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Our Ref: PSM1541-112L REV3

6 July 2016

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

ATTENTION: KYM DRACOPOULOS
kym.dracopoulos@goodman.com

Dear Kym

RE: OAKDALE SOUTH ESTATE
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 South Estate (OSE). The work was performed in accordance with our email proposal dated 5 June 2015. Approval to proceed was provided by Kym Dracopoulos of Goodman by email on 5 June 2015.

This letter has been prepared to inform a State Significant Development Application (SSDA) for the staged development of the OSE. 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 Map Data.

The letter responds to the Secretary's Environmental Assessment Requirements (SEARs) as they relate to salinity impacts as documented in Table 1. This letter supports an Environmental Impact Statement (EIS) prepared in respect of the proposal and should be read in conjunction with the EIS and development plans submitted with the SSDA.

TABLE 1
SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS (SEARs) FOR SOILS AND WATER

RELEVANT SEARs	RESPONSE
An outline of the proposed water requirements, including a consolidated site water balance, details of water supply sources, usage data and efficiency measures.	By other consultants, i.e. hydrologist or civil designers.
A detailed assessment of potential soil (including contamination and acid sulphate soil), surface water, groundwater and salinity impacts of the proposed development, including adequate mitigating and monitoring measures.	Assessment of soil, in terms of salinity and acid sulphate soils is described within this letter (Ref. PSM1541-112L). Mitigation and monitoring measures are discussed within the Salinity Management Plan (SMP) (Ref. PSM1541-113L). We understand that contamination is dealt with by other consultants, i.e. an environmental consultant
An assessment of the potential impacts of the development on Ropes Creek, its on-site tributaries and riparian areas.	By other consultants, i.e. civil designers.
An assessment of flooding impacts associated with the proposal including details of any flood liability of the site and changes to floor behaviour.	By other consultants, i.e. hydrologist or civil designers.
Description of the proposed erosion and sediment controls during construction and operation.	See SMP (Ref. PSM1541-113L)
Proposed cut and fill works associated with the development, and measures to minimise the extent of cut and fill.	By other consultants, i.e. civil designers.

2 PROPOSED DEVELOPMENT

The SSDA for the OSE seeks approval for:
An overarching planning framework to guide the staged development of the OSE including:

- An Indicative Master Plan and Structure Plan;
- Development Controls for the OSE;
- A Biodiversity Offset Strategy.

Stage 1 Development of the Estate including:

1. A package of estate-wide site preparation works to be implemented in stages including:
    - Subdivision;
    - Bulk earthworks (including construction of detention basins); and
    - Construction of retaining walls, road and utility infrastructure/services.
    - Environmental management measures and protocols for the site.
2. Development for the purposes of warehousing and distribution including:
    - The construction of warehouse buildings in Precincts 1, 4 and 5;
    - The construction of hardstand, loading, car parking and landscaping in Precincts 1, 4 and 5;
    - The fit out and use of buildings in Precincts 1, 4 and 5 for generic warehousing and distribution uses."

3 CONSULTATION

No formal consultation was undertaken in the preparation of this letter as procedures for management of soil salinity and acid sulphate soils are well established.

The following requirement was provided by the NSW EPA in a letter to the DoP dated 06 February 2015.

- Describe and assess the effectiveness or adequacy of any soil management and mitigation measures during construction and operation of the proposal including:

  a) erosion and sediment control measures.

  b) proposals for site remediation - see Managing Land Contamination, Planning Guidelines SEPP 55-Remediation of Land (Department of Urban Affairs and Planning and Environment Protection Authority, 1998).

  c) proposals for the management of these soils - see Assessing and Managing Acid Sulfate Soils, Environment Protection Authority, 1995 (note that this is the only methodology accepted by the EPA).

Acid sulphate soils have been assessed and discussed in Section 7.2 of this letter. We note that we have compared with the *"Acid Sulfate Soils Assessment Guidelines"* (1998) by the Acid Sulfate Soil Management Advisory Committee which notes that it "update[s] and expand[s] on the *Environmental Guidelines: Assessing and Managing Acid Sulfate Soils* published by the Environment Protection Authority (EPA) in 1995."

Recommendations on erosion and sediment control measures are discussed in our Salinity Management Plan (SMP) (Ref. PSM 1541-113L).

We understand that contamination is dealt with by an environmental consultant.

4 SALINITY INVESTIGATION - 10 JUNE 2015

The fieldwork was undertaken by PSM on 10 June 2015 and it comprised hand augering of 25 boreholes, E1 to E25. The boreholes were augered to various depths between 0.5 m to 1.0 m. Figure 1 presents the location of the boreholes. Their locations were selected to provide coverage of the site.

A total of (25) soil samples were collected from the base of boreholes for environmental testing by an environmental laboratory. The soil samples were sent for laboratory testing. Five samples, ie. E4, E8, E10, E18 and E23, were backup samples. They were not tested.

