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Our Ref: PSM1541-124L

18 November 2015

Goodman Property Services (Aunt) Pty Ltd
Level 17, 60 Castlereagh Street
SYDNEY NSW 2000

ATTENTION: KYM DRACOPOULOS
kym.dracopoulos@goodman.com

Dear Kym

RE: OAKDALE WEST PRECINT
SOIL SALINITY AND AGGRESSIVITY INVESTIGATION

1 INTRODUCTION

This letter presents the results of the soil salinity, aggressivity and acid sulphate investigation undertaken by Pells Sullivan Meynink (PSM) at Oakdale West Precinct. The work was undertaken in accordance with the PSM proposal dated 9 October 2015 (Ref. PSM1541-116L Rev1).

The aim of the letter is to assess the potential impacts of the proposed development on site salinity and has been prepared in accordance with the following guidelines and standards:

- AS2159:2009, Piling – Design and Installation, Standards Australia.
- AS3600:2009, Concrete Structures, Standards Australia.
- Department of Land and Water Conservation (DLWC) 2002, Site Investigations for Urban Salinity.
- Ahern C R, Stone, Y, and Blunden B 1998, Acid Sulfate Soils Assessment Guidelines, Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia.
- NSW Office of Environment and Heritage 2013, Acid Sulfate Soil Risk

2 SALINITY INVESTIGATION – OCTOBER 2015

The fieldwork was undertaken by PSM between 14 October 2015 and 20 October 2015 during a geotechnical investigation which has been reported separately (ref. PSM1541-123R dated 18 November 2015). A total of 25 samples were collected from boreholes and test pits, and have been numbered E1 to E25. Figure 1 presents the location and depth of the environmental samples. The locations were selected to provide coverage of the site.

3 LABORATORY TESTING

The disturbed soil samples recovered on site were sent to an NATA accredited environmental laboratory for the following testing:

- Soil pH
- Salinity (total soluble salts)
- Chlorides
- Sulphates
- Cation exchange capacity of calcium (Ca), magnesium (Mg), potassium (K) and sodium (Na)
- Exchangeable sodium percentage
- SPOCAS suite and chromium suite for acid sulphate soils

Table 2 presents a full list of the tested samples. The laboratory reports are provided in Attachment 1.

TABLE 2
LABORATORY TEST RESULTS

SAMPLE ID/DEPTH	Soil pH	ELECTRICAL CONDUCTIVITY [µS/cm]	MOISTURE CONTENT [%]	SOLUBLE SULPHATE BY ICPAES [mg/kg]	CHLORIDE BY DISCRETE ANALYSER [mg/kg]	EXCHANGEABLE CATIONS [meq/100g]					ESP [%]	SPOCAS and Chromium Suite
						Ca	Mg	K	Na	CEC		
E1/1.7m	5.4	467	14.2	180	510	0.1	4.2	0.1	1.8	6.2	29.0	-
E2/4.5m	9.3	234	10.3	20	60	16.2	6.9	0.1	1.2	24.5	4.9	-
E3/1m	6.1	244	11.4	160	420	4.7	8.1	0.2	2.3	15.3	15.0	-
E4/0.5m	5.0	332	28.9	200	710	0.3	7.0	0.1	3.1	10.6	29.2	-
E5/2.8m	5.2	435	21.9	590	470	0.2	6.0	0.3	2.2	8.7	25.3	-
E6/0.3m	7.0	26	15.9	20	120	10.2	9.9	0.2	1.6	7.1	21.9	Y
E7/0.5m	-	-	-	-	-	-	-	-	-	-	-	Y
E8/0.8m	6.4	31	21.5	40	250	1.2	10.6	0.2	1.6	11.7	13.6	Y
E9/0.5m	5.4	424	16.0	180	510	2.1	12.3	0.3	3.5	19.2	18.3	Y
E10/0.5m	5.2	279	21.0	280	180	<0.1	18.1	0.2	3.5	15.9	21.9	Y
E11/0.4m	5.0	425	21.2	70	690	0.9	10.6	0.1	1.6	12.3	13.4	Y
E12/0.4m	-	-	-	-	-	-	-	-	-	-	-	Y
E13/0.4m	5.4	113	21.5	100	90	0.3	7.6	0.1	2.2	18.5	11.8	Y

SAMPLE ID/DEPTH	Soil pH	ELECTRICAL CONDUCTIVITY [µS/cm]	MOISTURE CONTENT [%]	SOLUBLE SULPHATE BY ICPAES [mg/kg]	CHLORIDE BY DISCRETE ANALYSER [mg/kg]	EXCHANGEABLE CATIONS [meq/100g]					ESP [%]	SPOCAS and Chromium Suite
						Ca	Mg	K	Na	CEC		
E14/0.4m	5.7	303	18.3	110	480	0.1	8.8	0.1	2.7	22.9	11.8	Y
E15/0.3m	5.8	61	16.6	30	100	4.2	9.4	0.3	1.4	9.2	15.2	Y
E16/0.5m	6.9	48	17.6	40	1010	2.5	10.3	0.2	1.7	11.7	14.7	Y
E17/0.5m	-	-	-	-	-	-	-	-	-	-	-	Y
E18/1.3m	5.1	514	12.9	250	630	0.1	9.6	0.2	3.3	24.7	13.3	Y
E19/0.4m	5.9	73	17.1	20	120	3.7	8.4	0.2	1.8	12.7	14.1	Y
E20/0.4m	5.4	170	19.8	130	150	0.7	8.6	0.2	2.4	18.6	12.9	Y
E21/2.7m	8.8	136	12.8	<10	10	33.7	3.2	0.1	1.3	3.3	38.3	Y
E22/2.9m	9.4	178	11.5	50	20	21.4	6.6	0.1	2.4	7.7	30.5	Y
E23/2.4m	5.2	569	18.5	380	670	1.6	10.6	0.4	3.4	21.6	16.0	Y
E24/2.2m	-	-	-	-	-	-	-	-	-	-	-	Y
E25/0.9m	-	-	-	-	-	-	-	-	-	-	-	Y

4 SITE CONDITIONS

4.1 Surface Conditions

The site is covered with trees and grass. During the site investigation, no indications of salinity, such as visible salt crystal remnants, bare soil patches, die back of trees or gully erosion were observed. No visible signs of land degradation such as erosion, salt pans and dead trees were observed.

