at 0.25m intervals	9.2	6.3	W	Loose	**Clayey Gravelly Sand;** grey, fine to coarse grained, gravel is fine to medium grained, angular, shells (Colluvium/Marine) MPS 15 LL 15 P75 25
0.50						ASS and environmental sampling at 0.5m intervals	9.0	6.5			
			CI				9.3	6.4		Soft	**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular (Marien) MPS 3 LL 45 P75 70
1							9.1	6.6			
1.20							8.8	6.8			
							9.0	6.5		Very Soft	**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular (Marine) MPS 3 LL 35 P75 55
							8.8	6.5			
2							8.6	6.4			
2.30							8.6	6.5			
							8.5	6.2			**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular (Marine) MPS 3 LL 45 P75 70
							8.7	6.5			
3	PDL						8.7	6.4			
							8.6	6.6			
							8.6	6.4			
3.80			SC			No ASS sample recovery	8.4	6.2		Very Stiff to Hard	**Gravelly Clayey Sand;** purple-brown, fine to coarse grained, gravel is fine to medium grained, angular (Residual) MPS 10 LL 25 P75 20
4							8.7	6.3			

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle siz
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 3.0m depth in this borehole.

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Borehole No. A9
Sheet 1 of 2

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 20.7.04 Job No: 21024.1/10474.3
Location: E550685750 N7755327
Surface R.L.: -2.00m Datum: AHD
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals	9.0	6.3	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine grained, angular, shells (Marine) MPS 5 LL NP P75 5
0.30			SC			ASS and environmental sampling at 0.5m intervals	9.0	6.4		Soft	**Gravelly Clayey Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, shells (Colluvium/Marine) MPS 20 LL 20 P75 20
0.80							8.6	6.6			
1							8.5	6.5			**Clayey Sand;** grey, fine to coarse grained, trace of fine grained gravel, angular (Marine) MPS 4 LL 40 P75 45
							8.9	6.6			
							8.7	6.6			
							8.8	6.5			
2							8.7	6.4			
							8.8	6.4			
2.50			CH				8.7	6.3			**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular (Marine) MPS 4 LL 55 P75 75
							8.6	6.5			
3							8.6	6.5			
3.10	PDL										
3.20			GC				8.7	6.3		Loose	**Sandy Gravel;** grey, fine to medium grained, subrounded, sand is fine to coarse grained, with clay (Marine) MPS 10 LL 30 P75 10
							8.7	6.3			
							8.8	6.2			
4							8.7	6.1			

METHOD
auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 3.2m depth in this borehole.

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Borehole No. A9
Sheet 2 of 2

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 20.7.04 Job No: 21024.1/10474.3
Location: E550685750 N7755327

Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.00m Datum: AHD

Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING		VISUAL SOIL DESCRIPTION		
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			GC	A T					W	Loose	**Sandy Gravel**; refer sheet 1, depth 3.10m
4.15											**Hand Auger Refusal at 4.15m**
5											
6											
7											
8											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 3.2m depth in this borehole.

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BOREHOLE LOG

Borehole No. A10
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 16.7.04 Job No: 21024.1/10474.3
Location: E550685893 N7755328
Surface R.L.: -2.00m Datum: AHD
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			GP	A T		Field screening at 0.25m intervals	9.0	6.5	W	Soft	**Sandy Gravel;** grey, fine to coarse grained, gravel is fine to medium grained, angular, shells, with silt (Colluvium/Marine) MPS 10 LL NP P75 10
0.40			CH			ASS and environmental sampling at 0.5m intervals	9.0	6.4			**Gravelly Sandy Clay;** grey, gravel is fine grained, angular, sand is fine to coarse grained, shells (Marine) MPS 5 LL 55 P75 60
							8.6	6.5			
1							8.7	6.5			
							8.9	6.8			
							9.1	6.4			
							9.0	6.6			
2							9.1	6.7			
											Hand Auger Refusal at 2.0m depth
3											
4											

METHOD
- auger
- W washbore
- P percussion
- H hammer
- C core
- R rotary air flush

BIT
- R roller
- B blank
- V V bit
- T TC bit
- D diamond

SUPPORT
- C casing
- M mud

SAMPLING
- U undisturbed sample & size in mm
- D disturbed sample
- N Standard Penetration Test & Result
- PP Pocket Penetrometer Value

MOISTURE
- D dry
- M moist
- W wet

VISUAL DESCRIPTION
- MPS maximum particle size
- LL Liquid Limit
- P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 3.2m depth in this borehole.

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BOREHOLE LOG

Borehole No. A11
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 16.7.04 Job No: 21024.1/10474.3
Location: E550685994 N7755311
Surface R.L.: -2.15m Datum: AHD
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Fill Site
			GP	A T		Field screening at 0.25m intervals	9.1	6.4	W	Loose	**Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained, with silt, coral and shells (Colluvium/Marine) MPS 100 LL NP P75 10
0.20			GC			ASS and environmental sampling at 0.5m intervals	8.9	6.3			**Clayey Sandy Gravel;** grey, fine to coarse grained, angular, sand is fine to coarse grained, coral and shells (Colluvium/Marine) MPS 40 LL 20 P75 20
0.70							9.2	6.6		Soft	
1							9.1	6.5			MPS 20 LL 45 P75 30
							8.9	6.5			
							8.9	6.6			
							8.7	6.7			
2							8.9	6.9			
											Borehole complete at 2.00m
3											
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle si
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

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BOREHOLE LOG

Borehole No. A12
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 19.7.04 Job No: 21024.1/10474.3
Location: E550685589 N7755301
Surface R.L.: -2.50m Datum: AHD
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SC	A T		Field screening at 0.25m intervals	9.2	6.4	W	Loose	**Clayey Gravelly Sand;** grey, fine to coarse grained, gravel is fine grained, angular, shells (Marine) MPS 5 LL 35 P75 25
						ASS and environmental sampling at 0.5m intervals	9.5	5.9			
							9.1	6.1			
0.80											**Gravelly Clayey Sand;** grey, fine to coarse grained, gravel is fine grained, angular, shells (Marine) MPS 5 LL 45 P75 35
1							8.7	6.4			
							9.0	5.4			
							8.6	5.7			
							8.2	6.2			
1.80											
			CI				8.6	6.1		Soft	**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 45 P75 60
2											
							8.7	6.5			
							8.6	6.6			
2.70	PDL										
							8.7	6.6			
2.90											
3			CH				8.8	6.7			**Clay;** with fine to coarse grained sand (Marine) MPS 2 LL 60 P75 80
							8.7	6.5			
							8.9	6.6			
3.75							9.1	6.8			
											Borehole complete at 3.75m
4											

METHOD
A auger
washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.7m depth in this borehole.

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A.C.N. 103 205 205

UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A13
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 21.7.04 Job No: 21024.1/10474.3
Location: E550685623 N7755291
Surface R.L.: -2.60m Datum: AHD
Supervisor VJ Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SM	A T		Field screening at 0.25m intervals	8.8	6.5	W	Soft	**Silty Sand;** pale grey, fine to coarse grained, with fine grained gravel, subrounded, shells (Marine) MPS 4 LL 45 P75 35
			SC			ASS and environmental sampling at 0.5m intervals	8.7	6.5			
0.60			CH				8.8	6.6			**Clayey Silty Sand;** grey, fine to coarse grained, shells (Marine) MPS 4 LL 50 P75 45
1							8.8	6.7			**Sandy Silty Clay;** grey, sand is fine to coarse grained, shells (Marine) MPS 4 LL 55 P75 60
1.10							8.8	6.5			
							8.9	6.6			**Silty Clay;** grey, with fine to coarse grained sand, shells (Marine) MPS 4 LL 60 P75 80
							8.7	6.4			
2							8.8	6.3			
							8.6	6.6			
							8.5	6.3			
2.60	PDL						8.9	6.5			
3							8.9	6.5			**Silty Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 1 LL 60 P75 90
							8.6	6.7			
							8.6	6.4			
3.75							8.8	6.6			
4											**Borehole complete at 3.75m**

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle si
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.6m depth in this borehole.

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UNGR 103G
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BOREHOLE LOG

Borehole No. A14
Sheet 1 of 2

Client:	G.G. Betros & Associates Pty Ltd	Date:	12.7.04	Job No:	21024.1/10474.3
		Location:	E550685781 N7755271		
Project:	Environmental & Acid Sulfate Investigation	Surface R.L.:	-2.70m	Datum:	AHD
Site:	Shute Harbour Marina	Supervisor	CG	Chkd:	AW

Drill Contractor	Ullman & Nolan Technical Services	Drill Model	Hand Auger	Mounting	Boat	Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SC	A T		Field screening at 0.25m intervals	9.1	6.7	W	Loose	**Clayey Sand;** grey, fine to coarse grained (Marine) MPS 2 LL 20 P75 25
						ASS and environmental sampling at 0.5m intervals	9.9	7.3			
0.60			CI				9.5	6.6			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 40 P75 55
1							9.4	6.9			
							9.5	6.6			
1.40			CH				9.5	6.7			**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 65 P75 75
							8.9	6.6			
2							8.9	6.6			
							8.8	6.4			
2.50	PDL						8.7	6.7			
							8.9	6.3			**Clay;** grey, trace of fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 70 P75 90
3							8.8	6.5			
3.10						No further ASS and environmental samples collected	8.7	6.3			
3.50							8.7	6.4			
							8.5	6.3			
4							8.6	6.1			

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.5m depth in this borehole.

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Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
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BOREHOLE LOG

Borehole No. A14
Sheet 2 of 2

Client: G.G. Betros & Associates Pty Ltd
Date: 20.7-6.8.04 Job No: 21024.1/10474.3
Location: E550685781 N7755271
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.70m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor: Ullman & Nolan Technical Services | Drill Model: Hand Auger | Mounting: Boat | Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SC	A T		No further ASS and environmental samples collected			W	Loose	**Clay;** refer sheet 1, 2.50m depth
4.20							8.7	5.7		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, subrounded to rounded (Residual?) MPS 3 LL 25 P75 40
							8.7	5.7			
							8.7	6.1			**Rock;** extremely weathered to **Clayey Gravelly Sand;** grey-purple, fine to coarse grained, gravel is fine to coarse, angular (Residual) MPS 3 LL 25 P75 40
4.80										Stiff	
							8.7	6.1			
5											
5.10			GP				8.7	6.1		Very Dense to Hard	**Rock;** extremely weathered to **Sandy Gravel;** red-purple, fine to coarse grained, angular, sand is fine to coarse grained (Residual) MPS 20 LL NP P75 10
5.50							8.8	6.1			
											Hand Auger Refusal at 5.50m
6											
7											
8											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle s
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.5m depth in this borehole.

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Borehole No. A15
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 27.7.04 Job No: 21024.1/10474.3
Location: E550685820 N7755268
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.70m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals			W	Loose	**Sand;** grey, fine to coarse grained, with fine to coarse grained gravel, angular, trace of silt, shells (Marine) MPS 20 LL NP P75 5
0.20			SC				8.7	6.5		Soft	
0.50						ASS and environmental sampling at 0.5m intervals	9.2	6.4			**Clayey Sand;** grey, fine to coase grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 25 P75 25
							8.8	6.2			
							8.8	6.4			**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 35 P75 35
1											
1.20							8.8	6.3			
			CI				8.9	6.3			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 45 P75 55
							8.9	6.4			
2							8.8	6.4			
							8.8	6.4			
2.30											**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, shells (Marine) MPS 4 LL 55 P75 70
2.50	PDL		CH				8.8	6.4			
2.60							8.9	6.0			
3							8.9	6.1			**Clay;** grey, with fine to coarse grained sand (Marine) MPS 2 LL 65 P75 85
							9.1	6.2			
3.50							9.1	6.3			
											Borehole complete at 3.50m
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.5m depth in this borehole.

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BOREHOLE LOG

Borehole No. A16
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 29.7.04 Job No: 21024.1/10474.3
Location: E550685925 N7755251
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.65m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals			W	Loose	**Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, trace of silt, shells (Marine) MPS 10 LL NP P75 5
0.20							9.0	6.4			
			SC			ASS and environmental sampling at 0.5m intervals	9.0	6.5		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 25 P75 20
0.70							9.0	6.4			
1							8.9	6.5			MPS 5 LL 40 P75 35
1.20							8.9	6.5			
			CI				8.8	6.3			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 50 P75 60
							8.8	6.1			
2							8.6	6.1			
			CH				8.6	6.1			**Clay;** grey, with fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 60 P75 80
2.50	PDL						8.6	6.1			
2.55											**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 4 LL 65 P75 95
							8.4	6.1			
3							8.4	6.3			
							8.4	6.2			
							8.7	6.3			
3.75							8.4	6.1			
4											**Borehole complete at 3.75m**

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.55m depth in this borehole.

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UNGR 103G
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BOREHOLE LOG

Borehole No. A17
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 16.7.04 Job No: 21024.1/10474.3
Location: E550686021 N7755270
Surface R.L.: -2.65m Datum: AHD
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals	8.6	6.3	W	Loose	**Sand;** grey, fine to coarse grained, with silt, trace of fine grained gravel, angular (Colluvium/Marine) MPS 20 LL NP P75 10
0.30			CH							Soft	
						ASS and environmental sampling at 0.5m intervals	9.1	6.5			**Clay;** grey, with fine to coarse grained sand, trace of medium to coarse grained gravel, angular, shells (Marine) MPS 5 LL 55 P75 70
							8.7	6.4			
1							8.6	6.3			
							8.8	6.6			
							8.8	6.2			
							9.1	6.8			
2							9.0	6.8			
2.10							8.9	6.8			trace of fine grained sand, shells (Marine) MPS 4 LL 65 P75 85
2.55	PDL						8.8	6.6			
							8.8	6.5			
3							8.7	6.5			
							8.8	6.6			
							8.8	6.8			
3.75							8.7	6.7			
4											**Borehole complete at 3.75m**

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.55m depth in this borehole.

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Borehole No. A18
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 29.7.04 Job No: 21024.1/10474.3
Location: E550685611 N7755264
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.60m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals	9.0	6.2	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, shells (Marine) MPS 20 LL NP P75 5
0.60			SC			ASS and environmental sampling at 0.5m intervals	8.6	5.9		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 25 P75 35
1			Cl				8.7	6.0			
1.50							8.8	5.9			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 45 P75 60
2			CH				8.7	6.2			
2.20							8.4	6.5			**Clay;** grey, with fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 4 LL 55 P75 80
2.60	PDL						8.3	6.2			
3							8.6	6.1			
3.75							8.5	5.9			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 2 LL 65 P75 90
4							8.5	5.6			
							8.5	5.6			
							8.5	5.6			
							8.5	5.6			
							8.5	5.7			
							8.5	5.7			**Borehole complete at 3.75m**

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle s
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.6m depth in this borehole.

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Technical Services Pty Ltd
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UNGR 103G
(-/1/03)

BORHOLE LOG

Borehole No. A19
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 15.7.04 Job No: 21024.1/10474.3
Location: E550685718 N7755246
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.70m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SC	A T		Field screening at 0.25m intervals	8.8	6.5	W	Loose	**Clayey Sand;** grey, fine to coarse grained, trace of medium to coarse grained gravel, angular (Colluvium/Marine) MPS 20 LL 20 P75 30
0.50						ASS and environmental sampling at 0.5m intervals	8.6	6.6			trace of fine grained gravel, angular MPS 5 LL 40 P75 40
							9.0	6.4			
1							8.9	6.8			
							8.7	6.3			
1.50							8.5	6.4			
			CH							Very Soft	**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular (Marine) MPS 5 LL 60 P75 70
							8.4	6.9			
2							8.6	6.7			
							8.4	6.8			
2.50	PDL						8.8	6.3			
							8.6	6.4			
3							8.9	6.5			
							9.0	6.6			
3.50							8.8	6.3			
											Borehole complete at 3.50m
4											

METHOD
- auger
- W washbore
- P percussion
- H hammer
- C core
- R rotary air flush

BIT
- R roller
- B blank
- V V bit
- T TC bit
- D diamond

SUPPORT
- C casing
- M mud

SAMPLING
- U undisturbed sample & size in mm
- D disturbed sample
- N Standard Penetration Test & Result
- PP Pocket Penetrometer Value

MOISTURE
- D dry
- M moist
- W wet

VISUAL DESCRIPTION
- MPS maximum particle size
- LL Liquid Limit
- P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.5m depth in this borehole.

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UNGR 103G
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Borehole No. A20
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 29.7.04 Job No: 21024.1/10474.3
Location: E550685883 N7755229
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.80m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals	9.1	6.3	W	Loose	**Sand;** grey, fine to coarse grained, with fine to coarse grained gravel, angular, trace of silt, shells (Marine) MPS 20 LL NP P75 10
			SC			ASS and environmental sampling at 0.5m intervals	9.0	6.3		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 25 P75 35
							9.0	6.3			
							8.8	6.2			
1.10			CI				8.9	6.1			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 4 LL 50 P75 65
1.50							8.9	6.0			**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular, shells (marine) MPS 5 LL 55 P75 80
							8.9	5.9			
1.90			CH				8.8	5.8			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 2 LL 65 P75 90
2							8.8	5.9			
2.40	PDL						8.8	5.9			
							8.5	6.1			
3							8.6	6.2			
							8.6	6.3			
3.50							8.4	6.4			
4											**Borehole complete at 3.50m**

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.4m depth in this borehole.

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Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A21
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 21.7.04 Job No: 21024.1/10474.3
Location: E550685974 N7755215
Surface R.L.: -2.90m Datum: AHD
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SM	A T		Field screening at 0.25m intervals			W	Soft	**Silty Sand;** grey, fine to coarse grained, shells 40% (Marine) MPS 4 LL 30 P75 30
0.20			SC				9.1	6.6			
						ASS and environmental sampling at 0.5m intervals	8.8	6.5			**Silty Clayey Sand;** grey, fine to coarse grained, shells 25% (Marine) MPS 4 LL 40 P75 45
							8.8	6.7			
							8.7	6.6			
1											
1.20							8.7	6.6			
			CI				8.7	6.6			**Silty Clay;** grey, with fine to coarse grained sand, shells 15% (Marine) MPS 3 LL 50 P75 55
							8.8	6.6			
							8.6	6.7			
2											
2.10											dark grey,shells 5% MPS 3 LL 60 P75 80
2.30	PDL		CH				8.3	6.4			**Silty Clay;** dark grey (Marine) MPS 1 LL 70 P75 90
							8.7	6.5			
							8.5	6.5			
3							8.2	6.5			
							8.7	6.4			
3.50							8.5	6.5			
											Borehole complete at 3.50m
4											

METHOD
auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.3m depth in this borehole.

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BOREHOLE LOG

Borehole No. A22
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 19.7.04 Job No: 21024.1/10474.3
Location: E550686047 N7755205
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.80m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A		Field screening at 0.25m intervals			W	Loose	**Sand;** grey, fine to coarse grained, with silt, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL NP P75 10
0.10			SC	T			8.8	6.4		Firm	
						ASS and environmental sampling at 0.5m intervals	9.2	6.4			**Clayey Sand;** grey,fine to coarse grained (Marine) MPS 2 LL 20 P75 20
0.60			CH				8.8	6.5		Soft	
1							8.7	6.4			**Clay;** grey, with fine to coarse grained sand (Marine) MPS 2 LL 65 P75 70
							8.7	6.2			
							9.0	6.4			
							8.7	6.0			
2							8.7	6.1			
							8.5	6.2			
2.40	PDL										
2.50							8.4	6.3			
							8.5	6.2			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 2 LL 65 P75 90
3							8.5	6.2			
							8.6	6.4			
							8.3	6.0			
3.50											**Borehole complete at 3.50m**
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.4m depth in this borehole.

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UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A23
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 29.7.04 Job No: 21024.1/10474.3
Location: E550685534 N7755224
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.00m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained gravel, angular, with silt, shells (Marine) MPS 20 LL NP P75 10
			SC				9.1	5.9			
						ASS and environmental sampling at 0.5m intervals	9.0	5.9		Soft	**Clayey Sand;** grey, fine to coarse grained, with fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 20 P75 25
							8.8	5.8			
0.90			CI				8.5	5.8			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular (Marine) MPS 7 LL 40 P75 55
1											
1.20			CH				8.4	5.8			
							8.5	5.9			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (marine) MPS 7 LL 55 P75 75
							8.3	5.6			
2							8.3	5.5			
							8.3	5.7			
2.40							8.4	5.7			**Clay;** grey, trace of fine to coarse grained sand (Residual) MPS 2 LL 65 P75 95
							8.5	5.8			
3							8.6	5.7			**Hand Auger Refusal at 3.0m**
4											

METHOD
- auger
- W washbore
- P percussion
- H hammer
- C core
- R rotary air flush

BIT
- R roller
- B blank
- V V bit
- T TC bit
- D diamond

SUPPORT
- C casing
- M mud

SAMPLING
- U undisturbed sample & size in mm
- D disturbed sample
- N Standard Penetration Test & Result
- PP Pocket Penetrometer Value

MOISTURE
- D dry
- M moist
- W wet

VISUAL DESCRIPTION
- MPS maximum particle size
- LL Liquid Limit
- P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 3.2m depth in this borehole.

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Borehole No. A24
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 30.7.04 Job No: 21024.1/10474.3
Location: E550685662 N7755187
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.72m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 20 LL NP P75 10
0.20			SC				8.5	5.6		Soft	
						ASS and environmental sampling at 0.5m intervals	8.5	5.5			**Clayey Sand;** grey, fine to coarse grained, with fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 20 P75 25
0.60			CI				8.6	5.4			
							8.5	5.4			
1											**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 40 P75 50
1.20			CH				8.4	5.5			
							8.2	5.6			
							8.3	6.1			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 60 P75 75
							8.3	6.2			
2											**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 2 LL 70 P75 95
							8.5	5.7			
2.48	PDL						8.6	5.6			
							8.5	5.8			
3							8.4	5.7			
							8.3	5.7			
3.50							8.4	5.6			
											Borehole complete at 3.50m
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.48m depth in this borehole.

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Borehole No. A25
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 4.8.04 Job No: 21024.1/10474.3
Location: E550685764 N7755173
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.85m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine grained, angular, with silt, shells (Marine) MPS 25 LL NP P75 10
0.20			SC			ASS and environmental sampling at 0.5m intervals	8.8	5.8		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 25 LL 20 P75 25
							8.6	5.8			
							8.6	6.1			
0.80			CI								**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 40 P75 55
1							8.7	6.0			
1.20			CH				8.7	6.0			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 55 P75 70
							8.7	5.9			
							8.4	5.8			
1.90							8.5	5.7			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 4 LL 70 P75 90
2											
							8.4	5.8			
2.34	PDL										
							8.5	5.9			
							8.4	6.0			
3							8.6	5.9			
							8.6	6.0			
3.50							8.6	6.1			
											Borehole complete at 3.50m
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.34m depth in this borehole.

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(-/1/03)

Borehole No. A26
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 3.8.04 Job No: 21024.1/10474.3
Location: E550685808 N7755185
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.80m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 20 LL NP P75 10
			SC				9.1	6.1		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 20 LL 20 P75 25
						ASS and environmental sampling at 0.5m intervals	9.1	6.1			
0.60			CI				8.7	5.8			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 40 P75 55
1							8.6	5.9			
1.20			CH				8.6	5.6			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 55 P75 75
							8.6	5.7			
1.80							8.5	5.8			
2							8.6	5.7			**Clay;** grey, trace of fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 2 LL 65 P75 90
							8.6	5.9			
2.40	PDL						8.6	5.8			
							8.6	5.8			
3							8.4	5.9			
3.25							8.5	5.8			
											Hand Auger Refusal at 3.25m
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.4m depth in this borehole.

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UNGR 103G
(-/1/03)

Borehole No. A27
Sheet 1 of 1

BOREHOLE LOG

ent: G.G. Betros & Associates Pty Ltd
Date: 30.7.04 Job No: 21024.1/10474.3
Location: E550685897 N7755144
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.80m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A		Field screening at 0.25m intervals	8.7	5.8	W	Loose	**Gravelly Silty Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, shells (Marine) MPS 25 LL NP P75 15
			SC	T		ASS and environmental sampling at 0.5m intervals	8.6	5.6		Soft	**Clayey Sand;** grey, fine to coarse grained, with fine to coarse grained gravel, angular, shells (Marine) MPS 15 LL 25 P75 20
0.60			CI				8.6	5.7			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 45 P75 50
1							8.7	5.8			
1.20			CH				8.6	5.8			**Clay;** grey, with fine to coarse grained sand, trace of medium grained gravel, angular, shells (Marine) MPS 7 LL 65 P75 75
							8.6	5.8			
1.80							8.7	5.7			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 2 LL 75 P75 95
2							8.6	5.7			
							8.6	5.6			
2.40	PDL						8.5	5.6			
							8.6	5.6			
3							8.6	5.8			
							8.6	5.6			
3.50							8.5	5.7			**Borehole complete at 3.50m**
4											

ETHOD
auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.4m depth in this borehole.

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UNGR 103G
(-/1/03)

BORHOLE LOG

Borehole No. A28
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 29.7.04 Job No: 21024.1/10474.3
Location: E550685997 N7755121
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -3.10m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, trace of silt, shells (Marine) MPS 20 LL NP P75 5
0.20							8.8	6.0			
			SC			ASS and environmental sampling at 0.5m intervals	8.7	6.0		Soft	**Clayey Sand;** grey, fine to coarse grained, with fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 25 P75 35
0.60			CI				8.3	5.6			
1							8.2	5.5			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 45 P75 60
1.20			CH				8.3	5.7			**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 4 LL 55 P75 80
							8.4	5.7			
1.70							8.4	5.7			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 2 LL 65 P75 90
2							8.4	5.5			
2.10	PDL										
							8.3	5.6			
							8.3	5.7			
							8.2	5.4			
3							8.1	5.3			
							8.2	5.5			
3.50							8.2	5.6			
											Borehole complete at 3.50m
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.1m depth in this borehole.

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Borehole No. A29
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 3.8.04 Job No: 21024.1/10474.3
Location: E550685566 N7755167
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.60m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 20 LL NP P75 10
			SC				9.3	6.2			
						ASS and environmental sampling at 0.5m intervals	9.2	6.1			**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 20 LL 20 P75 25
							9.0	6.1			
0.90											
1			CI				9.0	6.1			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 45 P75 55
							8.8	6.0			
1.30			CH								
							8.7	5.9			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 55 P75 70
							8.9	6.0			
1.90											
2							8.8	6.0			**Clay;** grey, trace of fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 4 LL 60 P75 90
							8.7	5.9			
							8.8	5.8			
2.60	PDL										
							8.7	5.9			
3							8.6	6.0			
							8.7	6.1			
							8.7	6.4			
3.75							8.8	6.3			
4											**Borehole complete at 3.75m**

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.6m depth in this borehole.

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Borehole No. A30
Sheet 1 of 1

BOREHOLE LOG

Client:	G.G. Betros & Associates Pty Ltd	Date:	3.8.04	Job No:	21024.1/10474.3
		Location:	E550685650 N7755160		
Project:	Environmental & Acid Sulfate Investigation	Surface R.L.:	-2.70m	Datum:	AHD
Site:	Shute Harbour Marina	Supervisor	CG	Chkd:	AW

Drill Contractor	Ullman & Nolan Technical Services	Drill Model	Hand Auger	Mounting	Boat	Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A T		Field screening at 0.25m intervals	8.9	6.0	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 25 LL NP P75 10
			SC			ASS and environmental sampling at 0.5m intervals	8.8	6.0		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 20 LL 20 P75 25
0.70			CI				8.7	6.5			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 40 P75 50
1							8.8	6.4			
1.20			CH				8.7	6.4			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 60 P75 75
							8.7	6.2			
							8.7	6.1			
1.90							8.7	6.1			**Clay;** grey, trace of fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 4 LL 65 P75 90
2							8.6	6.1			
2.50	PDL						8.7	6.0			
							8.7	6.0			
3							8.6	6.0			
							8.6	5.9			
3.50							8.6	5.9			
											Borehole complete at 3.50m
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.5m depth in this borehole.