5 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	pH	ELECTRICAL CONDUCTIVITY [µS/cm]	MOISTURE CONTENT [%]	SOLUBLE SULPHATE BY ICPAES [mg/kg]	CHLORIDE BY DISCRETE ANALYSER [mg/kg]	EXCHANGEABLE CATIONS [meq/100g]					ESP [%]
						Ca	Mg	K	Na	CEC	
E1/0.5m	7.7	186	18.9	80	380	3.5	3	0.3	0.3	7.2	4.5
E2/0.5m	6.2	164	18.2	100	1140	1.3	3.6	<0.1	0.6	5.5	10.2
E3/0.5m	6.6	76	17.7	90	370	1.2	5.4	<0.1	0.9	7.5	12.6
E5/0.6m	6.8	174	19.2	50	190	3.9	8.4	0.1	1.2	13.7	9
E6/0.6m	6.7	669	15.8	280	1100	0.5	6.7	<0.1	2.7	10	26.7
E7/0.7m	6.6	35	14.7	40	160	2.4	6.4	0.2	0.7	9.7	7.3
E9/0.6m	5.9	454	14.9	460	410	0.8	7.2	<0.1	2.6	10.8	24.4
E11/0.5m	6.8	76	16.3	40	590	0.9	3.7	0.1	1	5.8	17.4
E12/0.5m	5.7	220	17	60	440	0.3	2.7	<0.1	0.8	3.9	20.1
E13/0.5m	5.2	345	18.7	290	270	<0.1	2.5	<0.1	0.4	3.1	14.5
E14/0.5m	5.5	115	18.8	100	40	0.7	7.9	0.2	1	9.8	10.3
E15/0.5m	6.2	46	18.4	60	350	0.6	7.5	0.1	1.1	9.3	12
E16/0.7m	6.3	48	20	20	30	0.3	7.8	0.2	1.7	10	17.2

SAMPLE ID	pH	ELECTRICAL CONDUCTIVITY [µS/cm]	MOISTURE CONTENT [%]	SOLUBLE SULPHATE BY ICPAES [mg/kg]	CHLORIDE BY DISCRETE ANALYSER [mg/kg]	EXCHANGEABLE CATIONS [meq/100g]					ESP [%]
						Ca	Mg	K	Na	CEC	
E17/0.6m	6.8	28	15.8	20	120	0.7	6	0.1	0.9	7.8	11.1
E19/0.7m	5.9	100	20.4	100	60	1	8.9	0.1	1.4	12.4	11.2
E20/0.5m	6	79	19.4	100	900	2.6	8.1	0.2	0.6	11.6	5.6
E21/0.6m	6	367	19.8	30	470	0.4	3.5	<0.1	0.7	4.7	15.8
E22/0.8m	5.4	288	17	190	220	0.4	5.1	0.1	1.4	7.1	19.5
E24/0.5m	5.9	141	21.6	190	260	0.8	3.3	<0.1	0.6	4.7	12.3
E25/0.6m	6.7	130	14.8	150	840	0.4	4.4	<0.1	0.9	5.7	16.4

6 SITE CONDITIONS

6.1 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.

6.2 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 5.2 to 7.7, with an average of 6.2.
- Concentrations of chlorides in samples analysed to be in the range of 30 mg/kg to 1140 mg/kg.
- Concentrations of sulphates in samples analysed to be in the range of 20 mg/kg to 460 mg/kg.
- Cation Exchange Capacity (CEC) in samples analysed to be in the range 3.1 meq/100g to 13.7 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 28 µS/cm to 669 µS/cm.

7 ASSESSMENT

7.1 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 "Medium clay" with a corresponding M of 7. 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
E1/0.5m	0.186	Silty Clay	7	1.302	Non-saline
E2/0.5m	0.164	Silty Clay	7	1.148	Non-saline
E3/0.5m	0.076	Silty Clay	7	0.532	Non-saline
E5/0.6m	0.174	Silty Clay	7	1.218	Non-saline
E6/0.6m	0.669	Silty Clay	7	4.683	Moderately saline
E7/0.7m	0.035	Silty Clay	7	0.245	Non-saline
E9/0.6m	0.454	Silty Clay	7	3.178	Slightly saline
E11/0.5m	0.076	Silty Clay	7	0.532	Non-saline
E12/0.5m	0.22	Silty Clay	7	1.54	Non-saline
E13/0.5m	0.345	Silty Clay	7	2.415	Slightly saline
E14/0.5m	0.115	Silty Clay	7	0.805	Non-saline
E15/0.5m	0.046	Silty Clay	7	0.322	Non-saline
E16/0.7m	0.048	Silty Clay	7	0.336	Non-saline
E17/0.6m	0.028	Silty Clay	7	0.196	Non-saline
E19/0.7m	0.1	Silty Clay	7	0.7	Non-saline
E20/0.5m	0.079	Silty Clay	7	0.553	Non-saline
E21/0.6m	0.367	Silty Clay	7	2.569	Slightly saline
E22/0.8m	0.288	Silty Clay	7	2.016	Slightly saline
E24/0.5m	0.141	Silty Clay	7	0.987	Non-saline
E25/0.6m	0.13	Silty Clay	7	0.91	Non-saline

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

7.2 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 the 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:

- All samples have sulphur trail (S_{POS}) lower than the action criteria in Table 4.4 of the Guidelines.
- Samples from the borehole E12, E14, E16 and E20 have higher acidity trail (*TPA* or *TSA*) than the action criteria.

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

7.3 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.

7.4 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 4.5% to 26.7%, 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).

8 SALINITY MANAGEMENT PLAN

A separate salinity management plan (Ref. PSM1541-113L) 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