4.2 Soil Chemistry

The salinity and aggressivity test results summarised in Table 1 indicate the following:

- pH of the soil samples analysed to be in the range of 5.0 to 9.4, with an average of 6.2.
- Concentrations of chlorides in samples analysed to be in the range of 10 mg/kg to 1010 mg/kg.
- Concentrations of sulphates in samples analysed to be in the range of 20 mg/kg to 590 mg/kg.
- Cation Exchange Capacity (CEC) in samples analysed to be in the range 3.3 meq/100g to 24.7 meq/100g.
- The 1:5 soil to water extraction and subsequent electrical conductivity ($EC_{1:5}$) of the soil samples analysed to be in the range of 26 µS/cm to 569 µS/cm.

5 ASSESSMENT

5.1 Salinity

Site Investigations for Urban Salinity (DLWC 2002) classify soil salinity based on electrical conductivity (EC_e) as per Richards (1954). The method of conversion from $EC_{1:5}$ to EC_e (electrical conductivity of saturated extract) is based on DLWC (2002) and given by $EC_e = EC_{1:5} \times M$, where M is the multiplication factor based on "Soil Texture Group".

The "Soil Texture Group" of the samples tested has been assessed as either "Medium clay" or "Heavy clay" with a corresponding M of 7 or 6 respectively. The salinity classification for the soil samples that were tested is presented in Table 3.

TABLE 3
SALINITY CLASSIFICATION

SAMPLE ID	$EC_{1:5}$ (dS/m)	SOIL TYPE	M	EC_e (dS/m)	SALINITY CLASS
E1/1.7m	0.467	Heavy clay	6	2.802	Slightly saline
E2/4.5m	0.234	Medium clay	7	1.638	Non-saline
E3/1m	0.244	Heavy clay	6	1.464	Non-saline
E4/0.5m	0.332	Heavy clay	6	1.992	Non-saline
E5/2.8m	0.435	Heavy clay	6	2.61	Slightly saline
E6/0.3m	0.026	Medium clay	7	0.182	Non-saline
E8/0.8m	0.031	Heavy clay	6	0.186	Non-saline
E9/0.5m	0.424	Medium clay	7	2.968	Slightly saline
E10/0.5m	0.279	Heavy clay	6	1.674	Non-saline
E11/0.4m	0.425	Medium clay	7	2.975	Slightly saline
E13/0.4m	0.113	Heavy clay	6	0.678	Non-saline
E14/0.4m	0.303	Heavy clay	6	1.818	Non-saline
E15/0.3m	0.061	Medium clay	7	0.427	Non-saline
E16/0.5m	0.048	Medium clay	7	0.336	Non-saline
E18/1.3m	0.514	Medium clay	7	3.598	Slightly saline
E19/0.4m	0.073	Heavy clay	6	0.438	Non-saline
E20/0.4m	0.170	Heavy clay	6	1.02	Non-saline
E21/0.7m	0.136	Heavy clay	6	0.816	Non-saline
E22/2.9m	0.178	Medium clay	7	1.246	Non-saline
E23/2.4m	0.569	Medium clay	7	3.983	Slightly saline

It is assessed that the majority of soils on site are classified as “Non-saline” with some soils classified as “Slightly saline”.

Table 4.8.2 of Australian Standard AS3600-2009 “Concrete Structures” provides an exposure classification for concrete structures in saline soils based on soil electrical conductivity (EC_e). We assess the exposure classification for this site is “A2”.

5.2 Acid Sulphate Soils

The site is not located within the areas covered by the Acid Sulfate Soil Risk Map Data (2013), and the risk of acid sulphate soils is considered low within this site.

SPOCAS suite and chromium suite tests were completed on samples for assessment.

We have compared the test results with Table 4.4 of the “Acid Sulfate Soils Assessment Guidelines” (1998).

The test results indicate samples from boreholes E7, E9, E11, E12, E13, E15, E17, E20 and E23 have higher acidity trail (*TPA* or *TSA*) than the action criteria in Table 4.4 of the Guidelines.

We note that these boreholes are located in proposed fill areas. Figure 2 presents the proposed cut and fill plan. Thus, we expect minimum disturbance of the existing ground.

Based on the above, we consider that the development will not disturb acid sulfate soils and that no further action is required to address this issue.

5.3 Corrosivity

Table 4.8.1 of AS3600-2009 "Concrete Structures" provides criteria for exposure classification for concrete in sulphate soils based on sulphates in soil and groundwater, and pH of soil. On the basis of the sulphate and pH testing completed we assess the exposure classification for concrete in sulphate soils to be A2.

Similarly Table 6.4.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for concrete piles in soil, and here the exposure classification for concrete piles in soil is mild.

Table 6.5.2(C) of Australian Standard AS2159:2009, Piling – Design and Installation provides criteria for exposure classification for steel piles based on resistivity, soil and groundwater pH, and chlorides in soil and groundwater. On the basis of the resistivity, pH and chloride testing completed we assess the exposure classification for steel piles in the soil to be mild.