ULLMAN & NOLAN
Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A31
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 4.8.04 Job No: 21024.1/10474.3
Location: E550685709 N7755145
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.70m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor: Ullman & Nolan Technical Services | Drill Model: Hand Auger | Mounting: Boat | Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 20 LL NP P75 10
0.20			SC				9.0	5.9		Soft	
						ASS and environmental sampling at 0.5m intervals	9.0	5.9			**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 25 LL 20 P75 25
							8.5	6.2			
0.90							8.6	6.1			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 40 P75 50
1			CI								
1.20			CH				8.6	5.9			
							8.7	5.9			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 50 P75 70
							8.8	5.9			
1.90							8.7	5.7			**Clay;** grey, trace of fine to coarse grained sand, shells (Marine) MPS 5 LL 75 P75 95
2							8.7	5.8			
2.50	PDL						8.6	5.7			
							8.7	5.9			
3							8.6	5.9			
							8.7	6.0			
3.50							8.7	6.0			
											Borehole complete at 3.50m
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.5m depth in this borehole.

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Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A32
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 4.8.04 Job No: 21024.1/10474.3
Location: E550685809 N7755131

Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.80m Datum: AHD

Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Silty Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, shells (marine) MPS 25 LL NP P75 15
			SC				8.9	5.9		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 20 LL 25 P75 25
						ASS and environmental sampling at 0.5m intervals	9.0	5.8			
							8.9	5.9			
0.80			CI								**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 45 P75 50
1							8.7	5.9			
1.20			CH				8.9	5.7			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 60 P75 75
							8.9	5.8			
							8.8	6.1			
1.90							8.7	6.3			**Clay;** grey, trace of fine to coarse grained sand, shells (Marine) MPS 4 LL 75 P75 90
2							8.7	6.1			
2.40	PDL						8.7	6.1			
							8.8	6.0			
3							8.9	5.8			
							8.8	5.9			
3.50							8.8	5.8			**Borehole complete at 3.50m**
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.4m depth in this borehole.

ULLMAN & NOLAN
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UNGR 103G
(-/1/03)

Borehole No. A33
Sheet 1 of 1

BOREHOLE LOG

ent: G.G. Betros & Associates Pty Ltd
Date: 30.7.04 Job No: 21024.1/10474.3
Location: E550685958 N7755100
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -3.10m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A		Field screening at 0.25m intervals	8.6	6.0	W	Loose	**Gravelly Silty Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, shells (Colluvium/Marine) MPS 20 LL NP P75 15
			SC	T						Soft	
0.50			CI			ASS and environmental sampling at 0.5m intervals	8.7	6.0			**Clayey Sand;** grey, fine to coarse grained, with fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 20 P75 25
							8.5	5.9			
1							8.4	6.0			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 40 P75 55
							8.4	5.9			
							8.4	5.9			
1.60			CH				8.2	5.6			**Clay;** grey, with fine to coarse grained sand, trace of medium grained gravel, angular, shells (Marine) MPS 7 LL 65 P75 70
1.80											
2							8.1	5.7			
2.10	PDL										**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 0.1 LL 75 P75 95
							8.2	5.6			
							8.3	5.6			
							8.4	5.6			
3							8.3	6.7			
3.25							8.2	5.7			
											Borehole complete at 3.25m
4											

ETHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.1m depth in this borehole.

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A.C.N. 103 205 205

UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A34
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 2.8.04 Job No: 21024.1/10474.3
Location: E550685441 N7755131
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.40m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals	8.8	6.2	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with clay, shells (Marine) MPS 25 LL NP P75 10
			SC			ASS and environmental sampling at 0.5m intervals	8.9	6.2		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 25 P75 30
							8.8	5.9			
0.80			CI				8.9	6.0			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 40 P75 75
1											
1.20			CH				8.9	5.9			MPS 7 LL 55 P75 80
							9.0	5.9			
							9.0	6.3			
1.80											**Clay;** grey, trace of fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 4 LL 65 P75 90
2							9.0	6.3			
							9.0	5.9			
							8.8	5.8			
2.80	PDL						8.8	5.9			
3							8.8	5.8			
							8.8	5.9			
							8.8	5.8			
							8.8	5.8			
4							8.7	5.8			**Borehole complete at 4.00m**

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.8m depth in this borehole.

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A.C.N. 103 205 205

UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A35
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 2.8.04 Job No: 21024.1/10474.3
Location: E550685491 N7755137
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.50m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals	9.0	5.9	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 20 LL NP P75 10
			SC			ASS and environmental sampling at 0.5m intervals	8.9	6.0		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 25 P75 30
							8.9	6.3			
0.90							8.9	6.2			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 40 P75 70
1			CI				8.8	6.2			
1.30			CH				8.8	6.2			MPS 7 LL 55 P75 75
1.80							8.8	6.0			
2							8.8	6.0			**Clay;** grey, trace of fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 4 LL 70 P75 90.
							8.7	6.1			
							8.7	6.0			
2.70	PDL						8.6	6.1			
3							8.6	6.2			
							8.7	6.1			
							8.6	6.2			
3.75							8.7	6.0			
4											**Borehole complete at 3.75m**

METHOD
auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.7m depth in this borehole.

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A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A36
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 4.8.04 Job No: 21024.1/10474.3
Location: E550685587 N7755084
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.70m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screenin g Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A T		Field screening at 0.25m intervals	9.1	6.0	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 25 LL NP P75 10
			SC			ASS and environmental sampling at 0.5m intervals	9.1	6.0		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 25 LL 25 P75 20
							9.0	6.0			
0.80			CI								**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 45 P75 50
1							8.9	6.0			
							8.7	6.1			
							8.7	6.2			
1.50			CH								**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 60 P75 70
							8.8	6.3			
1.80											
							8.7	6.2			
2											**Clay;** grey, trace of fine to coarse grained sand, shells (Marine) MPS 4 LL 75 P75 90
							8.5	6.4			
2.50	PDL						8.6	6.6			
							8.7	6.4			
3							8.5	6.2			
							8.7	5.9			
3.50							8.6	6.0			**Borehole complete at 3.50m**
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle s
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.5m depth in this borehole.

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Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A37
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 5.8.04 Job No: 21024.1/10474.3
Location: E550685754 N7755067
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.80m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A T		Field screening at 0.25m intervals	8.6	6.0	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Colluvium/Marine) MPS 25 LL NP P75 10
			SC			ASS and environmental sampling at 0.5m intervals	8.6	5.9		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 25 LL 20 P75 30
0.70							9.0	6.3			
			CI				8.9	6.3			**Sandy Clay;** grey, sand is fine to coarse grained, with fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 40 P75 50
1											
1.20			CH				9.0	6.4			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 55 P75 70
							9.0	6.4			
							8.9	6.2			
1.90							8.7	6.1			**Clay;** grey, trace of fine to coarse grained sand, shells (Marine) MPS 4 LL 75 P75 90
2											
							8.9	6.2			
2.40	PDL						9.1	6.3			
							8.9	6.2			
3							9.0	6.2			
							8.6	6.3			
3.50							8.7	6.2			
											Borehole complete at 3.50m
4											

METHOD
auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.4m depth in this borehole.

ULLMAN & NOLAN
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A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A38
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 5.8.04 Job No: 21024.1/10474.3
Location: E550685800 N7755066
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.80m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A T		Field screening at 0.25m intervals	9.2	6.2	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 25 LL NP P75 10
			SC			ASS and environmental sampling at 0.5m intervals	9.1	6.1		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 20 LL 25 P75 30
0.70			CI				8.8	6.3			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 45 P75 55
1							8.7	6.4			
1.30			CH				8.7	6.4			**Clay;** grey, with fine to coarse grained sand, with fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 60 P75 70
							8.7	6.0			
2							8.7	6.0			
							8.7	6.0			**Clay;** grey, trace of fine to coarse grained sand, shells (Marine) MPS 4 LL 75 P75 90
2.40	PDL						8.7	6.1			
							8.7	6.1			
3							8.6	6.2			
							8.7	6.1			
3.50							8.7	6.0			**Borehole complete at 3.50m**
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle s.
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.4m depth in this borehole.

ULLMAN & NOLAN
Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A39
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 5.8.04 Job No: 21024.1/10474.3
Location: E550685884 N7755047
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -3.00m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 25 LL NP P75 10
			SC				9.0	6.2		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 25 LL 25 P75 30
						ASS and environmental sampling at 0.5m intervals	9.1	6.3			
0.70			CI				8.9	6.2			**Sandy Clay;** grey, sand is fine to coarse grained, with fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 45 P75 50
1							8.7	6.1			
1.25			CH				8.6	6.1			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 55 P75 75
							8.7	6.1			
1.70							8.8	6.1			**Clay;** grey, trace of fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 75 P75 90
2							8.7	6.1			
2.20	PDL						8.6	6.2			
							8.6	6.2			
							8.6	5.9			
3							8.6	5.8			
3.25							8.5	5.7			**Borehole complete at 3.25m**
4											

METHOD
- auger
- washbore
- P percussion
- H hammer
- C core
- R rotary air flush

BIT
- R roller
- B blank
- V V bit
- T TC bit
- D diamond

SUPPORT
- C casing
- M mud

SAMPLING
- U undisturbed sample & size in mm
- D disturbed sample
- N Standard Penetration Test & Result
- PP Pocket Penetrometer Value

MOISTURE
- D dry
- M moist
- W wet

VISUAL DESCRIPTION
- MPS maximum particle size
- LL Liquid Limit
- P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.2m depth in this borehole.

ULLMAN & NOLAN
Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A40
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 22.7.04 Job No: 21024.1/10474.3
Location: E550686101 N7755075
Surface R.L.: -3.40m Datum: AHD
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SC	A T		Field screening at 0.25m intervals	8.3	6.4	W	Soft	**Clayey Silty Sand;** grey spotted white, fine to coarse grained, shells (Marine) MPS 2 LL 35 P75 35
						ASS and environmental sampling at 0.5m intervals	8.6	6.5			
							8.7	6.4			
							8.4	6.3			
1											
1.10			CH				8.1	6.5			**Silty Clay;** grey, with fine to coarse grained sand, shells 10% (Marine) MPS 2.5 LL 60 P75 75
							8.7	6.4			
							8.5	6.3			
1.80	PDL										
2							8.5	6.3			
							8.8	6.3			
2.30											**Silty Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 1 LL 75 P75 90
							8.6	6.3			
							8.4	6.3			
							8.3	6.4			
3											**Borehole complete at 3.00m**
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle s
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 1.8m depth in this borehole.

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UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A41
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 29.7.04 Job No: 21024.1/10474.3
Location: E550685459 N7755090
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.60m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A T		Field screening at 0.25m intervals	8.5	5.6	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, trace of silt, shells (Marine) MPS 20 LL NP P75 5
0.60			SC			ASS and environmental sampling at 0.5m intervals	8.5	5.7		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 25 P75 35
			CI				8.4	5.7			
1							8.5	5.8			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 45 P75 65
1.10			CH				8.4	5.6			
							8.3	5.6			**Clay;** grey, with fine to coarse grained sand, shells (Marine) MPS 7 LL 55 P75 80
							8.4	5.4			
2							8.3	5.5			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 1 LL 65 P75 90
							8.3	5.4			
2.60	PDL						8.2	5.3			
							8.0	5.2			
3							7.9	5.2			
							8.2	5.5			
							8.4	5.8			
3.75							8.5	5.9			
4											**Borehole complete at 3.75m**

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.6m depth in this borehole.

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UNGR 103G
(-/1/03)

Borehole No. A42
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 5.8.04 Job No: 21024.1/10474.3
Location: E550685559 N7755075
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.60m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Colluvium/Marine) MPS 25 LL NP P75 10
			SC				9.0	6.1		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 20 LL 20 P75 25
						ASS and environmental sampling at 0.5m intervals	9.0	6.2			
							9.0	6.0			
0.90											
1			CI				8.9	6.1			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 45 P75 60
							8.7	6.0			
1.30			CH				9.0	6.0			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 60 P75 70
							8.9	6.1			
2							8.7	6.3			
2.10							8.8	6.0			**Clay;** grey, trace of fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 4 LL 75 P75 90
	PDL						8.7	5.9			
2.60							8.7	6.0			
3							8.6	5.9			
							8.5	6.0			
							8.5	6.0			
3.75							8.6	6.0			
4											**Borehole complete at 3.75m**

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.6m depth in this borehole.

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Borehole No. A43
Sheet 1 of 1

BOREHOLE LOG

ent: G.G. Betros & Associates Pty Ltd
Date: 28.7.04 Job No: 21024.1/10474.3
Location: E550685656 N7755059
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.80m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals	9.0	6.1	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to medium grained, angular, trace of silt, shells (Marine) MPS 15 LL NP P75 5
0.20			SC			ASS and environmental sampling at 0.5m intervals	8.8	6.1		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 25 P75 35
							9.3	6.1			
0.90			CI				9.3	6.2			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 45 P75 60
1											
1.20							9.2	6.2			
							9.2	6.3			**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 45 P75 80
							8.8	6.4			
							8.7	6.0			
2											
2.10			CH				8.8	6.0			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 2 LL 65 P75 90
2.40	PDL						9.0	5.8			
							8.7	6.1			
3							8.7	6.1			
							8.5	6.1			
							8.6	6.1			
3.50											**Borehole complete at 3.75m**
4											

ETHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.4m depth in this borehole.

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BOREHOLE LOG

Borehole No. A44
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 26.7.04 Job No: 21024.1/10474.3
Location: E550685721 N7755038
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.70m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.10			SP	A T		Field screening at 0.25m intervals	9.0	6.4	W	Loose	**Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, trace of silt, shells (Marine) MPS 10 LL NP P75 5
			SC			ASS and environmental sampling at 0.5m intervals	8.9	6.5		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 20 P75 25
							8.9	6.5			
1							8.9	6.5			
1.10			CI				8.6	6.3			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 40 P75 60
							8.7	6.2			
1.60			CH				8.9	6.5			**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 60 P75 75
2							8.7	6.8			
							8.5	6.5			
2.50	PDL						8.5	6.4			
2.60							8.5	6.6			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 2 LL 65 P75 95
3							8.5	6.4			
							8.7	6.4			
3.50							8.4	6.7			
4											**Borehole complete at 3.50m**

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle s
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.5m depth in this borehole.

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UNGR 103G
(-/1/03)

Borehole No. A45
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Project: Environmental & Acid Sulfate Investigation
Site: Shute Harbour Marina

Date: 26.7.04 Job No: 21024.1/10474.3
Location: E550685844 N7755029
Surface R.L.: -2.95m Datum: AHD
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
			SP	A T		Field screening at 0.25m intervals ASS and environmental sampling at 0.5m intervals	8.4	6.2	W	Loose	**Silty Sand;** grey, fine to coarse grained, trace of fine grained gravel, angularshells (Marine) MPS 5 LL NP P75 15
							8.8	6.3			
0.70			SC				8.9	6.4		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 3 LL 30 P75 40
1							8.9	6.3			
1.20			CH				8.8	6.1			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 55 P75 70
1.50							8.6	5.9			
							8.6	6.3			
2							8.8	6.7			
2.25	PDL						8.7	6.8			**Clay;** grey, with fine to coarse grained sand (Marine) MPS 2 LL 65 P75 80
							8.6	6.3			
							8.7	6.3			
3							8.8	6.2			
3.25							8.9	6.1			
											Borehole complete at 3.25m
4											

METHOD
- auger
- V washbore
- P percussion
- H hammer
- C core
- R rotary air flush

BIT
- R roller
- B blank
- V V bit
- T TC bit
- D diamond

SUPPORT
- C casing
- M mud

SAMPLING
- U undisturbed sample & size in mm
- D disturbed sample
- N Standard Penetration Test & Result
- PP Pocket Penetrometer Value

MOISTURE
- D dry
- M moist
- W wet

VISUAL DESCRIPTION
- MPS maximum particle size
- LL Liquid Limit
- P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.25m depth in this borehole.

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UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A46
Sheet 1 of 1

Client:	G.G. Betros & Associates Pty Ltd	Date:	27.7.04	Job No:	21024.1/10474.3
		Location:	E550685381 N7755036		
Project:	Environmental & Acid Sulfate Investigation	Surface R.L.:	-2.30m	Datum:	AHD
Site:	Shute Harbour Marina	Supervisor	CG	Chkd:	AW

Drill Contractor: Ullman & Nolan Technical Services | Drill Model: Hand Auger | Mounting: Boat | Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals	9.0	6.9	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to medium grained, angular, trace of silt, shells (Marine) MPS 20 LL NP P75 5
			SC			ASS and environmental sampling at 0.5m intervals	9.2	6.2		Soft	**Clayey Sand;** grey, fine to coarse grained, with fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 25 P75 25
							9.1	6.4			
1							8.9	6.3			
1.20							9.0	6.3			
			CI				8.7	6.4			**Clay;** grey, with fine to coarse grained sand, with fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 45 P75 60
1.60			CH				8.7	6.3			**Clay;** grey, with fine to coarse grained sand, shells (Marine) MPS 2 LL 60 P75 80
2							8.9	6.3			
2.20							8.9	6.2			**Clay;** grey, trace of fine to coarse grained sand, shells (Marine MPS 2 LL 65 P75 90
							8.8	6.4			
							8.8	6.4			
2.90	PDL										
3							8.9	6.2			
							8.9	6.3			
							8.5	6.4			
							8.3	6.2			
4							8.2	6.1			**Borehole complete at 4.00m**

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle si
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.9m depth in this borehole.

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Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A47
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 27.7.04 Job No: 21024.1/10474.3
Location: E550685477 N7755033
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.60m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Dredge Site
0.20			SP	A T		Field screening at 0.25m intervals	8.9	6.3	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, trace of silt, shells (Marine) MPS 20 LL NP P75 5
			SC			ASS and environmental sampling at 0.5m intervals	9.1	6.5		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 20 P75 20
							9.1	6.5			
							9.0	6.3			
1											
1.10			CI				8.9	6.2			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 15 LL 45 P75 55
							8.7	6.2			
1.65			CH				8.8	6.4			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 7 LL 55 P75 70
2							8.9	6.4			
2.20							8.8	6.5			**Clay;** grey, trace of fine to coarse grained sand, trace of fine grained gravel (Marine) MPS 3 LL 65 P75 90
2.60	PDL						8.8	6.5			
							8.9	6.6			
3							8.7	6.3			
							8.8	6.1			
							8.6	6.2			
3.75							8.3	6.2			
4											**Borehole complete at 3.75m**

METHOD
- auger
- W washbore
- P percussion
- H hammer
- C core
- R rotary air flush

BIT
- R roller
- B blank
- V V bit
- T TC bit
- D diamond

SUPPORT
- C casing
- M mud

SAMPLING
- U undisturbed sample & size in mm
- D disturbed sample
- N Standard Penetration Test & Result
- PP Pocket Penetrometer Value

MOISTURE
- D dry
- M moist
- W wet

VISUAL DESCRIPTION
- MPS maximum particle size
- LL Liquid Limit
- P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.6m depth in this borehole.

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Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A48
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 10.8.04 Job No: 21024.1/10474.3
Location: E551686151 N7755040
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -2.94m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Access Channel
			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 25 LL NP P75 10
0.20			SC				9.0	6.2		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 25 P75 25
						ASS and environmental sampling at 0.5m intervals	9.0	6.1			
0.70			CI				8.3	6.0			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 45 P75 60
1							8.5	5.9			
1.20			CH				8.6	6.0			**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 3 LL 55 P75 70
							8.7	6.0			
							8.5	5.8			
1.90							8.6	5.7			**Clay;** grey, trace of fine to coarse grained sand (Marine) MPS 2 LL 65 P75 90
2							8.5	5.8			
							8.5	5.8			
2.75	PDL						8.6	5.8			
3							8.5	5.7			
							8.5	5.8			
							8.3	5.9			
3.75							8.2	5.9			
4											**Borehole complete at 3.75m**

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle s
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.75m depth in this borehole.

ULLMAN & NOLAN

Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A49
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 10.8.04 Job No: 21024.1/10474.3
Location: E550686248 N7755011
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -3.04m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Access Channel
			SP	A T		Field screening at 0.25m intervals			W	Loose	**Gravelly Silty Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, shells (Marine) MPS 20 LL NP P75 15
0.20			SC				9.0	6.5		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 10 LL 20 P75 25
						ASS and environmental sampling at 0.5m intervals	9.0	6.4			
0.70			CI				8.9	6.3			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 5 LL 40 P75 65
1							8.7	6.2			
							8.6	6.1			
1.40			CH				8.6	6.0			**Clay;** grey, with fine to coarse grained sand, with fine grained gravel, angular, shells (Marine) MPS 3 LL 55 P75 75
							8.7	5.9			
1.80							8.8	5.9			**Clay;** grey, trace of fine to coarse grained sand, shells (Marine) MPS 2 LL 70 P75 90
2							8.6	5.9			
							8.7	6.1			
2.65	PDL						8.6	5.9			
3							8.5	5.8			
							8.5	5.9			
							8.5	5.7			
3.75							8.4	5.7			
4											**Borehole complete at 3.75m**

METHOD
auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.65m depth in this borehole.

ULLMAN & NOLAN
Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A50
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 10.8.04 Job No: 21024.1/10474.3
Location: E550686386 N7754971
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -3.09m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Access Channel
			SP	A T		Field screening at 0.25m intervals	9.1	6.1	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 20 LL NP P75 10
0.25			SC			ASS and environmental sampling at 0.5m intervals	9.1	6.1		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 25 LL 20 P75 25
							8.9	6.2			
0.80			CI				8.7	6.2			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine grained gravel, angular, shells (Marine) MPS 5 LL 45 P75 65
1							8.7	6.0			
1.30			CH				8.6	6.1			**Clay;** grey, with fine to coarse grained sand, trace of fine to medium grained gravel, angular, shells (Marine) MPS 3 LL 55 P75 75
							8.6	6.2			
2							8.6	6.2			
							8.7	6.0			**Clay;** grey, trace of fine to coarse grained sand, shells (Marine) MPS 2 LL 70 P75 90
							8.6	6.0			
2.60	PDL						8.7	6.1			
3							8.6	6.0			
							8.6	6.2			
							8.4	6.2			
3.75							8.5	6.2			
4											**Borehole complete at 3.75m**

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle s.
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.6m depth in this borehole.

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A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A51
Sheet 1 of 1

BOREHOLE LOG

Client: G.G. Betros & Associates Pty Ltd
Date: 10.8.04 Job No: 21024.1/10474.3
Location: E550686484 N7754935
Project: Environmental & Acid Sulfate Investigation
Surface R.L.: -3.14m Datum: AHD
Site: Shute Harbour Marina
Supervisor CG Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	Access Channel
			SP	A T		Field screening at 0.25m intervals	9.2	6.1	W	Loose	**Gravelly Sand;** grey, fine to coarse grained, gravel is fine to coarse grained, angular, with silt, shells (Marine) MPS 25 LL NP P75 10
0.25			SC			ASS and environmental sampling at 0.5m intervals	9.1	6.2		Soft	**Clayey Sand;** grey, fine to coarse grained, trace of fine to coarse grained gravel, angular, shells (Marine) MPS 25 LL 25 P75 20
							8.8	6.0			
0.90							8.8	6.0			**Sandy Clay;** grey, sand is fine to coarse grained, trace of fine to medium grained gravel, angular, shells (Marine) MPS 5 LL 40 P75 65
1			CI				8.6	5.9			
1.40			CH				8.7	5.8			**Clay;** grey, with fine to coarse grained sand, trace of fine grained gravel, angular, shells (Marine) MPS 4 LL 55 P75 75
							8.7	5.8			
1.90							8.7	5.8			**Clay;** grey, trace of fine to coarse grained sand, shells (Marine) MPS 2 LL 65 P75 90
2							8.8	5.9			
2.50	PDL						8.7	5.8			
							8.7	5.8			
3							8.7	5.9			
							8.7	5.9			
3.50							8.8	6.0			**Borehole complete at 3.50m**
4											

METHOD
auger
washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

Note: Proposed dredge level (PDL) at -5.2m corresponds to 2.5m depth in this borehole.

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Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

Borehole No. A52
Sheet 1 of 1

BOREHOLE LOG

Client:	G.G. Betros & Associates Pty Ltd	Date:	18.10.04	Job No:	21024.1/10474.3
		Location:	N7755543 E685736		
Project:	Environmental & Acid Sulphate Investigation	Surface R.L.:	3.6m	Datum:	AHD
Site:	Shute Harbour Marina	Supervisor	RC	Chkd:	AW

Drill Contractor	Ullman & Nolan Technical Services	Drill Model	Hand Auger	Mounting	Boat	Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	
0.15			ML	A T		SPOCAS	6.0 5.8	4.6 4.1	W	Very Dense	**Sandy Gravelly Silt;** pale brown, fine to coarse grained, gravel is medium to coarse grained MPS 10 LL 20 P75 50 **Hand auger refusal at 0.15m**
1											
2											
3											
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

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UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A53
Sheet 1 of 1

Client: G.G. Betros & Associates Pty Ltd
Date: 18.10.04 Job No: 21024.1/10474.3
Location: N7755570 E685836
Project: Environmental & Acid Sulphate Investigation
Surface R.L.: 2.4m Datum: AHD
Site: Shute Harbour Marina
Supervisor RC Chkd: AW

Drill Contractor Ullman & Nolan Technical Services Drill Model Hand Auger Mounting Boat Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	
0.15			GM	A T		SPOCAS	7.3 6.2	4.8 4.7	D	Dense to Very Dense	**Silty Sandy Gravel;** very pale grey, fine to coarse grained, angular, sand is fne to coarse grained (Colluvium/Marine) MPS 25 LL 10 P75 20
											Hand auger refusal at 0.15m
1											
2											
3											
4											

METHOD
A auger
W washbore
P percussion
H hammer
C core
R rotary air flush

BIT
R roller
B blank
V V bit
T TC bit
D diamond

SUPPORT
C casing
M mud

SAMPLING
U undisturbed sample & size in mm
D disturbed sample
N Standard Penetration Test & Result
PP Pocket Penetrometer Value

MOISTURE
D dry
M moist
W wet

VISUAL DESCRIPTION
MPS maximum particle size
LL Liquid Limit
P75 % passing 75um sieve

ULLMAN & NOLAN
Technical Services Pty Ltd
A.C.N. 103 205 205

UNGR 103G
(-/1/03)

BOREHOLE LOG

Borehole No. A54
Sheet 1 of 1

Client:	G.G. Betros & Associates Pty Ltd	Date:	18.10.04	Job No:	21024.1/10474.3
		Location:	N7755547 E685836		
Project:	Environmental & Acid Sulphate Investigation	Surface R.L.:	2.6m	Datum:	AHD
Site:	Shute Harbour Marina	Supervisor	RC	Chkd:	AW

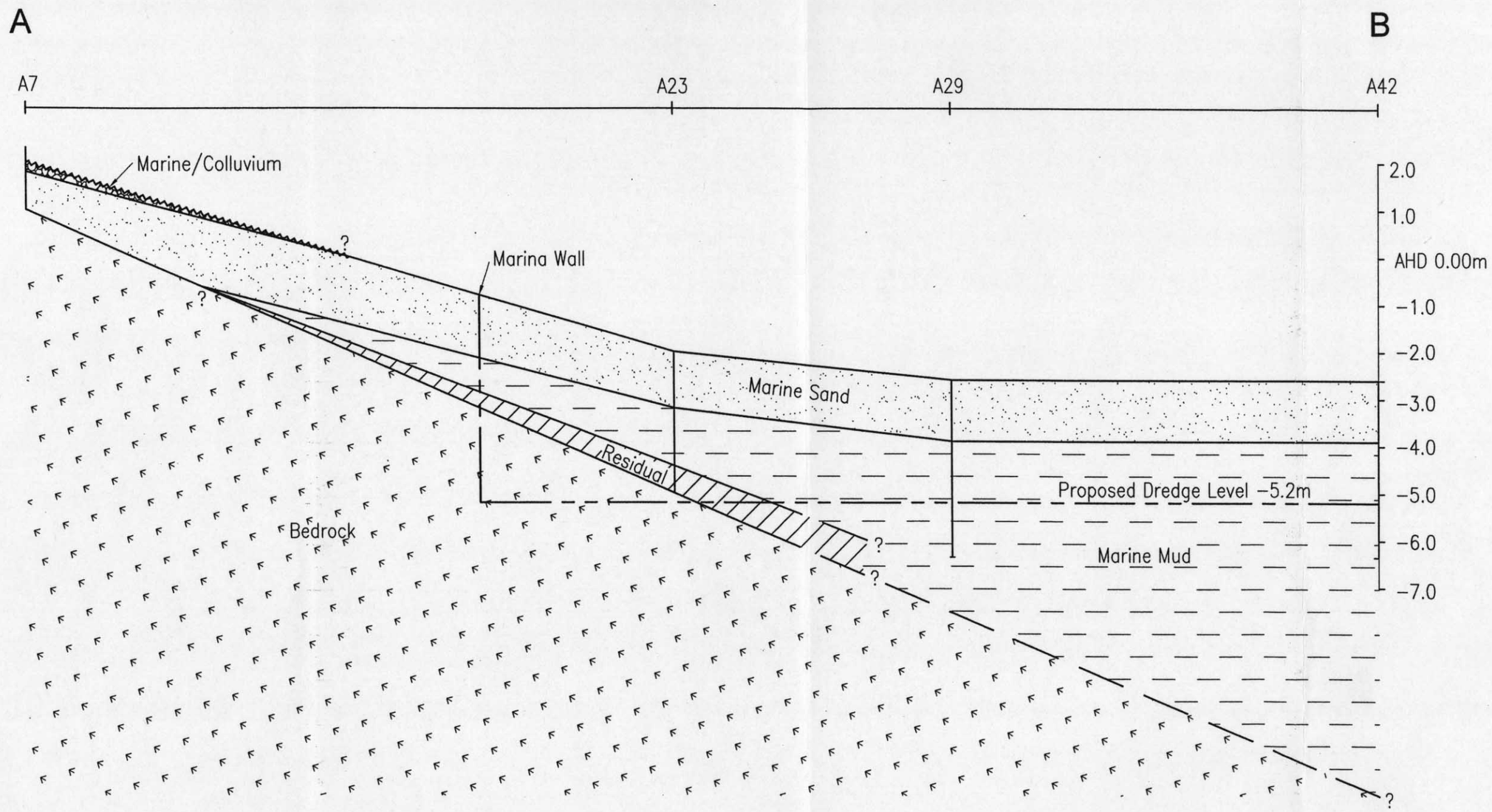
Drill Contractor	Ullman & Nolan Technical Services	Drill Model	Hand Auger	Mounting	Boat	Diameter 50mm