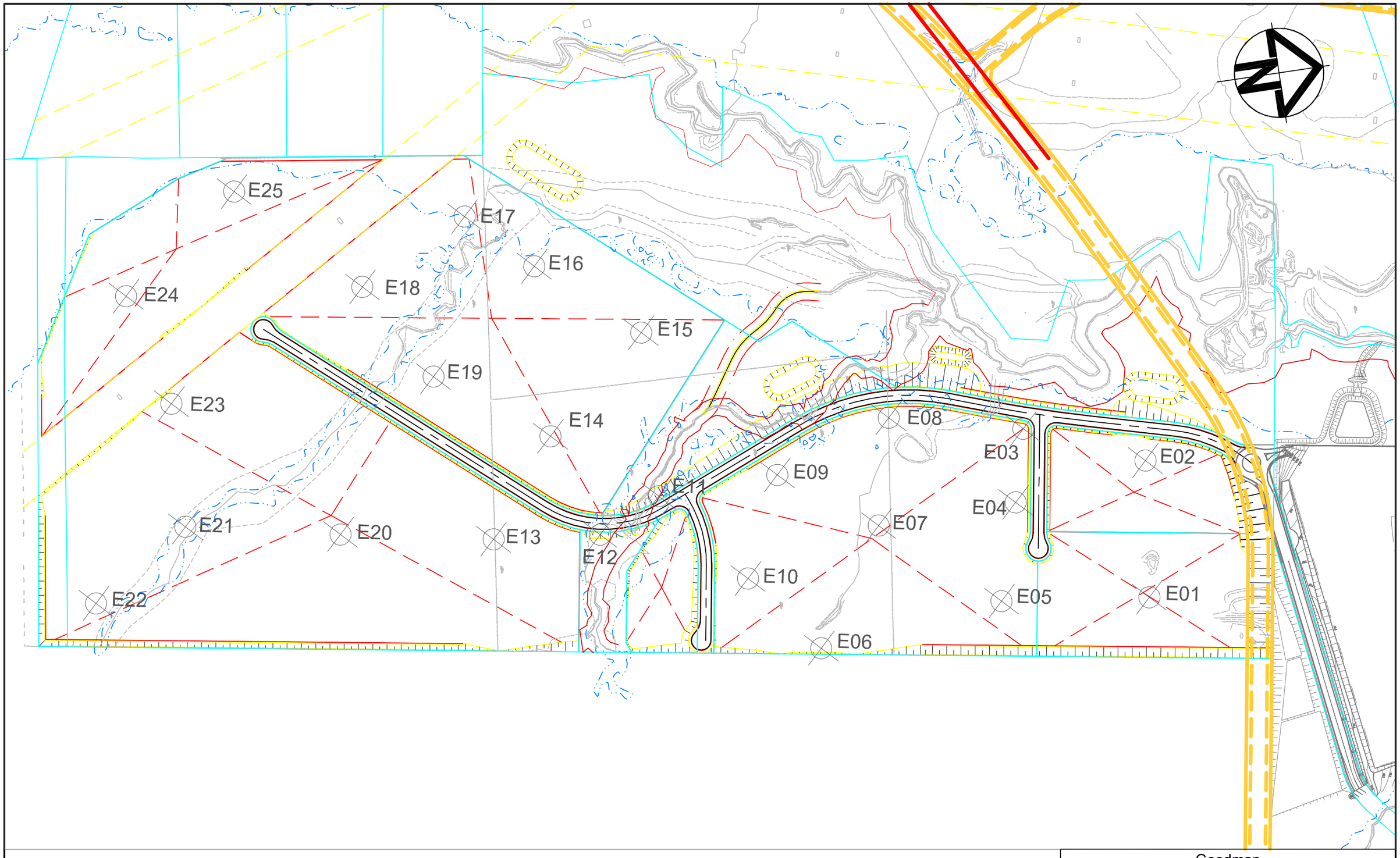
AGUSTRIA SALIM
Associate

GARRY MOSTYN
Principal

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*.



0 50 100 150 200

Scale (m)

PSM

Pells Sullivan Meynink

Goodman
Oakdale South, Eastern Creek

Sampling and hand auger hole locations
Salinity Investigation

PSM1541.20-110L	Figure 1

EARTHWORKS VOLUMES

EXISTING TOPSOIL STRIPPING VOLUME (cu m) REFER NOTE No 2	EXCAVATION OF EXISTING CREEKS AND DAMS (cu m) REFER NOTE No 3	EXISTING ROCK CUT (cu m)	EXISTING VENM CUT (cu m)	NET CUT (cu m)	NET FILL (cu m)	BALANCE (cu m)
-138,263	-38,282	-210,113	-358,291	-568,404	1,500,804	932,400