5.4 Sodicity

Sodicity provides a measure of the likely dispersion on wetting and to shrink/swell properties of a soil. Soil sodicity is classified based on the Exchangeable Sodium Percentage (ESP) which is the amount of exchangeable sodium as a percentage of the Cation Exchange Capacity (DLWC, 2002).

The Exchangeable Sodium Percentages calculated from these laboratory results, ranging from 4.9% to 38.3%, indicates that the soils on site range from non-sodic to highly sodic when compared to criteria listed in "Site Investigations for Urban Salinity", DLWC (2002).

6 SALINITY MANAGEMENT PLAN

A separate salinity management plan (Ref. PSM1541-125L) has been prepared based on this Salinity investigation. It is issued as a separate document to this letter.

Should there be any queries, do not hesitate to contact the undersigned.

For and on behalf of
PELLS SULLIVAN MEYNINK

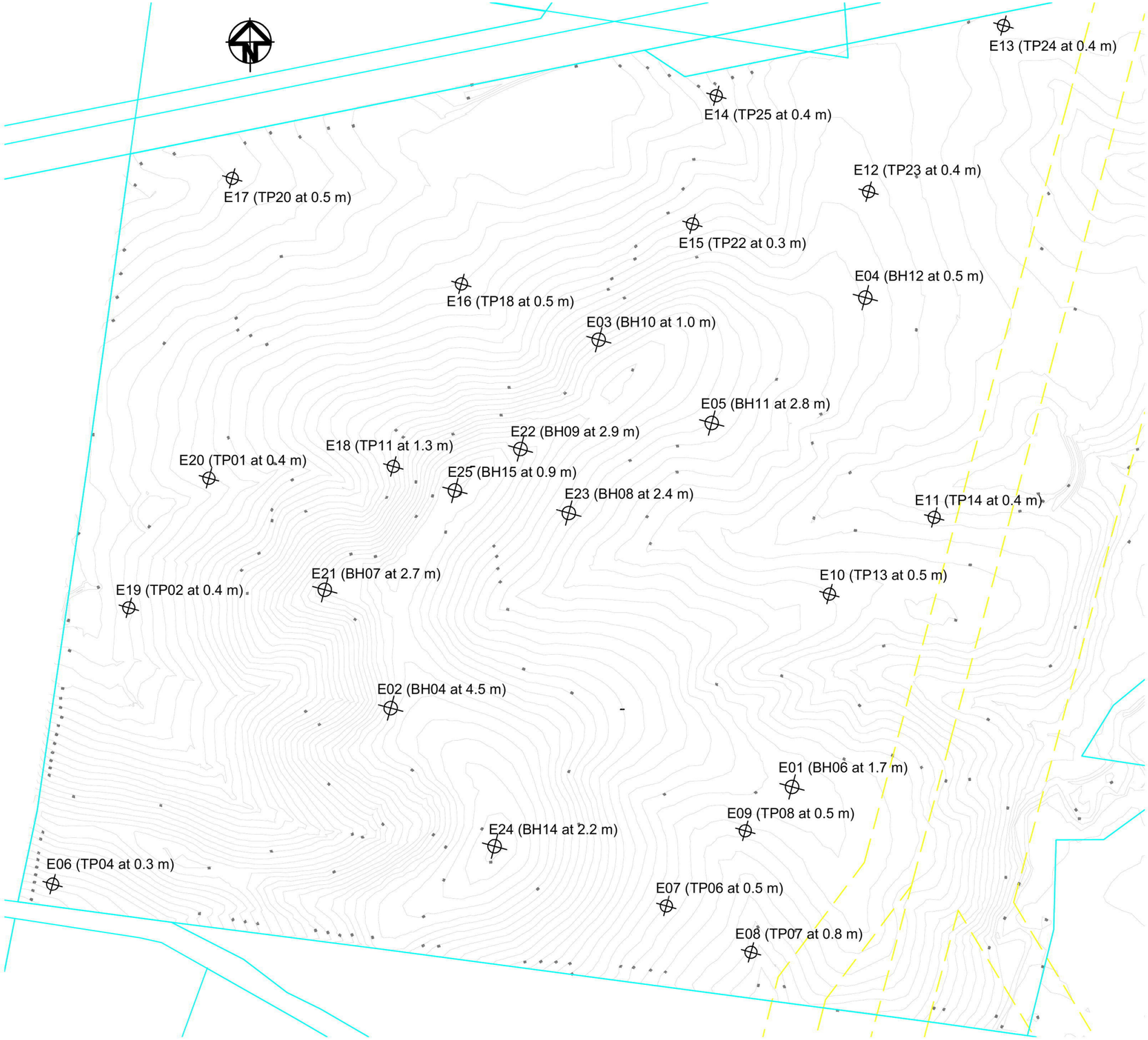
CHRISTOPHER FERNANDEZ
Geotechnical Engineer

GARRY MOSTYN
Chief Engineer

Encl. Figure 1 Locality Plan
Figure 2 Cut and Fill Plan
Attachment 1 Laboratory Test Reports

REFERENCES

1. AS2159:2009, *Piling – Design and Installation*, Standards Australia.
2. AS3600:2009, *Concrete Structures*, Standards Australia.
3. Department of Land and Water Conservation (DLWC) 2002, *Site Investigations for Urban Salinity.*
4. Ahern C R, Stone, Y, and Blunden B 1998, *Acid Sulfate Soils Assessment Guidelines*, Acid Sulfate Soil Management Advisory Committee, Wollongbar, NSW, Australia.
5. NSW Office of Environment and Heritage 2013, *Acid Sulfate Soil Risk Map Data*.



