



CERTIFICATE OF ANALYSIS

Work Order : **ES2320565**
Client : **WARRUMBUNGLE SHIRE COUNCIL**
Contact
Address : 59 Binnia St,
COOLAH NSW
Telephone : ----
Project : Coolah STP - EPL 4445
Order number : 36339
C-O-C number : ----
Sampler
Site : ----
Quote number : EN/333
No. of samples received : 10
No. of samples analysed : 10

Page : 1 of 4
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 21-Jun-2023 10:40
Date Analysis Commenced : 26-Jun-2023
Issue Date : 30-Jun-2023 13:39



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Evie Sidarta	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the 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.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

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.
~ = Indicates an estimated value.

- ALS is not NATA accredited for the analysis of Exchangeable Cations on Alkaline Soils when performed under ALS Method ED006.
- 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 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Ingrams 100mm	Ingrams 150mm	Ingrams 250mm	Ingrams 400mm	Ingrams 600mm
Sampling date / time				20-Jun-2023 13:30	20-Jun-2023 13:45	20-Jun-2023 13:45	20-Jun-2023 13:45	20-Jun-2023 13:45	
Compound	CAS Number	LOR	Unit	ES2320565-001	ES2320565-002	ES2320565-003	ES2320565-004	ES2320565-005	
				Result	Result	Result	Result	Result	
EA006: Sodium Adsorption Ratio (SAR)									
∅ Sodium Adsorption Ratio	----	0.01	-	5.95	6.52	5.74	6.84	7.18	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	21.9	22.0	23.8	22.9	23.6	
ED006: Exchangeable Cations on Alkaline Soils									
∅ Exchangeable Calcium	----	0.2	meq/100g	----	25.2	24.0	25.5	21.0	
∅ Exchangeable Magnesium	----	0.2	meq/100g	----	11.6	10.5	11.9	10.5	
∅ Exchangeable Potassium	----	0.2	meq/100g	----	1.0	1.1	1.0	0.7	
∅ Exchangeable Sodium	----	0.2	meq/100g	----	2.2	1.9	2.5	2.2	
∅ Cation Exchange Capacity	----	0.2	meq/100g	----	40.1	37.5	40.9	34.4	
∅ Exchangeable Sodium Percent	----	0.2	%	----	5.5	5.0	6.1	6.5	
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g	32.5	----	----	----	----	
Exchangeable Magnesium	----	0.1	meq/100g	15.2	----	----	----	----	
Exchangeable Potassium	----	0.1	meq/100g	1.2	----	----	----	----	
Exchangeable Sodium	----	0.1	meq/100g	1.0	----	----	----	----	
Cation Exchange Capacity	----	0.1	meq/100g	49.8	----	----	----	----	
Exchangeable Sodium Percent	----	0.1	%	2.1	----	----	----	----	
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	139	116	131	95.0	91.0	
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	20	mg/kg	2580	2370	1840	2170	2200	
EK062: Total Nitrogen as N (TKN + NOx)									
^ Total Nitrogen as N	----	20	mg/kg	2720	2490	1970	2260	2290	
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	2	mg/kg	1520	1410	1250	1340	1270	



Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	RLPB 100mm	RLPB 150mm	RLPB 250mm	RLPB 400mm	RLPB 600mm
Sampling date / time			20-Jun-2023 13:00	20-Jun-2023 13:15	20-Jun-2023 13:15	20-Jun-2023 15:15	20-Jun-2023 15:15	
Compound	CAS Number	LOR	Unit	ES2320565-006	ES2320565-007	ES2320565-008	ES2320565-009	ES2320565-010
				Result	Result	Result	Result	Result
EA006: Sodium Adsorption Ratio (SAR)								
∅ Sodium Adsorption Ratio	----	0.01	-	3.38	3.21	3.09	2.69	3.07
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	28.8	35.2	28.2	28.8	29.3
ED006: Exchangeable Cations on Alkaline Soils								
∅ Exchangeable Calcium	----	0.2	meq/100g	20.2	18.1	17.4	19.1	16.5
∅ Exchangeable Magnesium	----	0.2	meq/100g	13.2	14.5	13.4	13.3	12.0
∅ Exchangeable Potassium	----	0.2	meq/100g	1.5	1.7	1.6	1.5	1.4
∅ Exchangeable Sodium	----	0.2	meq/100g	1.1	1.0	1.0	0.9	0.9
∅ Cation Exchange Capacity	----	0.2	meq/100g	36.0	35.2	33.4	34.8	30.8
∅ Exchangeable Sodium Percent	----	0.2	%	3.0	2.8	2.9	2.7	2.8
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N (Sol.)	----	0.1	mg/kg	17.9	29.0	29.4	25.3	33.3
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	20	mg/kg	1800	1470	2360	2830	2420
EK062: Total Nitrogen as N (TKN + NOx)								
^ Total Nitrogen as N	----	20	mg/kg	1820	1500	2390	2860	2450
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	2	mg/kg	1520	1290	1280	1290	1460

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EA006: Sodium Adsorption Ratio (SAR)