EARTHWORKS CUT/FILL LEGEND

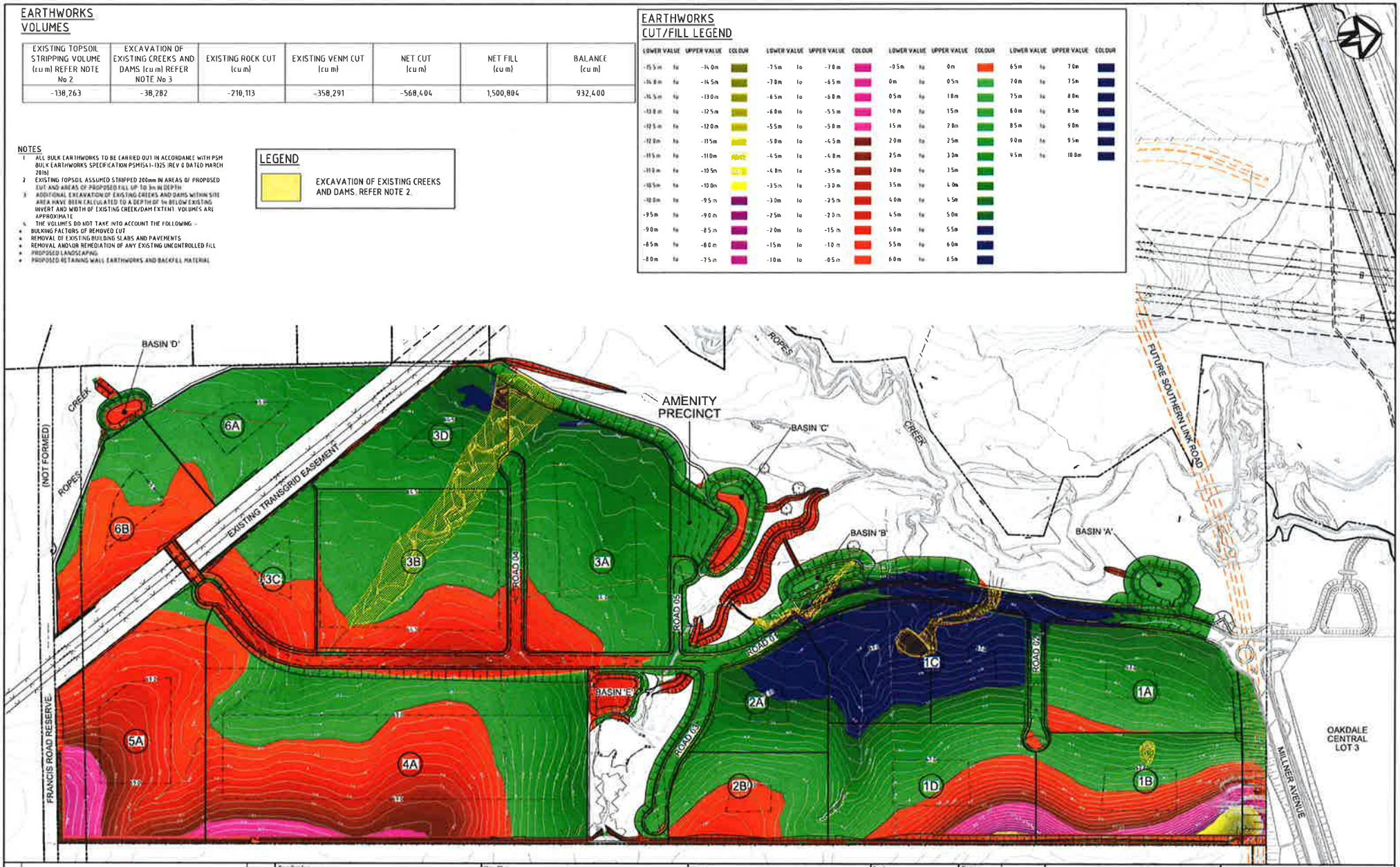
LOWER VALUE		UPPER VALUE	COLOUR	LOWER VALUE		UPPER VALUE	COLOUR	LOWER VALUE		UPPER VALUE	COLOUR	LOWER VALUE		UPPER VALUE	COLOUR
-15.5m	to	-14.0m		-7.5m	to	-7.0m		-0.5m	to	0m		6.5m	to	7.0m	
-14.0m	to	-14.5m		-7.0m	to	-6.5m		0m	to	0.5m		7.0m	to	7.5m	
-14.5m	to	-13.0m		-6.5m	to	-6.0m		0.5m	to	1.0m		7.5m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

NOTES

1. ALL BULK EARTHWORKS TO BE CARRIED OUT IN ACCORDANCE WITH PSM BULK EARTHWORKS SPECIFICATION PSM1541-1325 (REV 0 DATED MARCH 2016)
2. EXISTING TOPSOIL ASSUMED STRIPPED 200mm IN AREAS OF PROPOSED CUT AND AREAS OF PROPOSED FILL UP TO 3m IN DEPTH
3. ADDITIONAL EXCAVATION OF EXISTING CREEKS AND DAMS WITHIN SITE AREA HAVE BEEN CALCULATED TO A DEPTH OF 1m BELOW EXISTING INVERT AND WIDTH OF EXISTING CREEK/DAM EXTENT. VOLUMES ARE APPROXIMATE
4. THE VOLUMES DO NOT TAKE INTO ACCOUNT THE FOLLOWING :-
   - BULKING FACTORS OF REMOVED CUT
   - REMOVAL OF EXISTING BUILDING SLABS AND PAVEMENTS
   - REMOVAL AND/OR REMEDIATION OF ANY EXISTING UNCONTROLLED FILL
   - PROPOSED LANDSCAPING
   - PROPOSED RETAINING WALL EARTHWORKS AND BACKFILL MATERIAL

LEGEND

EXCAVATION OF EXISTING CREEKS AND DAMS. REFER NOTE 2.



Issue	Description	Date
A	ISSUE FOR TENDER	16-06-16

Bar Scales: 0 50 100 150 200 250m — 1 : 2500 @ A1

Key Plan

Client: Goodman

Scales: 1 : 2500 (Datum: Grid MGA, Height AHD)

Drawn: JB | Designed: JB | Checked: AMc | Approved:

Project: OAKDALE SOUTH

Title: BULK EARTHWORKS CUT/FILL PLAN

Civil Engineers and Project Managers
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Status: FOR TENDER — NOT TO BE USED FOR CONSTRUCTION | A1

Drawing No.: C5020 | Project No.: 14-193 | Issue: A

F:\14-193 Oakdale South\Dwgs\Civil\Final\3000_Overall Detailed Design\C5020.dwg

ATTACHMENT 1

LABORATORY TEST REPORTS

CERTIFICATE OF ANALYSIS

Work Order	: **ES1523685**	Page	: 1 of 14
Client	: **PELLS SULLIVAN MEYNINK PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: AGUSTRIAL SALIM	Contact	:
Address	: G3, 56 DELHI ROAD NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: Agustria.Salim@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 South (PSM1541)	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 10-Jun-2015 17:40
C-O-C number	: ----	Date Analysis Commenced	: 12-Jun-2015
Sampler	: WILL PIPER, YUN BAI	Issue Date	: 22-Jun-2015 15:59
Site	: ----		
		No. of samples received	: 20
Quote number	: ----	No. of samples analysed	: 20

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
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils
Pabi Subba	Senior Organic Chemist	Sydney Inorganics
Satishkumar Trivedi	Acid Sulfate Soils Supervisor	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.

