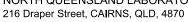
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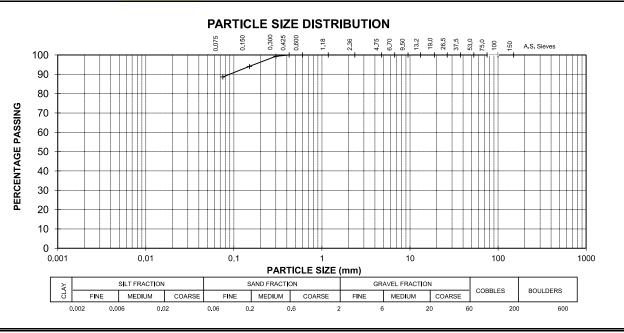
## PARTICLE SIZE DISTRIBUTION & CONSISTENCY LIMITS TEST REPORT

Client	Ports North	Job Number	107672522-5000		
Client Address	Cnr Grafton and Hartley Streets, Cairns, Qld 4870	Date	16-Mar-12		
Project	Dredge Material Assessment	Report Number	NQ-12105	Page No 1 of 1	
Location	Cairns Shipping Channel	Sampling Method	As Supplied to Laboratory		
Lab Ref No.	12/7067	Sample Identification	TP5 2.9-3.6m		

Laboratory Specimen Description

CH CLAY, high plasticity, pale grey and pale red brown, with trace of sand.

PARTICLE SI	ZE DISTRIBUTI	<b>ON</b> AS128	39 3.6.1		CLAS	SIFICATION LIMITS AN	D MOISTURE CONTE	NT	
Sieve Size	% Passing	Spec. Lower	Spec. Upper	Test		Method	Result	Spec. Lower	Spec. Upper
150 mm	100			Liquid Limit	%	AS1289 3.1.2	65		
100 mm	100			Plastic Limit	%	AS1289 3.2.1	18		
75 mm	100			Plasticity Index	%	AS1289 3.3.1	47		
53 mm	100			Linear Shrinkage	%	AS1289 3.4.1	ND		
37.5 mm	100			Moisture Content	%	AS1289 2.1.1	30.5		
26.5 mm	100								
19.0 mm	100			Sample History :			Low Temp Oven Dried		
13.2 mm	100			Preparation Method	d :		Dry sieved		
9.5 mm	100			Crumbling / Curling	g of Linear	Shrinkage :	-		
6.7 mm	100			Linear Shrinkage M	lould Leng	gth :	-		
4.75 mm	100			NP = non-plastic		NO = not obtainable	ND = not determined		
2.36 mm	100								
1.18 mm	100								
0.600mm	100								
0.425mm	100								
0.300mm	99								
0.150mm	94								
0.075mm	89								





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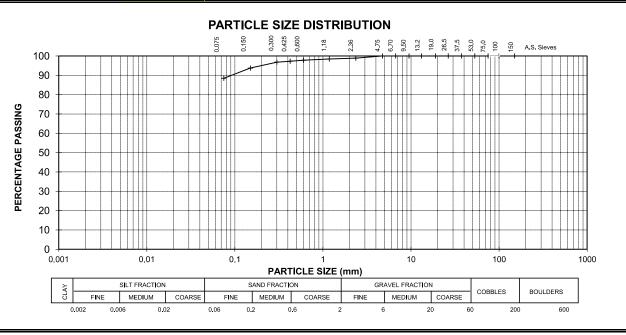
#### PARTICLE SIZE DISTRIBUTION & CONSISTENCY LIMITS TEST REPORT

Client F	Ports North	Job Number	107672522-5000		
Client Address C	Cnr Grafton and Hartley Streets, Cairns, Qld 4870	Date	16-Mar-12		
Project [	Oredge Material Assessment	Report Number	NQ-12104	Page No 1 of 1	
Location (	Cairns Shipping Channel	Sampling Method	As Supplied to Laboratory		
Lab Ref No. 1	12/7066	Sample Identification	TP5 2.5-2.9m		

Laboratory Specimen Description CH CLAY,

CH CLAY, high plasticity, grey, with trace of sand.

PARTICLE SI	ZE DISTRIBUTI	<b>ON</b> AS128	9 3.6.1		CLASS	SIFICATION LIMITS AN	D MOISTURE CONTE	NT	
Sieve Size	% Passing	Spec. Lower	Spec. Upper	Test		Method	Result	Spec. Lower	Spec. Upper
150 mm	100			Liquid Limit	%	AS1289 3.1.2	59		
100 mm	100			Plastic Limit	%	AS1289 3.2.1	19		
75 mm	100			Plasticity Index	%	AS1289 3.3.1	40		
53 mm	100			Linear Shrinkage	%	AS1289 3.4.1	ND		
37.5 mm	100			Moisture Content	%	AS1289 2.1.1	76.4		
26.5 mm	100								
19.0 mm	100			Sample History :			Low Temp Oven Dried		
13.2 mm	100			Preparation Metho	d :		Dry sieved		
9.5 mm	100			Crumbling / Curling	of Linear	Shrinkage :	-		
6.7 mm	100			Linear Shrinkage N	lould Leng	gth :	-		
4.75 mm	100			NP = non-plastic		NO = not obtainable	ND = not determined		
2.36 mm	99								
1.18 mm	98								
0.600mm	98								
0.425mm	97								
0.300mm	97					_	<u> </u>		
0.150mm	94								
0.075mm	88								





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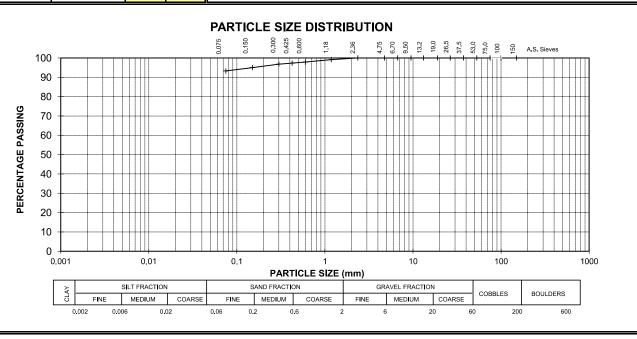


#### PARTICLE SIZE DISTRIBUTION & CONSISTENCY LIMITS TEST REPORT

Project         Dredge Material Assessment         Report Number         NQ-12103         Page No 1 of 1           Location         Cairns Shipping Channel         Sampling Method         As Supplied to Laboratory	Client	Ports North	Job Number	107672522-5000		
Location Cairns Shipping Channel Sampling Method As Supplied to Laboratory	Client Address	Cnr Grafton and Hartley Streets, Cairns, Qld 4870	Date	16-Mar-12		
	Project	Dredge Material Assessment	Report Number	NQ-12103	Page No 1 of 1	
Lab Ref No. 12/7065 Sample Identification TP4 3.3-3.4m	Location	Cairns Shipping Channel	Sampling Method	As Supplied to Laboratory		
	Lab Ref No.	12/7065	Sample Identification	TP4 3.3-3.4m		

 Laboratory Specimen Description
 CH CLAY, high plasticity, dark grey.