STRATA				DRILLING			TESTING				VISUAL SOIL DESCRIPTION
Depth (m)	R.L	Log	Classification	Method & Bit	Support	Sampling	ASS Screening Results pH_F	pH_{FOX}	Moisture	Consistency	
			GM	A T		SPOCAS	7.3	4.8	D	Dense to Very Dense	**Silty Sandy Gravel;** yellow-brown, fine to coarse grained, angular, sand is fine to coarse grained (Colluvium/Marine) MPS 25 LL 10 P75 20
0.30							6.2	4.9			
											Hand auger refusal at 0.30m
1											
2											
3											
4											

METHOD	BIT	SUPPORT	SAMPLING	MOISTURE	VISUAL DESCRIPTION
A auger	R roller	C casing	U undisturbed sample & size in mm	D dry	MPS maximum particle size
W washbore	B blank	M mud	D disturbed sample	M moist	LL Liquid Limit
P percussion	V V bit		N Standard Penetration Test & Result	W wet	P75 % passing 75um sieve
H hammer	T TC bit		PP Pocket Penetrometer Value		
C core	D diamond				
R rotary air flush					

Appendix C

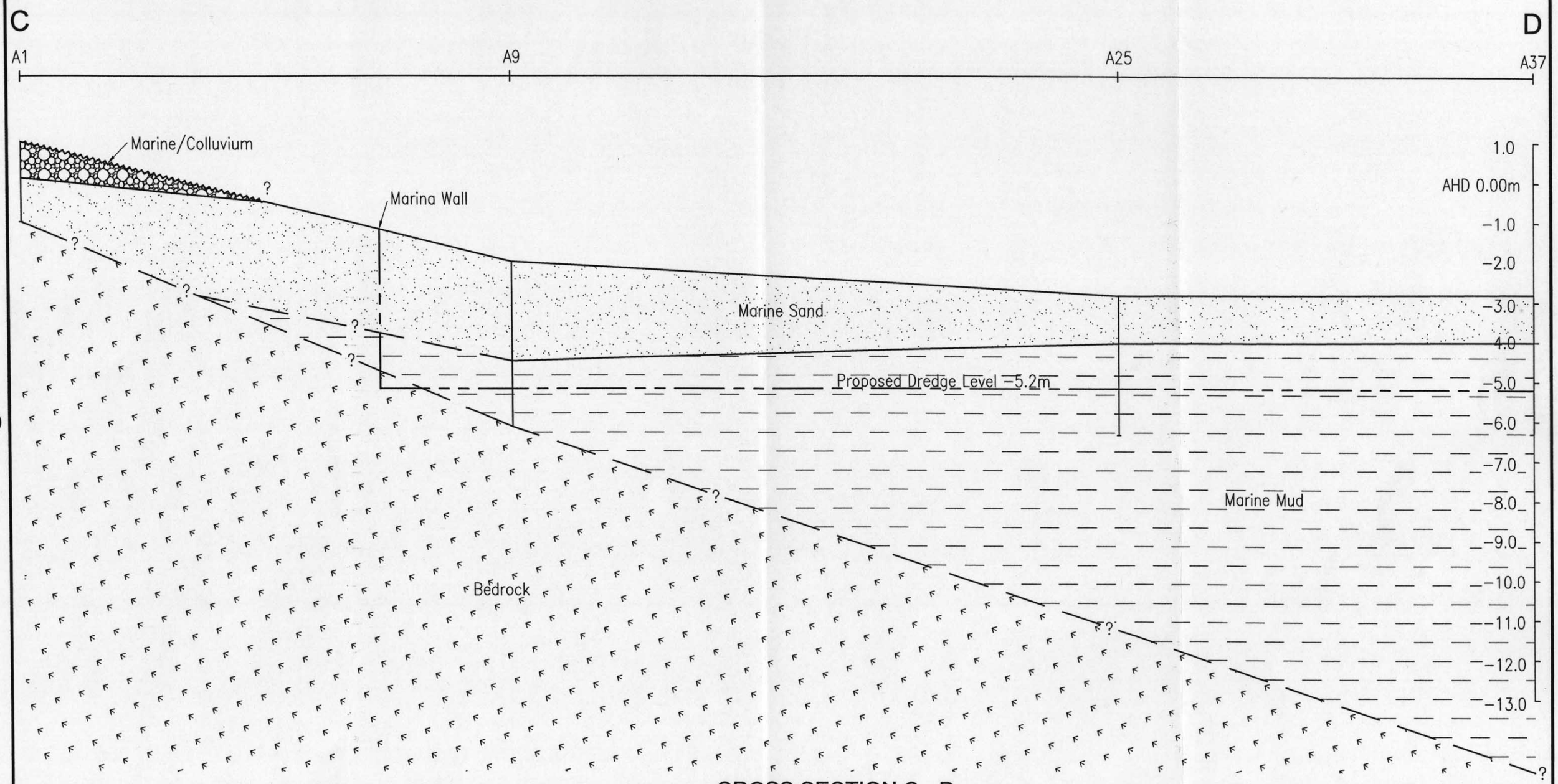
Figures 2-4 – Cross-sectional diagrams



CROSS SECTION A - B

Scale: 1:1000
Horizontal : Vertical Exaggeration = 1:10

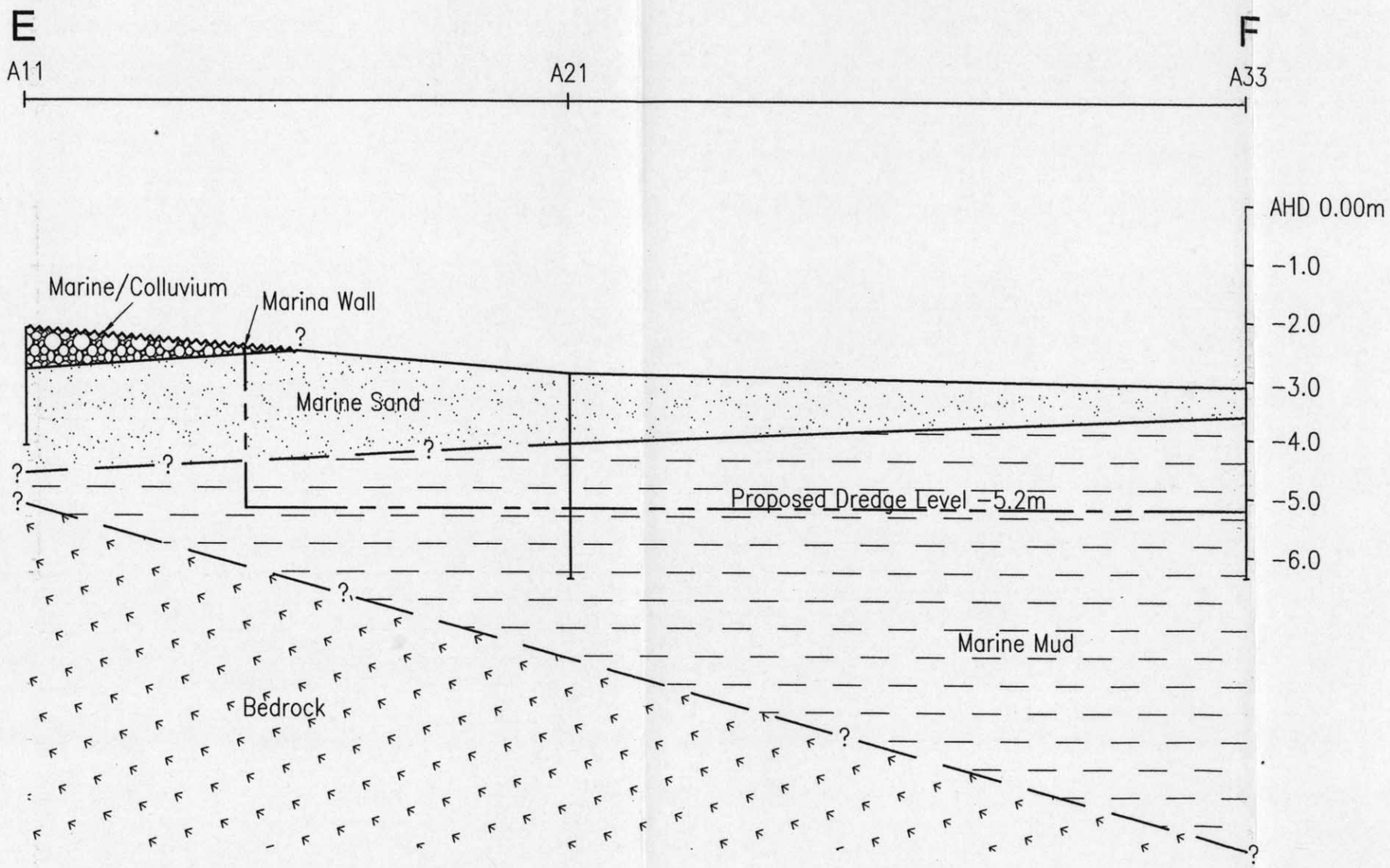
JOB No. 21024.1	UN DWG No. 10474.3-2-4A	DATE 11/04	Checked by Date	NOTES KEY: A7 = ACID SULPHATE BOREHOLE AND NUMBER FOR LOCATION OF CROSS SECTIONS, REFER FIGURE 1	ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD MACKAY PO BOX 5630 MACKAY 4741 PH (07) 49525255 FAX (07) 49525455 A.C.N. 103 205 205	SHUTE HARBOUR MARINA DEVELOPMENT PTY LTD SHUTE HARBOUR MARINA ACID SULPHATE SOILS INVESTIGATION CROSS SECTION A - B SCALE at A3 AS SHOWN DRAWING No. Fig. 2



CROSS SECTION C - D

Scale: 1:1000
Horizontal : Vertical Exaggeration = 1:10

JOB No. 21024.1	UN DWG No. 10474.3-2-4A	DATE 11/04	Checked by Date	NOTES KEY: A1 = ACID SULPHATE BOREHOLE AND NUMBER FOR LOCATION OF CROSS SECTIONS, REFER FIGURE 1	MACKAY	ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD PO BOX 5630 MACKAY 4741 PH (07) 49525255 FAX (07) 49525455 A.C.N. 103 205 205	SHUTE HARBOUR MARINA DEVELOPMENT PTY LTD SHUTE HARBOUR MARINA ACID SULPHATE SOILD INVESTIGATION CROSS SECTION C - D	SCALE at A3 AS SHOWN DRAWING No. Fig. 3



CROSS SECTION E - F

Scale: 1:1000
Horizontal : Vertical Exaggeration = 1:10

JOB No. 21024.1	UN DWG No. 10474.3-2-4A	DATE 11/04	Checked by / Date	NOTES KEY: A11 = ACID SULPHATE BOREHOLE AND NUMBER FOR LOCATION OF CROSS SECTIONS, REFER FIGURE 1	MACKAY ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD PO BOX 5630 MACKAY 4741 PH (07) 49525255 FAX (07) 49525455 A.C.N. 103 205 205	SHUTE HARBOUR MARINA DEVELOPMENT PTY LTD SHUTE HARBOUR MARINA ACID SULPHATE SOILS INVESTIGATION CROSS SECTION E - F	SCALE at A3 AS SHOWN DRAWING No. Fig. 4

Appendix D

Laboratory Results and Sample Receipt Advice

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 05 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 20/7/04 NUMBER OF SAMPLES 20 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 26 JULY 2004 LAB REF. LR2674.407

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_BT/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A2	0-0.5	8.77		0						<0.01		-1.430						-49.3	-48.9	1.44
A2	0.5-0.8	9.09		0						0.04		-1.332						-47.0	-45.0	1.37
A2	0.8-1.3	8.99		0						0.15		-2.094						-77.1	-69.2	2.25
A2	1.3-1.8	9.02		0						0.07		-1.034						-37.7	-34.3	1.10
A3	0-0.5	9.23		0						0.06		-3.551						-123.9	-120.7	3.61
A3	0.5-0.9	8.86		0						0.24		-8.245						-291.0	-278.7	8.49
A3	0.9-1.3	8.84		0						0.28		-1.866						-73.7	-59.2	2.15
A3	1.3-1.35	8.27		0						0.14		-0.482						-21.3	-14.2	0.62
A5	0-0.5	9.08		0						0.04		-3.979						-137.9	-135.7	4.02
A5	0.5-1.2	9.08		0						0.06		-3.965						-138.2	-134.9	4.03
A5	1.2-1.7	9.04		0						0.09		-4.927						-172.2	-167.4	5.02
A5	1.7-2.0	8.82		0						0.15		-5.788						-203.7	-195.9	5.94
A6	0-0.5	9.07		0						0.06		-3.859						-134.4	-131.3	3.92
A6	0.5-1.0	8.90		0						0.13		-4.584						-161.6	-155.0	4.71
A6	1.0-1.6	8.72		0						0.21		-3.544						-128.7	-118.0	3.75
A11	0-0.5	9.07		0						0.17		-5.646						-199.3	-190.8	5.81
A11	0.5-0.7	9.04		0						0.11		-5.080						-178.0	-172.3	5.19
A11	0.7-1.2	8.71		0						0.22		-3.842						-139.5	-128.0	4.07
A11	1.2-1.7	8.68		0						0.22		-4.294						-155.0	-143.5	4.52
A11	1.7-2.0	8.54		0						0.33		-6.478						-233.4	-216.6	6.81

Signatory P. Edwards

For and behalf of Bio-Track Pty Ltd

Determination of soil carbonate

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT	17 AUGUST 2004
CLIENT NAME	MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS	PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME	SHUTE HARBOUR
SAMPLING DATE	3/8/04 NUMBER OF SAMPLES 13
PACKAGING	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
DISPOSAL	SAMPLES DISPOSED ON 1/1/2005
LOG-IN DATE	09 AUGUST 2004 LAB REF. LR984.601
METHOD	As per QLD DNR 2003 Method 6B. CO2 evolved in ferric 12 N HCl, manometric measurement. Carbonate calibration based on CaCO3 standard, calcium carbonate (grav. oven dry 85'C) reported assumes all carbonate as calcium carbonate. Equivalent sulphide soil conversion per DNR 2003 section 3.1. Fineness Factor of 1.5. Note %S eq is an alkalinity value not sulphide.

SAMPLE ID	ALKALINITY (moles/ton)	CaCO3 (%)	ANC (%S eq)	ANC/(FF=1.5) %S eq/FF
A 27 0-0.5	8960	44.82	14.34	9.562
A 27 1.0-1.5	4670	23.36	7.48	4.984
A 27 2.0-2.5	2210	11.03	3.53	2.352
A 27 3.0-3.5	1460	7.32	2.34	1.562
A 43 0-0.5	6850	34.25	10.96	7.307
A 43 1.0-1.5	5080	25.39	8.13	5.417
A 43 2.0-2.5	2780	13.92	4.45	2.969
A 43 3.0-3.5	2190	10.93	3.50	2.333
A 16 0-0.5	10150	50.77	16.25	10.831
A 16 1.0-1.5	5590	27.96	8.95	5.965
A 16 2.0-2.5	2510	12.56	4.02	2.680
A 16 3.0-3.5	1360	6.78	2.17	1.446
A 16 3.5-3.75	1790	8.95	2.86	1.909

Signatory P. Colinton For and behalf of Bio-Track Pty Ltd

Determination of soil carbonate

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT	17 AUGUST 2004
CLIENT NAME	MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS	PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME	SHUTE HARBOUR
SAMPLING DATE	3/8/04 NUMBER OF SAMPLES 8
PACKAGING	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
DISPOSAL	SAMPLES DISPOSED ON 1/1/2005
LOG-IN DATE	09 AUGUST 2004 LAB REF. LR984.525
METHOD	As per QLD DNR 2003 Method 6B. CO2 evolved in ferric 12 N HCl, manometric measurement. Carbonate calibration based on CaCO3 standard, calcium carbonate (grav. oven dry 85'C) reported assumes all carbonate as calcium carbonate. Equivalent sulphide soil conversion per DNR 2003 section 3.1. Fineness Factor of 1.5. Note %S eq is an alkalinity value not sulphide.

SAMPLE ID	ALKALINITY (moles/ton)	CaCO3 (%)	ANC (%S eq)	ANC/(FF=1.5) %S eq/FF
A 28 0.5-1.0	6520	32.62	10.44	6.960
A 28 1.5-2.0	4010	20.06	6.42	4.280
A 28 2.5-3.0	2210	11.03	3.53	2.352
A 28 3.0-3.5	1880	9.40	3.01	2.005
A 41 0.5-1.0	4900	24.49	7.84	5.225
A 41 1.5-2.0	3580	17.89	5.73	3.817
A 41 2.5-3.0	2770	13.83	4.42	2.950
A 41 3.5-3.75	1620	8.12	2.60	1.732

Signatory P. Eshuton For and behalf of Bio-Track Pty Ltd

Determination of soil carbonate

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT	17 AUGUST 2004
CLIENT NAME	MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS	PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME	SHUTE HARBOUR MARINA
SAMPLING DATE	19-21/7/04 NUMBER OF SAMPLES 20
PACKAGING	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
DISPOSAL	SAMPLES DISPOSED ON 1/1/2005
LOG-IN DATE	29 JULY 2004 LAB REF. LR2974.631
METHOD	As per QLD DNR 2003 Method 6B. CO2 evolved in ferric 12 N HCl, manometric measurement. Carbonate calibration based on CaCO3 standard, calcium carbonate (grav. oven dry 85'C) reported assumes all carbonate as calcium carbonate. Equivalent sulphide soil conversion per DNR 2003 section 3.1. Fineness Factor of 1.5. Note %S eq is an alkalinity value not sulphide.

SAMPLE ID	ALKALINITY (moles/ton)	CaCO3 (%)	ANC (%S eq)	ANC/(FF=1.5) %S eq/FF
A 9 0.5-1.0	5750	28.75	9.20	6.133
A 9 1.0-1.5	4870	24.35	7.79	5.195
A 9 1.5-2.0	3420	17.10	5.47	3.648
A 9 2.0-2.5	3020	15.10	4.83	3.221
A 9 2.5-3.0	1710	8.55	2.74	1.824
A 9 3.0-3.5	1450	7.25	2.32	1.547
A 9 3.5-4.15	1130	5.65	1.81	1.205
A 12 0-0.5	11340	56.70	18.14	12.096
A 12 1.0-1.5	3470	17.35	5.55	3.701
A 12 1.5-2.0	4780	23.90	7.65	5.099
A 12 2.0-2.5	3370	16.85	5.39	3.595
A 12 2.5-3.0	1960	9.80	3.14	2.091
A 12 3.0-3.5	2620	13.10	4.19	2.795
A 12 3.5-3.75	2340	11.70	3.74	2.496
A 21 0-0.5	11940	59.70	19.10	12.736
A 21 1.0-1.5	4450	22.25	7.12	4.747
A 21 1.5-2.0	3300	16.50	5.28	3.520
A 21 2.0-2.5	1630	8.15	2.61	1.739
A 21 2.5-3.0	1140	5.70	1.82	1.216
A 21 3.0-3.5	1000	5.00	1.60	1.067

Signatory P. Robertson For and behalf of Bio-Track Pty Ltd

Determination of soil carbonate

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT	17 AUGUST 2004
CLIENT NAME	MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS	PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME	SHUTE HARBOUR
SAMPLING DATE	3/8/04 NUMBER OF SAMPLES 13
PACKAGING	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
DISPOSAL	SAMPLES DISPOSED ON 1/1/2005
LOG-IN DATE	09 AUGUST 2004 LAB REF. LR984.613
METHOD	As per QLD DNR 2003 Method 6B. CO2 evolved in ferric 12 N HCl, manometric measurement. Carbonate calibration based on CaCO3 standard, calcium carbonate (grav. oven dry 85'C) reported assumes all carbonate as calcium carbonate. Equivalent sulphide soil conversion per DNR 2003 section 3.1. Fineness Factor of 1.5. Note %S eq is an alkalinity value not sulphide.

SAMPLE ID	ALKALINITY (moles/ton)	CaCO3 (%)	ANC (%S eq)	ANC/(FF=1.5) %S eq/FF
A 15 0.5-1.0	5060	25.30	8.10	5.398
A 15 1.0-1.5	4440	22.19	7.10	4.733
A 15 1.5-2.0	3940	19.70	6.30	4.203
A 15 2.0-2.5	2540	12.68	4.06	2.704
A 15 2.5-3.0	1750	8.75	2.80	1.866
A 15 3.0-3.5	1790	8.95	2.86	1.909
A 45 0-0.5	7810	39.04	12.49	8.329
A 45 0.5-1.0	7620	38.12	12.20	8.133
A 45 1.0-1.5	4340	21.69	6.94	4.627
A 45 1.5-2.0	3440	17.20	5.51	3.670
A 45 2.0-2.5	2630	13.17	4.21	2.809
A 45 2.5-3.0	3000	15.00	4.80	3.200
A 45 3.0-3.25	2170	10.87	3.48	2.318

Signatory P. Johnston For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Bio-Track

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 18 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 20/7/04 NUMBER OF SAMPLES 28 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 26 JULY 2004 LAB REF. LR2674.403

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_BT/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A1	0-0.5	8.41		0						0.11	-0.488							-20.4	-15.0	0.59
A1	0.5-0.9	8.41		0						0.11	-0.733							-29.0	-23.3	0.85
A1	0.9-1.4	8.74		0						0.19	-1.896							-71.5	-61.9	2.08
A1	1.4-2.0	8.75		0						0.18	-1.867							-70.3	-60.9	2.05
A10	0-0.4	8.95		0						0.20	-8.777							-307.8	-297.7	8.97
A10	0.4-0.9	8.61		0						0.24	-6.807							-241.6	-229.4	7.05
A10	0.9-1.4	8.55		0						0.26	-6.582							-234.8	-221.3	6.85
A10	1.4-2.0	8.56		0						0.32	-5.627							-204.1	-187.5	5.95
A14	0-0.6	8.61		0						0.08	-12.377							-427.2	-423.1	12.46
A14	0.6-1.1	8.53		0						0.15	-7.597							-265.6	-258.0	7.75
A14	1.1-1.6	8.48		0						0.18	-7.024							-247.0	-237.9	7.20
A14	1.6-2.1	8.61		0						0.34	-5.334							-194.7	-177.1	5.68
A14	2.1-2.6	8.32		0						0.18	-3.565							-128.4	-119.2	3.74
A14	2.6-3.1	8.39		0						0.52	-2.259							-95.4	-68.6	2.78
A17	0-0.5	8.53		0						0.14	-7.620							-266.0	-259.0	7.76
A17	0.5-1.0	8.51		0						0.20	-6.654							-235.1	-224.8	6.85
A17	1.0-1.5	8.62		0						0.18	-6.390							-225.3	-216.1	6.57
A17	1.5-2.0	8.57		0						0.18	-6.666							-234.8	-225.5	6.85
A17	2.0-2.5	8.40		0						0.25	-5.799							-207.4	-194.7	6.05
A17	2.5-3.0	8.42		0						0.24	-2.860							-106.2	-94.1	3.10
A17	3.0-3.5	8.24		0						0.30	-2.517							-96.5	-81.3	2.82
A19	0-0.5	8.66		0						0.10	-10.358							-358.7	-353.5	10.46
A19	0.5-1.0	8.25		0						0.33	-3.480							-130.5	-113.8	3.80
A19	1.0-1.5	8.62		0						0.15	-8.754							-305.3	-297.7	8.90
A19	1.5-2.0	8.41		0						0.17	-6.985							-245.5	-236.6	7.16

Signatory P. Poly Tom

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 18 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 20/7/04 NUMBER OF SAMPLES 28 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 26 JULY 2004 LAB REF. LR2674.403

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_BT/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A19	2.0-2.5	8.35		0						0.31		-4.291						-157.6	-142.0	4.60
A19	2.5-3.0	8.34		0						0.36		-2.438						-96.0	-77.5	2.80
A19	3.0-3.5	8.10		0						0.31		-1.978						-78.5	-62.6	2.29

Signatory P. Robertson

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 18 AUGUST 2004 Page 1 of 1 Report Pages.
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 3/8/04 NUMBER OF SAMPLES 14 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 09 AUGUST 2004 LAB REF. LR984.608

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_BT/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 44	0.5-1.0	7.94		0						0.14		-8.338						-290.8	-283.5	8.48
A 44	1.0-1.5	8.52		0						0.34		-6.600						-238.1	-220.6	6.94
A 44	1.5-2.0	8.70		0						0.37		-5.609						-205.2	-186.1	5.98
A 44	2.0-2.5	8.36		0						0.48		-3.912						-150.8	-126.0	4.40
A 44	2.5-3.0	8.38		0						0.39		-3.371						-128.9	-109.1	3.76
A 44	3.0-3.5	8.43		0						0.54		-3.372						-134.2	-106.5	3.91
A 47	0-0.5	8.64		0						0.07		-7.991						-276.3	-272.9	8.06
A 47	0.5-1.0	8.63		0						0.11		-8.258						-287.0	-281.3	8.37
A 47	1.0-1.5	8.47		0						0.19		-6.499						-229.6	-219.6	6.69
A 47	1.5-2.0	8.56		0						0.38		-5.781						-211.1	-191.9	6.16
A 47	2.0-2.5	8.39		0						0.30		-3.904						-144.2	-128.8	4.20
A 47	2.5-3.0	8.33		0						0.52		-2.752						-112.1	-85.7	3.27
A 47	3.0-3.5	8.29		0						0.58		-2.108						-92.0	-62.6	2.68
A 47	3.5-3.75	8.31		0						0.64		-1.664						-79.1	-46.2	2.31

Signatory

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 18 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR MARINA YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 20-21/7/4 NUMBER OF SAMPLES 27 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 29 JULY 2004 LAB REF. LR2974.625

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_BT/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH	pH	pH	TAA	TPA	TSA	S KCl	S P	S POS	S Cr	s-RAS	s EQ	Ca KCl	Ca P	Mg KCl	Mg P	CBN POS	LIME1	LIME2	sANC_BT
	m	KCL	ox	m/t	m/t	m/t	%	%	%	%	%	%	kg/m3	mg/kg	mg/kg	mg/kg	m/t	kg/t	kg/t	%
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 22	0-0.5									0.09		0.094							4.8	
A 40	0.5-1.0									0.06		0.061							3.1	

Signatory

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 18 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR MARINA YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 20-21/7/4 NUMBER OF SAMPLES 27 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 29 JULY 2004 LAB REF. LR2974.625