- Poor spike recovery for (TEST NAME) due to matrix interferences(confirmed by re-analysis).
- ASS: EA033 (CRS Suite): ANC not required because pH KCl less than 6.5
- ASS: EA029 (SPOCAS): Excess ANC not required because pH OX less than 6.5.
- 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.
- 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	E25/0.6m	E24/0.5m	E22/0.8m	E21/0.6m	E20/0.5m
				Client sampling date / time	10-Jun-2015 09:15	10-Jun-2015 09:40	10-Jun-2015 10:05	10-Jun-2015 10:15	10-Jun-2015 10:20
Compound	CAS Number	LOR	Unit		ES1523685-001	ES1523685-002	ES1523685-003	ES1523685-004	ES1523685-005
					Result	Result	Result	Result	Result
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		6.7	5.9	5.4	6.0	6.0
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		130	141	288	367	79
EA014 Total Soluble Salts									
^ Total Soluble Salts	----	5	mg/kg		421	458	935	1190	256
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		4.6	----	----	5.0	4.3
pH OX (23B)	----	0.1	pH Unit		4.8	----	----	4.9	3.9
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		22	----	----	19	90
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		39	----	----	11	205
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		16	----	----	<2	116
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		0.036	----	----	0.030	0.144
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		0.062	----	----	<0.020	0.329
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		0.026	----	----	<0.020	0.185
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		<0.020	----	----	<0.020	<0.020
Peroxide Sulfur (23De)	----	0.02	% S		<0.020	----	----	<0.020	0.038
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S		<0.020	----	----	<0.020	0.038
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t		<10	----	----	<10	23
EA029-D: Calcium Values									
KCl Extractable Calcium (23Vh)	----	0.02	% Ca		<0.020	----	----	<0.020	0.036
Peroxide Calcium (23Wh)	----	0.02	% Ca		<0.020	----	----	<0.020	0.039
Acid Reacted Calcium (23X)	----	0.02	% Ca		<0.020	----	----	<0.020	<0.020
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		<10	----	----	<10	<10
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		<0.020	----	----	<0.020	<0.020
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		0.102	----	----	0.098	0.123
Peroxide Magnesium (23Tm)	----	0.02	% Mg		0.112	----	----	0.120	0.144
Acid Reacted Magnesium (23U)	----	0.02	% Mg		<0.020	----	----	0.022	0.021
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		<10	----	----	18	17
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		<0.020	----	----	0.029	0.028

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E25/0.6m	E24/0.5m	E22/0.8m	E21/0.6m	E20/0.5m
				Client sampling date / time	10-Jun-2015 09:15	10-Jun-2015 09:40	10-Jun-2015 10:05	10-Jun-2015 10:15	10-Jun-2015 10:20
Compound	CAS Number	LOR	Unit		ES1523685-001	ES1523685-002	ES1523685-003	ES1523685-004	ES1523685-005
					Result	Result	Result	Result	Result
EA029-G: Retained Acidity									
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	----	----	----	0.027
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	----	----	----	0.027
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	----	----	----	13
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		0.04	----	----	0.03	0.20
Net Acidity (acidity units)	----	10	mole H+ / t		22	----	----	19	126
Liming Rate	----	1	kg CaCO3/t		2	----	----	1	9
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		----	4.2	4.0	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t		----	94	92	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	0.15	0.15	----	----
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-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	<0.02	<0.02	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	0.03	0.05	----	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	0.03	0.05	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	14	23	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		----	0.02	0.04	----	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		----	1.5	1.5	----	----
Net Acidity (sulfur units)	----	0.02	% S		----	0.17	0.18	----	----
Net Acidity (acidity units)	----	10	mole H+ / t		----	109	115	----	----
Liming Rate	----	1	kg CaCO3/t		----	8	9	----	----
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1	%		14.8	21.6	17.0	19.8	19.4
ED008: Exchangeable Cations									
^ Exchangeable Calcium	----	0.1	meq/100g		0.4	0.8	0.4	0.4	2.6
^ Exchangeable Magnesium	----	0.1	meq/100g		4.4	3.3	5.1	3.5	8.1
^ Exchangeable Potassium	----	0.1	meq/100g		<0.1	<0.1	0.1	<0.1	0.2