PARTICLE SI	ZE DISTRIBUTI	<b>ON</b> AS128	9 3.6.1		CLASS	SIFICATION LIMITS AND	MOISTURE CONTE	NT	
Sieve Size	% Passing	Spec. Lower	Spec. Upper	Test		Method	Result	Spec. Lower	Spec. Upper
150 mm	100			Liquid Limit	%	AS1289 3.1.2	68		
100 mm	100			Plastic Limit	%	AS1289 3.2.1	23		
75 mm	100			Plasticity Index	%	AS1289 3.3.1	45		
53 mm	100			Linear Shrinkage	%	AS1289 3.4.1	ND		
37.5 mm	100			Moisture Content	%	AS1289 2.1.1	106.6		
26.5 mm	100								
19.0 mm	100			Sample History :			Low Temp Oven Dried		
13.2 mm	100			Preparation Method	d :		Dry sieved		
9.5 mm	100			Crumbling / Curling	of Linear	Shrinkage :	-		
6.7 mm	100			Linear Shrinkage M	ould Leng	gth :	-		
4.75 mm	100			NP = non-plastic		NO = not obtainable	ND = not determined		
2.36 mm	100								
1.18 mm	99								
0.600mm	98								
0.425mm	97								
0.300mm	97								
0.150mm	95								
0.075mm	93								



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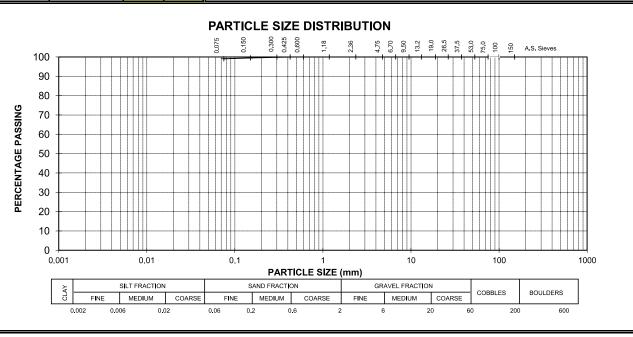


#### PARTICLE SIZE DISTRIBUTION & CONSISTENCY LIMITS TEST REPORT

Client	Ports North	Job Number	107672522-5000		
Client Address (	Cnr Grafton and Hartley Streets, Cairns, Qld 4870	Date	16-Mar-12		
Project [	Dredge Material Assessment	Report Number	NQ-12102 Page No 1 of 1		
Location (	Cairns Shipping Channel	Sampling Method	As Supplied to Laboratory		
Lab Ref No.	12/7064	Sample Identification	TP3 2.8-3.2m		

Laboratory Specimen Description CH CLAY, high plasticity, grey.

PARTICLE SI	ZE DISTRIBUTI	<b>ON</b> AS128	9 3.6.1		CLAS	SIFICATION LIMITS AN	D MOISTURE CONTE	NT	
Sieve Size	% Passing	Spec. Lower	Spec. Upper	Test		Method	Result	Spec. Lower	Spec. Upper
150 mm	100			Liquid Limit	%	AS1289 3.1.2	75		
100 mm	100			Plastic Limit	%	AS1289 3.2.1	22		
75 mm	100			Plasticity Index	%	AS1289 3.3.1	53		
53 mm	100			Linear Shrinkage	%	AS1289 3.4.1	ND		
37.5 mm	100			Moisture Content	%	AS1289 2.1.1	69.4		
26.5 mm	100								
19.0 mm	100			Sample History :			Low Temp Oven Dried		
13.2 mm	100			Preparation Metho	d :		Dry sieved		
9.5 mm	100			Crumbling / Curling	g of Linear	Shrinkage :	-		
6.7 mm	100			Linear Shrinkage N	lould Leng	gth :	-		
4.75 mm	100			NP = non-plastic		NO = not obtainable	ND = not determined		
2.36 mm	100								
1.18 mm	100								
0.600mm	100								
0.425mm	100								
0.300mm	100								
0.150mm	100								
0.075mm	99								



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Darryl Murphy	Laboratory Manager	20-Mar-12
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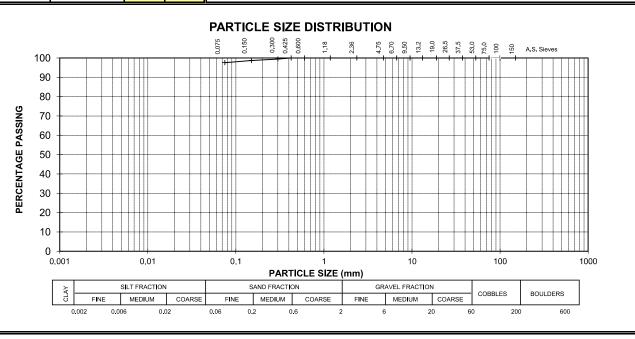


#### PARTICLE SIZE DISTRIBUTION & CONSISTENCY LIMITS TEST REPORT

Client Ports North	Job Number	107672522-5000			
Client Address Cnr Grafton and Hartley Streets, Cairns,	Qld 4870 Date	16-Mar-12			
Project Dredge Material Assessment	Report Number	NQ-12101	Page No 1 of 1		
Location Cairns Shipping Channel	Sampling Method	As Supplied to Labo	As Supplied to Laboratory		
<b>Lab Ref No.</b> 12/7063	Sample Identification	TP3 1.5-2.8m			

Laboratory Specimen Description CH CLAY, high plasticity, grey.