NOTE:

1. PSM environmental sampling undertaken between 14 and 20 October 2015.

2. Test locations were surveyed by a hand-held GPS unit with a vertical accuracy of ± 5 m.

3. The base plan was taken from "SKC051 - OPTIMISED MASTER PLAN CUT TO FILL PLAN" dated 14 September 2015

E23 (BH09 at 2.4 m) - Enviromental sample (borehole/testpit name at depth)

PSM

Pells Sullivan Meynink

Goodman Pty Ltd
Oakdale West Estate
Kemps Creek, NSW

SOIL SALINITY AND AGGRESSIVITY INVESTIGATION
LOCALITY PLAN

PSM154-124L	FIGURE 1

NOTES

1. TOTAL PAD AREA EXCLUDES BATTERS.
2. PROPOSED BATTER SLOPE IS 1 (V) IN 3(H).
3. EARTHWORKS VOLUMES DENOTED ARE APPROXIMATE ONLY AND HAVE BEEN CALCULATED BETWEEN THE EARTHWORKS SURFACE LEVEL AND THE EXISTING SURFACE LEVEL. THE VOLUMES DO NOT TAKE INTO ACCOUNT THE FOLLOWING :-
   - STRIPPING AND STOCKPILING OF EXISTING TOP SOIL
   - BULKING FACTORS OF REMOVED CUT
   - REMOVAL OF EXISTING BUILDING SLABS AND PAVEMENTS
   - REMOVAL AND\OR REMEDIATION OF ANY EXISTING UNCONTROLLED FILL
   - PROPOSED LANDSCAPING
   - STORMWATER AND UTILITIES TRENCHING
   - EXISTING DAMS OR WATER BODIES WHERE BY THE BASE HAS NOT BEEN SURVEYED DUE TO THE PRESENCE OF WATER AT TIME OF SURVEY

LEGEND

STAGE BOUNDARY

EARTHWORKS
CUT/FILL LEGEND

LOWER VALUE		UPPER VALUE	COLOUR	LOWER VALUE		UPPER VALUE	COLOUR
15.5m	o	14.0m		0.5m	o	0m	
14.0m	o	14.5m		0m	o	0.5m	
14.5m	o	13.0m		0.5m	o	1.0m	
13.0m	o	12.5m		1.0m	o	1.5m	
12.5m	o	12.0m		1.5m	o	2.0m	
12.0m	o	11.5m		2.0m	o	2.5m	
11.5m	o	11.0m		2.5m	o	3.0m	
11.0m	o	10.5m		3.0m	o	3.5m	
10.5m	o	10.0m		3.5m	o	4.0m	
10.0m	o	9.5m		4.0m	o	4.5m	
9.5m	o	9.0m		4.5m	o	5.0m	
9.0m	o	8.5m		5.0m	o	5.5m	
8.5m	o	8.0m		5.5m	o	6.0m	
8.0m	o	7.5m		6.0m	o	6.5m	
7.5m	o	7.0m		6.5m	o	7.0m	
7.0m	o	6.5m		7.0m	o	7.5m	
6.5m	o	6.0m		7.5m	o	8.0m	
6.0m	o	5.5m		8.0m	o	8.5m	
5.5m	o	5.0m		8.5m	o	9.0m	
5.0m	o	4.5m		9.0m	o	9.5m	
4.5m	o	4.0m		9.5m	o	10.0m	
4.0m	o	3.5m		10.0m	o	10.5m	
3.5m	o	3.0m		10.5m	o	11.0m	
3.0m	o	2.5m		11.0m	o	11.5m	
2.5m	o	2.0m		11.5m	o	12.0m	
2.0m	o	1.5m		12.0m	o	12.5m	
1.5m	o	1.0m		12.5m	o	13.0m	
1.0m	o	0.5m		13.0m	o	14.5m	

STAGE 1

STAGE 2

STAGE 3

STAGE 4

0 50 100 150 200 250m

1 : 2500 @ A1

P1	ISSUED FOR INFORMATION	2-06-15
Issue	Description	Date

Status: PRELIMINARY ONLY
NOT TO BE USED FOR CONSTRUCTION

A1

Scales	1:2500	Drawn	JB
		Designed	JB
Height Datum	AHD	Checked	
Grid	MGA	Approved	

File: SKC051 - OPTIMISED MASTER PLAN CUT TO FILL PLAN.dwg

Client: Goodman

Civil Engineers and Project Managers
at&l
Suite 702, 154 Pacific Hwy
St Leonards NSW 2065
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Project: OAKDALE WEST

Title: OPTIMISED MASTER PLAN CUT TO FILL PLAN

Drawing No.	Project No.	Issue
SKC051	15-272	P1

Date Plotted: 11 Nov 2015 - 02:06PM File Name: U:\J1501 To 1600\PSM1541\Documents In\PSM1541.40\SKC051 - OPTIMISED MASTER PLAN CUT TO FILL PLAN - Standard\SKC051 - OPTIMISED MASTER PLAN CUT TO FILL PLAN.dwg V1

ATTACHMENT 1

LABORATORY TEST REPORTS

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1533704**	Page	: 1 of 2
Client	: **PELLS SULLIVAN MEYNINK PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: DUC TRAN	Contact	:
Address	: G3, 56 DELHI ROAD NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: duc.tran@psm.com.au	E-mail	:
Telephone	: +61 02 9812 5000	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 9812 5001	Facsimile	: +61-2-8784 8500
Project	: PSM 1541.4	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 15-Oct-2015 13:30
C-O-C number	: ----	Date Analysis Commenced	: 20-Oct-2015
Sampler	: ----	Issue Date	: 23-Oct-2015 10:41
Site	: ----		
		No. of samples received	: 5
Quote number	: ----	No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Dian Dao		Sydney Inorganics
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