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E25/0.6m	E24/0.5m	E22/0.8m	E21/0.6m	E20/0.5m
				Client sampling date / time	10-Jun-2015 09:15	10-Jun-2015 09:40	10-Jun-2015 10:05	10-Jun-2015 10:15	10-Jun-2015 10:20
Compound	CAS Number	LOR	Unit		ES1523685-001	ES1523685-002	ES1523685-003	ES1523685-004	ES1523685-005
					Result	Result	Result	Result	Result
ED008: Exchangeable Cations - Continued									
^ **Exchangeable Sodium**	----	0.1	meq/100g		**0.9**	**0.6**	**1.4**	**0.7**	**0.6**
^ **Cation Exchange Capacity**	----	0.1	meq/100g		**5.7**	**4.7**	**7.1**	**4.7**	**11.6**
^ **Exchangeable Sodium Percent**	----	0.1	%		**16.4**	**12.3**	**19.5**	**15.8**	**5.6**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		**840**	**260**	**220**	**470**	**900**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	E19/0.7m	E17/0.6m	E13/0.5m	E16/0.7m	E15/0.5m
			Client sampling date / time	10-Jun-2015 10:40	10-Jun-2015 11:20	10-Jun-2015 11:45	10-Jun-2015 12:30	10-Jun-2015 12:50
Compound	CAS Number	LOR	Unit	ES1523685-006	ES1523685-007	ES1523685-008	ES1523685-009	ES1523685-010
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	5.9	6.8	5.2	6.3	6.2
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	100	28	345	48	46
EA014 Total Soluble Salts								
^ Total Soluble Salts	----	5	mg/kg	325	91	1120	157	150
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	----	----	----	4.4	----
pH OX (23B)	----	0.1	pH Unit	----	----	----	5.1	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	----	----	----	58	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	----	----	----	70	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	----	----	----	11	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	----	----	----	0.093	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	----	----	----	0.111	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	----	----	----	<0.020	----
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.02	% S	----	----	----	<0.020	----
Peroxide Sulfur (23De)	----	0.02	% S	----	----	----	<0.020	----
Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	----	----	----	<0.020	----
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	----	----	----	<10	----
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.02	% Ca	----	----	----	<0.020	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	----	----	----	<0.020	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	----	----	----	<0.020	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	----	----	----	<10	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	----	----	----	<0.020	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	----	----	----	0.094	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	----	----	----	0.104	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	----	----	----	<0.020	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	----	----	----	<10	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	----	----	----	<0.020	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E19/0.7m	E17/0.6m	E13/0.5m	E16/0.7m	E15/0.5m
				Client sampling date / time	10-Jun-2015 10:40	10-Jun-2015 11:20	10-Jun-2015 11:45	10-Jun-2015 12:30	10-Jun-2015 12:50
Compound	CAS Number	LOR	Unit		ES1523685-006	ES1523685-007	ES1523685-008	ES1523685-009	ES1523685-010
					Result	Result	Result	Result	Result
EA029-G: Retained Acidity									
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	----	----	<0.020	----
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	----
Net Acidity (sulfur units)	----	0.02	% S		----	----	----	0.09	----
Net Acidity (acidity units)	----	10	mole H+ / t		----	----	----	58	----
Liming Rate	----	1	kg CaCO3/t		----	----	----	4	----
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		4.0	4.4	4.3	----	4.4
Titratable Actual Acidity (23F)	----	2	mole H+ / t		99	87	92	----	40
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		0.16	0.14	0.15	----	0.06
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S		<0.005	<0.005	<0.005	----	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		<10	<10	<10	----	<10
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		<0.02	<0.02	<0.02	----	<0.02
HCl Extractable Sulfur (20Be)	----	0.02	% S		0.03	<0.02	0.03	----	<0.02
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		0.03	<0.02	0.03	----	<0.02
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		13	<10	12	----	<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
Net Acidity (sulfur units)	----	0.02	% S		0.18	0.14	0.17	----	0.06
Net Acidity (acidity units)	----	10	mole H+ / t		112	87	104	----	40
Liming Rate	----	1	kg CaCO3/t		8	6	8	----	3
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1	%		20.4	15.8	18.7	20.0	18.4
ED008: Exchangeable Cations									
^ Exchangeable Calcium	----	0.1	meq/100g		1.0	0.7	<0.1	0.3	0.6
^ Exchangeable Magnesium	----	0.1	meq/100g		8.9	6.0	2.5	7.8	7.5
^ Exchangeable Potassium	----	0.1	meq/100g		0.1	0.1	<0.1	0.2	0.1