PARTICLE SI	ZE DISTRIBUTI	<b>ON</b> AS128	9 3.6.1		CLASS	SIFICATION LIMITS AND	MOISTURE CONTE	NT	
Sieve Size	% Passing	Spec. Lower	Spec. Upper	Test		Method	Result	Spec. Lower	Spec. Upper
150 mm	100			Liquid Limit	%	AS1289 3.1.2	73		
100 mm	100			Plastic Limit	%	AS1289 3.2.1	20		
75 mm	100			Plasticity Index	%	AS1289 3.3.1	53		
53 mm	100			Linear Shrinkage	%	AS1289 3.4.1	ND		
37.5 mm	100			Moisture Content	%	AS1289 2.1.1	67.5		
26.5 mm	100								
19.0 mm	100			Sample History :			Low Temp Oven Dried		
13.2 mm	100			Preparation Method	d :		Dry sieved		
9.5 mm	100			Crumbling / Curling	of Linear	Shrinkage :	-		
6.7 mm	100			Linear Shrinkage M	ould Leng	gth :	-		
4.75 mm	100			NP = non-plastic		NO = not obtainable	ND = not determined		
2.36 mm	100								
1.18 mm	100								
0.600mm	100								
0.425mm	100								
0.300mm	99								
0.150mm	99								
0.075mm	98								



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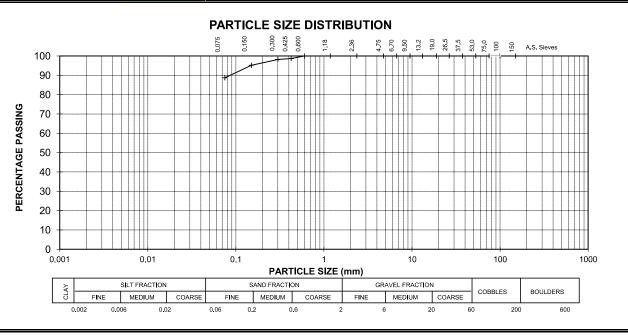
#### PARTICLE SIZE DISTRIBUTION & CONSISTENCY LIMITS TEST REPORT

Client	Ports North	Job Number	107672522-5000		
Client Address	Cnr Grafton and Hartley Streets, Cairns, Qld 4870	Date	16-Mar-12		
Project	Dredge Material Assessment	Report Number	NQ-12100	Page No 1 of 1	
Location	Cairns Shipping Channel	Sampling Method	As Supplied to Laboratory		
Lab Ref No.	12/7062	Sample Identification	TP2 1.6-1.7m		

Laboratory Specimen Description

 $\ensuremath{\mathsf{CI}}$  CLAY, medium plasticity, pale grey, with trace of sand.

PARTICLE SI	PARTICLE SIZE DISTRIBUTION AS1289 3.6.1			CLASSIFICATION LIMITS AND MOISTURE CONTENT					
Sieve Size	% Passing	Spec. Lower	Spec. Upper	Test		Method	Result	Spec. Lower	Spec. Upper
150 mm	100			Liquid Limit	%	AS1289 3.1.2	40		
100 mm	100			Plastic Limit	%	AS1289 3.2.1	18		
75 mm	100			Plasticity Index	%	AS1289 3.3.1	22		
53 mm	100			Linear Shrinkage	%	AS1289 3.4.1	ND		
37.5 mm	100			Moisture Content	%	AS1289 2.1.1	29.7		
26.5 mm	100								
19.0 mm	100			Sample History :			Low Temp Oven Dried		
13.2 mm	100			Preparation Metho	d :		Dry sieved		
9.5 mm	100			Crumbling / Curling	of Linear	Shrinkage :	-		
6.7 mm	100			Linear Shrinkage N	1ould Leng	gth :	-		
4.75 mm	100			NP = non-plastic		NO = not obtainable	ND = not determined		
2.36 mm	100								
1.18 mm	100								
0.600mm	100								
0.425mm	99								
0.300mm	98								
0.150mm	95								
0.075mm	89								



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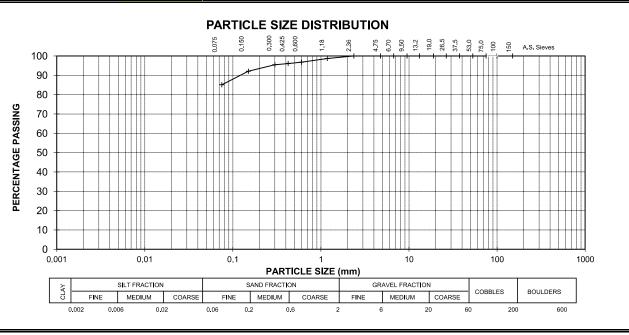
#### PARTICLE SIZE DISTRIBUTION & CONSISTENCY LIMITS TEST REPORT

Client	Ports North	Job Number	107672522-5000		
Client Address	Cnr Grafton and Hartley Streets, Cairns, Qld 4870	Date	16-Mar-12		
Project	Dredge Material Assessment	Report Number	NQ-12099	Page No 1 of 1	
Location	Cairns Shipping Channel	Sampling Method	As Supplied to Laboratory		
Lab Ref No.	12/7061	Sample Identification	TP2 0.0-0.0.7m		

Laboratory Specimen Description

CI CLAY, medium plasticity, pale grey brown, with trace of sand.

PARTICLE SI	ZE DISTRIBUTI	<b>ON</b> AS128	9 3.6.1	CLASSIFICATION LIMITS AND MOISTURE CONTENT					
Sieve Size	% Passing	Spec. Lower	Spec. Upper	Test		Method	Result	Spec. Lower	Spec. Upper
150 mm	100			Liquid Limit	%	AS1289 3.1.2	37		
100 mm	100			Plastic Limit	%	AS1289 3.2.1	18		
75 mm	100			Plasticity Index	%	AS1289 3.3.1	19		
53 mm	100			Linear Shrinkage	%	AS1289 3.4.1	ND		
37.5 mm	100			Moisture Content	%	AS1289 2.1.1	27.0		
26.5 mm	100								
19.0 mm	100			Sample History :			Low Temp Oven Dried		
13.2 mm	100			Preparation Metho	d :		Dry sieved		
9.5 mm	100			Crumbling / Curling	of Linear	Shrinkage :	-		
6.7 mm	100			Linear Shrinkage N	1ould Leng	gth :	-		
4.75 mm	100			NP = non-plastic		NO = not obtainable	ND = not determined	1	
2.36 mm	100								
1.18 mm	99								
0.600mm	97								
0.425mm	96								
0.300mm	95								
0.150mm	92								
0.075mm	85								