General Comments

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

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

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

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl (Method 15G1) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 001	SAMPLE 002	SAMPLE 003	SAMPLE 004	SAMPLE 005
			Client sampling date / time	14-Oct-2015 23:20	14-Oct-2015 15:20	14-Oct-2015 15:36	14-Oct-2015 16:04	14-Oct-2015 16:56
Compound	CAS Number	LOR	Unit	ES1533704-001	ES1533704-002	ES1533704-003	ES1533704-004	ES1533704-005
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	5.4	9.3	6.1	5.0	5.2
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	467	234	244	332	435
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1	%	14.2	10.3	11.4	28.9	21.9
ED008: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	0.1	16.2	4.7	0.3	0.2
^ Exchangeable Magnesium	----	0.1	meq/100g	4.2	6.9	8.1	7.0	6.0
^ Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.2	0.1	0.3
^ Exchangeable Sodium	----	0.1	meq/100g	1.8	1.2	2.3	3.1	2.2
^ Cation Exchange Capacity	----	0.1	meq/100g	6.2	24.5	15.3	10.6	8.7
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	180	20	160	200	590
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	510	60	420	710	470

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1533633**	Page	: 1 of 14
Amendment	: **1**		
Client	: **PELLS SULLIVAN MEYNINK PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: CHRISTOPHER FERNANDEZ	Contact	:
Address	: G3, 56 DELHI ROAD NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: christopher.fernandez@psmconsult.com.au	E-mail	:
Telephone	: +61 02 9812 5000	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 9812 5001	Facsimile	: +61-2-8784 8500
Project	: OAKDALEWEST	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: PSM1541.4	Date Samples Received	: 16-Oct-2015 14:00
C-O-C number	: ----	Date Analysis Commenced	: 21-Oct-2015
Sampler	: CHRISTOPHER FERNANDEZ	Issue Date	: 03-Nov-2015 09:40
Site	: ----		
		No. of samples received	: 18
Quote number	: ----	No. of samples analysed	: 18

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

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

Signatories	*Position*	*Accreditation Category*
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Dian Dao		Sydney Inorganics
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	Brisbane Acid Sulphate Soils
Shobhna Chandra	Metals Coordinator	Sydney Inorganics

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LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- This report has been amended and re-released to allow the reporting of additional analytical data.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- ASS: EA029 (SPOCAS): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from kg/t dry weight to kg/m3 in-situ soil, multiply reported results x wet bulk density of soil in t/m3.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl (Method 15G1) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 006	SAMPLE 007	SAMPLE 008	SAMPLE 009	SAMPLE 010
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]
Compound	CAS Number	LOR	Unit	ES1533633-001	ES1533633-002	ES1533633-003	ES1533633-004	ES1533633-005
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	7.0	----	6.4	5.4	5.2
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	26	----	31	424	279
EA014 Total Soluble Salts								
^ Total Soluble Salts	----	5	mg/kg	85	----	102	1380	907
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	5.3	4.0	4.3	4.2	4.2
pH OX (23B)	----	0.1	pH Unit	6.6	4.4	4.5	4.6	4.4
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	17	98	51	63	55
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	99	51	71	60
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	8	5
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.027	0.158	0.081	0.101	0.088
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	0.159	0.081	0.113	0.097
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	0.021	<0.020	0.023	0.032
Peroxide Sulfur (23De)	----	0.02	% S	<0.020	0.024	<0.020	0.032	0.039
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	<0.020	<0.020	<0.020	<0.020
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	<10	<10	<10
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.204	0.032	<0.020	0.049	<0.020
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.197	0.032	<0.020	0.048	<0.020
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.020	<0.020	<0.020	<0.020	<0.020
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	<0.020	<0.020	<0.020	<0.020
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.128	0.139	0.101	0.184	0.232
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.131	0.142	0.104	0.181	0.238
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	<0.020	<0.020	<0.020	<0.020
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SAMPLE 006	SAMPLE 007	SAMPLE 008	SAMPLE 009	SAMPLE 010
				Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]
Compound	CAS Number	LOR	Unit		ES1533633-001	ES1533633-002	ES1533633-003	ES1533633-004	ES1533633-005
					Result	Result	Result	Result	Result
EA029-E: Magnesium Values - Continued									
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		<0.020	<0.020	<0.020	<0.020	<0.020
EA029-F: Excess Acid Neutralising Capacity									
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3		0.256	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t		51	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S		0.082	----	----	----	----
EA029-G: Retained Acidity									
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	0.027	<0.020	0.036	0.045
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	<0.020	<0.020	<0.020	<0.020
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	<10	<10	<10	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		----	<0.020	<0.020	<0.020	<0.020
EA029-H: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S		0.03	0.16	0.08	0.12	0.10
Net Acidity (acidity units)	----	10	mole H+ / t		17	103	51	75	66
Liming Rate	----	1	kg CaCO3/t		1	8	4	6	5
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		5.3	4.0	4.3	4.2	4.2
Titratable Actual Acidity (23F)	----	2	mole H+ / t		16	98	51	63	55
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		0.02	0.16	0.08	0.10	0.09
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S		<0.005	<0.005	<0.005	<0.005	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		<10	<10	<10	<10	<10
EA033-C: Acid Neutralising Capacity									
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3		----	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t		----	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S		----	----	----	----	----
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	0.02	<0.02	0.02	0.03