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E19/0.7m	E17/0.6m	E13/0.5m	E16/0.7m	E15/0.5m
				Client sampling date / time	10-Jun-2015 10:40	10-Jun-2015 11:20	10-Jun-2015 11:45	10-Jun-2015 12:30	10-Jun-2015 12:50
Compound	CAS Number	LOR	Unit		ES1523685-006	ES1523685-007	ES1523685-008	ES1523685-009	ES1523685-010
					Result	Result	Result	Result	Result
ED008: Exchangeable Cations - Continued									
^ **Exchangeable Sodium**	----	0.1	meq/100g		**1.4**	**0.9**	**0.4**	**1.7**	**1.1**
^ **Cation Exchange Capacity**	----	0.1	meq/100g		**12.4**	**7.8**	**3.1**	**10.0**	**9.3**
^ **Exchangeable Sodium Percent**	----	0.1	%		**11.2**	**11.1**	**14.5**	**17.2**	**12.0**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		**60**	**120**	**270**	**30**	**350**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	E14/0.5m	E12/0.5m	E11/0.5m	E9/0.6m	E7/0.7m
			Client sampling date / time	10-Jun-2015 14:00	10-Jun-2015 14:55	10-Jun-2015 15:25	10-Jun-2015 15:55	10-Jun-2015 16:05
Compound	CAS Number	LOR	Unit	ES1523685-011	ES1523685-012	ES1523685-013	ES1523685-014	ES1523685-015
				Result	Result	Result	Result	Result
EA002 : pH (Soils)								
pH Value	----	0.1	pH Unit	5.5	5.7	6.8	5.9	6.6
EA010: Conductivity								
Electrical Conductivity @ 25°C	----	1	µS/cm	115	220	76	454	35
EA014 Total Soluble Salts								
^ Total Soluble Salts	----	5	mg/kg	373	716	247	1480	115
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	4.3	5.8	----	5.0	----
pH OX (23B)	----	0.1	pH Unit	4.0	4.8	----	6.4	----
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	56	4	----	24	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	135	82	----	10	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	79	77	----	<2	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	0.090	<0.020	----	0.039	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	0.216	0.131	----	<0.020	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	0.126	0.124	----	<0.020	----
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	----	0.037	----
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	<0.020	0.028	----	0.022	----
Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.020	0.036	----	0.023	----
Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.020	<0.020	----	<0.020	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	<10	----	<10	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	<0.020	----	<0.020	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	0.100	0.124	----	0.098	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg	0.113	0.162	----	0.094	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	0.038	----	<0.020	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	10	31	----	<10	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.020	0.050	----	<0.020	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E14/0.5m	E12/0.5m	E11/0.5m	E9/0.6m	E7/0.7m
				Client sampling date / time	10-Jun-2015 14:00	10-Jun-2015 14:55	10-Jun-2015 15:25	10-Jun-2015 15:55	10-Jun-2015 16:05
Compound	CAS Number	LOR	Unit		ES1523685-011	ES1523685-012	ES1523685-013	ES1523685-014	ES1523685-015
					Result	Result	Result	Result	Result
EA029-G: Retained Acidity									
HCl Extractable Sulfur (20Be)	----	0.02	% S		**0.020**	----	----	----	----
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		**0.10**	<0.02	----	**0.04**	----
Net Acidity (acidity units)	----	10	mole H+ / t		**66**	<10	----	**28**	----
Liming Rate	----	1	kg CaCO3/t		**5**	<1	----	**2**	----
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		----	----	**5.4**	----	**4.9**
Titratable Actual Acidity (23F)	----	2	mole H+ / t		----	----	**7**	----	**14**
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-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	----	----	----	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	----	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		----	----	----	----	----
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	----	**14**
Liming Rate	----	1	kg CaCO3/t		----	----	<1	----	**1**
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1	%		**18.8**	**17.0**	**16.3**	**14.9**	**14.7**
ED008: Exchangeable Cations									
^ Exchangeable Calcium	----	0.1	meq/100g		**0.7**	**0.3**	**0.9**	**0.8**	**2.4**
^ Exchangeable Magnesium	----	0.1	meq/100g		**7.9**	**2.7**	**3.7**	**7.2**	**6.4**
^ Exchangeable Potassium	----	0.1	meq/100g		**0.2**	<0.1	**0.1**	<0.1	**0.2**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E14/0.5m	E12/0.5m	E11/0.5m	E9/0.6m	E7/0.7m
				Client sampling date / time	10-Jun-2015 14:00	10-Jun-2015 14:55	10-Jun-2015 15:25	10-Jun-2015 15:55	10-Jun-2015 16:05
Compound	CAS Number	LOR	Unit		ES1523685-011	ES1523685-012	ES1523685-013	ES1523685-014	ES1523685-015
					Result	Result	Result	Result	Result
ED008: Exchangeable Cations - Continued									
^ **Exchangeable Sodium**	----	0.1	meq/100g		**1.0**	**0.8**	**1.0**	**2.6**	**0.7**
^ **Cation Exchange Capacity**	----	0.1	meq/100g		**9.8**	**3.9**	**5.8**	**10.8**	**9.7**
^ **Exchangeable Sodium Percent**	----	0.1	%		**10.3**	**20.1**	**17.4**	**24.4**	**7.3**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		**40**	**440**	**590**	**410**	**160**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E6/0.6m	E5/0.6m	E3/0.5m	E2/0.5m	E1/0.5m
				Client sampling date / time	10-Jun-2015 16:10	10-Jun-2015 16:15	10-Jun-2015 16:25	10-Jun-2015 16:30	10-Jun-2015 16:38
Compound	CAS Number	LOR	Unit		ES1523685-016	ES1523685-017	ES1523685-018	ES1523685-019	ES1523685-020
					Result	Result	Result	Result	Result
EA002 : pH (Soils)									
pH Value	----	0.1	pH Unit		6.7	6.8	6.6	6.2	7.7
EA010: Conductivity									
Electrical Conductivity @ 25°C	----	1	µS/cm		669	174	76	164	186
EA014 Total Soluble Salts									
^ Total Soluble Salts	----	5	mg/kg		2170	566	248	533	606
EA029-A: pH Measurements									
pH KCl (23A)	----	0.1	pH Unit		----	4.9	4.9	4.8	----
pH OX (23B)	----	0.1	pH Unit		----	4.8	5.1	4.6	----
EA029-B: Acidity Trail									
Titratable Actual Acidity (23F)	----	2	mole H+ / t		----	14	14	27	----
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t		----	5	16	36	----
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t		----	<2	2	9	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		----	0.022	0.022	0.044	----
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S		----	<0.020	0.026	0.058	----
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S		----	<0.020	<0.020	<0.020	----
EA029-C: Sulfur Trail									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	<0.020	<0.020	<0.020	----
Peroxide Sulfur (23De)	----	0.02	% S		----	<0.020	<0.020	<0.020	----
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		----	0.089	0.022	0.074	----
Peroxide Calcium (23Wh)	----	0.02	% Ca		----	0.145	0.023	0.072	----
Acid Reacted Calcium (23X)	----	0.02	% Ca		----	0.056	<0.020	<0.020	----
acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t		----	28	<10	<10	----
sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S		----	0.045	<0.020	<0.020	----
EA029-E: Magnesium Values									
KCl Extractable Magnesium (23Sm)	----	0.02	% Mg		----	0.115	0.125	0.127	----
Peroxide Magnesium (23Tm)	----	0.02	% Mg		----	0.157	0.142	0.131	----
Acid Reacted Magnesium (23U)	----	0.02	% Mg		----	0.043	<0.020	<0.020	----
Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t		----	35	14	<10	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S		----	0.056	0.023	<0.020	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E6/0.6m	E5/0.6m	E3/0.5m	E2/0.5m	E1/0.5m
				Client sampling date / time	10-Jun-2015 16:10	10-Jun-2015 16:15	10-Jun-2015 16:25	10-Jun-2015 16:30	10-Jun-2015 16:38
Compound	CAS Number	LOR	Unit		ES1523685-016	ES1523685-017	ES1523685-018	ES1523685-019	ES1523685-020
					Result	Result	Result	Result	Result
EA029-G: Retained Acidity									
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	----	----	----	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	----	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		----	----	----	----	----
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	0.04	----
Net Acidity (acidity units)	----	10	mole H+ / t		----	14	14	27	----
Liming Rate	----	1	kg CaCO3/t		----	1	1	2	----
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		5.7	----	----	----	6.4
Titratable Actual Acidity (23F)	----	2	mole H+ / t		6	----	----	----	<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-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		----	----	----	----	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		----	----	----	----	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		----	----	----	----	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		----	----	----	----	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		----	----	----	----	----
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
EA055: Moisture Content									
^ Moisture Content (dried @ 103°C)	----	1	%		15.8	19.2	17.7	18.2	18.9
ED008: Exchangeable Cations									
^ Exchangeable Calcium	----	0.1	meq/100g		0.5	3.9	1.2	1.3	3.5
^ Exchangeable Magnesium	----	0.1	meq/100g		6.7	8.4	5.4	3.6	3.0
^ Exchangeable Potassium	----	0.1	meq/100g		<0.1	0.1	<0.1	<0.1	0.3