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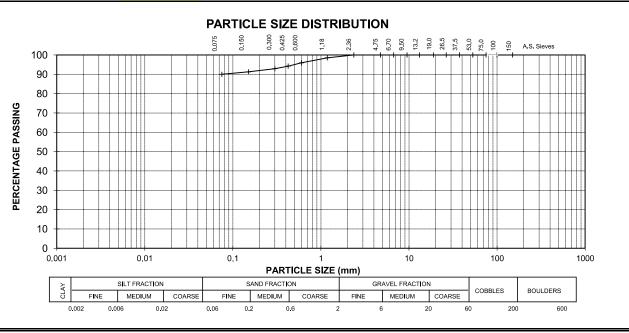
#### PARTICLE SIZE DISTRIBUTION & CONSISTENCY LIMITS TEST REPORT

Client	Ports North	Job Number	107672522-5000		
Client Address	Cnr Grafton and Hartley Streets, Cairns, Qld 4870	Date	16-Mar-12		
Project	Dredge Material Assessment	Report Number	NQ-12098	Page No 1 of 1	
Location	Cairns Shipping Channel	Sampling Method	As Supplied to Laboratory		
Lab Ref No.	12/7060	Sample Identification	TP1 0.0-0.05m		

Laboratory Specimen Description

 $\ensuremath{\mathsf{CH}}$  CLAY, high plasticity, pale grey and pale brown, with trace of sand.

PARTICLE SIZE DISTRIBUTION AS1289 3.6.1			39 3.6.1	CLASSIFICATION LIMITS AND MOISTURE CONTENT					
Sieve Size	% Passing	Spec. Lower	Spec. Upper	Test		Method	Result	Spec. Lower	Spec. Upper
150 mm	100			Liquid Limit	%	AS1289 3.1.2	57		
100 mm	100			Plastic Limit	%	AS1289 3.2.1	17		
75 mm	100			Plasticity Index	%	AS1289 3.3.1	40		
53 mm	100			Linear Shrinkage	%	AS1289 3.4.1	ND		
37.5 mm	100			Moisture Content	%	AS1289 2.1.1	35.0		
26.5 mm	100								
19.0 mm	100			Sample History :			Low Temp Oven Dried		
13.2 mm	100			Preparation Method	d :		Dry sieved		
9.5 mm	100			Crumbling / Curling	g of Linear	Shrinkage :	-		
6.7 mm	100			Linear Shrinkage M	lould Leng	jth :	-		
4.75 mm	100			NP = non-plastic		NO = not obtainable	ND = not determined		
2.36 mm	100								
1.18 mm	99								
0.600mm	96								
0.425mm	94								
0.300mm	93								
0.150mm	91								
0.075mm	90								



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Darryl Murphy	Laboratory Manager	20-Mar-12
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# LABORATORY REPORT COVERSHEET

**Date:** 16 March 2012

To: Golder Associates Pty Ltd

PO Box 5823

CAIRNS QLD 4870

Attention: Jo Parisi

**Your Reference:** 107672522 Cairns Shipping Lane

**Laboratory Report No:** CE76936

Samples Received: 13/03/2012

Samples / Quantity: 8 Soils

The above samples were received intact and analysed according to your written instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

Jon Dicker

Manager CAIRNS **Shey Goddard** 

Speddard

Administration Manager

**CAIRNS** 



ACCREDITATION

Page 1 of 6



PROJECT: 107672522 Cairns Shipping Lane

Chromium Suite Our Reference Your Reference Type of Sample Date Sampled	Units	CE76936-1 TP1-001 Soil 2/03/2012	CE76936-2 TP2-001 Soil 2/03/2012	CE76936-3 TP2-003 Soil 2/03/2012
Date Extracted		13/03/2012	13/03/2012	13/03/2012
Date Analysed		13/03/2012	13/03/2012	13/03/2012
Moisture	% w/w	25	21	23
рН ксі	pH Units	9.3	7.7	7.7
TAA pH 6.5	kg H2SO4/tonne	<0.5	<0.5	<0.5
Chromium Reducible Sulfur (Scr)	% w/w	0.012	0.11	0.14
Shci	% w/w	NA	NA	NA
S KCI	% w/w	NA	NA	NA
S NAS	% w/w	NA	NA	NA
Acid Neutralisation Capacity ANСвт	% CaCO3	NA	1.6	1.1



PROJECT: 107672522 Cairns Shipping Lane

Chromium Suite Our Reference Your Reference Type of Sample Date Sampled	Units	CE76936-4 TP3-001 Soil 1/03/2012	CE76936-5 TP3-003 Soil 1/03/2012	CE76936-6 TP4-001 Soil 1/03/2012
Date Extracted		13/03/2012	13/03/2012	13/03/2012
Date Analysed		13/03/2012	13/03/2012	13/03/2012
Moisture	% w/w	39	42	51
рН ксі	pH Units	8.7	8.7	9.0
TAA pH 6.5	kg H2SO4/tonne	<0.5	<0.5	<0.5
Chromium Reducible Sulfur (Scr)	% w/w	1.7	1.7	0.40
Sнсı	% w/w	NA	NA	NA
S KCI	% w/w	NA	NA	NA
S NAS	% w/w	NA	NA	NA
Acid Neutralisation Capacity ANСвт	% CaCO <sub>3</sub>	2.2	3.0	9.0

Chromium Suite Our Reference Your Reference Type of Sample Date Sampled	Units	CE76936-7 TP5-001 Soil 1/03/2012	CE76936-8 TP5-003 Soil 1/03/2012	
Date Extracted		13/03/2012	13/03/2012	
Date Analysed		13/03/2012	13/03/2012	
Moisture	% w/w	42	25	
рН ксі	pH Units	8.7	7.9	
TAA pH 6.5	kg H2SO4/tonne	<0.5	<0.5	
Chromium Reducible Sulfur (ScR)	% w/w	1.4	1.1	
Shoi	% w/w	NA	NA	
S kci	% w/w	NA	NA	
S NAS	% w/w	NA	NA	
Acid Neutralisation Capacity ANСвт	% CaCO₃	4.4	0.6	