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 006	SAMPLE 007	SAMPLE 008	SAMPLE 009	SAMPLE 010
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]
Compound	CAS Number	LOR	Unit	ES1533633-001	ES1533633-002	ES1533633-003	ES1533633-004	ES1533633-005
				Result	Result	Result	Result	Result
EA033-D: Retained Acidity - Continued								
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.03	<0.02	0.04	0.05
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	<0.02	<0.02	<0.02	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	<10	<10	<10	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	<0.02	<0.02	<0.02	<0.02
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.02	0.16	0.08	0.11	0.10
Net Acidity (acidity units)	----	10	mole H+ / t	16	101	52	70	62
Liming Rate	----	1	kg CaCO3/t	1	8	4	5	5
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.02	0.16	0.08	0.11	0.10
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	16	101	52	70	62
Liming Rate excluding ANC	----	1	kg CaCO3/t	1	8	4	5	5
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1	%	15.9	----	21.5	16.0	21.0
ED008: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	10.2	----	1.2	2.1	<0.1
^ Exchangeable Magnesium	----	0.1	meq/100g	9.9	----	10.6	12.3	18.1
^ Exchangeable Potassium	----	0.1	meq/100g	0.2	----	0.2	0.3	0.2
^ Exchangeable Sodium	----	0.1	meq/100g	1.6	----	1.6	3.5	3.5
^ Cation Exchange Capacity	----	0.1	meq/100g	21.9	----	13.6	18.3	21.9
^ Exchangeable Sodium Percent	----	0.1	%	7.1	----	11.7	19.2	15.9
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	20	----	40	180	280
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	120	----	250	510	180

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 011	SAMPLE 012	SAMPLE 013	SAMPLE 014	SAMPLE 015
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]
Compound	CAS Number	LOR	Unit	ES1533633-006	ES1533633-007	ES1533633-008	ES1533633-009	ES1533633-010
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	5.0	----	5.4	5.7	5.8
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	425	----	113	303	61
EA014 Total Soluble Salts								
^ Total Soluble Salts	----	5	mg/kg	1380	----	368	985	197
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.3	4.1	4.1	4.5	4.3
pH OX (23B)	----	0.1	pH Unit	4.2	4.0	4.2	4.6	4.0
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	78	96	103	35	47
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	94	120	121	28	75
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	17	24	18	<2	28
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.124	0.153	0.166	0.056	0.075
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.151	0.192	0.195	0.044	0.120
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.027	0.039	0.029	<0.020	0.045
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	0.027	0.023	<0.020	<0.020	<0.020
Peroxide Sulfur (23De)	----	0.02	% S	0.037	0.030	<0.020	0.024	<0.020
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	<0.020	<0.020	0.024	<0.020
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	<10	15	<10
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.020	<0.020	<0.020	<0.020	0.071
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.021	<0.020	<0.020	<0.020	0.072
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.021	<0.020	<0.020	<0.020	<0.020
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	10	<10	<10	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	<0.020	<0.020	<0.020	<0.020
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.140	0.136	0.092	0.156	0.111
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.144	0.140	0.091	0.154	0.116
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	<0.020	<0.020	<0.020	<0.020
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 011	SAMPLE 012	SAMPLE 013	SAMPLE 014	SAMPLE 015
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]
Compound	CAS Number	LOR	Unit	ES1533633-006	ES1533633-007	ES1533633-008	ES1533633-009	ES1533633-010
				Result	Result	Result	Result	Result
EA029-E: Magnesium Values - Continued								
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.020	<0.020	<0.020	<0.020	<0.020
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	----	----
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.02	% S	**0.044**	**0.039**	<0.020	**0.026**	<0.020
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	<0.020	<0.020	<0.020	**0.026**	<0.020
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	<10	<10	<10	**12**	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.15**	**0.17**	**0.16**	**0.10**	**0.07**
Net Acidity (acidity units)	----	10	mole H+ / t	**92**	**108**	**103**	**62**	**47**
Liming Rate	----	1	kg CaCO3/t	**7**	**8**	**8**	**5**	**4**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.3**	**4.1**	**4.1**	**4.4**	**4.3**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**78**	**96**	**103**	**35**	**47**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.12**	**0.15**	**0.16**	**0.06**	**0.07**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	<0.005	<0.005	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	<10	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	----	----
EA033-D: Retained Acidity								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	**0.03**	**0.02**	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	SAMPLE 011	SAMPLE 012	SAMPLE 013	SAMPLE 014	SAMPLE 015
				Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]
Compound	CAS Number	LOR	Unit		ES1533633-006	ES1533633-007	ES1533633-008	ES1533633-009	ES1533633-010
					Result	Result	Result	Result	Result
EA033-D: Retained Acidity - Continued									
HCl Extractable Sulfur (20Be)	----	0.02	% S		0.04	0.04	<0.02	0.03	<0.02
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	<0.02	<0.02	<0.02	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	<10	<10	<10	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	<0.02	<0.02	<0.02	<0.02
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S		0.14	0.16	0.17	0.07	0.07
Net Acidity (acidity units)	----	10	mole H+ / t		86	104	104	41	47
Liming Rate	----	1	kg CaCO3/t		6	8	8	3	4
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		0.14	0.16	0.17	0.07	0.07
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		86	104	104	41	47
Liming Rate excluding ANC	----	1	kg CaCO3/t		6	8	8	3	4
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1	%		21.2	----	21.5	18.3	16.6
ED008: Exchangeable Cations									
^ Exchangeable Calcium	----	0.1	meq/100g		0.9	----	0.3	0.1	4.2
^ Exchangeable Magnesium	----	0.1	meq/100g		10.6	----	7.6	8.8	9.4
^ Exchangeable Potassium	----	0.1	meq/100g		0.1	----	0.1	0.1	0.3
^ Exchangeable Sodium	----	0.1	meq/100g		1.6	----	2.2	2.7	1.4
^ Cation Exchange Capacity	----	0.1	meq/100g		13.4	----	11.8	11.8	15.2
^ Exchangeable Sodium Percent	----	0.1	%		12.3	----	18.5	22.9	9.2
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		70	----	100	110	30
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		690	----	90	480	100