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E6/0.6m	E5/0.6m	E3/0.5m	E2/0.5m	E1/0.5m
				Client sampling date / time	10-Jun-2015 16:10	10-Jun-2015 16:15	10-Jun-2015 16:25	10-Jun-2015 16:30	10-Jun-2015 16:38
Compound	CAS Number	LOR	Unit		ES1523685-016	ES1523685-017	ES1523685-018	ES1523685-019	ES1523685-020
					Result	Result	Result	Result	Result
ED008: Exchangeable Cations - Continued									
^ **Exchangeable Sodium**	----	0.1	meq/100g		**2.7**	**1.2**	**0.9**	**0.6**	**0.3**
^ **Cation Exchange Capacity**	----	0.1	meq/100g		**10.0**	**13.7**	**7.5**	**5.5**	**7.2**
^ **Exchangeable Sodium Percent**	----	0.1	%		**26.7**	**9.0**	**12.6**	**10.2**	**4.5**
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	10	mg/kg		**1100**	**190**	**370**	**1140**	**380**

CERTIFICATE OF ANALYSIS

Work Order	: **ES1524591**	Page	: 1 of 6
Client	: **PELLS SULLIVAN MEYNINK PTY LTD**	Laboratory	: Environmental Division Sydney
Contact	: AGUSTRIAL SALIM	Contact	:
Address	: G3, 56 DELHI ROAD NORTH RYDE NSW, AUSTRALIA 2113	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: Agustria.Salim@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 South (PSM1541)	QC Level	: NEPM 2013 Schedule B(3) and ALS QCS3 requirement
Order number	: ----	Date Samples Received	: 23-Jun-2015 17:40
C-O-C number	: ----	Date Analysis Commenced	: 24-Jun-2015
Sampler	: WILL PIPER, YUN BAI	Issue Date	: 25-Jun-2015 15:15
Site	: ----		
		No. of samples received	: 20
Quote number	: ----	No. of samples analysed	: 20

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*
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.

- Gross Alpha and Beta Activity analyses are performed by ALS Fyshwick (NATA Accreditation number 992).

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E25/0.6m	E24/0.5m	E22/0.8m	E21/0.6m	E20/0.5m
				Client sampling date / time	10-Jun-2015 09:15	10-Jun-2015 09:40	10-Jun-2015 10:05	10-Jun-2015 10:15	10-Jun-2015 10:20
Compound	CAS Number	LOR	Unit		ES1524591-001	ES1524591-002	ES1524591-003	ES1524591-004	ES1524591-005
					Result	Result	Result	Result	Result
EA055: Moisture Content									
^ **Moisture Content (dried @ 103°C)**	----	1	%		**14.9**	**20.8**	**16.1**	**18.0**	**23.0**
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**150**	**190**	**190**	**30**	**100**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E19/0.7m	E17/0.6m	E13/0.5m	E16/0.7m	E15/0.5m
				Client sampling date / time	10-Jun-2015 10:40	10-Jun-2015 11:20	10-Jun-2015 11:45	10-Jun-2015 12:30	10-Jun-2015 12:50
Compound	CAS Number	LOR	Unit		ES1524591-006	ES1524591-007	ES1524591-008	ES1524591-009	ES1524591-010
					Result	Result	Result	Result	Result
EA055: Moisture Content									
^ **Moisture Content (dried @ 103°C)**	----	1	%		**20.5**	**18.2**	**20.2**	**19.5**	**17.6**
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**100**	**20**	**290**	**20**	**60**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E14/0.5m	E12/0.5m	E11/0.5m	E9/0.6m	E7/0.7m
				Client sampling date / time	10-Jun-2015 14:00	10-Jun-2015 14:55	10-Jun-2015 15:25	10-Jun-2015 15:55	10-Jun-2015 16:05
Compound	CAS Number	LOR	Unit		ES1524591-011	ES1524591-012	ES1524591-013	ES1524591-014	ES1524591-015
					Result	Result	Result	Result	Result
EA055: Moisture Content									
^ **Moisture Content (dried @ 103°C)**	----	1	%		**19.8**	**18.3**	**17.0**	**15.4**	**17.1**
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**100**	**60**	**40**	**460**	**40**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Client sample ID	E6/0.6m	E5/0.6m	E3/0.5m	E2/0.5m	E1/0.5m
				Client sampling date / time	10-Jun-2015 16:10	10-Jun-2015 16:15	10-Jun-2015 16:25	10-Jun-2015 16:30	10-Jun-2015 16:35
Compound	CAS Number	LOR	Unit		ES1524591-016	ES1524591-017	ES1524591-018	ES1524591-019	ES1524591-020
					Result	Result	Result	Result	Result
EA055: Moisture Content									
^ **Moisture Content (dried @ 103°C)**	----	1	%		**16.4**	**20.6**	**17.2**	**18.9**	**20.0**
ED040S : Soluble Sulfate by ICPAES									
Sulfate as SO4 2-	14808-79-8	10	mg/kg		**280**	**50**	**90**	**100**	**80**