PROJECT: 107672522 Cairns Shipping Lane

TEST PARAMETERS	UNITS	LOR	METHOD
Chromium Suite			
Date Extracted			
Date Analysed			
Moisture	% w/w	0.1	AN002 RL2A1
рН ксі	pH Units	0.1	AS4969.2 / AN219
TAA pH 6.5	kg H2SO4/tonne	0.5	AS4969.2 / AN219
Chromium Reducible Sulfur (ScR)	% w/w	0.005	AS4969.7
Shci	% w/w	0.005	AS4969.8 / AN014
S KCI	% w/w	0.005	AS4969.4
S NAS	% w/w	0.005	AS4969.11
Acid Neutralisation Capacity ANC <sub>BT</sub>	% CaCO3	0.1	AN214



PROJECT: 107672522 Cairns Shipping Lane

QUALITY CONTROL	UNITS	Blank	Duplicate Sm#	Duplicate Sample  Duplicate	Spike	CMS Recovery
Date Extracted		13/03/12	CE76936-1	13/03/2012    13/03/2012	Batch Spike	13/03/12
Date Analysed		13/03/12	CE76936-1	13/03/2012    13/03/2012	Batch Spike	13/03/12
Moisture	% w/w	-	CE76936-1	25    [N/T]	Batch Spike	-
рН ксі	pH Units	5.2	CE76936-1	9.3    9.4    RPD: 1	Batch Spike	99%
TAA pH 6.5	kg H2SO4 /tonne	-	CE76936-1	<0.5    <0.5	Batch Spike	93%
Chromium Reducible Sulfur (Scr)	% w/w	-	CE76936-1	0.012    0.015    RPD: 22	Batch Spike	100%
Sнci	% w/w	-	CE76936-1	NA    NA	Batch Spike	-
S KCI	% w/w	-	CE76936-1	NA    NA	Batch Spike	-
S NAS	% w/w	-	CE76936-1	NA    NA	Batch Spike	-
Acid Neutralisation Сарасіty ANСвт	% CaCO3	-	CE76936-1	NA    NA	Batch Spike	-



PROJECT: 107672522 Cairns Shipping Lane

#### LABORATORY REPORT

#### NOTES:

LOR - Limit of Reporting.

The significance of all reported results are defined by their analytical limit of reporting.

Liming rate calculated using a Fineness factor of 1.5 (which is equivalent to finely divided Ag Lime <0.5mm) and Neutralising Value (NV) of 100%

If using Liming Material <100% NV, then Liming Rate can be adusted as follows:

Actual Liming Rate equals Calculated Liming Rate times 100 divided by NV of actual Liming Material Bulk Density of Material of 1g/cm3 assumed.

If Bulk Density differs from 1g/cm3 then Liming rate can be adjusted as follows:

Actual Liming Rate equals Calculated Liming Rate times Actual Bulk Density

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Unless otherwise stated the results shown in this test report only refer to the sample(s) tested and such sample(s) are only retained for 60 days only. This document cannot be reproduced except in full, without prior approval of the Company.

Analysis Date: Between 13/03/12 and 16/03/12

#### Disclaimer:

ACCREDITATION

SGS and the authors have prepared this document in good faith,

consulting with Ahern CR, McElnea AE, Sullivan LA (2004)

Acid Sulphate Soils Laboratory Methods Guidelines,

Queensland Department of Natural Resources, Mines and Energy, Indooroopilly, Qld Aust.

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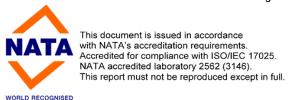
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28 Bank Street, West End QLD 4101 PO Box 3427 South Brisbane BC QLD 4101 Phone:(07) 3840 9500 Fax:(07) 3840 9501 www.golder.com.au

Report No.: R12466

Sampled By: Client

107672522-5000

12301151

Job No.:

Reg'n No.:

Sample No.:

#### TRIAXIAL SHEAR TEST

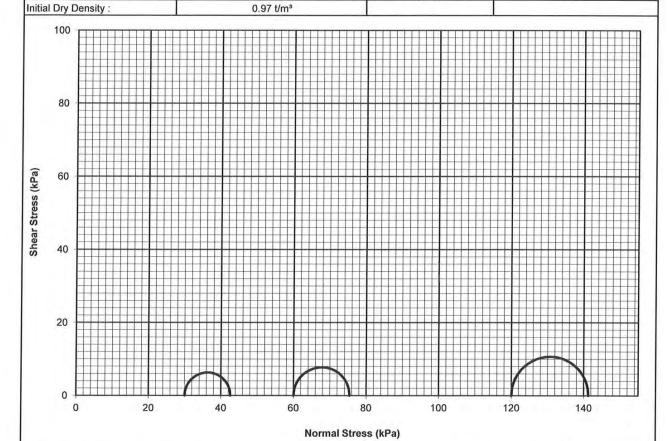
Client: Ports North Address: Corner Grafton & Hartley Streets, Cairns

Project: **Dredge Material Assessment** 

Location: PN-TP3-003, CH 17683 (10.9m) Date of Test: 20/03/12

Type of test: Unsaturated, Unconsolidated, Undrained, Staged

Sample Type: Undisturbed Strain Rate 0.50 mm/min Specimen Diameter: 47.0 mm Specimen Height: 94.5 mm Initial Moisture Content: 64.3 % Initial Saturation: 98 %



Stage	Initial Cell Pressure (kPa)	Maximum Principal Stress (kPa) σ <sub>1</sub>	Minimum Principal Stress (kPa) σ <sub>3</sub>	Maximum Deviator Stress (kPa)	Failure Strain (%)
1	30	43	30	13	0.8
2	60	75	60	15	2.1
3	120	141	120	21	19.0

Failure Criteria: Maximum Shear Stress Remarks: Shear plane at 45° after test. Material Description: (CH) Silty CLAY, dark grey

Test Procedure: AS1289.6.4.1

Prepared by M Checked by

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Nick Farrer

Senior Technical Officer NATA Accred. No.: 1961

Approved Signatory

Golder Form No. R19 RL1 - 29/01/08



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PO Box 3427 South Brisbane BC QLD 4101
Phone:(07) 3840 9500 Fax:(07) 3840 9501
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# TRIAXIAL SHEAR TEST (STRESS STRAIN GRAPH)