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 016	SAMPLE 017	SAMPLE 018	SAMPLE 019	SAMPLE 020
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]
Compound	CAS Number	LOR	Unit	ES1533633-011	ES1533633-012	ES1533633-013	ES1533633-014	ES1533633-015
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	6.9	----	5.1	5.9	5.4
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	48	----	514	73	170
EA014 Total Soluble Salts								
^ Total Soluble Salts	----	5	mg/kg	156	----	1670	238	552
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.8	4.2	4.3	4.3	4.1
pH OX (23B)	----	0.1	pH Unit	5.1	4.8	5.0	4.4	4.5
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	26	66	36	43	79
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	26	72	36	49	91
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	6	<2	7	12
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.041	0.106	0.057	0.068	0.126
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.041	0.115	0.058	0.079	0.146
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	<0.020	<0.020	<0.020
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	0.027	<0.020	<0.020	<0.020
Peroxide Sulfur (23De)	----	0.02	% S	<0.020	0.024	<0.020	<0.020	<0.020
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	<0.020	<0.020	<0.020	<0.020
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	<10	<10	<10
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.060	<0.020	<0.020	0.097	<0.020
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.061	<0.020	<0.020	0.096	0.021
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.020	<0.020	<0.020	<0.020	0.021
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	<10	<10	10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	<0.020	<0.020	<0.020	<0.020
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.120	0.108	0.147	0.130	0.112
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.121	0.107	0.135	0.135	0.113
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	<0.020	<0.020	<0.020	<0.020
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 016	SAMPLE 017	SAMPLE 018	SAMPLE 019	SAMPLE 020
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]
Compound	CAS Number	LOR	Unit	ES1533633-011	ES1533633-012	ES1533633-013	ES1533633-014	ES1533633-015
				Result	Result	Result	Result	Result
EA029-E: Magnesium Values - Continued								
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.020	<0.020	<0.020	<0.020	<0.020
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	----	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	----	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	----	----	----	----	----
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	**0.023**	**0.021**	**0.020**	<0.020
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	<0.020	**0.021**	**0.020**	<0.020
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	<10	<10	<10	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	<0.020	<0.020	<0.020	<0.020
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	**0.04**	**0.10**	**0.07**	**0.08**	**0.13**
Net Acidity (acidity units)	----	10	mole H+ / t	**26**	**64**	**46**	**52**	**79**
Liming Rate	----	1	kg CaCO3/t	**2**	**5**	**3**	**4**	**6**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**4.8**	**4.2**	**4.3**	**4.3**	**4.1**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	**26**	**66**	**36**	**43**	**79**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	**0.04**	**0.10**	**0.06**	**0.07**	**0.13**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	<0.005	<0.005	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	<10	<10
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	----	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	----	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	----	----	----	----	----
EA033-D: Retained Acidity								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	**0.03**	<0.02	<0.02	<0.02

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 016	SAMPLE 017	SAMPLE 018	SAMPLE 019	SAMPLE 020
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]
Compound	CAS Number	LOR	Unit	ES1533633-011	ES1533633-012	ES1533633-013	ES1533633-014	ES1533633-015
				Result	Result	Result	Result	Result
EA033-D: Retained Acidity - Continued								
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	0.02	0.02	0.02	<0.02
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	<0.02	<0.02	<0.02	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	<10	<10	<10	<10
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	<0.02	<0.02	<0.02	<0.02
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	0.04	0.10	0.06	0.08	0.13
Net Acidity (acidity units)	----	10	mole H+ / t	26	66	37	49	82
Liming Rate	----	1	kg CaCO3/t	2	5	3	4	6
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.04	0.10	0.06	0.08	0.13
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	26	66	37	49	82
Liming Rate excluding ANC	----	1	kg CaCO3/t	2	5	3	4	6
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1	%	17.6	----	12.9	17.1	19.8
ED008: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	2.5	----	0.1	3.7	0.7
^ Exchangeable Magnesium	----	0.1	meq/100g	10.3	----	9.6	8.4	8.6
^ Exchangeable Potassium	----	0.1	meq/100g	0.2	----	0.2	0.2	0.2
^ Exchangeable Sodium	----	0.1	meq/100g	1.7	----	3.3	1.8	2.4
^ Cation Exchange Capacity	----	0.1	meq/100g	14.7	----	13.3	14.1	12.9
^ Exchangeable Sodium Percent	----	0.1	%	11.7	----	24.7	12.7	18.6
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	40	----	250	20	130
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	1010	----	630	120	150