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_BT/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 8	0.5-1.0									0.11		0.110							5.6	
A 9	0-0.5									0.04		0.044							2.2	
A 9	0.5-1.0									0.07		0.071							3.6	
A 9	1.0-1.5									0.12		0.124							6.3	
A 9	1.5-2.0									0.15		0.154							7.9	
A 9	2.0-2.5									0.19		0.192							9.8	
A 9	2.5-3.0									0.19		0.190							9.7	
A 9	3.0-3.5									0.24		0.237							12.1	
A 9	3.5-4.15									0.19		0.192							9.8	
A 12	0-0.5									0.07		0.074							3.8	
A 12	0.5-1.0									0.12		0.124							6.3	
A 12	1.0-1.5									0.16		0.163							8.3	
A 12	1.5-2.0									0.12		0.120							6.1	
A 12	2.0-2.5									0.14		0.145							7.4	
A 12	2.5-3.0									0.25		0.253							12.9	
A 12	3.0-3.5									0.22		0.217							11.1	
A 12	3.5-3.75									0.26		0.258							13.2	
A 13	0.5-1.0									0.11		0.110							5.6	
A 21	0-0.5									0.07		0.072							3.7	
A 21	0.5-1.0									0.13		0.127							6.5	
A 21	1.0-1.5									0.13		0.133							6.8	
A 21	1.5-2.0									0.18		0.176							9.0	
A 21	2.0-2.5									0.19		0.188							9.6	
A 21	2.5-3.0									0.21		0.207							10.6	
A 21	3.0-3.5									0.16		0.161							8.2	

Signatory P. Edwards

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 24 AUGUST 2004 Page 1 of 1 Report Pages.
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 3/8/04 · NUMBER OF SAMPLES 13 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 09 AUGUST 2004 LAB REF. LR984.551

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 20	0.5-1.0	8.70		0						0.11		-6.513						-227.0	-221.6	6.62
A 20	1.5-2.0	8.39		0						0.29		-3.635						-134.4	-119.8	3.92
A 20	2.5-3.0	8.38		0						0.32		-3.806						-141.6	-125.1	4.13
A 20	3.0-3.5	7.90		0						0.33		-1.757						-71.5	-54.7	2.09
A 33	0.5-1.0	8.67		0						0.26		-8.278						-292.8	-279.5	8.54
A 33	1.5-2.0	8.43		0						0.55		-4.227						-163.7	-135.8	4.77
A 33	2.5-3.0	8.27		0						0.29		-2.357						-90.6	-76.0	2.64
A 33	3.0-3.25	8.16		0						0.12		-2.078						-75.3	-69.3	2.20
A 46	0.5-1.0	8.71		0						0.17		-7.073						-248.2	-239.8	7.24
A 46	1.5-2.0	8.25		0						0.18		-5.119						-181.7	-172.5	5.30
A 46	2.5-3.0	8.33		0						0.41		-2.868						-112.3	-91.5	3.28
A 46	3.0-3.5	8.27		0						0.27		-2.699						-101.8	-88.0	2.97
A 46	3.5-4.0	8.40		0						0.25		-2.206						-84.3	-71.4	2.46

Signatory P. Robertson For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 24 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 3/8/04 NUMBER OF SAMPLES 14 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 09 AUGUST 2004 LAB REF. LR984.518

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 24	0-0.5	8.95		0						0.08	-10.439							-360.9	-356.5	10.52
A 24	1.0-1.5	8.48		0						0.20	-3.723							-134.4	-124.4	3.92
A 24	2.0-2.5	8.48		0						0.23	-3.120							-115.0	-103.1	3.35
A 24	3.0-3.5	8.40		0						0.16	-2.516							-91.9	-83.5	2.68
A 18	0-0.5	8.94		0						0.24	-12.267							-428.7	-416.7	12.50
A 18	1.0-1.5	8.60		0						0.16	-6.100							-214.7	-206.5	6.26
A 18	2.0-2.5	8.30		0						0.27	-2.942							-110.0	-96.4	3.21
A 18	3.0-3.5	8.29		0						0.19	-1.821							-68.9	-59.3	2.01
A 18	3.5-3.75	8.17		0						0.26	-2.258							-86.4	-73.0	2.52
A 23	0-0.5	8.84		0						0.08	-7.932							-274.6	-270.7	8.01
A 23	1.0-1.5	8.60		0						0.19	-6.212							-219.5	-209.9	6.40
A 23	2.0-2.5	8.43		0						0.43	-3.487							-134.3	-112.4	3.92
A 23	3.0-3.5	8.30		0						0.33	-2.285							-89.7	-72.7	2.62
A 23	4.0-4.25	8.11		0						0.34	-1.925							-77.8	-60.2	2.27

Signatory P. Robertson

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 24 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 3/8/04 NUMBER OF SAMPLES 25 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 09 AUGUST 2004 LAB REF. LR984.524

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH	pH	pH	TAA	TPA	TSA	S KCl	S P	S POS	S Cr	s-RAS	s EQ	Ca KCl	Ca P	Mg KCl	Mg P	CBN POS	LIME1	LIME2	sANC_BT
	m	KCL	ox	m/t	m/t	m/t	%	%	%	%	%	%	kg/m3	mg/kg	mg/kg	mg/kg	m/t	kg/t	kg/t	%
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 24	0.5-1.0									0.15		0.154							7.9	
A 24	1.5-2.0									0.24		0.241							12.3	
A 24	2.5-3.0									0.36		0.355							18.2	
A 28	0-0.5									0.18		0.176							9.0	
A 28	0.5-1.0									0.19		0.193							9.9	
A 28	1.0-1.5									0.24		0.244							12.5	
A 28	1.5-2.0									0.28		0.283							14.5	
A 28	2.0-2.5									0.59		0.588							30.1	
A 28	2.5-3.0									0.62		0.622							31.8	
A 28	3.0-3.5									0.72		0.718							36.7	
A 18	0.5-1.0									0.13		0.135							6.9	
A 18	1.5-2.0									0.35		0.347							17.8	
A 18	2.5-3.0									0.38		0.383							19.6	
A 41	0-0.5									0.11		0.114							5.8	
A 41	0.5-1.0									0.20		0.202							10.3	
A 41	1.0-1.5									0.39		0.391							20.0	
A 41	1.5-2.0									0.31		0.309							15.8	
A 41	2.0-2.5									0.35		0.350							17.9	
A 41	2.5-3.0									0.38		0.378							19.4	
A 41	3.0-3.5									0.56		0.558							28.5	
A 41	3.5-3.75									0.67		0.669							34.2	
A 23	0.5-1.0									0.18		0.178							9.1	
A 23	1.5-2.0									0.28		0.277							14.2	
A 23	2.5-3.0									0.31		0.314							16.0	
A 23	3.5-4.0									0.36		0.355							18.2	

Signatory P. Edmondson

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 24 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 3/8/04 NUMBER OF SAMPLES 31 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 09 AUGUST 2004 LAB REF. LR984.555

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 27	0-0.5									0.05		0.054							2.8	
A 27	0.5-1.0									0.16		0.156							8.0	
A 27	1.0-1.5									0.34		0.343							17.6	
A 27	1.5-2.0									0.39		0.394							20.2	
A 27	2.0-2.5									0.36		0.360							18.4	
A 27	2.5-3.0									0.48		0.483							24.7	
A 27	3.0-3.5									0.42		0.417							21.3	
A 33	0-0.5									0.10		0.099							5.1	
A 33	1.0-1.5									0.27		0.271							13.9	
A 33	2.0-2.5									0.44		0.438							22.4	
A 43	0-0.5									0.09		0.086							4.4	
A 43	0.5-1.0									0.12		0.120							6.2	
A 43	1.0-1.5									0.25		0.255							13.0	
A 43	1.5-2.0									0.24		0.240							12.3	
A 43	2.0-2.5									0.31		0.310							15.8	
A 43	2.5-3.0									0.45		0.447							22.9	
A 43	3.0-3.5									0.45		0.454							23.2	
A 20	0-0.5									0.09		0.090							4.6	
A 20	1.0-1.5									0.29		0.294							15.0	
A 20	2.0-2.5									0.46		0.463							23.7	
A 16	0-0.5									0.07		0.074							3.8	
A 16	0.5-1.0									0.15		0.149							7.6	
A 16	1.0-1.5									<0.01		0.003							0.2	
A 16	1.5-2.0									0.21		0.208							10.6	
A 16	2.0-2.5									0.43		0.426							21.8	

Signatory

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 24 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 3/8/04 NUMBER OF SAMPLES 31 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 09 AUGUST 2004 LAB REF. LR984.555

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 16	2.5-3.0									0.45		0.449							22.9	
A 16	3.0-3.5									0.56		0.564							28.8	
A 16	3.5-3.75									0.57		0.570							29.1	
A 46	0-0.5									0.15		0.145							7.4	
A 46	1.0-1.5									0.23		0.229							11.7	
A 46	2.0-2.5									0.39		0.388							19.8	

Signatory P. Robertson

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 24 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 3/8/04 NUMBER OF SAMPLES 15 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 09 AUGUST 2004 LAB REF. LR984.604

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 15	0-0.5									0.14		0.138							7.0	
A 15	0.5-1.0									0.26		0.259							13.3	
A 15	1.0-1.5									0.24		0.235							12.0	
A 15	1.5-2.0									0.25		0.254							13.0	
A 15	2.0-2.5									0.28		0.279							14.3	
A 15	2.5-3.0									0.33		0.331							16.9	
A 15	3.0-3.5									0.51		0.512							26.2	
A 44	0-0.5									0.11		0.114							5.8	
A 45	0-0.5									0.04		0.042							2.2	
A 45	0.5-1.0									0.15		0.153							7.8	
A 45	1.0-1.5									0.22		0.219							11.2	
A 45	1.5-2.0									0.35		0.355							18.2	
A 45	2.0-2.5									0.41		0.408							20.9	
A 45	2.5-3.0									0.46		0.456							23.3	
A 45	3.0-3.25									0.32		0.318							16.3	

Signatory P. Palmer

For and behalf of Bio-Track Pty Ltd

Determination of soil carbonate

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT	26 AUGUST 2004
CLIENT NAME	MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS	PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME	SHUTE HARBOUR
SAMPLING DATE	17/7-10/8/04 NUMBER OF SAMPLES 42
PACKAGING	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
DISPOSAL	SAMPLES DISPOSED ON 1/1/2005
LOG-IN DATE	19 AUGUST 2004 LAB REF. LR1984.435
METHOD	As per QLD DNR 2003 Method 6B. CO2 evolved in ferric 12 N HCl, manometric measurement. Carbonate calibration based on CaCO3 standard, calcium carbonate (grav. oven dry 85'C) reported assumes all carbonate as calcium carbonate. Equivalent sulphide soil conversion per DNR 2003 section 3.1. Fineness Factor of 1.5. Note %S eq is an alkalinity value not sulphide.

SAMPLE ID	ALKALINITY (moles/ton)	CaCO3 (%)	ANC (%S eq)	ANC/(FF=1.5) %S eq/FF
A 36 0.5-1.0	6360	31.80	10.18	6.784
A 36 1.5-2.0	2260	11.29	3.61	2.408
A 36 2.0-2.5	3270	16.34	5.23	3.486
A 36 2.5-3.0	3000	15.00	4.80	3.200
A 36 3.0-3.5	2870	14.37	4.60	3.066
A 25 0-0.5	8300	41.52	13.29	8.857
A 25 1.0-1.5	4570	22.86	7.32	4.877
A 25 2.0-2.5	2790	13.96	4.47	2.978
A 25 2.5-3.0	1660	8.32	2.66	1.775
A 25 3.0-3.5	1730	8.64	2.77	1.843
A 31 0.5-1.0	7050	35.27	11.29	7.525
A 31 1.5-2.0	3930	19.67	6.30	4.197
A 31 2.5-3.0	2900	14.49	4.64	3.092
A 31 3.0-3.5	2400	12.01	3.84	2.563
A 39 0.5-1.0	6870	34.36	10.99	7.330
A 39 1.5-2.0	3640	18.20	5.82	3.883
A 39 2.5-3.0	2560	12.78	4.09	2.727
A 39 3.0-3.25	2010	10.04	3.21	2.142
A 34 0-0.5	5790	28.95	9.26	6.176
A 34 1.0-1.5	4900	24.48	7.83	5.221
A 34 2.0-2.5	2830	14.16	4.53	3.021
A 34 2.5-3.0	2100	10.51	3.36	2.242
A 34 3.0-3.5	1190	5.94	1.90	1.267
A 34 3.5-4.0	1630	8.16	2.61	1.740
A 35 0.5-1.0	6380	31.89	10.20	6.803
A 35 1.5-2.0	3700	18.52	5.93	3.951
A 35 2.0-2.5	2800	14.01	4.48	2.990
A 35 2.5-3.0	2440	12.18	3.90	2.598
A 35 3.0-3.5	1980	9.90	3.17	2.112
A 35 3.5-3.75	2170	10.87	3.48	2.319
A 26 0-0.5	9880	49.41	15.81	10.540
A 26 1.0-1.5	3770	18.85	6.03	4.021
A 26 2.0-2.5	2000	9.99	3.20	2.131
A 26 2.5-3.0	1980	9.88	3.16	2.108
A 26 3.0-3.25	1870	9.34	2.99	1.993
A 4 0.6-1.1	9580	47.89	15.33	10.217
A 4 1.6-2.1	8050	40.26	12.88	8.590
A 4 2.6-3.1	4380	21.92	7.01	4.676
A 4 3.0-3.5	6590	32.94	10.54	7.028
A 4 3.5-3.75	990	4.93	1.58	1.052
A 7 0-0.5	8730	43.66	13.97	9.314
A 7 0.5-1.0	7620	38.12	12.20	8.131

Signatory P. Johnston For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 26 AUGUST 2004 Page 1 of 1 Report Pages.
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 17/7-10/8/04 NUMBER OF SAMPLES 18 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 19 AUGUST 2004 LAB REF. LR1984.428

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 4	0.6-1.1									0.08		0.077							4.0	
A 4	1.1-1.6									0.11		0.106							5.4	
A 4	1.6-2.1									0.18		0.177							9.1	
A 4	2.1-2.6									0.25		0.246							12.6	
A 4	2.6-3.1									0.34		0.340							17.4	
A 4	3.0-3.5									0.19		0.195							10.0	
A 4	3.5-3.75									0.16		0.159							8.1	
A 49	0.5-1.0									0.28		0.280							14.3	
A 49	1.5-2.0									0.44		0.442							22.6	
A 48	0-0.5									0.10		0.099							5.1	
A 48	1.0-1.5									0.40		0.403							20.6	
A 51	0.5-1.0									0.20		0.204							10.4	
A 51	1.5-2.0									0.39		0.394							20.2	
A 50	0-0.5									0.10		0.099							5.1	
A 50	1.0-1.5									0.30		0.298							15.2	
A 50	2.0-2.5									0.46		0.461							23.6	
A 7	0-0.5									0.11		0.110							5.6	
A 7	0.5-1.0									0.18		0.175							9.0	

Signatory P. Edwards For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 27 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 17/7-10/8/04 NUMBER OF SAMPLES 35 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 19 AUGUST 2004 LAB REF. LR1984.424

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 32	0.5-1.0									0.24		0.236							12.1	
A 32	1.5-2.0									0.39		0.385							19.7	
A 36	0-0.5									0.07		0.072							3.7	
A 36	0.5-1.0									0.18		0.176							9.0	
A 36	1.0-1.5									0.22		0.219							11.2	
A 36	1.5-2.0									0.20		0.196							10.0	
A 36	2.0-2.5									0.45		0.448							22.9	
A 36	2.5-3.0									0.42		0.418							21.4	
A 36	3.0-3.5									0.43		0.434							22.2	
A 30	0.5-1.0									0.13		0.130							6.6	
A 30	1.5-2.0									0.23		0.229							11.7	
A 25	0-0.5									0.12		0.119							6.1	
A 25	0.5-1.0									0.17		0.169							8.7	
A 25	1.0-1.5									0.32		0.317							16.2	
A 25	1.5-2.0									0.35		0.352							18.0	
A 25	2.0-2.5									0.42		0.421							21.5	
A 25	2.5-3.0									0.47		0.469							24.0	
A 25	3.0-3.5									0.53		0.529							27.0	
A 31	0-0.5									0.12		0.124							6.4	
A 31	0.5-1.0									0.15		0.154							7.9	
A 31	1.0-1.5									0.27		0.267							13.6	
A 31	1.5-2.0									0.32		0.315							16.1	
A 31	2.0-2.5									0.41		0.412							21.1	
A 31	2.5-3.0									0.44		0.439							22.4	
A 31	3.0-3.5									0.50		0.502							25.7	

Signatory P. Robertson

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 27 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 17/7-10/8/04 NUMBER OF SAMPLES 35 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 19 AUGUST 2004 LAB REF. LR1984.424

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH	pH	pH	TAA	TPA	TSA	S KCl	S P	S POS	S Cr	s-RAS	s EQ	Ca KCl	Ca P	Mg KCl	Mg P	CBN POS	LIME1	LIME2	sANC_BT
	m	KCL	ox	m/t	m/t	m/t	%	%	%	%	%	%	kg/m3	mg/kg	mg/kg	mg/kg	m/t	kg/t	kg/t	%
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 42	0.5-1.0									0.26		0.259							13.2	
A 42	1.5-2.0									0.28		0.280							14.3	
A 42	2.5-3.0									0.48		0.475							24.3	
A 39	0-0.5									0.07		0.074							3.8	
A 39	0.5-1.0									0.16		0.158							8.1	
A 39	1.0-1.5									0.29		0.289							14.8	
A 39	1.5-2.0									0.36		0.364							18.6	
A 39	2.0-2.5									0.27		0.274							14.0	
A 39	2.5-3.0									0.46		0.463							23.7	
A 39	3.0-3.25									0.27		0.275							14.0	

Signatory

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 27 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 17/7-10/8/04 NUMBER OF SAMPLES 22 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 19 AUGUST 2004 LAB REF. LR1984.433

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH	pH	pH	TAA	TPA	TSA	S KCl	S P	S POS	S Cr	s-RAS	s EQ	Ca KCl	Ca P	Mg KCl	Mg P	CBN POS	LIME1	LIME2	sANC_BT
	m	KCL	ox	m/t	m/t	m/t	%	%	%	%	%	%	kg/m3	mg/kg	mg/kg	mg/kg	m/t	kg/t	kg/t	%
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 49	0-0.5	8.90		0						0.10		-4.073						-143.2	-138.0	4.18
A 49	1.0-1.5	8.50		0						0.41		-3.274						-126.2	-105.4	3.68
A 49	2.0-2.5	8.28		0						0.44		-5.363						-198.8	-176.6	5.80
A 49	2.5-3.0	7.93		0						0.46		-2.180						-90.7	-66.9	2.64
A 49	3.0-3.5	8.21		0						0.55		-1.745						-78.6	-50.6	2.29
A 49	3.5-3.75	8.22		0						0.55		-1.875						-83.1	-55.1	2.42
A 48	0.5-1.0	8.56		0						0.28		-5.315						-191.8	-177.6	5.59
A 48	1.5-2.0	8.29		0						0.48		-3.091						-122.5	-97.9	3.57
A 48	2.0-2.5	8.20		0						0.54		-2.428						-101.8	-74.2	2.97
A 48	2.5-3.0	8.21		0						0.55		-2.369						-100.1	-71.9	2.92
A 48	3.0-3.5	8.19		0						0.60		-1.815						-82.6	-52.2	2.41
A 48	3.5-3.75	8.07		0						0.59		-1.802						-81.9	-51.9	2.39
A 51	0-0.5	8.85		0						0.09		-4.837						-168.8	-164.4	4.92
A 51	1.0-1.5	8.44		0						0.33		-3.565						-133.5	-116.7	3.89
A 51	2.0-2.5	8.31		0						0.47		-3.065						-121.2	-97.2	3.53
A 51	2.5-3.0	8.15		0						0.46		-2.573						-104.1	-80.4	3.04
A 51	3.0-3.5	8.20		0						0.50		-2.589						-105.9	-80.4	3.09
A 50	0.5-1.0	8.68		0						0.22		-5.488						-195.7	-184.6	5.71
A 50	1.5-2.0	8.34		0						0.37		-3.056						-117.6	-98.5	3.43
A 50	2.5-3.0	8.26		0						0.52		-2.323						-97.6	-70.8	2.85
A 50	3.0-3.5	8.27		0						0.50		-2.463						-101.6	-76.0	2.96
A 50	3.5-3.75	8.31		0						0.49		-2.032						-86.4	-61.5	2.52

Signatory

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 30 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 17/7-10/8/04 NUMBER OF SAMPLES 30 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 19 AUGUST 2004 LAB REF. LR1984.427

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 38	0.5-1.0									0.40		0.399							20.4	
A 38	1.5-2.0									0.37		0.367							18.7	
A 37	0-0.5									0.12		0.118							6.0	
A 37	1.0-1.5									0.28		0.284							14.5	
A 34	0-0.5									0.24		0.238							12.1	
A 34	0.5-1.0									0.28		0.282							14.4	
A 34	1.0-1.5									0.41		0.409							20.9	
A 34	1.5-2.0									0.60		0.596							30.5	
A 34	2.0-2.5									0.72		0.721							36.9	
A 34	2.5-3.0									0.87		0.869							44.4	
A 34	3.0-3.5									0.57		0.567							29.0	
A 34	3.5-4.0									0.82		0.819							41.9	
A 35	0-0.5									0.24		0.239							12.2	
A 35	0.5-1.0									0.22		0.219							11.2	
A 35	1.0-1.5									0.41		0.409							20.9	
A 35	1.5-2.0									0.44		0.439							22.5	
A 35	2.0-2.5									0.65		0.646							33.0	
A 35	2.5-3.0									0.55		0.550							28.1	
A 35	3.0-3.5									0.78		0.783							40.0	
A 35	3.5-3.75									0.88		0.880							45.0	
A 26	0-0.5									0.12		0.121							6.2	
A 26	0.5-1.0									0.34		0.339							17.3	
A 26	1.0-1.5									0.64		0.644							32.9	
A 26	1.5-2.0									0.67		0.670							34.3	
A 26	2.0-2.5									0.83		0.834							42.6	

Signatory P. Robinson

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 30 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 17/7-10/8/04 NUMBER OF SAMPLES 30 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 19 AUGUST 2004 LAB REF. LR1984.427

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil.

I.D.	DEPTH	pH	pH	TAA	TPA	TSA	S KCl	S P	S POS	S Cr	s-RAS	s EQ	Ca KCl	Ca P	Mg KCl	Mg P	CBN POS	LIME1	LIME2	sANC_BT
	m	KCL	ox	m/t	m/t	m/t	%	%	%	%	%	%	kg/m3	mg/kg	mg/kg	mg/kg	m/t	kg/t	kg/t	%
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 26	2.5-3.0									0.84		0.835							42.7	
A 26	3.0-3.25									0.79		0.789							40.3	
A 29	0-0.5									0.23		0.232							11.8	
A 29	1.0-1.5									0.36		0.359							18.4	
A 29	2.0-2.5									0.55		0.554							28.4	

Signatory

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 30 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 17/7-10/8/04 NUMBER OF SAMPLES 30 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 19 AUGUST 2004 LAB REF. LR1984.431

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 32	0-0.5	8.67		0						0.15		-5.031						-177.8	-169.9	5.18
A 32	1.0-1.5	8.30		0						0.49		-4.310						-164.5	-139.6	4.80
A 32	2.0-2.5	8.10		0						0.63		-2.091						-93.3	-61.1	2.72
A 32	2.5-3.0	7.72		0						0.67		-4.800						-187.5	-153.4	5.47
A 32	3.0-3.5	7.71		0						0.81		-1.161						-67.8	-26.1	1.98
A 30	0-0.5	8.48		0						0.19		-4.687						-167.4	-157.5	4.88
A 30	1.0-1.5	8.21		0						0.39		-5.040						-186.1	-166.3	5.43
A 30	2.0-2.5	7.68		0						0.56		-3.963						-155.2	-126.5	4.52
A 30	2.5-3.0	7.90		0						0.61		-3.199						-130.6	-99.5	3.81
A 30	3.0-3.5	8.06		0						0.62		-2.778						-116.7	-84.7	3.40
A 42	0-0.5	8.37		0						0.25		-4.635						-167.6	-154.7	4.89
A 42	1.0-1.5	8.80		0						0.46		-4.392						-166.4	-142.8	4.85
A 42	2.0-2.5	8.02		0						0.66		-2.853						-120.3	-86.8	3.51
A 42	3.0-3.5	7.73		0						0.80		-2.007						-96.4	-55.3	2.81
A 42	3.5-3.75	7.96		0						0.85		-1.530						-81.7	-38.1	2.38
A 38	0-0.5	8.06		0						0.19		-4.533						-162.0	-152.2	4.73
A 38	1.0-1.5	8.01		0						0.20		-4.757						-170.1	-159.7	4.96
A 38	2.0-2.5	7.78		0						0.58		-3.418						-137.0	-107.5	4.00
A 38	2.5-3.0	7.21		0						0.35		-1.881						-76.6	-58.5	2.23
A 38	3.0-3.5	7.94		0						0.46		-2.326						-95.7	-71.9	2.79
A37	0.5-1.0	7.98		0						0.20		-4.613						-165.2	-154.7	4.82
A 37	1.5-2.0	7.87		0						0.19		-3.441						-124.6	-114.7	3.63
A 37	2.0-2.5	7.74		0						0.25		-3.048						-112.9	-100.4	3.29
A 37	2.5-3.0	7.74		0						0.35		-2.930						-112.4	-94.6	3.28
A 37	3.0-3.5	7.62		0						0.84		-1.778						-89.7	-46.9	2.62

Signatory P. Robertson

For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: **Bio-Track Pty Ltd** ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 30 AUGUST 2004
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN GEOTECHNIC
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 17/7-10/8/04 NUMBER OF SAMPLES 30 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 19 AUGUST 2004 LAB REF. LR1984.431

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA/TPA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation and Bulk Density = 1.6 g/cc but DO NOT include any safety factors. Suggested factor=1.5-1.8.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/m3	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 29	0.5-1.0	8.08		0						0.12		-5.910						-206.9	-200.6	6.03
A 29	1.5-2.0	8.28		0						0.19		-4.211						-150.8	-141.3	4.40
A 29	2.5-3.0	7.88		0						0.93		-2.300						-110.8	-63.2	3.23
A 29	3.0-3.5	7.83		0						1.01		-1.866						-98.7	-46.9	2.88
A 29	3.5-3.75	8.01		0						0.94		-1.616						-87.6	-39.6	2.56

Signatory P. Edwards For and behalf of Bio-Track Pty Ltd

Determination of soil carbonate

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT	23 September 2004
CLIENT NAME	MR ROWAN COSSINS c/o ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD
CLIENT ADDRESS	PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME	SHUTE HARBOUR
SAMPLING DATE	20/7/04 NUMBER OF SAMPLES 20
PACKAGING	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
DISPOSAL	SAMPLES DISPOSED ON 1/1/2005
LOG-IN DATE	26 JULY 2004 LAB REF. LR2674.408
METHOD	As per QLD DNR 2003 Method 6B. CO2 evolved in ferric 12 N HCl, manometric measurement. Carbonate calibration based on CaCO3 standard, calcium carbonate (grav. oven dry 85'C) reported assumes all carbonate as calcium carbonate. Equivalent sulphide soil conversion per DNR 2003 section 3.1. Fineness Factor of 1.5. Note %S eq is an alkalinity value not sulphide.