Client : Address : Ports North

Corner Grafton & Hartley Streets, Cairns

Project:

Dredge Material Assessment

Location:

PN-TP3-003, CH 17683 (10.9m)

Report No.:

R12466

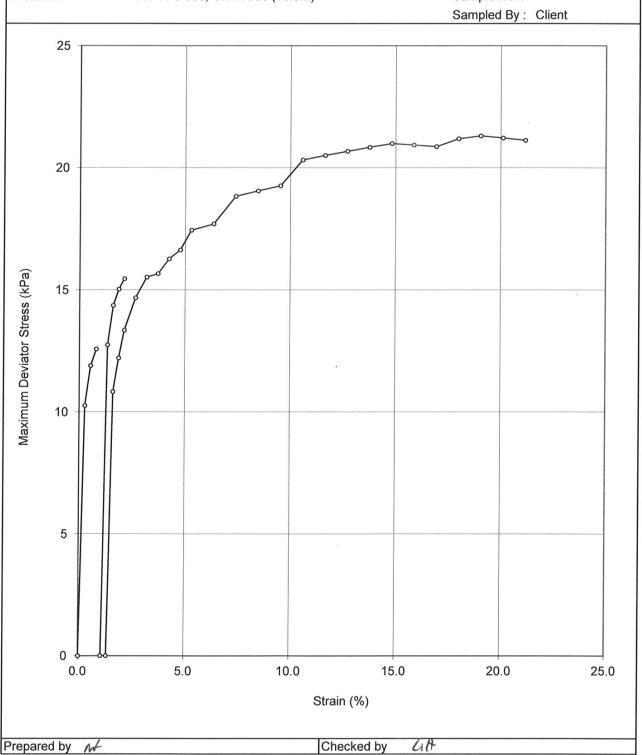
Job No. :

107672522-5000

Reg'n No.:

12301151

Sample No.:



107672522-5000

12301152



#### **BRISBANE LABORATORY**

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Job No.:

Reg'n No.:

Sample No.:

Sampled By: Client

# TRIAXIAL SHEAR TEST

Report No.: R12467 Client: Ports North

Address: Corner Grafton & Hartley Streets, Cairns

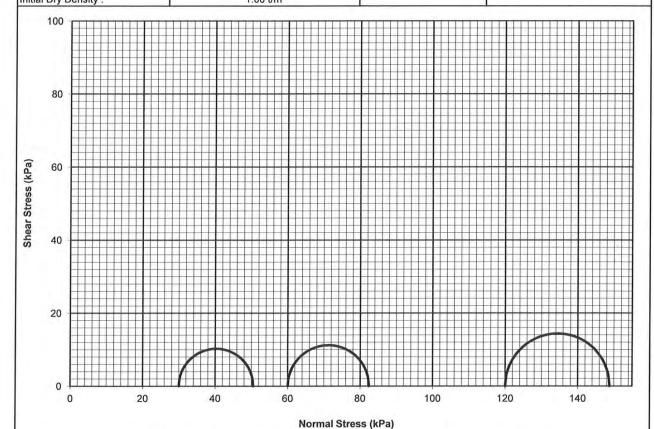
**Dredge Material Assessment** Project: PN-TP3-004, CH 17683 (12.7m) Location:

Date of Test: 21/03/12

Unsaturated, Unconsolidated, Undrained, Staged

Type of test:

Sample Type: Undisturbed Strain Rate 0.50 mm/min Specimen Diameter: 47.0 mm Specimen Height: 94.7 mm Initial Moisture Content: Initial Saturation: 100 % 63.0 % Initial Dry Density: 1.00 t/m3



Stage	Initial Cell Pressure (kPa)	Maximum Principal Stress (kPa) σ <sub>1</sub>	Minimum Principal Stress (kPa) σ <sub>3</sub>	Maximum Deviator Stress (kPa)	Failure Strain (%)
1	30	50	30 ·	20	1.6
2	60	82	60	22	2.4
3	120	149	120	29	9.5

Failure Criteria: Maximum Shear Stress Remarks: Shear plane at 45° after test. Material Description: (CH) Silty CLAY, dark grey

Test Procedure: AS1289.6.4.1

all Prepared by Checked by

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Nick Farrer

Senior Technical Officer

Approved Signatory

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# TRIAXIAL SHEAR TEST (STRESS STRAIN GRAPH)

Client:

Ports North

Address :

Corner Grafton & Hartley Streets, Cairns

Project:

Dredge Material Assessment

Location:

PN-TP3-004, CH 17683 (12.7m)

Report No.:

R12467

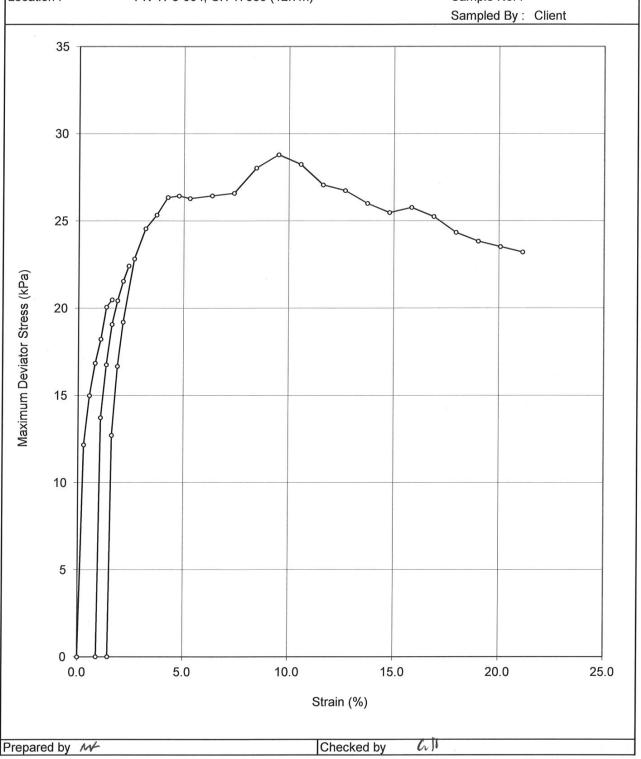
Job No.:

107672522-5000

Reg'n No.:

12301152

Sample No.:





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# TRIAXIAL SHEAR TEST

Client:

Ports North

Address: Project:

Corner Grafton & Hartley Streets, Cairns

**Dredge Material Assessment** 

Location:

PN-TP5-002, CH 22508 (12.1m)

Date of Test: 21/03/12 Report No.: R12468

Job No.: 107672522-5000 Reg'n No.: 12301153

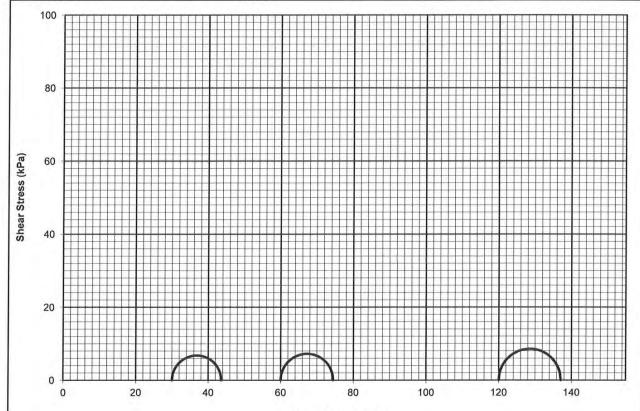
Sample No.:

Sampled By : Client

Type of test:	Unsaturated, Unconsolidated, Undrained, Staged				
Sample Type :	Undisturbed	Strain Rate :			

0.50 mm/min Specimen Diameter: 47.0 mm Specimen Height: 94.4 mm Initial Moisture Content: 85.9 % Initial Saturation: 98 %

Initial Dry Density: 0.80 t/m<sup>3</sup>



#### Normal Stress (kPa)

Stage	Initial Cell Pressure (kPa)	Maximum Principal Stress (kPa) σ <sub>1</sub>	Minimum Principal Stress (kPa) σ <sub>3</sub>	Maximum Deviator Stress (kPa)	Failure Strain (%)
1	30	44	30	14	0.5
2	60	74	60	14	1.1
3	120	137	120	17	7.4

Failure Criteria:

Maximum Shear Stress

Remarks:

Shear plane at 45° after test. (CH) Silty CLAY, dark grey

Test Procedure:

Material Description:

AS1289.6.4.1

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Senior Technical Officer

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# TRIAXIAL SHEAR TEST (STRESS STRAIN GRAPH)

Client:

Ports North

Address:

Corner Grafton & Hartley Streets, Cairns

Project:

**Dredge Material Assessment** 

Location:

PN-TP5-002, CH 22508 (12.1m)

Report No.:

R12468

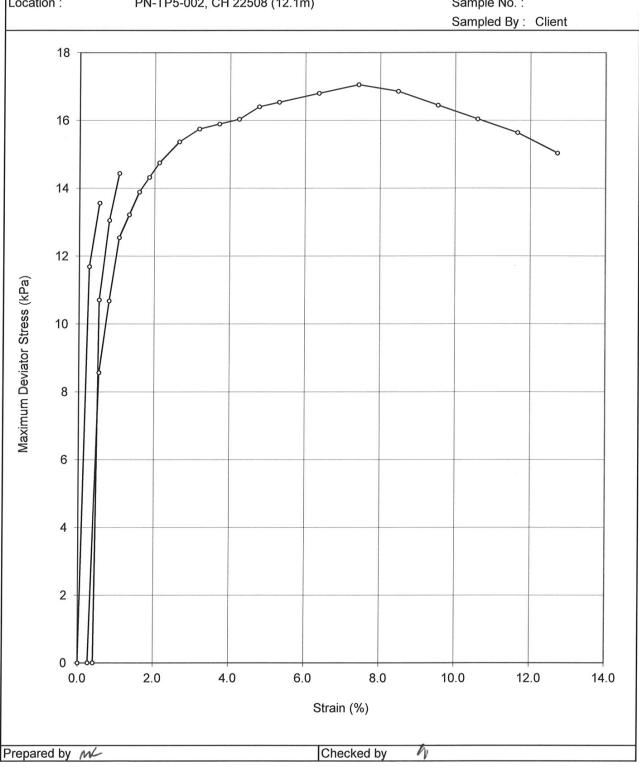
Job No.:

107672522-5000

Reg'n No.:

12301153

Sample No.:





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# TRIAXIAL SHEAR TEST

Client:

Ports North

Address: Project:

Corner Grafton & Hartley Streets, Cairns

**Dredge Material Assessment** 

Location:

PN-TP5-004, CH 22508 (12.75m)

Date of Test: 21/03/12 Report No.: R12469

Job No.: 107672522-5000

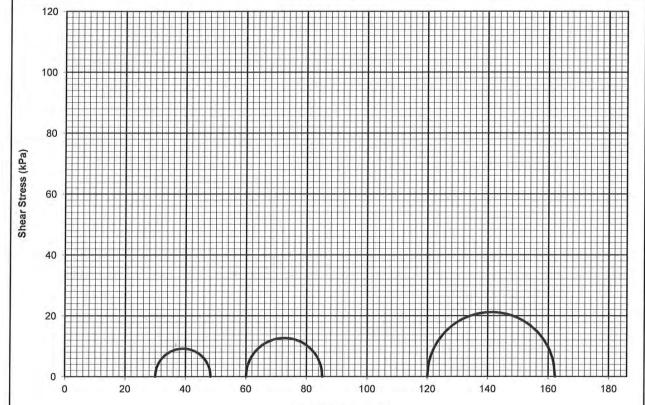
Reg'n No.:

12301154

Sample No.:

Sampled By: Client

Type of test :	Unsaturated, Unconsolidate	Unsaturated, Unconsolidated, Undrained, Staged							
Sample Type :	Undisturbed	Strain Rate :	0.50 mm/min						
Specimen Diameter :	47.0 mm	Specimen Height:	94.4 mm						
Initial Moisture Content :	35.8 %	Initial Saturation :	66 %						
Initial Dry Density :	1.10 t/m³								



Normal	Stress	(kPa)

Stage	Initial Cell Pressure (kPa)	Maximum Principal Stress (kPa) σ <sub>1</sub>	Minimum Principal Stress (kPa) σ <sub>3</sub>	Maximum Deviator Stress (kPa)	Failure Strain (%)
1	30	48	30	18	0.5
2	60	85	60	25	1.3
3	120	162	120	42	15.9