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 021	SAMPLE 022	SAMPLE 023	----	----
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	----	----
Compound	CAS Number	LOR	Unit	ES1533633-016	ES1533633-017	ES1533633-018	--------	--------
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	8.8	9.4	5.2	----	----
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	136	178	569	----	----
EA014 Total Soluble Salts								
^ Total Soluble Salts	----	5	mg/kg	444	578	1850	----	----
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	8.4	8.6	4.2	----	----
pH OX (23B)	----	0.1	pH Unit	8.3	8.4	4.0	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	50	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	67	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	17	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	<0.020	0.081	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	<0.020	0.108	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	0.027	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	<0.020	0.031	----	----
Peroxide Sulfur (23De)	----	0.02	% S	<0.020	<0.020	0.039	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	<0.020	<0.020	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	<10	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.551	0.384	0.049	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	1.15	1.00	0.047	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.596	0.622	<0.020	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	297	310	<10	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.477	0.497	<0.020	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.042	0.071	0.152	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.067	0.122	0.152	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.025	0.050	<0.020	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	20	41	<10	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 021	SAMPLE 022	SAMPLE 023	----	----
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	----	----
Compound	CAS Number	LOR	Unit	ES1533633-016	ES1533633-017	ES1533633-018	--------	--------
				Result	Result	Result	Result	Result
EA029-E: Magnesium Values - Continued								
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	**0.032**	**0.066**	<0.020	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	**2.14**	**2.25**	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**428**	**449**	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	**0.686**	**0.719**	----	----	----
EA029-G: Retained Acidity								
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	**0.042**	----	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	<0.020	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	<10	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	<0.020	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	**0.10**	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	**61**	----	----
Liming Rate	----	1	kg CaCO3/t	<1	<1	**4**	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**8.4**	**8.6**	**4.2**	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	**50**	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	**0.08**	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	<0.005	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**2.70**	**3.46**	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**539**	**691**	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**0.86**	**1.11**	----	----	----
EA033-D: Retained Acidity								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	**0.03**	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 021	SAMPLE 022	SAMPLE 023	----	----
			Client sampling date / time	[15-Oct-2015]	[15-Oct-2015]	[15-Oct-2015]	----	----
Compound	CAS Number	LOR	Unit	ES1533633-016	ES1533633-017	ES1533633-018	--------	--------
				Result	Result	Result	Result	Result
EA033-D: Retained Acidity - Continued								
HCl Extractable Sulfur (20Be)	----	0.02	% S	----	----	0.04	----	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S	----	----	<0.02	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t	----	----	<10	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S	----	----	<0.02	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.09	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	56	----	----
Liming Rate	----	1	kg CaCO3/t	<1	<1	4	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	0.09	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	56	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	4	----	----
EA055: Moisture Content								
^ Moisture Content (dried @ 103°C)	----	1	%	12.8	11.5	18.5	----	----
ED008: Exchangeable Cations								
^ Exchangeable Calcium	----	0.1	meq/100g	33.7	21.4	1.6	----	----
^ Exchangeable Magnesium	----	0.1	meq/100g	3.2	6.6	10.6	----	----
^ Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.4	----	----
^ Exchangeable Sodium	----	0.1	meq/100g	1.3	2.4	3.4	----	----
^ Cation Exchange Capacity	----	0.1	meq/100g	38.3	30.5	16.0	----	----
^ Exchangeable Sodium Percent	----	0.1	%	3.3	7.7	21.6	----	----
ED040S : Soluble Sulfate by ICPAES								
Sulfate as SO4 2-	14808-79-8	10	mg/kg	<10	50	380	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	10	mg/kg	10	20	670	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **ES1534168**	Page	: 1 of 4
Client	: **PELLS SULLIVAN MEYNINK PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: CHRISTOPHER FERNANDEZ	Contact	:
Address	: G3, 56 DELHI ROAD NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: christopher.fernandez@psm.com.au	E-mail	:
Telephone	: +61 02 9812 5000	Telephone	: +61-2-8784 8555
Facsimile	: +61 02 9812 5001	Facsimile	: +61-2-8784 8500
Project	: OAKDALE WEST	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 21-Oct-2015 15:47
C-O-C number	: ----	Date Analysis Commenced	: 30-Oct-2015
Sampler	: CHRISTOPHER FERNANDEZ	Issue Date	: 02-Nov-2015 15:31
Site	: ----		
		No. of samples received	: 2
Quote number	: ----	No. of samples analysed	: 2

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

WORLD RECOGNISED ACCREDITATION

Signatories

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

Signatories	*Position*	*Accreditation Category*
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils

General Comments

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

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

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

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

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.

- ASS: EA029 (SPOCAS): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite):Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- ASS: EA029 (SPOCAS): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from kg/t dry weight to kg/m3 in-situ soil, multiply reported results x wet bulk density of soil in t/m3.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 24	SAMPLE 25	----	----	----
			Client sampling date / time	[19-Oct-2015]	[21-Oct-2015]	----	----	----
Compound	CAS Number	LOR	Unit	ES1534168-001	ES1534168-002	--------	--------	--------
				Result	Result	Result	Result	Result
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	7.2	9.0	----	----	----
pH OX (23B)	----	0.1	pH Unit	7.2	9.3	----	----	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	----	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	----	----	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	<0.020	----	----	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	<0.020	----	----	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	<0.020	----	----	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	<0.020	----	----	----
Peroxide Sulfur (23De)	----	0.02	% S	<0.020	<0.020	----	----	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	<0.020	----	----	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	<10	----	----	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	0.047	0.339	----	----	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	0.102	9.08	----	----	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	0.055	8.74	----	----	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	28	4360	----	----	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	0.044	7.00	----	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.139	<0.020	----	----	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.163	0.065	----	----	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	0.024	0.065	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	20	54	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	0.032	0.086	----	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	0.513	34.8	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	102	6960	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	0.164	11.1	----	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	SAMPLE 24	SAMPLE 25	----	----	----
			Client sampling date / time	[19-Oct-2015]	[21-Oct-2015]	----	----	----
Compound	CAS Number	LOR	Unit	ES1534168-001	ES1534168-002	--------	--------	--------
				Result	Result	Result	Result	Result
EA029-F: Excess Acid Neutralising Capacity - Continued								
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	<1	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	7.2	9.0	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	----	----	----
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	0.80	33.5	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	160	6700	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	0.26	10.7	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	<1	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	----	----	----