SAMPLE ID	ALKALINITY (moles/ton)	CaCO3 (%)	ANC (%S eq)	ANC/(FF=1.5) %S eq/FF
A2 0-0.5	2340	11.70	3.74	2.496
A2 0.5-0.8	2020	10.08	3.23	2.150
A2 0.8-1.3	2170	10.83	3.47	2.311
A2 1.3-1.8	1580	7.88	2.52	1.681
A3 0-0.5	6160	30.82	9.86	6.575
A3 0.5-0.9	8480	42.41	13.57	9.047
A3 0.9-1.3	5520	27.58	8.82	5.883
A3 1.3-1.35	1000	4.98	1.59	1.063
A5 0-0.5	7360	36.80	11.78	7.851
A5 0.5-1.2	8480	42.41	13.57	9.047
A5 1.2-1.7	9760	48.80	15.61	10.410
A5 1.7-2.0	9130	45.67	14.62	9.744
A6 0-0.5	11820	59.09	18.91	12.606
A6 0.5-1.0	12160	60.82	19.46	12.975
A6 1.0-1.6	10660	53.30	17.05	11.370
A11 0-0.5	10710	53.54	17.13	11.421
A11 0.5-0.7	12400	61.99	19.84	13.224
A11 0.7-1.2	9070	45.33	14.50	9.670
A11 1.2-1.7	10200	50.98	16.31	10.876
A11 1.7-2.0	7120	35.61	11.40	7.598

Signatory P. Colquhoun For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275. 781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 23 SEPTEMBER 2004 @12:40:32 Page 1 of 1 Report Pages.
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN TECHNICAL SERVICES PTY LTD
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR MARINA YOUR PROJECT/JOB REFERENCE 21024.1
SAMPLING DATE 20-21/7/4 NUMBER OF SAMPLES 25 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE ** SAMPLES DISPOSED ON 1/1/2005
DATE RECEIVED 29 JULY 2004 LAB REF. LR2974.622

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation but DO NOT include any safety factors. Suggested factor=1.5-1.8. Rates are kg/ton.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL 23A	pH ox 23B	TAA m/t 23F	TPA m/t 23G	TSA m/t 23H	S KCl % 23Ce	S P % 23De	S POS % 23Ee	S Cr % 22B	s-RAS % s23Re	s EQ % s	Ca KCl kg/t 23Vh	Ca P mg/kg 23Wh	Mg KCl mg/kg 23Sm	Mg P mg/kg 23Tm	CBN POS m/t a23U&X	LIME1 kg/t	LIME2 kg/t	sANC_BT % s19A2	
A 8	0-0.5	8.94		0						0.06	-12.699							-273.5	-271.5	12.76	
A 8	1.0-1.5	8.78		0						0.09	-7.630							-165.5	-162.6	7.72	
A 8	1.5-2.0	8.43		0						0.17	-4.343							-96.6	-91.3	4.51	
A 8	2.0-2.5	8.70		0						0.21	-3.659							-82.8	-76.3	3.86	
A 8	2.5-3.0	8.50		0						0.22	-3.486							-79.5	-72.4	3.71	
A 8	3.0-3.5	8.27		0						0.29	-4.205							-96.3	-87.1	4.49	
A 8	3.5-3.8	8.18		0						0.30	-3.065							-72.1	-62.5	3.37	
A 13	0-0.5	8.43		0						0.07	-11.540							-248.7	-246.6	11.61	
A 13	1.0-1.5	8.79		0						0.13	-8.502							-184.9	-180.9	8.63	
A 13	1.5-2.0	8.67		0						0.19	-5.758							-127.4	-121.4	5.95	
A 13	2.0-2.5	8.67		0						0.20	-0.262							-9.8	-3.5	0.46	
A 13	2.5-3.0	8.42		0						0.16	-2.993							-67.6	-62.4	3.16	
A 13	3.0-3.5	8.64		0						0.23	-1.711							-41.7	-34.2	1.95	
~~A 13~~	~~3.5-3.75~~	~~8.59~~		~~0~~						~~0.22~~	~~0.049~~							~~-3.6~~	~~-3.3~~	~~0.17~~	see repeat sheet.
A 22	0.5-1.0	8.50		0						0.18	-6.386							-140.6	-135.0	6.56	
A 22	1.0-1.5	8.71		0						0.25	-5.556							-124.4	-116.5	5.81	
A 22	1.5-2.0	8.40		0						0.21	-3.626							-82.2	-75.5	3.84	
A 22	2.0-2.5	8.31		0						0.24	-2.932							-68.0	-60.3	3.17	
A 22	2.5-3.0	8.27		0						0.09	-2.984							-66.0	-63.0	3.08	
A 22	3.0-3.5	8.24		0						0.21	-2.195							-51.5	-44.9	2.40	
A 40	0-0.5	9.13		0						0.05	-6.243							-135.0	-133.2	6.30	
A 40	1.0-1.5	8.77		0						0.15	-16.432							-355.3	-350.7	16.58	
A 40	1.5-2.0	9.23		0						0.14	-8.093							-176.4	-172.0	8.23	
A 40	2.0-2.5	8.52		0						0.17	-2.310							-53.2	-47.7	2.48	
A 40	2.5-3.0	8.35		0						0.24	-2.360							-55.7	-48.1	2.60	

Signatory P. Johnston For and behalf of Bio-Track Pty Ltd

DETERMINATION OF ACID SULFATE SOIL PROPERTIES

CERTIFICATE OF ANALYSIS

Analysis By: Bio-Track Pty Ltd ABN 91 056 237 275

781 Mt. Glorious Road Highvale, Brisbane, Australia, 4520 Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT 27 SEPTEMBER 2004 @13:17:59 Page 1 of 1 Report Pages.
CLIENT NAME MR ROWAN COSSINS c/o ULLMAN & NOLAN TECHNICAL SERVICES P/L
CLIENT ADDRESS PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME SHUTE HARBOUR
SAMPLING DATE no record NUMBER OF SAMPLES 1 SAMPLE TYPE:SOIL SAMPLE FOR ACID SULFATE STUDY
PACKAGING 4 ** SAMPLES DISPOSED ON 1/6/2005
DATE RECEIVED 27 SEPTEMBER 2004 LAB REF. LR2794.529

Samples as received. METHODOLOGY: As per (DNR QASSIT May 2004) for <850 um sample fraction, oven dry (85'C) mass
LIME1 rates calculated to neutralise TPA (or TAA if >TPA)+ aS_RAS -ANC_E/1.5 LIME2 rates calculated to neutralise TAA + aS_POS or S_Cr + aS_RAS -ANC_BT/1.5
NB. Lime rates assume 97% lime neutralisation but DO NOT include any safety factors. Suggested factor=1.5-1.8. Rates are kg/ton.
CBN POS= moles carbonate alkalinity released by oxidation assuming (Ca POS - Ca KCl) + (Mg POS - Mg KCl) is due to carbonate solution.
Blanks represent unmeasured values, zeros represent measured values. If pH KCl>4.5 then s-RAS may be zero for undisturbed soil. ANC measured on KCl extract NOT oxidised digest.

I.D.	DEPTH m	pH KCL	pH ox	TAA m/t	TPA m/t	TSA m/t	S KCl %	S P %	S POS %	S Cr %	s-RAS %	s EQ %	Ca KCl kg/t	Ca P mg/kg	Mg KCl mg/kg	Mg P mg/kg	CBN POS m/t	LIME1 kg/t	LIME2 kg/t	sANC_BT %
Analytical Method Codes		23A	23B	23F	23G	23H	23Ce	23De	23Ee	22B	s23Re	s	23Vh	23Wh	23Sm	23Tm	a23U&X			s19A2
A 13	3.5-3.75	8.59		0						0.22		-2.333						-54.6	-47.7	2.55

Signatory P. Robinson

For and behalf of Bio-Track Pty Ltd

SOIL ANALYSIS REPORT

Analysis By: Bio-Track Pty Ltd
ABN 91 056 237 275
Mt. Glorious Road
Highvale, Brisbane, Australia, 4520
Ph. 07 3289 7179 Fx. 07 3289 7155

DATE OF REPORT	15 OCTOBER 2004
CLIENT NAME	MR ROWAN COSSINS
CLIENT FIRM	ULLMAN & NOLAN TECHNICAL SERVICES P/L
CLIENT ADDRESS	PO BOX 5630 MACKAY MC Q 4741
PROJECT NAME	SHUTE HARBOUR MARINA SAMPLING DATE 20-21/7/04
NUMBER OF SAMPLES	14 SAMPLE TYPE INTACT
PACKAGING	SAMPLES LABELLED ** SAMPLES DISPOSED ON 1/7/2005
LOG-IN DATE	15 OCTOBER 2004 LAB REF. LR15104.391

SAMPLE ID	E.C. dS/m
A 22 0-0.5	5.1
A 22 0.5-1.0	6.3
A 22 1.0-1.5	6.9
A 22 1.5-2.0	7.0
A 22 2.0-2.5	7.7
A 22 2.5-3.0	7.1
A 22 3.0-3.5	7.3
A 25 0-0.5	4.7
A 25 0.5-1.0	5.7
A 25 1.0-1.5	7.7
A 25 1.5-2.0	8.3
A 25 2.0-2.5	7.9
A 25 2.5-3.0	9.4
A 25 3.0-3.5	9.7

ANALYTICAL METHOD
EC by conductivity meter 1:5 soil water extract

Signatory P. Edmiston For and behalf of Bio-Track Pty Ltd

FOR THE ATTENTION OF MR ROWAN COSSINS

20 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR2674.408

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	26 JULY 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY
SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	20/7/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 20 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A2	0	0.5	SOIL CARBONATE	## 19816
A2	0.5	0.8	SOIL CARBONATE	## 19817
A2	0.8	1.3	SOIL CARBONATE	## 19818
A2	1.3	1.8	SOIL CARBONATE	## 19819
A3	0	0.5	SOIL CARBONATE	## 19820
A3	0.5	0.9	SOIL CARBONATE	## 19821
A3	0.9	1.3	SOIL CARBONATE	## 19822
A3	1.3	1.35	SOIL CARBONATE	## 19823
A5	0	0.5	SOIL CARBONATE	## 19824
A5	0.5	1.2	SOIL CARBONATE	## 19825
A5	1.2	1.7	SOIL CARBONATE	## 19826
A5	1.7	2.0	SOIL CARBONATE	## 19827
A6	0	0.5	SOIL CARBONATE	## 19828
A6	0.5	1.0	SOIL CARBONATE	## 19829
A6	1.0	1.6	SOIL CARBONATE	## 19830
A11	0	0.5	SOIL CARBONATE	## 19831
A11	0.5	0.7	SOIL CARBONATE	## 19832
A11	0.7	1.2	SOIL CARBONATE	## 19833
A11	1.2	1.7	SOIL CARBONATE	## 19834
A11	1.7	2.0	SOIL CARBONATE	## 19835

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

20 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR2674.407

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	26 JULY 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY
SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	20/7/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 20 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A2	0	0.5	TAA/Cr S/ N RAS	## 19816
A2	0.5	0.8	TAA/Cr S/ N RAS	## 19817
A2	0.8	1.3	TAA/Cr S/ N RAS	## 19818
A2	1.3	1.8	TAA/Cr S/ N RAS	## 19819
A3	0	0.5	TAA/Cr S/ N RAS	## 19820
A3	0.5	0.9	TAA/Cr S/ N RAS	## 19821
A3	0.9	1.3	TAA/Cr S/ N RAS	## 19822
A3	1.3	1.35	TAA/Cr S/ N RAS	## 19823
A5	0	0.5	TAA/Cr S/ N RAS	## 19824
A5	0.5	1.2	TAA/Cr S/ N RAS	## 19825
A5	1.2	1.7	TAA/Cr S/ N RAS	## 19826
A5	1.7	2.0	TAA/Cr S/ N RAS	## 19827
A6	0	0.5	TAA/Cr S/ N RAS	## 19828
A6	0.5	1.0	TAA/Cr S/ N RAS	## 19829
A6	1.0	1.6	TAA/Cr S/ N RAS	## 19830
A11	0	0.5	TAA/Cr S/ N RAS	## 19831
A11	0.5	0.7	TAA/Cr S/ N RAS	## 19832
A11	0.7	1.2	TAA/Cr S/ N RAS	## 19833
A11	1.2	1.7	TAA/Cr S/ N RAS	## 19834
A11	1.7	2.0	TAA/Cr S/ N RAS	## 19835

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

28 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR2674.403

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	26 JULY 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY
SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	20/7/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 28 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A1	0	0.5	TAA/Cr S/ N RAS	## 19784
A1	0.5	0.9	TAA/Cr S/ N RAS	## 19785
A1	0.9	1.4	TAA/Cr S/ N RAS	## 19786
A1	1.4	2.0	TAA/Cr S/ N RAS	## 19787
A10	0	0.4	TAA/Cr S/ N RAS	## 19788
A10	0.4	0.9	TAA/Cr S/ N RAS	## 19789
A10	0.9	1.4	TAA/Cr S/ N RAS	## 19790
A10	1.4	2.0	TAA/Cr S/ N RAS	## 19791
A14	0	0.6	TAA/Cr S/ N RAS	## 19792
A14	0.6	1.1	TAA/Cr S/ N RAS	## 19793
A14	1.1	1.6	TAA/Cr S/ N RAS	## 19794
A14	1.6	2.1	TAA/Cr S/ N RAS	## 19795
A14	2.1	2.6	TAA/Cr S/ N RAS	## 19796
A14	2.6	3.1	TAA/Cr S/ N RAS	## 19797
A17	0	0.5	TAA/Cr S/ N RAS	## 19798
A17	0.5	1.0	TAA/Cr S/ N RAS	## 19799
A17	1.0	1.5	TAA/Cr S/ N RAS	## 19800
A17	1.5	2.0	TAA/Cr S/ N RAS	## 19801
A17	2.0	2.5	TAA/Cr S/ N RAS	## 19802
A17	2.5	3.0	TAA/Cr S/ N RAS	## 19803
A17	3.0	3.5	TAA/Cr S/ N RAS	## 19804
A19	0	0.5	TAA/Cr S/ N RAS	## 19805
A19	0.5	1.0	TAA/Cr S/ N RAS	## 19806
A19	1.0	1.5	TAA/Cr S/ N RAS	## 19807
A19	1.5	2.0	TAA/Cr S/ N RAS	## 19808
A19	2.0	2.5	TAA/Cr S/ N RAS	## 19809
A19	2.5	3.0	TAA/Cr S/ N RAS	## 19810
A19	3.0	3.5	TAA/Cr S/ N RAS	## 19811

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

27 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR MARINA Lab Ref. LR2974.625

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	29 JULY 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER 60599

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	20-21/7/4
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 27 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 8	0.5	1.0	TAA & Cr reducible S	## 20110
A 9	0	0.5	TAA & Cr reducible S	## 20111
A 9	0.5	1.0	TAA & Cr reducible S	## 20112
A 9	1.0	1.5	TAA & Cr reducible S	## 20113
A 9	1.5	2.0	TAA & Cr reducible S	## 20114
A 9	2.0	2.5	TAA & Cr reducible S	## 20115
A 9	2.5	3.0	TAA & Cr reducible S	## 20116
A 9	3.0	3.5	TAA & Cr reducible S	## 20117
A 9	3.5	4.15	TAA & Cr reducible S	## 20118
A 12	0	0.5	TAA & Cr reducible S	## 20119
A 12	0.5	1.0	TAA & Cr reducible S	## 20120
A [illegible]	1.0	1.5	TAA & Cr reducible S	## 20121
A [illegible]	1.5	2.0	TAA & Cr reducible S	## 20122
A 12	2.0	2.5	TAA & Cr reducible S	## 20123
A 12	2.5	3.0	TAA & Cr reducible S	## 20124
A 12	3.0	3.5	TAA & Cr reducible S	## 20125
A 12	3.5	3.75	TAA & Cr reducible S	## 20126
A 13	0.5	1.0	TAA & Cr reducible S	## 20127
A 21	0	0.5	TAA & Cr reducible S	## 20128
A 21	0.5	1.0	TAA & Cr reducible S	## 20129
A 21	1.0	1.5	TAA & Cr reducible S	## 20130
A 21	1.5	2.0	TAA & Cr reducible S	## 20131
A 21	2.0	2.5	TAA & Cr reducible S	## 20132
A 21	2.5	3.0	TAA & Cr reducible S	## 20133
A 21	3.0	3.5	TAA & Cr reducible S	## 20134
A 22	0	0.5	TAA & Cr reducible S	## 20135
A 40	0.5	1.0	TAA & Cr reducible S	## 20136

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

20 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR MARINA Lab Ref. LR2974.631

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	29 JULY 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER 60599

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	19-21/7/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 20 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 9	0.5	1.0	SOIL CARBONATE	## 20146
A 9	1.0	1.5	SOIL CARBONATE	## 20147
A 9	1.5	2.0	SOIL CARBONATE	## 20148
A 9	2.0	2.5	SOIL CARBONATE	## 20149
A 9	2.5	3.0	SOIL CARBONATE	## 20150
A 9	3.0	3.5	SOIL CARBONATE	## 20151
A 9	3.5	4.15	SOIL CARBONATE	## 20152
A 12	0	0.5	SOIL CARBONATE	## 20153
A 12	1.0	1.5	SOIL CARBONATE	## 20154
A 12	1.5	2.0	SOIL CARBONATE	## 20155
A 12	2.0	2.5	SOIL CARBONATE	## 20156
A 12	2.5	3.0	SOIL CARBONATE	## 20157
A 12	3.0	3.5	SOIL CARBONATE	## 20158
A 12	3.5	3.75	SOIL CARBONATE	## 20159
A 21	0	0.5	SOIL CARBONATE	## 20160
A 21	1.0	1.5	SOIL CARBONATE	## 20161
A 21	1.5	2.0	SOIL CARBONATE	## 20162
A 21	2.0	2.5	SOIL CARBONATE	## 20163
A 21	2.5	3.0	SOIL CARBONATE	## 20164
A 21	3.0	3.5	SOIL CARBONATE	## 20165

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

25 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR MARINA Lab Ref. LR2974.622

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	29 JULY 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER 60599

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	20-21/7/4
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 25 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 8	0	0.5	TAA & Cr reducible S	## 20084
A 8	1.0	1.5	TAA & Cr reducible S	## 20085
A 8	1.5	2.0	TAA & Cr reducible S	## 20086
A 8	2.0	2.5	TAA & Cr reducible S	## 20087
A 8	2.5	3.0	TAA & Cr reducible S	## 20088
A 8	3.0	3.5	TAA & Cr reducible S	## 20089
A 8	3.5	3.8	TAA & Cr reducible S	## 20090
A 13	0	0.5	TAA & Cr reducible S	## 20092
A 13	1.0	1.5	TAA & Cr reducible S	## 20093
A 13	1.5	2.0	TAA & Cr reducible S	## 20094
A 13	2.0	2.5	TAA & Cr reducible S	## 20095
A [illegible]	2.5	3.0	TAA & Cr reducible S	## 20096
A [illegible]	3.0	3.5	TAA & Cr reducible S	## 20097
A 13	3.5	3.75	TAA & Cr reducible S	## 20098
A 22	0.5	1.0	TAA & Cr reducible S	## 20099
A 22	1.0	1.5	TAA & Cr reducible S	## 20100
A 22	1.5	2.0	TAA & Cr reducible S	## 20101
A 22	2.0	2.5	TAA & Cr reducible S	## 20102
A 22	2.5	3.0	TAA & Cr reducible S	## 20103
A 22	3.0	3.5	TAA & Cr reducible S	## 20104
A 40	0	0.5	TAA & Cr reducible S	## 20105
A 40	1.0	1.5	TAA & Cr reducible S	## 20106
A 40	1.5	2.0	TAA & Cr reducible S	## 20107
A 40	2.0	2.5	TAA & Cr reducible S	## 20108
A 40	2.5	3.0	TAA & Cr reducible S	## 20109

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

15 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR984.604

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	09 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	3/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 15 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 15	0	0.5	TAA & Cr reducible S	## 20915
A 15	0.5	1.0	TAA & Cr reducible S	## 20916
A 15	1.0	1.5	TAA & Cr reducible S	## 20917
A 15	1.5	2.0	TAA & Cr reducible S	## 20918
A 15	2.0	2.5	TAA & Cr reducible S	## 20919
A 15	2.5	3.0	TAA & Cr reducible S	## 20920
A 15	3.0	3.5	TAA & Cr reducible S	## 20921
A 44	0	0.5	TAA & Cr reducible S	## 20922
A 45	0	0.5	TAA & Cr reducible S	## 20923
A 45	0.5	1.0	TAA & Cr reducible S	## 20924
A 45	1.0	1.5	TAA & Cr reducible S	## 20925
A 45	1.5	2.0	TAA & Cr reducible S	## 20926
A 45	2.0	2.5	TAA & Cr reducible S	## 20927
A 45	2.5	3.0	TAA & Cr reducible S	## 20928
A 45	3.0	3.25	TAA & Cr reducible S	## 20929

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

25 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR984.524

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	09 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	3/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 25 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 24	0.5	1.0	TAA & Cr reducible S	## 20811
A 24	1.5	2.0	TAA & Cr reducible S	## 20812
A 24	2.5	3.0	TAA & Cr reducible S	## 20813
A 28	0	0.5	TAA & Cr reducible S	## 20814
A 28	0.5	1.0	TAA & Cr reducible S	## 20815
A 28	1.0	1.5	TAA & Cr reducible S	## 20816
A 28	1.5	2.0	TAA & Cr reducible S	## 20817
A 28	2.0	2.5	TAA & Cr reducible S	## 20818
A 28	2.5	3.0	TAA & Cr reducible S	## 20819
A 28	3.0	3.5	TAA & Cr reducible S	## 20820
A 18	0.5	1.0	TAA & Cr reducible S	## 20821
A [illegible]	1.5	2.0	TAA & Cr reducible S	## 20822
A [illegible]	2.5	3.0	TAA & Cr reducible S	## 20823
A 41	0	0.5	TAA & Cr reducible S	## 20824
A 41	0.5	1.0	TAA & Cr reducible S	## 20825
A 41	1.0	1.5	TAA & Cr reducible S	## 20826
A 41	1.5	2.0	TAA & Cr reducible S	## 20827
A 41	2.0	2.5	TAA & Cr reducible S	## 20828
A 41	2.5	3.0	TAA & Cr reducible S	## 20829
A 41	3.0	3.5	TAA & Cr reducible S	## 20830
A 41	3.5	3.75	TAA & Cr reducible S	## 20831
A 23	0.5	1.0	TAA & Cr reducible S	## 20832
A 23	1.5	2.0	TAA & Cr reducible S	## 20833
A 23	2.5	3.0	TAA & Cr reducible S	## 20834
A 23	3.5	4.0	TAA & Cr reducible S	## 20835

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

31 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR984.555

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	09 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	3/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 31 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 27	0	0.5	TAA & Cr reducible S	## 20857
A 27	0.5	1.0	TAA & Cr reducible S	## 20858
A 27	1.0	1.5	TAA & Cr reducible S	## 20859
A 27	1.5	2.0	TAA & Cr reducible S	## 20860
A 27	2.0	2.5	TAA & Cr reducible S	## 20861
A 27	2.5	3.0	TAA & Cr reducible S	## 20862
A 27	3.0	3.5	TAA & Cr reducible S	## 20863
A 33	0	0.5	TAA & Cr reducible S	## 20864
A 33	1.0	1.5	TAA & Cr reducible S	## 20865
A 33	2.0	2.5	TAA & Cr reducible S	## 20866
A 43	0	0.5	TAA & Cr reducible S	## 20867
A 43	0.5	1.0	TAA & Cr reducible S	## 20868
A 43	1.0	1.5	TAA & Cr reducible S	## 20869
A 43	1.5	2.0	TAA & Cr reducible S	## 20870
A 43	2.0	2.5	TAA & Cr reducible S	## 20871
A 43	2.5	3.0	TAA & Cr reducible S	## 20872
A 43	3.0	3.5	TAA & Cr reducible S	## 20873
A 20	0	0.5	TAA & Cr reducible S	## 20874
A 20	1.0	1.5	TAA & Cr reducible S	## 20875
A 20	2.0	2.5	TAA & Cr reducible S	## 20876
A 16	0	0.5	TAA & Cr reducible S	## 20877
A 16	0.5	1.0	TAA & Cr reducible S	## 20878
A 16	1.0	1.5	TAA & Cr reducible S	## 20879
A 16	1.5	2.0	TAA & Cr reducible S	## 20880
A 16	2.0	2.5	TAA & Cr reducible S	## 20881
A 16	2.5	3.0	TAA & Cr reducible S	## 20882
A 16	3.0	3.5	TAA & Cr reducible S	## 20883
A 16	3.5	3.75	TAA & Cr reducible S	## 20884
A 46	0	0.5	TAA & Cr reducible S	## 20885
A 46	1.0	1.5	TAA & Cr reducible S	## 20886
A 46	2.0	2.5	TAA & Cr reducible S	## 20887

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

14 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR984.518

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	09 AUGUST 2004
YOUR JOB REFERENCE	21024:1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	3/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 14 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 24	0	0.5	TAA & Cr reducible S	## 20797
A 24	1.0	1.5	TAA & Cr reducible S	## 20798
A 24	2.0	2.5	TAA & Cr reducible S	## 20799
A 24	3.0	3.5	TAA & Cr reducible S	## 20800
A 18	0	0.5	TAA & Cr reducible S	## 20801
A 18	1.0	1.5	TAA & Cr reducible S	## 20802
A 18	2.0	2.5	TAA & Cr reducible S	## 20803
A 18	3.0	3.5	TAA & Cr reducible S	## 20804
A 18	3.5	3.75	TAA & Cr reducible S	## 20805
A 23	0	0.5	TAA & Cr reducible S	## 20806
A 23	1.0	1.5	TAA & Cr reducible S	## 20807
A [illegible]	2.0	2.5	TAA & Cr reducible S	## 20808
A [illegible]	3.0	3.5	TAA & Cr reducible S	## 20809
A 23	4.0	4.25	TAA & Cr reducible S	## 20810

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

13 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR984.551

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	09 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	3/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 13 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 20	0.5	1.0	TAA & Cr reducible S	## 20844
A 20	1.5	2.0	TAA & Cr reducible S	## 20845
A 20	2.5	3.0	TAA & Cr reducible S	## 20846
A 20	3.0	3.5	TAA & Cr reducible S	## 20847
A 33	0.5	1.0	TAA & Cr reducible S	## 20848
A 33	1.5	2.0	TAA & Cr reducible S	## 20849
A 33	2.5	3.0	TAA & Cr reducible S	## 20850
A 33	3.0	3.25	TAA & Cr reducible S	## 20851
A 46	0.5	1.0	TAA & Cr reducible S	## 20852
A 46	1.5	2.0	TAA & Cr reducible S	## 20853
A 46	2.5	3.0	TAA & Cr reducible S	## 20854
A 46	3.0	3.5	TAA & Cr reducible S	## 20855
A 46	3.5	4.0	TAA & Cr reducible S	## 20856

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

14 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR984.608

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	09 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	3/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 14 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 44	0.5	1.0	TAA & Cr reducible S	## 20930
A 44	1.0	1.5	TAA & Cr reducible S	## 20931
A 44	1.5	2.0	TAA & Cr reducible S	## 20932
A 44	2.0	2.5	TAA & Cr reducible S	## 20933
A 44	2.5	3.0	TAA & Cr reducible S	## 20934
A 44	3.0	3.5	TAA & Cr reducible S	## 20935
A 47	0	0.5	TAA & Cr reducible S	## 20936
A 47	0.5	1.0	TAA & Cr reducible S	## 20937
A 47	1.0	1.5	TAA & Cr reducible S	## 20938
A 47	1.5	2.0	TAA & Cr reducible S	## 20939
A 47	2.0	2.5	TAA & Cr reducible S	## 20940
A [illegible]	2.5	3.0	TAA & Cr reducible S	## 20941
A [illegible]	3.0	3.5	TAA & Cr reducible S	## 20942
A 47	3.5	3.75	TAA & Cr reducible S	## 20943

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

13 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR984.613

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	09 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	3/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 13 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 15	0.5	1.0	SOIL CARBONATE	## 20944
A 15	1.0	1.5	SOIL CARBONATE	## 20945
A 15	1.5	2.0	SOIL CARBONATE	## 20946
A 15	2.0	2.5	SOIL CARBONATE	## 20947
A 15	2.5	3.0	SOIL CARBONATE	## 20948
A 15	3.0	3.5	SOIL CARBONATE	## 20949
A 45	0	0.5	SOIL CARBONATE	## 20950
A 45	0.5	1.0	SOIL CARBONATE	## 20951
A 45	1.0	1.5	SOIL CARBONATE	## 20952
A 45	1.5	2.0	SOIL CARBONATE	## 20953
A 45	2.0	2.5	SOIL CARBONATE	## 20954
A 45	2.5	3.0	SOIL CARBONATE	## 20955
A 45	3.0	3.25	SOIL CARBONATE	## 20956

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

13 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR984.601

T[illegible]ollowing details have been recorded for this sample batch.