Failure Criteria:

Maximum Shear Stress

Remarks:

Shear plane at 45° after test. (CH) Silty CLAY, dark grey

Material Description: Test Procedure:

AS1289.6.4.1

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# TRIAXIAL SHEAR TEST (STRESS STRAIN GRAPH)

Client :

Ports North

Address :

Corner Grafton & Hartley Streets, Cairns

Project:

Dredge Material Assessment

Location:

PN-TP5-004, CH 22508 (12.75m)

Report No.:

R12469

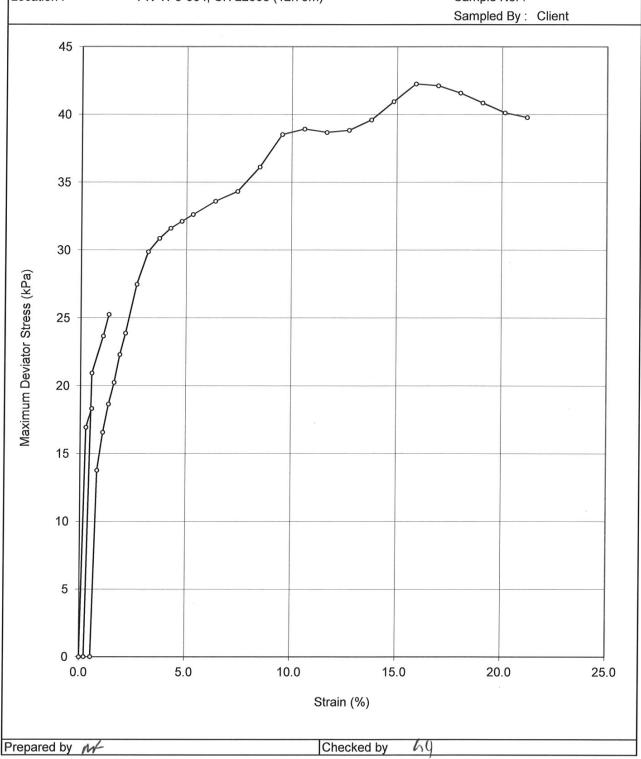
Job No. :

107672522-5000

Reg'n No.:

12301154

Sample No.:



Test Location	Depth Range (m - BGL)	Material Description	pH <sub>FIELD</sub>	рН <sub>ксі</sub>	TAA (kg H <sub>2</sub> SO <sub>4</sub> /tonne)	sTAA Converted to %S*	S <sub>NAS</sub> (if pH less than 4.5)	Existing Acidity %S (sTAA + 0.75 x S <sub>NAS</sub> )		Acid Neutralising Capacity %CaCO3 (if pH more than 6.5)	Net Acidity %S (S <sub>CR</sub> +Existing Acidity - ANC/FF)	ls This AASS	Is This PASS	Liming Rate for Net Acidity (Neutralises both AASS & PASS) (kg/m3)
PN-TP1-001	0.0-0.5	CLAY, CH	8.27	9.3	< 0.5	< 0.016		0.000	0.012	0	0.012	No	No	NA
PN-TP2-001	0.0-0.7	CLAY, CI	6.76	7.7	< 0.5	< 0.016		0.000	0.110	1.6	-0.232	No	YES	No Additional Lime Required
PN-TP2-003	1.6-1.7	CLAY, CI	6.76	7.7	< 0.5	< 0.016		0.000	0.140	1.1	-0.095	No	YES	No Additional Lime Required
PN-TP3-001	1.5-2.8	CLAY, CH	7.39	8.7	< 0.5	< 0.016		0.000	1.700	2.2	1.230	No	YES	93.0
PN-TP3-003	2.8-3.2	CLAY, CH	7.23	8.7	< 0.5	< 0.016		0.000	1.700	3	1.059	No	YES	80.1
PN-TP4-001	3.3-3.4	CLAY, CH	7.76	9.0	< 0.5	< 0.016		0.000	0.400	9	-1.522	No	YES	No Additional Lime Required
PN-TP5-001	2.5-2.9	CLAY, CH	7.59	8.7	< 0.5	< 0.016		0.000	1.400	4.4	0.460	No	YES	34.8
PN-TP5-003	2.9-3.6	CLAY, CH	6.23	7.9	< 0.5	< 0.016		0.000	1.100	0.6	0.972	No	YES	73.5

Note: \* Equivalent oxidisable sulfur calculated as TAA/30,59

Liming rates assume a bulk density of 1.60 t/m3

Fineness Factor = 1.5

#### TABLE 1

## SUMMARY OF ACID SULFATE TEST RESULTS

Dient Ports North

Job Title Dredge Material Assessment Location Cairns Shipping Channel

 Golder Associates Pty Ltd
 Form No. NQ-004 RL0, 05/10



## pH FIELD TESTS

Method: As per the Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998.

Client :	Ports North	Project Number :	107672522 - 5000
Project :	South Foreshore - Dredge Assessi	Tested By/Date :	CWG - 8/03/2012
Location :	Trinity Inlet Shipping Lane	Checked By / Date :	

pH Meter No.: Gac501	pH Peroxide :	4.05
Date pH Meter Calibrated : 8/01/2012	pH Distilled Water :	5.92

Hole No.	Depth (m)	Soil Type	рН	pH fox	reaction	PASS Potential		
						high	medium	low
PN-TP1-001	0.0-0.5m	soft clay	8.3	6.4	very slight			
PN-TP2-001	0.0-0.7m	soft clay	6.8	5.4	slight			
PN-TP2-003	1.6-1.7m	firm clay	6.8	4.4	slight			
PN-TP-3-001	1.5-2.8m	soft clay	7.4	4.9	veryreactive			
PN-TP-3-003	2.8-3.2m	firm clay	7.2	3.0	veryreactive			
PN-TP4-001	3.3-3.4m	soft clay	7.8	5.8	moderatlyreactive			
PN-TP5-001	2.5-2.9m	soft clay	7.6	5.1	veryreactive			
PN-TP3-003	2.9-3.6m	firm clay	6.2	2.8	veryreactive			



# **DREDGED MATERIAL PROPERTIES**

# **Golder Boreholes 2013**