Fl[illegible]	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	09 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	3/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 13 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 27	0	0.5	SOIL CARBONATE	## 20902
A 27	1.0	1.5	SOIL CARBONATE	## 20903
A 27	2.0	2.5	SOIL CARBONATE	## 20904
A 27	3.0	3.5	SOIL CARBONATE	## 20905
A 43	0	0.5	SOIL CARBONATE	## 20906
A 43	1.0	1.5	SOIL CARBONATE	## 20907
A 43	2.0	2.5	SOIL CARBONATE	## 20908
A 43	3.0	3.5	SOIL CARBONATE	## 20909
A 16	0	0.5	SOIL CARBONATE	## 20910
A 16	1.0	1.5	SOIL CARBONATE	## 20911
A 16	2.0	2.5	SOIL CARBONATE	## 20912
A [illegible]	3.0	3.5	SOIL CARBONATE	## 20913
A [illegible]	3.5	3.75	SOIL CARBONATE	## 20914

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

8 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR984.525

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	09 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER CHAIN OF CUSTODY

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	3/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - STORED ON ICE
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 8 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 28	0.5	1.0	SOIL CARBONATE	## 20836
A 28	1.5	2.0	SOIL CARBONATE	## 20837
A 28	2.5	3.0	SOIL CARBONATE	## 20838
A 28	3.0	3.5	SOIL CARBONATE	## 20839
A 41	0.5	1.0	SOIL CARBONATE	## 20840
A 41	1.5	2.0	SOIL CARBONATE	## 20841
A 41	2.5	3.0	SOIL CARBONATE	## 20842
A 41	3.5	3.75	SOIL CARBONATE	## 20843

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

42 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR1984.435

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	19 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER 60612

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	17/7-10/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 42 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 36	0.5	1.0	SOIL CARBONATE	## 21346
A 36	1.5	2.0	SOIL CARBONATE	## 21347
A 36	2.0	2.5	SOIL CARBONATE	## 21348
A 36	2.5	3.0	SOIL CARBONATE	## 21349
A 36	3.0	3.5	SOIL CARBONATE	## 21350
A 25	0	0.5	SOIL CARBONATE	## 21351
A 25	1.0	1.5	SOIL CARBONATE	## 21352
A 25	2.0	2.5	SOIL CARBONATE	## 21353
A 25	2.5	3.0	SOIL CARBONATE	## 21354
A 25	3.0	3.5	SOIL CARBONATE	## 21355
A 31	0.5	1.0	SOIL CARBONATE	## 21356
A [illegible]	1.5	2.0	SOIL CARBONATE	## 21357
A [illegible]	2.5	3.0	SOIL CARBONATE	## 21358
A 31	3.0	3.5	SOIL CARBONATE	## 21359
A 39	0.5	1.0	SOIL CARBONATE	## 21360
A 39	1.5	2.0	SOIL CARBONATE	## 21361
A 39	2.5	3.0	SOIL CARBONATE	## 21362
A 39	3.0	3.25	SOIL CARBONATE	## 21363
A 34	0	0.5	SOIL CARBONATE	## 21364
A 34	1.0	1.5	SOIL CARBONATE	## 21365
A 34	2.0	2.5	SOIL CARBONATE	## 21366
A 34	2.5	3.0	SOIL CARBONATE	## 21367
A 34	3.0	3.5	SOIL CARBONATE	## 21368
A 34	3.5	4.0	SOIL CARBONATE	## 21369
A 35	0.5	1.0	SOIL CARBONATE	## 21370
A 35	1.5	2.0	SOIL CARBONATE	## 21371
A 35	2.0	2.5	SOIL CARBONATE	## 21372
A 35	2.5	3.0	SOIL CARBONATE	## 21373
A 35	3.0	3.5	SOIL CARBONATE	## 21374
A 35	3.5	3.75	SOIL CARBONATE	## 21375
A 26	0	0.5	SOIL CARBONATE	## 21376
A 26	1.0	1.5	SOIL CARBONATE	## 21377
A 26	2.0	2.5	SOIL CARBONATE	## 21378
A 26	2.5	3.0	SOIL CARBONATE	## 21379
A 26	3.0	3.25	SOIL CARBONATE	## 21380
A 4	0.6	1.1	SOIL CARBONATE	## 21381
A 4	1.6	2.1	SOIL CARBONATE	## 21382
A 4	2.6	3.1	SOIL CARBONATE	## 21383
A 4	3.0	3.5	SOIL CARBONATE	## 21384
A 4	3.5	3.75	SOIL CARBONATE	## 21385
A 7	0	0.5	SOIL CARBONATE	## 21386
A 7	0.5	1.0	SOIL CARBONATE	## 21387

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

22 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR1984.433

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	19 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER 60612

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	17/7-10/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 22 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 49	0	0.5	TAA & Cr reducible S	## 21324
A 49	1.0	1.5	TAA & Cr reducible S	## 21325
A 49	2.0	2.5	TAA & Cr reducible S	## 21326
A 49	2.5	3.0	TAA & Cr reducible S	## 21327
A 49	3.0	3.5	TAA & Cr reducible S	## 21328
A 49	3.5	3.75	TAA & Cr reducible S	## 21329
A 48	0.5	1.0	TAA & Cr reducible S	## 21330
A 48	1.5	2.0	TAA & Cr reducible S	## 21331
A 48	2.0	2.5	TAA & Cr reducible S	## 21332
A 48	2.5	3.0	TAA & Cr reducible S	## 21333
A 48	3.0	3.5	TAA & Cr reducible S	## 21334
A 48	3.5	3.75	TAA & Cr reducible S	## 21335
A 51	0	0.5	TAA & Cr reducible S	## 21336
A 51	1.0	1.5	TAA & Cr reducible S	## 21337
A 51	2.0	2.5	TAA & Cr reducible S	## 21338
A 51	2.5	3.0	TAA & Cr reducible S	## 21339
A 51	3.0	3.5	TAA & Cr reducible S	## 21340
A 50	0.5	1.0	TAA & Cr reducible S	## 21341
A 50	1.5	2.0	TAA & Cr reducible S	## 21342
A 50	2.5	3.0	TAA & Cr reducible S	## 21343
A 50	3.0	3.5	TAA & Cr reducible S	## 21344
A 50	3.5	3.75	TAA & Cr reducible S	## 21345

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

18 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR1984.428

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	19 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER 60612

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	17/7-10/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 18 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 4	0.6	1.1	Cr S ONLY	## 21275
A 4	1.1	1.6	Cr S ONLY	## 21276
A 4	1.6	2.1	Cr S ONLY	## 21277
A 4	2.1	2.6	Cr S ONLY	## 21278
A 4	2.6	3.1	Cr S ONLY	## 21279
A 4	3.0	3.5	Cr S ONLY	## 21280
A 4	3.5	3.75	Cr S ONLY	## 21281
A 49	0.5	1.0	Cr S ONLY	## 21282
A 49	1.5	2.0	Cr S ONLY	## 21283
A 48	0	0.5	Cr S ONLY	## 21284
A 48	1.0	1.5	Cr S ONLY	## 21285
A	0.5	1.0	Cr S ONLY	## 21286
A	1.5	2.0	Cr S ONLY	## 21287
A 50	0	0.5	Cr S ONLY	## 21289
A 50	1.0	1.5	Cr S ONLY	## 21290
A 50	2.0	2.5	Cr S ONLY	## 21291
A 7	0	0.5	Cr S ONLY	## 21292
A 7	0.5	1.0	Cr S ONLY	## 21293

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

35 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR1984.424

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	19 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER 60612

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	17/7-10/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 35 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 32	0.5	1.0	Cr S ONLY	## 21210
A 32	1.5	2.0	Cr S ONLY	## 21211
A 36	0	0.5	Cr S ONLY	## 21212
A 36	0.5	1.0	Cr S ONLY	## 21213
A 36	1.0	1.5	Cr S ONLY	## 21214
A 36	1.5	2.0	Cr S ONLY	## 21215
A 36	2.0	2.5	Cr S ONLY	## 21216
A 36	2.5	3.0	Cr S ONLY	## 21217
A 36	3.0	3.5	Cr S ONLY	## 21218
A 30	0.5	1.0	Cr S ONLY	## 21219
A 30	1.5	2.0	Cr S ONLY	## 21220
A 25	0	0.5	Cr S ONLY	## 21221
A 25	0.5	1.0	Cr S ONLY	## 21222
A 25	1.0	1.5	Cr S ONLY	## 21223
A 25	1.5	2.0	Cr S ONLY	## 21224
A 25	2.0	2.5	Cr S ONLY	## 21225
A 25	2.5	3.0	Cr S ONLY	## 21226
A 25	3.0	3.5	Cr S ONLY	## 21227
A 31	0	0.5	Cr S ONLY	## 21228
A 31	0.5	1.0	Cr S ONLY	## 21229
A 31	1.0	1.5	Cr S ONLY	## 21230
A 31	1.5	2.0	Cr S ONLY	## 21231
A 31	2.0	2.5	Cr S ONLY	## 21232
A 31	2.5	3.0	Cr S ONLY	## 21233
A 31	3.0	3.5	Cr S ONLY	## 21234
A 42	0.5	1.0	Cr S ONLY	## 21235
A 42	1.5	2.0	Cr S ONLY	## 21236
A 42	2.5	3.0	Cr S ONLY	## 21237
A 39	0	0.5	Cr S ONLY	## 21238
A 39	0.5	1.0	Cr S ONLY	## 21239
A 39	1.0	1.5	Cr S ONLY	## 21240
A 39	1.5	2.0	Cr S ONLY	## 21241
A 39	2.0	2.5	Cr S ONLY	## 21242
A 39	2.5	3.0	Cr S ONLY	## 21243
A 39	3.0	3.25	Cr S ONLY	## 21244

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

30 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR1984.431

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	19 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER 60612

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	17/7-10/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 30 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 32	0	0.5	TAA & Cr reducible S	## 21294
A 32	1.0	1.5	TAA & Cr reducible S	## 21295
A 32	2.0	2.5	TAA & Cr reducible S	## 21296
A 32	2.5	3.0	TAA & Cr reducible S	## 21297
A 32	3.0	3.5	TAA & Cr reducible S	## 21298
A 30	0	0.5	TAA & Cr reducible S	## 21299
A 30	1.0	1.5	TAA & Cr reducible S	## 21300
A 30	2.0	2.5	TAA & Cr reducible S	## 21301
A 30	2.5	3.0	TAA & Cr reducible S	## 21302
A 30	3.0	3.5	TAA & Cr reducible S	## 21303
A 42	0	0.5	TAA & Cr reducible S	## 21304
A	1.0	1.5	TAA & Cr reducible S	## 21305
A	2.0	2.5	TAA & Cr reducible S	## 21306
A 42	3.0	3.5	TAA & Cr reducible S	## 21307
A 42	3.5	3.75	TAA & Cr reducible S	## 21308
A 38	0	0.5	TAA & Cr reducible S	## 21309
A 38	1.0	1.5	TAA & Cr reducible S	## 21310
A 38	2.0	2.5	TAA & Cr reducible S	## 21311
A 38	2.5	3.0	TAA & Cr reducible S	## 21312
A 38	3.0	3.5	TAA & Cr reducible S	## 21313
A37	0.5	1.0	TAA & Cr reducible S	## 21314
A 37	1.5	2.0	TAA & Cr reducible S	## 21315
A 37	2.0	2.5	TAA & Cr reducible S	## 21316
A 37	2.5	3.0	TAA & Cr reducible S	## 21317
A 37	3.0	3.5	TAA & Cr reducible S	## 21318
A 29	0.5	1.0	TAA & Cr reducible S	## 21319
A 29	1.5	2.0	TAA & Cr reducible S	## 21320
A 29	2.5	3.0	TAA & Cr reducible S	## 21321
A 29	3.0	3.5	TAA & Cr reducible S	## 21322
A 29	3.5	3.75	TAA & Cr reducible S	## 21323

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

30 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR Lab Ref. LR1984.427

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN GEOTECHNIC
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	19 AUGUST 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER 60612

SAMPLE TYPE:	SOIL SAMPLE FOR ACID SULFATE STUDY
SAMPLE DATE	17/7-10/8/04
SAMPLE CONDITION	SAMPLES LABELLED - INTACT - BAGGED - CHILLED IN INSULATED PACKAGING
SAMPLE STORAGE	small mass of dried sample stored at room temperature in polythene bags until 1/1/2005

CUSTODY RECORD: 30 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 38	0.5	1.0	Cr S ONLY	## 21245
A 38	1.5	2.0	Cr S ONLY	## 21246
A 37	0	0.5	Cr S ONLY	## 21247
A 37	1.0	1.5	Cr S ONLY	## 21248
A 34	0	0.5	Cr S ONLY	## 21249
A 34	0.5	1.0	Cr S ONLY	## 21250
A 34	1.0	1.5	Cr S ONLY	## 21251
A 34	1.5	2.0	Cr S ONLY	## 21252
A 34	2.0	2.5	Cr S ONLY	## 21253
A 34	2.5	3.0	Cr S ONLY	## 21254
A 34	3.0	3.5	Cr S ONLY	## 21255
A 34	3.5	4.0	Cr S ONLY	## 21256
A 35	0	0.5	Cr S ONLY	## 21257
A 35	0.5	1.0	Cr S ONLY	## 21258
A 35	1.0	1.5	Cr S ONLY	## 21259
A 35	1.5	2.0	Cr S ONLY	## 21260
A 35	2.0	2.5	Cr S ONLY	## 21261
A 35	2.5	3.0	Cr S ONLY	## 21262
A 35	3.0	3.5	Cr S ONLY	## 21263
A 35	3.5	3.75	Cr S ONLY	## 21264
A 26	0	0.5	Cr S ONLY	## 21265
A 26	0.5	1.0	Cr S ONLY	## 21266
A 26	1.0	1.5	Cr S ONLY	## 21267
A 26	1.5	2.0	Cr S ONLY	## 21268
A 26	2.0	2.5	Cr S ONLY	## 21269
A 26	2.5	3.0	Cr S ONLY	## 21270
A 26	3.0	3.25	Cr S ONLY	## 21271
A 29	0	0.5	Cr S ONLY	## 21272
A 29	1.0	1.5	Cr S ONLY	## 21273
A 29	2.0	2.5	Cr S ONLY	## 21274

SAMPLE DISPOSAL DATE 1/1/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

FOR THE ATTENTION OF MR ROWAN COSSINS

14 test samples have been received by Bio-Track for analysis. Thank You

Project: SHUTE HARBOUR MARINA Lab Ref. LR15104.391

The following details have been recorded for this sample batch.

FIRM	ULLMAN & NOLAN TECHNICAL SERVICES P/L
REPORT MAILED TO	MR ROWAN COSSINS
MAILING ADDRESS	PO BOX 5630 MACKAY MC Q 4741
REPORT FAXED TO	07 4952 5455
CLIENT PHONE No.	07 4952 5255
LOGIN DATE	15 OCTOBER 2004
YOUR JOB REFERENCE	21024.1 CLIENT ORDER NUMBER PER EMAIL 14/10/04

SAMPLE TYPE:	SOIL SAMPLE
SAMPLE DATE	20-21/7/04
SAMPLE CONDITION	SAMPLES LABELLED, INTACT, EVACUATED, HEAT SEALED IN O2 RESISTANT POLYMER
SAMPLE STORAGE	dried sample stored at room temperature in O2 barrier film until 1/7/2005

CUSTODY RECORD: 14 samples now held by Bio-Track. Please check for any missing samples or labelling errors.

All samples listed for analysis have been received.

Hole/Sample	Upper	Lower	Test	Bio-Track Sample No.
A 22	0	0.5	SOIL EC	## 22471
A 22	0.5	1.0	SOIL EC	## 22472
A 22	1.0	1.5	SOIL EC	## 22473
A 22	1.5	2.0	SOIL EC	## 22474
A 22	2.0	2.5	SOIL EC	## 22475
A 22	2.5	3.0	SOIL EC	## 22476
A 22	3.0	3.5	SOIL EC	## 22477
A 25	0	0.5	SOIL EC	## 22478
A 25	0.5	1.0	SOIL EC	## 22479
A 25	1.0	1.5	SOIL EC	## 22480
A 25	1.5	2.0	SOIL EC	## 22481
A 25	2.0	2.5	SOIL EC	## 22482
A 25	2.5	3.0	SOIL EC	## 22483
A 25	3.0	3.5	SOIL EC	## 22484

SAMPLE DISPOSAL DATE 1/7/2005

CONTACT BIO-TRACK Phone=07 32897179 Fax=07 32897155 Post= 781 MT GLORIOUS RD; HIGHVALE 4520

ALS Environmental

CERTIFICATE OF ANALYSIS

Client	: **ULLMAN & NOLAN PTY LTD**	**Laboratory**	: ALS Environmental Brisbane	**Page**	: **1 of 5**
Contact	: ROWAN COSSINS	**Contact**	: Michael Heery		
Address	: P O BOX 5630 MACKAY MC QLD AUSTRALIA 4741	**Address**	: 32 Shand Street Stafford QLD Australia 4053	**Work order**	: **EB0403940**
Project	: 21024.1	**Quote number**	: ----	**Date received**	: 28 Jul 2004
Order number	: 60600			**Date issued**	: 13 Aug 2004
C-O-C number	: - Not provided -				
Site	: - Not provided -				
E-mail	: soils@uneng.com.au	**E-mail**	: Michael.Heery@alsenviro.com	**No. of samples**	
Telephone	: (07)4952-5255	**Telephone**	: 61-7-32437222	**Received**	: 4
Facsimile	: (07)4952-5455	**Facsimile**	: 61-7-32437259	**Analysed**	: 4

This final report was issued on Friday, August 13, 2004 for the ALSE work order reference EB0403940 and supersedes any previous reports with this reference.
Results apply to the samples as submitted. All pages of this report have been checked and approved for release.
This report contains the following information:

- Analytical results for samples submitted
- Surrogate control limits
- Brief method summaries

Work order specific comments

Poor duplicate precision due to sample heterogeniety. Confirmed by re-extraction and re-analysis

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NATA Accredited Laboratory - 825

The Laboratory is accredited by the National Association of Testing Authorities, Australia. The test(s) reported herein have been performed in accordance with its scope of accreditation. This document shall not be reproduced except in full.

This document has been digitally signed by those names who appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Department
Katrina Hegarty	Organics - NATA 818 (Brisbane)
Kim McCabe	Inorganics - NATA 818 (Brisbane)
Kim McCabe	Industrial Minerals - NATA 818 (Brisbane)
Shaun Crabb	Inorganics - NATA 818 (Brisbane)

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (In the absence of specified USEPA limits).
Abbreviations: ***CAS number*** = *Chemical Abstract Services number,* ***LOR*** = *Limit of Reporting.* ***# Indicates a raised LOR, * Indicates failed Surrogate Recoveries.***
When date(s) are shown bracketed, these have been assumed by the laboratory for process purposes.

Analytical Results

			Client Sample ID :	**A4 0/0.1 04-2166 A**	**A4 0.1/0.5 04-2166 B**	**A22 0/0.1 04-2167 A**	**A22 0.1/0.5 04-2167 B**	
			Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	
			Sample Date / Time :	17 Jul 2004 15:00	17 Jul 2004 15:00	19 Jul 2004 15:00	19 Jul 2004 15:00	
			Laboratory Sample ID :					
Analyte	***CAS number***	***LOR***	***Units***	**EB0403940-001**	**EB0403940-002**	**EB0403940-003**	**EB0403940-004**	
EA055: Moisture Content								
Moisture Content (dried @ 103°C)		0.1	%	24.0	22.8	31.4	28.5	
EG005T: Total Metals by ICP-AES								
Arsenic	7440-38-2	1	mg/kg	2	3	2	6	
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	
Chromium	7440-47-3	1	mg/kg	3	4	5	11	
Copper	7440-50-8	1	mg/kg	<1	<1	2	2	
Iron	7439-89-6	10	mg/kg	2420	2610	3240	7230	
Lead	7439-92-1	1	mg/kg	3	2	3	4	
Nickel	7440-02-0	1	mg/kg	1	2	2	5	
Zinc	7440-66-6	1	mg/kg	4	4	6	10	
EG035T: Total Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon		0.02	%	----	0.09	0.24	----	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	----	<0.5	----	----	
Acenaphthylene	208-96-8	0.5	mg/kg	----	<0.5	----	----	
Acenaphthene	83-32-9	0.5	mg/kg	----	<0.5	----	----	
Fluorene	86-73-7	0.5	mg/kg	----	<0.5	----	----	
Phenanthrene	85-01-8	0.5	mg/kg	----	<0.5	----	----	
Anthracene	120-12-7	0.5	mg/kg	----	<0.5	----	----	
Fluoranthene	206-44-0	0.5	mg/kg	----	<0.5	----	----	
Pyrene	129-00-0	0.5	mg/kg	----	<0.5	----	----	
Benz(a)anthracene	56-55-3	0.5	mg/kg	----	<0.5	----	----	
Chrysene	218-01-9	0.5	mg/kg	----	<0.5	----	----	
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg	----	<0.5	----	----	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	----	<0.5	----	----	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	----	<0.5	----	----	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	----	<0.5	----	----	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	----	<0.5	----	----	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	----	<0.5	----	----	

Analytical Results

				Client Sample ID.:	A4 0/0.1 04-2166 A	A4 0.1/0.5 04-2166 B	A22 0/0.1 04-2167 A	A22 0.1/0.5 04-2167 B	
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	
				Sample Date / Time :	17 Jul 2004 15:00	17 Jul 2004 15:00	19 Jul 2004 15:00	19 Jul 2004 15:00	
				Laboratory Sample ID :	EB0403940-001	EB0403940-002	EB0403940-003	EB0403940-004	
Analyte	*CAS number*	*LOR*	*Units*						
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction		2	mg/kg		----	<2	<2	----	
C10 - C14 Fraction		50	mg/kg		----	<50	<50	----	
C15 - C28 Fraction		100	mg/kg		----	<100	<100	----	
C29 - C36 Fraction		100	mg/kg		----	<100	<100	----	
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	----	
Toluene	108-88-3	0.2	mg/kg		----	<0.2	<0.2	----	
Ethylbenzene	100-41-4	0.2	mg/kg		----	<0.2	<0.2	----	
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg		----	<0.2	<0.2	----	
ortho-Xylene	95-47-6	0.2	mg/kg		----	<0.2	<0.2	----	
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.2	µgSn/kg		----	16.5	2.4	----	
EP075(SIM)S: Phenolic Compound Surrogates									
2-Fluorophenol	367-12-4	0.1	%		----	72.8	----	----	
Phenol-d6	13127-88-3	0.1	%		----	75.3	----	----	
2-Chlorophenol-D4	93951-73-6	0.1	%		----	64.9	----	----	
2.4.6-Tribromophenol	118-79-6	0.1	%		----	72.2	----	----	
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		----	60.3	----	----	
Anthracene-d10	1719-06-8	0.1	%		----	87.4	----	----	
4-Terphenyl-d14	1718-51-0	0.1	%		----	82.2	----	----	
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		----	84.9	85.4	----	
Toluene-D8	2037-26-5	0.1	%		----	100	98.2	----	
4-Bromofluorobenzene	460-00-4	0.1	%		----	82.4	83.5	----	
EP090S: Organotin Surrogate									
Tripropyltin		0.1	%		----	37.8	47.7	----	

Surrogate Control Limits and Method Reference Summary

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Surrogate Control Limits

The following report provides the surrogate thresholds for each analyte reported herein.

Matrix Type: SOIL

Surrogate Control Limits

Method name	*Analyte name*	*Lower Limit*	*Upper Limit*
EP075(SIM): PAH/Phenols (SIM)			
EP075(SIM)S: Phenolic Compound Surrogates	2-Fluorophenol	25	121
	Phenol-d6	24	113
	2-Chlorophenol-D4	23	134
	2.4.6-Tribromophenol	19	122
EP075(SIM)T: PAH Surrogates	2-Fluorobiphenyl	30	115
	Anthracene-d10	27	133
	4-Terphenyl-d14	18	137
EP080: TPH Volatiles/BTEX			
EP080S: TPH(V)/BTEX Surrogates	1.2-Dichloroethane-D4	80	120
	Toluene-D8	81	117
	4-Bromofluorobenzene	74	121
EP090: Organotin Analysis			
EP090S: Organotin Surrogate	Tripropyltin	20	130

Method Reference Summary

Matrix Type: SOIL

Method Reference Summary

Preparation Methods

EN69 : Hot Block Digest for metals in soils sediments and sludges - USEPA 200.2 Mod. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM (1999) Schedule B(3) (Method 202)

GEO30 : Dry and Pulverise (up to 100g) -

ORG16 : Methanolic Extraction of Soils for Purge and Trap - (USEPA SW 846 - 5030A) 10g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC.

ORG17B : Tumbler Extraction of Solids (Option B - Non-concentrating) - In-house, Mechanical agitation (tumbler). 20g of sample, Na2SO4 and surrogate are extracted with 150mL 1:1 DCM/Acetone by end over end tumble. The solvent is transferred directly to a GC vial for analysis.

ORG35 : Organotin Sample Preparation - In house. 20g sample is spiked with surrogate and leached in a methanol:acetic acid:UHP water mix and vacuum filtered. Reagents and solvents are added to the sample and the mixture tumbled. The butyltin compounds are simultaneously derivatised and extracted. The extract is further extracted with petroleum ether. The resultant extracts are combined and concentrated for analysis.

Analytical Methods

EA055-103 : Moisture Content - A gravimetric procedure based on weight loss over a 12 hour drying period at 103-105 degrees C. This method is compliant with NEPM (1999) Schedule B(3) (Method 102)

EG005T : Total Metals by ICP-AES - (APHA 20th ed., 3120; USEPA SW 846 - 6010) (ICPAES) Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3)

EG035T : Total Mercury by FIMS - AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the extract. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve.

EP005 : Total Organic Carbon - In-house. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automaticaly measured by infra-red detector.

EP071 : TPH - Semivolatile Fraction - (USEPA SW 846 - 8015A) Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (1999) Schedule B(3) (Method 506.1)

EP075(SIM) : PAH/Phenols (SIM) - (USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 502 and 507)

EP080 : TPH Volatiles/BTEX - (USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501)

EP090 : Organotin Analysis - (USEPA SW 846 - 8270D) Prepared sample extracts are analysed by GC/MS coupled with high volume injection, and quanitified against an established calibration curve.

ALS Environmental

QUALITY CONTROL REPORT

Client	:	**ULLMAN & NOLAN PTY LTD**	**Laboratory**	:	ALS Environmental Brisbane	**Page**	:	**1 of 7**
Contact	:	ROWAN COSSINS	**Contact**	:	Michael Heery			
Address	:	P O BOX 5630 MACKAY MC QLD AUSTRALIA 4741	**Address**	:	32 Shand Street Stafford QLD Australia 4053	**Work order**	:	**EB0403940**
Project	:	21024.1	**Quote number**	:	----	**Date received**	:	28 Jul 2004
Order number	:	60600				**Date issued**	:	13 Aug 2004
C-O-C number	:	- Not provided -						
Site	:	- Not provided -						
E-mail	:	soils@uneng.com.au	**E-mail**	:	Michael.Heery@alsenviro.com	**No. of samples**		
Telephone	:	(07)4952-5255	**Telephone**	:	61-7-32437222	**Received**	:	4
Facsimile	:	(07)4952-5455	**Facsimile**	:	61-7-32437259	**Analysed**	:	4

This final report was issued on Friday, August 13, 2004 for the ALSE work order reference EB0403940 and supersedes any previous reports with this reference.
Results apply to the samples as submitted. All pages of this report have been checked and approved for release.
This report contains the following information:

- Laboratory Duplicates (DUP); Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Samples (LCS); Recovery and Acceptance Limits
- Matrix Spikes (MS); Recovery and Acceptance Limits

Work order specific comments

Poor duplicate precision due to sample heterogeniety. Confirmed by re-extraction and re-analysis

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NATA Accredited Laboratory - 825

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This document has been digitally signed by those names who appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Department
Katrina Hegarty	Organics - NATA 818 (Brisbane)
Kim McCabe	Inorganics - NATA 818 (Brisbane)
Kim McCabe	Industrial Minerals - NATA 818 (Brisbane)
Shaun Crabb	Inorganics - NATA 818 (Brisbane)

Quality Control Report - Laboratory Duplicates (DUP)

The quality control term **Laboratory Duplicate** refers to an intralaboratory split sample randomly selected from the sample batch. Laboratory duplicates provide information on method precision and sample heterogeneity.
- Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations: **LOR** = Limit of Reporting, **RPD** = Relative Percent Difference.*
* Indicates failed QC.

The permitted ranges for the RPD of Laboratory Duplicates (relative percent deviation) 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%

Matrix Type: SOIL ***Laboratory Duplicates (DUP) Report***

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EA055-103: Moisture Content						
EA055: Moisture Content - (QC Lot: 12705)				%	%	%
EB0403925-001	- Anonymous -	Moisture Content (dried @ 103°C)	0.1 %	26.2	25.2	3.9
EB0403940-003	A22 0/0.1 04-2167 A	Moisture Content (dried @ 103°C)	0.1 %	31.4	33.1	5.5
EG005T: Total Metals by ICP-AES						
EG005T: Total Metals by ICP-AES - (QC Lot: 12631)				mg/kg	mg/kg	%
EB0403906-007	- Anonymous -	Arsenic	1 mg/kg	4	4	0.0
		Cadmium	1 mg/kg	<1	<1	0.0
		Chromium	1 mg/kg	34	36	4.6
		Copper	1 mg/kg	38	35	7.4
		Iron	10 mg/kg	32000	29400	8.4
		Lead	1 mg/kg	10	9	0.0
		Nickel	1 mg/kg	35	30	15.7
		Zinc	1 mg/kg	79	71	11.3
EB0403937-005	- Anonymous -	Arsenic	1 mg/kg	2	2	0.0
		Cadmium	1 mg/kg	<1	<1	0.0
		Chromium	1 mg/kg	21	21	0.0
		Copper	1 mg/kg	8	7	0.0
		Iron	10 mg/kg	15600	15200	2.8
		Lead	1 mg/kg	7	10	34.6
		Nickel	1 mg/kg	9	8	0.0
		Zinc	1 mg/kg	29	28	4.1
EG035T: Total Mercury by FIMS						
EG035T: Total Mercury by FIMS - (QC Lot: 12632)				mg/kg	mg/kg	%
EB0403937-008	- Anonymous -	Mercury	0.1 mg/kg	<0.1	<0.1	0.0
EP005: Total Organic Carbon						
EP005: Total Organic Carbon (TOC) - (QC Lot: 13570)				%	%	%
EB0403940-002	A4 0.1/0.5 04-2166 B	Total Organic Carbon	0.02 %	0.09	0.09	0.0

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EP071: TPH - Semivolatile Fraction						
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 12596)				mg/kg	mg/kg	%
EB0403901-001	- Anonymous -	C10 - C14 Fraction	50 mg/kg	<50	<50	0.0
		C15 - C28 Fraction	100 mg/kg	<100	<100	0.0
		C29 - C36 Fraction	100 mg/kg	<100	<100	0.0
EB0403937-005	- Anonymous -	C10 - C14 Fraction	50 mg/kg	<50	<50	0.0
		C15 - C28 Fraction	100 mg/kg	<100	<100	0.0
		C29 - C36 Fraction	100 mg/kg	<100	<100	0.0
EP075(SIM): PAH/Phenols (SIM)						
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 12597)				mg/kg	mg/kg	%
EB0403906-001	- Anonymous -	Naphthalene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthylene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluorene	0.5 mg/kg	<0.5	<0.5	0.0
		Phenanthrene	0.5 mg/kg	<0.5	<0.5	0.0
		Anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Benz(a)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Chrysene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(b)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(k)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(a)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	<0.5	0.0
EB0403937-005	- Anonymous -	Naphthalene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthylene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluorene	0.5 mg/kg	<0.5	<0.5	0.0
		Phenanthrene	0.5 mg/kg	<0.5	<0.5	0.0
		Anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Benz(a)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Chrysene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(b)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(k)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(a)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	<0.5	0.0

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EP080: TPH Volatiles/BTEX						
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 12593)				mg/kg	mg/kg	%
EB0403937-001	- Anonymous -	C6 - C9 Fraction	2 mg/kg	<2	<2	0.0
EB0403937-001	- Anonymous -	Benzene	0.2 mg/kg	<0.2	<0.2	0.0
		Toluene	0.2 mg/kg	<0.2	<0.2	0.0
		Ethylbenzene	0.2 mg/kg	<0.2	<0.2	0.0
		meta- & para-Xylene	0.2 mg/kg	<0.2	<0.2	0.0
		ortho-Xylene	0.2 mg/kg	<0.2	<0.2	0.0
EB0403937-007	- Anonymous -	C6 - C9 Fraction	2 mg/kg	<2	<2	0.0
EB0403937-007	- Anonymous -	Benzene	0.2 mg/kg	<0.2	<0.2	0.0
		Toluene	0.2 mg/kg	<0.2	<0.2	0.0
		Ethylbenzene	0.2 mg/kg	<0.2	<0.2	0.0
		meta- & para-Xylene	0.2 mg/kg	<0.2	<0.2	0.0
		ortho-Xylene	0.2 mg/kg	<0.2	<0.2	0.0
EP090: Organotin Analysis						
EP090: Organotin Compounds - (QC Lot: 13253)				µgSn/kg	µgSn/kg	%
EB0403940-002	A4 0.1/0.5 04-2166 B	Tributyltin	0.2 µgSn/kg	16.5	0.4	* 190

Quality Control Report - Method Blank (MB) and Laboratory Control Samples (LCS)

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 type is to monitor potential laboratory contamination. The quality control term **Laboratory Control Sample (LCS)** refers to a known, interference free matrix spiked with target analytes or certified reference material. The purpose of this QC type is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of actual laboratory data. Abbreviations: LOR = Limit of reporting.

* Indicates failed QC. Refer to the Summary of all QC Outliers within the Interpretive Quality Control Report.

Matrix Type: SOIL

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

		Method blank result	Actual Results		Recovery Limits	
			Spike concentration	Spike Recovery	Dynamic Recovery Limits	
Analyte name	LOR			LCS	Low	High
EG005T: Total Metals by ICP-AES						
EG005T: Total Metals by ICP-AES - (QC Lot: 12631)		mg/kg	mg/kg	%	%	%
Arsenic	1 mg/kg	<1	13.8	101	70	130
Cadmium	1 mg/kg	<1	2.82	100	70	130
Chromium	1 mg/kg	<1	61.6	98.4	70	130
Copper	1 mg/kg	<1	54.7	98.0	70	130
Iron	10 mg/kg	<10	----	----	----	----
Lead	1 mg/kg	<1	55.5	98.4	70	130
Nickel	1 mg/kg	<1	55.1	99.3	70	130
Zinc	1 mg/kg	<1	105	98.8	70	130
EG035T: Total Mercury by FIMS						
EG035T: Total Mercury by FIMS - (QC Lot: 12632)		mg/kg	mg/kg	%	%	%
Mercury	0.1 mg/kg	<0.1	1.34	96.8	70	130
EP005: Total Organic Carbon						
EP005: Total Organic Carbon (TOC) - (QC Lot: 13570)		%	%	%	%	%
Total Organic Carbon	0.02 %	<0.02	100	107	70	130
EP071: TPH - Semivolatile Fraction						
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 12596)		mg/kg	mg/kg	%	%	%
C10 - C14 Fraction	50 mg/kg	<50	194	84.8	66	132
C15 - C28 Fraction	100 mg/kg	<100	272	102	52	146
C29 - C36 Fraction	100 mg/kg	<100	----	----	----	----

Matrix Type: SOIL

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

Analyte name	LOR	Method blank result	Actual Results: Spike concentration	Actual Results: Spike Recovery LCS	Recovery Limits: Dynamic Recovery Limits Low	Recovery Limits: Dynamic Recovery Limits High
EP075(SIM): PAH/Phenols (SIM)						
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 12597)		mg/kg	mg/kg	%	%	%
Naphthalene	0.5 mg/kg	<0.5	0.5	97.3	55	113
Acenaphthylene	0.5 mg/kg	<0.5	0.5	* 119	53	111
Acenaphthene	0.5 mg/kg	<0.5	0.5	105	58	105
Fluorene	0.5 mg/kg	<0.5	0.5	88.6	55	113
Phenanthrene	0.5 mg/kg	<0.5	0.5	* 118	62	113
Anthracene	0.5 mg/kg	<0.5	0.5	* 120	59	107
Fluoranthene	0.5 mg/kg	<0.5	0.5	* 110	68	107
Pyrene	0.5 mg/kg	<0.5	0.5	104	69	112
Benz(a)anthracene	0.5 mg/kg	<0.5	0.5	113	70	114
Chrysene	0.5 mg/kg	<0.5	0.5	107	63	121
Benzo(b)fluoranthene	0.5 mg/kg	<0.5	0.5	103	59	116
Benzo(k)fluoranthene	0.5 mg/kg	<0.5	0.5	103	59	116
Benzo(a)pyrene	0.5 mg/kg	<0.5	0.5	99.8	57	113
Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	0.5	78.2	46	129
Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	0.5	76.5	44	131
Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	0.5	77.8	42	137
EP080: TPH Volatiles/BTEX						
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 12593)		mg/kg	mg/kg	%	%	%
C6 - C9 Fraction	2 mg/kg	<2	26	94.1	83	122
EP080: BTEX - (QC Lot: 12593)		mg/kg	mg/kg	%	%	%
Benzene	0.2 mg/kg	<0.2	1	102	85	117
Toluene	0.2 mg/kg	<0.2	1	99.6	86	113
Ethylbenzene	0.2 mg/kg	<0.2	1	90.3	86	118
meta- & para-Xylene	0.2 mg/kg	<0.2	1	87.8	79	122
ortho-Xylene	0.2 mg/kg	<0.2	1	90.4	85	117
EP090: Organotin Analysis						
EP090: Organotin Compounds - (QC Lot: 13253)		µgSn/kg	µgSn/kg	%	%	%
Tributyltin	0.2 µgSn/kg	<0.2	25	85.4	50	86

Quality Control Report - Matrix Spikes (MS)

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 type is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQO's). 'Ideal' recovery ranges stated may be waived in the event of sample matrix interferences. - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations: **LOR** = Limit of Reporting, **RPD** = Relative Percent Difference.*
* Indicates failed QC. Refer to the Summary of all QC Outliers within the Interpretive Quality Control Report.

Matrix Type: SOIL

Matrix Spike (MS) Report

					Actual Results		Recovery Limits	
					Sample Result	Spike Recovery	Static Limits	
Analyte name	*Laboratory Sample ID*	*Client Sample ID*	*LOR*	*Spike Concentration*		*MS*	*Low*	*High*
EG005T: Total Metals by ICP-AES								
EG005T: Total Metals by ICP-AES - (QC Lot: 12631)				mg/kg	mg/kg	%	%	%
Arsenic	EB0403906-008	- Anonymous -	1 mg/kg	50.0	4	88.2	70	130
Cadmium			1 mg/kg	50.0	<1	99.4	70	130
Chromium			1 mg/kg	50.0	38	89.3	70	130
Copper			1 mg/kg	50.0	20	96.6	70	130
Iron			10 mg/kg	50.0	30100	* Not determined	70	130
Lead			1 mg/kg	50.0	9	92.2	70	130
Nickel			1 mg/kg	50.0	28	90.7	70	130
Zinc			1 mg/kg	50.0	61	87.1	70	130
EG035T: Total Mercury by FIMS								
EG035T: Total Mercury by FIMS - (QC Lot: 12632)				mg/kg	mg/kg	%	%	%
Mercury	EB0403937-009	- Anonymous -	0.1 mg/kg	10.0	0.2	94.4	70	130
EP071: TPH - Semivolatile Fraction								
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 12596)				mg/kg	mg/kg	%	%	%
C10 - C14 Fraction	EB0403901-002	- Anonymous -	50 mg/kg	194	<50	74.3	70	130
C15 - C28 Fraction			100 mg/kg	272	<100	99.8	70	130
EP075(SIM): PAH/Phenols (SIM)								
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 12597)				mg/kg	mg/kg	%	%	%
Acenaphthene	EB0403906-004	- Anonymous -	0.5 mg/kg	2.5	<0.5	101	70	130
Pyrene			0.5 mg/kg	2.5	<0.5	98.0	70	130
EP080: TPH Volatiles/BTEX								
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 12593)				mg/kg	mg/kg	%	%	%
C6 - C9 Fraction	EB0403937-002	- Anonymous -	2 mg/kg	14	<2	88.2	70	130
EP080: BTEX - (QC Lot: 12593)				mg/kg	mg/kg	%	%	%
Benzene	EB0403937-002	- Anonymous -	0.2 mg/kg	1	<0.2	99.1	70	130
Toluene			0.2 mg/kg	1	<0.2	98.2	70	130
EP090: Organotin Analysis								
EP090: Organotin Compounds - (QC Lot: 13253)				µgSn/kg	µgSn/kg	%	%	%
Tributyltin	EB0403940-003	A22 0/0.1 04-2167 A	0.2 µgSn/kg	25	2.4	69.6	20	130

ALS Environmental

CERTIFICATE OF ANALYSIS

Client	:	**ULLMAN & NOLAN PTY LTD**	**Laboratory**	:	ALS Environmental Brisbane	**Page**	:	**1 of 8**
Contact	:	ROWAN COSSINS	**Contact**	:	Michael Heery			
Address	:	P O BOX 5630 MACKAY MC QLD AUSTRALIA 4741	**Address**	:	32 Shand Street Stafford QLD Australia 4053	**Work order**	:	**EB0404380**
Project	:	21024.1 SHUTE HBR	**Quote number**	:	EB20040222	**Date received**	:	13 Aug 2004
Order number	:	60609				**Date issued**	:	27 Aug 2004
C-O-C number	:	- Not provided -						
Site	:	SHUTE HARBOUR						
E-mail	:	soils@uneng.com.au	**E-mail**	:	Michael.Heery@alsenviro.com	**No. of samples**		
Telephone	:	(07)4952-5255	**Telephone**	:	61-7-32437222	**Received**	:	14
Facsimile	:	(07)4952-5455	**Facsimile**	:	61-7-32437259	**Analysed**	:	14

This final report was issued on Friday, August 27, 2004 for the ALSE work order reference EB0404380 and supersedes any previous reports with this reference.
Results apply to the samples as submitted. All pages of this report have been checked and approved for release.
This report contains the following information:

- Analytical results for samples submitted
- Surrogate control limits

Work order specific comments

Low surrogates due to matrix interference confirmed by re-extraction/re-analysis.

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This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Department
Kim McCabe	Inorganics - NATA 818 (Brisbane)
Kim McCabe	Industrial Minerals - NATA 818 (Brisbane)
Michael Heery	Organics - NATA 818 (Brisbane)
Shaun Crabb	Inorganics - NATA 818 (Brisbane)

When moisture determination has been performed, results are reported on a dry weight basis. When a reported 'less than' result is higher than the LOR, this may be due to primary sample extracts/digestion dilution and/or insuffient sample amount for analysis. Surrogate Recovery Limits are static and based on USEPA SW846 or ALS-QWI/EN38 (in the absence of specified USEPA limits).
Abbreviations: ***CAS number*** = *Chemical Abstract Services number*, ***LOR*** = *Limit of Reporting*. ***# Indicates a raised LOR, * Indicates failed Surrogate Recoveries.***
When date(s) are shown bracketed, these have been assumed by the laboratory for process purposes.

Analytical Results

				Client Sample ID :	A7 0-0.1	A7 0.1-0.5	A23 0-0.1	A23 0.1-0.5	A41 0-0.1
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
				Sample Date / Time :	6 Aug 2004 15:00	(6 Aug 2004) 15:00	30 Jul 2004 15:00	(30 Jul 2004) 15:00	29 Aug 2004 15:00
				Laboratory Sample ID :	EB0404380-001	EB0404380-002	EB0404380-003	EB0404380-004	EB0404380-005
Analyte	*CAS number*	*LOR*	*Units*						
EA055: Moisture Content									
Moisture Content (dried @ 103°C)		0.1	%		26.1	21.2	35.2	32.8	31.8
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	1	mg/kg		2	2	----	7	----
Cadmium	7440-43-9	1	mg/kg		<1	<1	----	<1	----
Chromium	7440-47-3	1	mg/kg		3	3	----	11	----
Copper	7440-50-8	1	mg/kg		<1	<1	----	3	----
Iron	7439-89-6	10	mg/kg		1810	2170	----	6910	----
Lead	7439-92-1	1	mg/kg		2	4	----	4	----
Nickel	7440-02-0	1	mg/kg		<1	1	----	5	----
Zinc	7440-66-6	1	mg/kg		<1	<1	----	4	----
EG035T: Total Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	<0.1	----	<0.1	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon		0.02	%		----	0.13	----	0.45	0.50
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	----	<0.5	----	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		----	----	<0.5	----	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		----	----	<0.5	----	<0.5
Fluorene	86-73-7	0.5	mg/kg		----	----	<0.5	----	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		----	----	<0.5	----	<0.5
Anthracene	120-12-7	0.5	mg/kg		----	----	<0.5	----	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		----	----	<0.5	----	<0.5
Pyrene	129-00-0	0.5	mg/kg		----	----	<0.5	----	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	----	<0.5	----	<0.5
Chrysene	218-01-9	0.5	mg/kg		----	----	<0.5	----	<0.5
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		----	----	<0.5	----	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	----	<0.5	----	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	----	<0.5	----	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	----	<0.5	----	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	----	<0.5	----	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	----	<0.5	----	<0.5

Analytical Results

				Client Sample ID :	A7 0-0.1	A7 0.1-0.5	A23 0-0.1	A23 0.1-0.5	A41 0-0.1
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
				Sample Date / Time :	6 Aug 2004 15:00	(6 Aug 2004) 15:00	30 Jul 2004 15:00	(30 Jul 2004) 15:00	29 Aug 2004 15:00
				Laboratory Sample ID :	EB0404380-001	EB0404380-002	EB0404380-003	EB0404380-004	EB0404380-005
Analyte	*CAS number*	*LOR*	*Units*						
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction		2	mg/kg		<2	----	----	<2	----
C10 - C14 Fraction		50	mg/kg		<50	----	----	<50	----
C15 - C28 Fraction		100	mg/kg		<100	----	----	<100	----
C29 - C36 Fraction		100	mg/kg		<100	----	----	<100	----
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg		<0.2	----	----	<0.2	----
Toluene	108-88-3	0.2	mg/kg		<0.2	----	----	<0.2	----
Ethylbenzene	100-41-4	0.2	mg/kg		<0.2	----	----	<0.2	----
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg		<0.2	----	----	<0.2	----
ortho-Xylene	95-47-6	0.2	mg/kg		<0.2	----	----	<0.2	----
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.2	µgSn/kg		----	<0.2	----	<0.2	<0.2
EP075(SIM)S: Phenolic Compound Surrogates									
2-Fluorophenol	367-12-4	0.1	%		----	----	104	----	67.9
Phenol-d6	13127-88-3	0.1	%		----	----	98.1	----	87.3
2-Chlorophenol-D4	93951-73-6	0.1	%		----	----	94.9	----	64.8
2.4.6-Tribromophenol	118-79-6	0.1	%		----	----	74.8	----	98.1
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		----	----	79.9	----	* 27.0
Anthracene-d10	1719-06-8	0.1	%		----	----	89.4	----	85.0
4-Terphenyl-d14	1718-51-0	0.1	%		----	----	93.0	----	102
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		92.7	----	----	97.4	----
Toluene-D8	2037-26-5	0.1	%		* 73.7	----	----	* 79.0	----
4-Bromofluorobenzene	460-00-4	0.1	%		* 58.8	----	----	* 62.4	----
EP090S: Organotin Surrogate									
Tripropyltin		0.1	%		----	29.4	----	28.5	29.6

Analytical Results

				Client Sample ID :	A41 0.1-0.5	A43 0-0.1	A43 0.1-0.5	A25 0-0.1	A25 0.1-0.5
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
				Sample Date / Time :	(29 Aug 2004) 15:00	28 Aug 2004 15:00	(28 Aug 2004) 15:00	4 Aug 2004 15:00	(4 Aug 2004) 15:00
				Laboratory Sample ID :	EB0404380-006	EB0404380-007	EB0404380-008	EB0404380-009	EB0404380-010
Analyte	*CAS number*	*LOR*	*Units*						
EA055: Moisture Content									
Moisture Content (dried @ 103°C)		0.1	%		31.5	39.2	35.3	32.4	29.9
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	1	mg/kg		6	----	6	----	5
Cadmium	7440-43-9	1	mg/kg		<1	----	<1	----	<1
Chromium	7440-47-3	1	mg/kg		13	----	13	----	11
Copper	7440-50-8	1	mg/kg		3	----	3	----	2
Iron	7439-89-6	10	mg/kg		7700	----	7760	----	6590
Lead	7439-92-1	1	mg/kg		4	----	4	----	3
Nickel	7440-02-0	1	mg/kg		6	----	6	----	5
Zinc	7440-66-6	1	mg/kg		6	----	4	----	1
EG035T: Total Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	----	<0.1	----	<0.1
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon		0.02	%		----	----	----	----	0.36
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		----	----	----	<0.5	----
Acenaphthylene	208-96-8	0.5	mg/kg		----	----	----	<0.5	----
Acenaphthene	83-32-9	0.5	mg/kg		----	----	----	<0.5	----
Fluorene	86-73-7	0.5	mg/kg		----	----	----	<0.5	----
Phenanthrene	85-01-8	0.5	mg/kg		----	----	----	<0.5	----
Anthracene	120-12-7	0.5	mg/kg		----	----	----	<0.5	----
Fluoranthene	206-44-0	0.5	mg/kg		----	----	----	<0.5	----
Pyrene	129-00-0	0.5	mg/kg		----	----	----	<0.5	----
Benz(a)anthracene	56-55-3	0.5	mg/kg		----	----	----	<0.5	----
Chrysene	218-01-9	0.5	mg/kg		----	----	----	<0.5	----
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		----	----	----	<0.5	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		----	----	----	<0.5	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg		----	----	----	<0.5	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		----	----	----	<0.5	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		----	----	----	<0.5	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		----	----	----	<0.5	----
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction		2	mg/kg		<2	<2	<2	<2	<2
C10 - C14 Fraction		50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction		100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction		100	mg/kg		<100	<100	<100	<100	<100

Analytical Results

				Client Sample ID :	A41 0.1-0.5	A43 0-0.1	A43 0.1-0.5	A25 0-0.1	A25 0.1-0.5
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL
				Sample Date / Time :	(29 Aug 2004) 15:00	28 Aug 2004 15:00	(28 Aug 2004) 15:00	4 Aug 2004 15:00	(4 Aug 2004) 15:00
				Laboratory Sample ID :					
Analyte	*CAS number*	*LOR*	*Units*		EB0404380-006	EB0404380-007	EB0404380-008	EB0404380-009	EB0404380-010
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	100-41-4	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
ortho-Xylene	95-47-6	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
EP090: Organotin Compounds									
Tributyltin	56573-85-4	0.2	µgSn/kg		----	----	----	----	<0.2
EP075(SIM)S: Phenolic Compound Surrogates									
2-Fluorophenol	367-12-4	0.1	%		----	----	----	106	----
Phenol-d6	13127-88-3	0.1	%		----	----	----	96.6	----
2-Chlorophenol-D4	93951-73-6	0.1	%		----	----	----	93.1	----
2.4.6-Tribromophenol	118-79-6	0.1	%		----	----	----	78.5	----
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.1	%		----	----	----	91.0	----
Anthracene-d10	1719-06-8	0.1	%		----	----	----	97.9	----
4-Terphenyl-d14	1718-51-0	0.1	%		----	----	----	100	----
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.1	%		105	90.2	101	94.0	98.9
Toluene-D8	2037-26-5	0.1	%		87.9	* 77.4	90.0	* 75.8	85.4
4-Bromofluorobenzene	460-00-4	0.1	%		* 69.6	* 58.0	* 64.0	* 59.2	* 59.9
EP090S: Organotin Surrogate									
Tripropyltin		0.1	%		----	----	----	----	29.7

Analytical Results

				Client Sample ID :	A16 0-0.5	A16 0.1-0.5	A39 0-0.1	A39 0.1-0.5	
				Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	
				Sample Date / Time :	28 Jul 2004 15:00	(28 Jul 2004) 15:00	5 Aug 2004 15:00	(5 Aug 2004) 15:00	
				Laboratory Sample ID :	EB0404380-011	EB0404380-012	EB0404380-013	EB0404380-014	
Analyte	*CAS number*	*LOR*	*Units*						
EA055: Moisture Content									
Moisture Content (dried @ 103°C)		0.1	%		30.7	32.9	31.0	30.3	
EG005T: Total Metals by ICP-AES									
Arsenic	7440-38-2	1	mg/kg		3	----	----	5	
Cadmium	7440-43-9	1	mg/kg		<1	----	----	<1	
Chromium	7440-47-3	1	mg/kg		4	----	----	10	
Copper	7440-50-8	1	mg/kg		1	----	----	2	
Iron	7439-89-6	10	mg/kg		2350	----	----	6550	
Lead	7439-92-1	1	mg/kg		2	----	----	3	
Nickel	7440-02-0	1	mg/kg		2	----	----	5	
Zinc	7440-66-6	1	mg/kg		<1	----	----	<1	
EG035T: Total Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	----	----	<0.1	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	----	----	<0.5	
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	----	----	<0.5	
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	----	----	<0.5	
Fluorene	86-73-7	0.5	mg/kg		<0.5	----	----	<0.5	
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	----	----	<0.5	
Anthracene	120-12-7	0.5	mg/kg		<0.5	----	----	<0.5	
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	----	----	<0.5	
Pyrene	129-00-0	0.5	mg/kg		<0.5	----	----	<0.5	
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	----	----	<0.5	
Chrysene	218-01-9	0.5	mg/kg		<0.5	----	----	<0.5	
Benzo(b)fluoranthene	205-99-2	0.5	mg/kg		<0.5	----	----	<0.5	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	----	----	<0.5	
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	----	----	<0.5	
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg		<0.5	----	----	<0.5	
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	----	----	<0.5	
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	----	----	<0.5	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction		2	mg/kg		----	<2	<2	<2	
C10 - C14 Fraction		50	mg/kg		----	<50	<50	<50	
C15 - C28 Fraction		100	mg/kg		----	<100	<100	<100	
C29 - C36 Fraction		100	mg/kg		----	<100	<100	<100	
EP080: BTEX									
Benzene	71-43-2	0.2	mg/kg		----	<0.2	<0.2	<0.2	

Analytical Results

			Client Sample ID :	A16 0-0.5	A16 0.1-0.5	A39 0-0.1	A39 0.1-0.5	
			Sample Matrix Type / Description :	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	SOIL / SOIL	
			Sample Date / Time :	28 Jul 2004 15:00	(28 Jul 2004) 15:00	5 Aug 2004 15:00	(5 Aug 2004) 15:00	
			Laboratory Sample ID :	EB0404380-011	EB0404380-012	EB0404380-013	EB0404380-014	
Analyte	*CAS number*	*LOR*	*Units*					
EP080: BTEX								
Toluene	108-88-3	0.2	mg/kg	----	<0.2	<0.2	<0.2	
Ethylbenzene	100-41-4	0.2	mg/kg	----	<0.2	<0.2	<0.2	
meta- & para-Xylene	108-38-3 106-42-3	0.2	mg/kg	----	<0.2	<0.2	<0.2	
ortho-Xylene	95-47-6	0.2	mg/kg	----	<0.2	<0.2	<0.2	
EP075(SIM)S: Phenolic Compound Surrogates								
2-Fluorophenol	367-12-4	0.1	%	100	----	----	59.4	
Phenol-d6	13127-88-3	0.1	%	96.4	----	----	54.0	
2-Chlorophenol-D4	93951-73-6	0.1	%	99.5	----	----	48.3	
2.4.6-Tribromophenol	118-79-6	0.1	%	78.7	----	----	33.0	
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.1	%	84.7	----	----	63.9	
Anthracene-d10	1719-06-8	0.1	%	102	----	----	48.4	
4-Terphenyl-d14	1718-51-0	0.1	%	104	----	----	43.5	
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.1	%	----	96.8	102	99.1	
Toluene-D8	2037-26-5	0.1	%	----	81.5	89.0	86.6	
4-Bromofluorobenzene	460-00-4	0.1	%	----	* 63.3	* 68.5	* 67.8	

Surrogate Control Limits

The analytical procedures used by ALS Environmental are based on established internationally-recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house procedure are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported herein. Reference methods from which ALSE methods are based are provided in parenthesis.

Matrix Type: SOIL

		Surrogate Control Limits	
Method name	***Analyte name***	***Lower Limit***	***Upper Limit***
EP075(SIM): PAH/Phenols (SIM)			
EP075(SIM)S: Phenolic Compound Surrogates	2-Fluorophenol	25	121
	Phenol-d6	24	113
	2-Chlorophenol-D4	23	134
	2.4.6-Tribromophenol	19	122
EP075(SIM)T: PAH Surrogates	2-Fluorobiphenyl	30	115
	Anthracene-d10	27	133
	4-Terphenyl-d14	18	137
EP080: TPH Volatiles/BTEX			
EP080S: TPH(V)/BTEX Surrogates	1.2-Dichloroethane-D4	80	120
	Toluene-D8	81	117
	4-Bromofluorobenzene	74	121
EP090: Organotin Analysis			
EP090S: Organotin Surrogate	Tripropyltin	20	130

ALS Environmental

QUALITY CONTROL REPORT

Client	:	**ULLMAN & NOLAN PTY LTD**	**Laboratory**	:	ALS Environmental Brisbane	**Page**	:	**1 of 12**
Contact	:	ROWAN COSSINS	**Contact**	:	Michael Heery			
Address	:	P O BOX 5630 MACKAY MC QLD AUSTRALIA 4741	**Address**	:	32 Shand Street Stafford QLD Australia 4053	**Work order**	:	**EB0404380**
Project	:	21024.1 SHUTE HBR	**Quote number**	:	EB20040222	**Date received**	:	13 Aug 2004
Order number	:	60609				**Date issued**	:	27 Aug 2004
C-O-C number	:	- Not provided -						
Site	:	SHUTE HARBOUR						
E-mail	:	soils@uneng.com.au	**E-mail**	:	Michael.Heery@alsenviro.com	**No. of samples**		
Telephone	:	(07)4952-5255	**Telephone**	:	61-7-32437222	**Received**	:	14
Facsimile	:	(07)4952-5455	**Facsimile**	:	61-7-32437259	**Analysed**	:	14

This final report was issued on Friday, August 27, 2004 for the ALSE work order reference EB0404380 and supersedes any previous reports with this reference.
Results apply to the samples as submitted. All pages of this report have been checked and approved for release.
This report contains the following information:

- Laboratory Duplicates (DUP); Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Samples (LCS); Recovery and Acceptance Limits
- Matrix Spikes (MS); Recovery and Acceptance Limits

Work order specific comments

Low surrogates due to matrix interference confirmed by re-extraction/re-analysis.

ALSE - QUALITY, SERVICE and TECHNOLOGY provided GLOBALLY

NATA Accredited Laboratory - 825

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This document has been digitally signed by those names that appear on this report and are the authorised signatories. Digital signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatory	Department
Kim McCabe	Inorganics - NATA 818 (Brisbane)
Kim McCabe	Industrial Minerals - NATA 818 (Brisbane)
Michael Heery	Organics - NATA 818 (Brisbane)
Shaun Crabb	Inorganics - NATA 818 (Brisbane)

Quality Control Report - Laboratory Duplicates (DUP)

The quality control term **Laboratory Duplicate** refers to an intralaboratory split sample randomly selected from the sample batch. Laboratory duplicates provide information on method precision and sample heterogeneity.
- Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations:* ***LOR*** *= Limit of Reporting,* ***RPD*** *= Relative Percent Difference.*
* Indicates failed QC.

The permitted ranges for the RPD of Laboratory Duplicates (relative percent deviation) 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%

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EA055-103: Moisture Content						
EA055: Moisture Content - (QC Lot: 14225)				%	%	%
EB0404380-004	A23 0.1-0.5	Moisture Content (dried @ 103°C)	0.1 %	32.8	31.2	4.8
EB0404425-001	- Anonymous -	Moisture Content (dried @ 103°C)	0.1 %	7.2	8.1	11.8
EA055: Moisture Content - (QC Lot: 14265)				%	%	%
EB0404373-046	- Anonymous -	Moisture Content (dried @ 103°C)	0.1 %	2.4	2.4	0.0
EB0404380-008	A43 0.1-0.5	Moisture Content (dried @ 103°C)	0.1 %	35.3	34.3	2.9
EG005T: Total Metals by ICP-AES						
EG005T: Total Metals by ICP-AES - (QC Lot: 14570)				mg/kg	mg/kg	%
EB0404373-035	- Anonymous -	Arsenic	1 mg/kg	<1	<1	0.0
		Cadmium	1 mg/kg	<1	<1	0.0
		Chromium	1 mg/kg	2	2	0.0
		Copper	1 mg/kg	1	<1	0.0
		Iron	10 mg/kg	470	440	5.8
		Lead	1 mg/kg	1	<1	0.0
		Nickel	1 mg/kg	<1	<1	0.0
		Zinc	1 mg/kg	1	1	0.0
EB0404477-002	- Anonymous -	Arsenic	1 mg/kg	15	13	11.9
		Cadmium	1 mg/kg	<1	<1	0.0
		Chromium	1 mg/kg	10	10	0.0
		Copper	1 mg/kg	46	45	0.0
		Lead	1 mg/kg	190	190	0.0
		Nickel	1 mg/kg	11	12	0.0
		Zinc	1 mg/kg	171	165	3.9
EG035T: Total Mercury by FIMS						
EG035T: Total Mercury by FIMS - (QC Lot: 14569)				mg/kg	mg/kg	%
EB0404373-035	- Anonymous -	Mercury	0.1 mg/kg	<0.1	<0.1	0.0
EB0404477-002	- Anonymous -	Mercury	0.1 mg/kg	<0.1	0.1	0.0
EP005: Total Organic Carbon						
EP005: Total Organic Carbon (TOC) - (QC Lot: 15071)				%	%	%
EB0404319-001	- Anonymous -	Total Organic Carbon	0.02 %	0.07	0.07	0.0

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EP071: TPH - Semivolatile Fraction						
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14062)				mg/kg	mg/kg	%
EB0404332-005	- Anonymous -	C10 - C14 Fraction	50 mg/kg	<50	<50	0.0
		C15 - C28 Fraction	100 mg/kg	<100	<100	0.0
		C29 - C36 Fraction	100 mg/kg	<100	<100	0.0
EB0404347-043	- Anonymous -	C10 - C14 Fraction	50 mg/kg	<50	<50	0.0
		C15 - C28 Fraction	100 mg/kg	<100	<100	0.0
		C29 - C36 Fraction	100 mg/kg	<100	<100	0.0
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14132)				mg/kg	mg/kg	%
EB0404370-001	- Anonymous -	C10 - C14 Fraction	50 mg/kg	<50	<50	0.0
		C15 - C28 Fraction	100 mg/kg	780	810	3.8
		C29 - C36 Fraction	100 mg/kg	420	380	9.7
EB0404370-011	- Anonymous -	C10 - C14 Fraction	50 mg/kg	<50	<50	0.0
		C15 - C28 Fraction	100 mg/kg	<100	<100	0.0
		C29 - C36 Fraction	100 mg/kg	<100	<100	0.0
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14497)				mg/kg	mg/kg	%
EB0404380-001	A7 0-0.1	C10 - C14 Fraction	50 mg/kg	<50	<50	0.0
		C15 - C28 Fraction	100 mg/kg	<100	<100	0.0
		C29 - C36 Fraction	100 mg/kg	<100	<100	0.0

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EP075(SIM): PAH/Phenols (SIM)						
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 14063)				mg/kg	mg/kg	%
EB0404332-009	- Anonymous -	Naphthalene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthylene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluorene	0.5 mg/kg	<0.5	<0.5	0.0
		Phenanthrene	0.5 mg/kg	<0.5	<0.5	0.0
		Anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Benz(a)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Chrysene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(b)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(k)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(a)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	<0.5	0.0
EB0404380-011	A16 0-0.5	Naphthalene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthylene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluorene	0.5 mg/kg	<0.5	<0.5	0.0
		Phenanthrene	0.5 mg/kg	<0.5	<0.5	0.0
		Anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Benz(a)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Chrysene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(b)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(k)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(a)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	<0.5	0.0

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 14133)				mg/kg	mg/kg	%
EB0404370-001	- Anonymous -	Naphthalene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthylene	0.5 mg/kg	1.8	1.6	11.2
		Acenaphthene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluorene	0.5 mg/kg	<0.5	<0.5	0.0
		Phenanthrene	0.5 mg/kg	2.7	2.7	0.0
		Anthracene	0.5 mg/kg	1.7	1.7	0.0
		Fluoranthene	0.5 mg/kg	24.0	26.1	8.4
		Pyrene	0.5 mg/kg	27.1	31.5	15.1
		Benz(a)anthracene	0.5 mg/kg	16.3	18.9	14.8
		Chrysene	0.5 mg/kg	14.0	16.2	14.3
		Benzo(b)fluoranthene	0.5 mg/kg	16.0	19.1	17.2
		Benzo(k)fluoranthene	0.5 mg/kg	16.0	19.1	17.2
		Benzo(a)pyrene	0.5 mg/kg	20.5	24.0	15.9
		Indeno(1.2.3.cd)pyrene	0.5 mg/kg	8.9	9.8	9.3
		Dibenz(a.h)anthracene	0.5 mg/kg	3.3	1.7	66.3
		Benzo(g.h.i)perylene	0.5 mg/kg	11.0	11.7	5.8
EB0404370-011	- Anonymous -	Naphthalene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthylene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluorene	0.5 mg/kg	<0.5	<0.5	0.0
		Phenanthrene	0.5 mg/kg	<0.5	<0.5	0.0
		Anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Benz(a)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Chrysene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(b)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(k)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(a)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	<0.5	0.0

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 14498)				mg/kg	mg/kg	%
EB0404380-005	A41 0-0.1	Naphthalene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthylene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluorene	0.5 mg/kg	<0.5	<0.5	0.0
		Phenanthrene	0.5 mg/kg	<0.5	<0.5	0.0
		Anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Benz(a)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Chrysene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(b)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(k)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(a)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	<0.5	0.0
EB0404440-022	- Anonymous -	Naphthalene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthylene	0.5 mg/kg	<0.5	<0.5	0.0
		Acenaphthene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluorene	0.5 mg/kg	<0.5	<0.5	0.0
		Phenanthrene	0.5 mg/kg	<0.5	<0.5	0.0
		Anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Benz(a)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Chrysene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(b)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(k)fluoranthene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(a)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	<0.5	0.0
		Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	<0.5	0.0
		Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	<0.5	0.0

Matrix Type: SOIL

Laboratory Duplicates (DUP) Report

Laboratory Sample ID	Client Sample ID	Analyte name	LOR	Original Result	Duplicate Result	RPD
EP080: TPH Volatiles/BTEX						
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14111)				mg/kg	mg/kg	%
EB0404366-009	- Anonymous -	C6 - C9 Fraction	2 mg/kg	<2	<2	0.0
EB0404366-009	- Anonymous -	Benzene	0.2 mg/kg	<0.2	<0.2	0.0
		Toluene	0.2 mg/kg	<0.2	<0.2	0.0
		Ethylbenzene	0.2 mg/kg	<0.2	<0.2	0.0
		meta- & para-Xylene	0.2 mg/kg	<0.2	<0.2	0.0
		ortho-Xylene	0.2 mg/kg	<0.2	<0.2	0.0
EB0404380-013	A39 0-0.1	C6 - C9 Fraction	2 mg/kg	<2	<2	0.0
EB0404380-013	A39 0-0.1	Benzene	0.2 mg/kg	<0.2	<0.2	0.0
		Toluene	0.2 mg/kg	<0.2	<0.2	0.0
		Ethylbenzene	0.2 mg/kg	<0.2	<0.2	0.0
		meta- & para-Xylene	0.2 mg/kg	<0.2	<0.2	0.0
		ortho-Xylene	0.2 mg/kg	<0.2	<0.2	0.0
EP090: Organotin Analysis						
EP090: Organotin Compounds - (QC Lot: 14317)				µgSn/kg	µgSn/kg	%
EB0404199-001	- Anonymous -	Tributyltin	0.2 µgSn/kg	<0.2	<0.2	0.0

Quality Control Report - Method Blank (MB) and Laboratory Control Samples (LCS)

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 type is to monitor potential laboratory contamination. The quality control term **Laboratory Control Sample (LCS)** refers to a known, interference free matrix spiked with target analytes or certified reference material. The purpose of this QC type is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of actual laboratory data. Abbreviations: LOR = Limit of reporting.

* Indicates failed QC. Refer to the Summary of all QC Outliers within the Interpretive Quality Control Report.

Matrix Type: SOIL

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

Analyte name	LOR	Method blank result	Actual Results: Spike concentration	Actual Results: Spike Recovery LCS	Recovery Limits: Dynamic Recovery Limits Low	Recovery Limits: Dynamic Recovery Limits High
EG005T: Total Metals by ICP-AES						
EG005T: Total Metals by ICP-AES - (QC Lot: 14570)		mg/kg	mg/kg	%	%	%
Arsenic	1 mg/kg	<1	13.8	104	70	130
Cadmium	1 mg/kg	<1	2.82	103	70	130
Chromium	1 mg/kg	<1	61.6	104	70	130
Copper	1 mg/kg	<1	54.7	103	70	130
Iron	10 mg/kg	<10	----	----	----	----
Lead	1 mg/kg	<1	55.5	103	70	130
Nickel	1 mg/kg	<1	55.1	103	70	130
Zinc	1 mg/kg	<1	105	103	70	130
EG035T: Total Mercury by FIMS						
EG035T: Total Mercury by FIMS - (QC Lot: 14569)		mg/kg	mg/kg	%	%	%
Mercury	0.1 mg/kg	<0.1	1.34	95.4	70	130
EP005: Total Organic Carbon						
EP005: Total Organic Carbon (TOC) - (QC Lot: 15071)		%	%	%	%	%
Total Organic Carbon	0.02 %	<0.02	100	100	70	130
EP071: TPH - Semivolatile Fraction						
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14062)		mg/kg	mg/kg	%	%	%
C10 - C14 Fraction	50 mg/kg	<50	194	82.8	47	117
C15 - C28 Fraction	100 mg/kg	<100	272	94.9	74	132
C29 - C36 Fraction	100 mg/kg	<100	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14132)		mg/kg	mg/kg	%	%	%
C10 - C14 Fraction	50 mg/kg	<50	194	92.8	47	117
C15 - C28 Fraction	100 mg/kg	<100	272	80.5	74	132
C29 - C36 Fraction	100 mg/kg	<100	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14497)		mg/kg	mg/kg	%	%	%
C10 - C14 Fraction	50 mg/kg	<50	194	90.5	47	117
C15 - C28 Fraction	100 mg/kg	<100	272	85.4	74	132
C29 - C36 Fraction	100 mg/kg	<100	----	----	----	----

Matrix Type: SOIL

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

Analyte name	LOR	Method blank result	Actual Results: Spike concentration	Actual Results: Spike Recovery LCS	Recovery Limits: Dynamic Recovery Limits Low	Recovery Limits: Dynamic Recovery Limits High
EP075(SIM): PAH/Phenols (SIM)						
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 14063)		mg/kg	mg/kg	%	%	%
Naphthalene	0.5 mg/kg	<0.5	0.5	114	68	131
Acenaphthylene	0.5 mg/kg	<0.5	0.5	102	62	118
Acenaphthene	0.5 mg/kg	<0.5	0.5	110	66	129
Fluorene	0.5 mg/kg	<0.5	0.5	108	52	126
Phenanthrene	0.5 mg/kg	<0.5	0.5	112	56	125
Anthracene	0.5 mg/kg	<0.5	0.5	99.9	67	126
Fluoranthene	0.5 mg/kg	<0.5	0.5	99.8	55	131
Pyrene	0.5 mg/kg	<0.5	0.5	117	62	146
Benz(a)anthracene	0.5 mg/kg	<0.5	0.5	117	44	141
Chrysene	0.5 mg/kg	<0.5	0.5	106	66	133
Benzo(b)fluoranthene	0.5 mg/kg	<0.5	0.5	101	47	143
Benzo(k)fluoranthene	0.5 mg/kg	<0.5	0.5	101	47	143
Benzo(a)pyrene	0.5 mg/kg	<0.5	0.5	91.8	55	126
Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	0.5	78.1	19	124
Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	0.5	71.3	16	132
Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	0.5	86.6	31	140
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 14133)		mg/kg	mg/kg	%	%	%
Naphthalene	0.5 mg/kg	<0.5	5	86.1	68	131
Acenaphthylene	0.5 mg/kg	<0.5	5	88.6	62	118
Acenaphthene	0.5 mg/kg	<0.5	5	83.1	66	129
Fluorene	0.5 mg/kg	<0.5	5	76.2	52	126
Phenanthrene	0.5 mg/kg	<0.5	5	77.7	56	125
Anthracene	0.5 mg/kg	<0.5	5	83.2	67	126
Fluoranthene	0.5 mg/kg	<0.5	5	81.2	55	131
Pyrene	0.5 mg/kg	<0.5	5	88.8	62	146
Benz(a)anthracene	0.5 mg/kg	<0.5	5	78.0	44	141
Chrysene	0.5 mg/kg	<0.5	5	79.6	66	133
Benzo(b)fluoranthene	0.5 mg/kg	<0.5	5	83.0	47	143
Benzo(k)fluoranthene	0.5 mg/kg	<0.5	5	83.0	47	143
Benzo(a)pyrene	0.5 mg/kg	<0.5	5	84.6	55	126
Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	5	75.9	19	124
Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	5	74.6	16	132
Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	5	77.3	31	140

Matrix Type: SOIL

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

Analyte name	LOR	Method blank result	Actual Results: Spike concentration	Actual Results: Spike Recovery LCS	Recovery Limits: Dynamic Recovery Limits Low	Recovery Limits: Dynamic Recovery Limits High
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 14498)		mg/kg	mg/kg	%	%	%
Naphthalene	0.5 mg/kg	<0.5	5	104	68	131
Acenaphthylene	0.5 mg/kg	<0.5	5	94.7	62	118
Acenaphthene	0.5 mg/kg	<0.5	5	98.2	66	129
Fluorene	0.5 mg/kg	<0.5	5	90.9	52	126
Phenanthrene	0.5 mg/kg	<0.5	5	94.9	56	125
Anthracene	0.5 mg/kg	<0.5	5	102	67	126
Fluoranthene	0.5 mg/kg	<0.5	5	97.5	55	131
Pyrene	0.5 mg/kg	<0.5	5	94.3	62	146
Benz(a)anthracene	0.5 mg/kg	<0.5	5	103	44	141
Chrysene	0.5 mg/kg	<0.5	5	92.7	66	133
Benzo(b)fluoranthene	0.5 mg/kg	<0.5	5	98.4	47	143
Benzo(k)fluoranthene	0.5 mg/kg	<0.5	5	98.4	47	143
Benzo(a)pyrene	0.5 mg/kg	<0.5	5	95.2	55	126
Indeno(1.2.3.cd)pyrene	0.5 mg/kg	<0.5	5	86.0	19	124
Dibenz(a.h)anthracene	0.5 mg/kg	<0.5	5	81.1	16	132
Benzo(g.h.i)perylene	0.5 mg/kg	<0.5	5	91.0	31	140
EP080: TPH Volatiles/BTEX						
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14111)		mg/kg	mg/kg	%	%	%
C6 - C9 Fraction	2 mg/kg	<2	26	107	84	111
EP080: BTEX - (QC Lot: 14111)		mg/kg	mg/kg	%	%	%
Benzene	0.2 mg/kg	<0.2	1	116	78	119
Toluene	0.2 mg/kg	<0.2	1	117	77	119
Ethylbenzene	0.2 mg/kg	<0.2	1	111	79	120
meta- & para-Xylene	0.2 mg/kg	<0.2	1	111	76	121
ortho-Xylene	0.2 mg/kg	<0.2	1	111	81	120
EP090: Organotin Analysis						
EP090: Organotin Compounds - (QC Lot: 14317)		µgSn/kg	µgSn/kg	%	%	%
Tributyltin	0.2 µgSn/kg	<0.2	25	73.6	50	86

Quality Control Report - Matrix Spikes (MS)

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 type is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQO's). 'Ideal' recovery ranges stated may be waived in the event of sample matrix interferences. - Anonymous - Client Sample IDs refer to samples which are not specifically part of this work order but formed part of the QC process lot. *Abbreviations: **LOR** = Limit of Reporting, **RPD** = Relative Percent Difference.*

* Indicates failed QC. Refer to the Summary of all QC Outliers within the Interpretive Quality Control Report.

Matrix Type: SOIL

Matrix Spike (MS) Report

					Actual Results		Recovery Limits	
					Sample Result	Spike Recovery	Static Limits	
Analyte name	*Laboratory Sample ID*	*Client Sample ID*	*LOR*	*Spike Concentration*		*MS*	*Low*	*High*
EG005T: Total Metals by ICP-AES								
EG005T: Total Metals by ICP-AES - (QC Lot: 14570)				mg/kg	mg/kg	%	%	%
Arsenic	EB0404380-001	A7 0-0.1	1 mg/kg	50.0	2	100	70	130
Cadmium			1 mg/kg	50.0	<1	94.9	70	130
Chromium			1 mg/kg	50.0	3	95.7	70	130
Copper			1 mg/kg	50.0	<1	102	70	130
Iron			10 mg/kg	50.0	1810	* Not determined	70	130
Lead			1 mg/kg	50.0	2	93.3	70	130
Nickel			1 mg/kg	50.0	<1	91.4	70	130
Zinc			1 mg/kg	50.0	<1	88.9	70	130
EG035T: Total Mercury by FIMS								
EG035T: Total Mercury by FIMS - (QC Lot: 14569)				mg/kg	mg/kg	%	%	%
Mercury	EB0404380-001	A7 0-0.1	0.1 mg/kg	10.0	<0.1	93.3	70	130
EP071: TPH - Semivolatile Fraction								
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14062)				mg/kg	mg/kg	%	%	%
C10 - C14 Fraction	EB0404332-007	- Anonymous -	50 mg/kg	194	<50	94.1	70	130
C15 - C28 Fraction			100 mg/kg	272	<100	101	70	130
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14132)				mg/kg	mg/kg	%	%	%
C10 - C14 Fraction	EB0404370-002	- Anonymous -	50 mg/kg	194	<50	119	70	130
C15 - C28 Fraction			100 mg/kg	272	110	93.2	70	130
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14497)				mg/kg	mg/kg	%	%	%
C10 - C14 Fraction	EB0404380-006	A41 0.1-0.5	50 mg/kg	194	<50	88.2	70	130
C15 - C28 Fraction			100 mg/kg	272	<100	90.2	70	130
EP075(SIM): PAH/Phenols (SIM)								
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 14063)				mg/kg	mg/kg	%	%	%
Acenaphthene	EB0404332-011	- Anonymous -	0.5 mg/kg	2.5	<0.5	98.1	70	130
Pyrene			0.5 mg/kg	2.5	<0.5	98.3	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 14133)				mg/kg	mg/kg	%	%	%
Acenaphthene	EB0404370-002	- Anonymous -	0.5 mg/kg	2.5	<0.5	80.8	70	130
Pyrene			0.5 mg/kg	2.5	2.6	128	70	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - (QC Lot: 14498)				mg/kg	mg/kg	%	%	%
Acenaphthene	EB0404440-013	- Anonymous -	0.5 mg/kg	2.5	<0.5	74.5	70	130
Pyrene			0.5 mg/kg	2.5	<0.5	* 62.8	70	130

Matrix Type: SOIL

Matrix Spike (MS) Report

Analyte name	Laboratory Sample ID	Client Sample ID	LOR	Spike Concentration	Actual Results: Sample Result	Actual Results: Spike Recovery MS	Recovery Limits: Static Limits Low	Recovery Limits: Static Limits High
EP080: TPH Volatiles/BTEX								
EP080/071: Total Petroleum Hydrocarbons - (QC Lot: 14111)				mg/kg	mg/kg	%	%	%
C6 - C9 Fraction	EB0404366-010	- Anonymous -	2 mg/kg	14	<2	75.6	70	130
EP080: BTEX - (QC Lot: 14111)				mg/kg	mg/kg	%	%	%
Benzene	EB0404366-010	- Anonymous -	0.2 mg/kg	1	<0.2	72.2	70	130
Toluene			0.2 mg/kg	1	<0.2	72.5	70	130
EP090: Organotin Analysis								
EP090: Organotin Compounds - (QC Lot: 14317)				µgSn/kg	µgSn/kg	%	%	%
Tributyltin	EB0404285-001	- Anonymous -	0.2 µgSn/kg	25	<0.2	55.0	20	130

AUSTRALIAN LABORATORY SERVICES
32 Shand Street, Stafford, QLD 4053
PO Box 66, Everton Park, QLD 4053
Ph:(07) 3243 7222 Fax:(07) 3243 7218
Website: www.alsenviro.com

FAXED 28/7/04

ALS

Analysis Request / Chain of Custody Form

Company:	Ullman + Nolan Technical Services	Purchase Order Number:	60600
Contact:	Rowan Cossins	Project Identification:	21024.1
Postal Address:	PO Box 5630	Quotation Reference:	–
	Mackay Mail Centre 4740	Results Required By:	4.8.04
Phone:	07 49 525255	Special Requirements:	Keep refrigerated
Fax:	07 49 526455		
E-mail:	soils@uneng.com.au		
Result Format (Please Circle):	FAX MAIL	ALS Batch Number:	
Electronic:	EXCEL PDF	(Lab Use Only)	

VT ALS Environmental Brisbane Work Order EB0403940 Telephone 61-7-32437222

METALS -Water Samples	TOTAL (USEPA 3005) /FILTERED
(Please Circle)	ICPAES / ICPMS

ANALYSIS REQUIRED

	SAMPLE DATA			BASE 8 + Fe	TPH + BTEX	PAH	TBT	TOC
	Sample Identification	Date	Sample Type/ Matrix					
1	A4 0/0.1 04-2166 A	17.7.04	JAR	✓				
2	A4 0.1/0.5 B	✓	JAR	✓	✓	✓	✓	✓
3	A22 0/0.1 04-2167 A	19.7.04	JAR	✓	✓		✓	✓
4	A22 0.1/0.5 B	✓	JAR	✓				

Relinquished By		Received By	
Name: Veanna Joiner	Date: 27-7-04	Name: M.N.	Date: 28/7/04
Company: UNTS	Time: 4:30	Company: Australian Laboratory Services	Time: 11:55 am

CHAIN OF CUSTODY

CLIENT: UNTS

Contact: Roman Cessins
Address: 71 Connors Rd Maclean
Phone: 49525255
Fax: 49525455

Purchase Order No:

Project ID: 21024.1 Shute Harbour

Quotation:

Final Report: ☐ E-mail: ☑ Fax: ☐
E-mail Format : ☑ .PDF ☑ Excel ☐ Other
E-mail Address : soils@uneng.com.au

TAT Required: ☐ 24 hr TAT ☑ Standard TAT (5 - 7 Days) ☐ Specify.....

ALS Environmental
32 Shand Street
Stafford QLD 4053
Ph: 07 3243 7222
Fax: 07 3243 7218

ALS Environmental

SAMPLE ID	DATE	MATRIX	TIME	Base 8 + Fe	TPH/BTEX	PAH	TBT	TOC						COMMENTS
A7 0-0.1 (1)	6/8/04	Soil	PM	✓	✓									FAXED 13/8/04
A7 0.1-0.5 (2)	✓	✓	✓	✓										
A23 0-0.1 (3)	29/7/04	✓	✓				✓	✓						
A23 0.1-0.5 (4)	✓	✓	✓			✓								
A41 0-0.1 (5)	29/7/04	✓	✓	✓	✓		✓	✓						
A41 0.1-0.5 (6)	✓	✓	✓			✓	✓	✓						
A43 0-0.1 (7)	28/7/04	✓	✓	✓	✓									
A43 0.1-0.5 (8)	✓	✓	✓		✓									
A25 0-0.1 (9)	4/8/04	✓	✓	✓	✓									
A25 0.1-0.5 (10)	✓	✓	✓		✓	✓								
A16 0-0.5 (11)	28/7/04	✓	✓	✓	✓		✓	✓						
A16 0.1-0.5 (12)	✓	✓	✓	✓		✓								
A39 0-0.1 (13)	5/8/04	✓	✓		✓									
A39 0.1-0.5 (14)	✓	✓	✓	✓	✓	✓								

ALS Environmental Brisbane Work Order EB0404380
Telephone : 61-7-32437222

Notes:

RELINQUISHED BY (SIGN / PRINT): DATE: 11/8/04
OF: UNTS TIME: PM

RECEIVED BY (SIGN / PRINT): Kate DATE: 13.8
OF: ALS enviro. TIME: 12pm

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