

Tiedman Irrigation Program

AGL UPSTREAM INVESTMENTS PTY LTD

Soil Quality Monitoring and Management Program - Report 5: Irrigation (Activities from 4 July 2014 to 31 December 2014)

January 2015 Compliance Report | Final

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Acronyms, initialisms and abbreviations

AGL	AGL Upstream Infrastructure Investments Pty Ltd
ANZECC	The Australian and New Zealand Environmental Conservation Council
Qcsg	Applied CSG blended water
CSC	cation exchange capacity
CSG	coal seam gas
DID	Daily Irrigation Deficit
DLL	Diffuse double layer
DRE	Division of Resource and Energy
ECE	Effective cation exchange capacity
EPL	Environment Protection Licence
ETo	Evapotranspiration
ESP	Exchangeable sodium percentage
GGP	Gloucester Gas Project
Ha	Hectares
IL	Interception Loss
ML	Megalitres
mS/cm	Microsiemens per centimetre
Mm	Millimetres
EPA	NSW Environment Protection Authority
OCSG	Office of Coal Seam Gas
P	Percolation
PEL	Petroleum Exploration Licence
pH _{Ca}	pH in CaCl ₂ at 1:5 ratio (it has a greater buffer capacity and more typical of field conditions)
Qr	Rainfall
REF	Review of Environmental Factors
R	Runoff
SAR	Sodium adsorption ratio
SQMMP	Soil quality monitoring and management program
C _{TH}	Threshold concentration
TIP	Tiedman Irrigation Program
TSD	Tiedman South dam
C _{TU}	Turbidity concentration

Executive Summary

This is the fifth in a series of compliance reports presenting the results of soil analyses for AGL's Tiedman Irrigation Program. This report covers the period from 5th July 2014 to 31st December 2014, and is submitted in compliance with the approved Soil Quality Monitoring and Management Program (SQMMP) (Fodder King 2012).

The following sections present mass balance, and soil physical and chemical data for the Program's two irrigation areas (Stage 1A and Stage 1B) following irrigation with blended water. However, there was no blended water irrigation in the Stage 1B area during this monitoring period.

The active irrigation area within Stage 1A is 12 hectares (ha) in area and the major focus of the approved Review of Environmental Factors (REF) and SQMMP, and Environment Protection Licence (EPL) conditions. The Stage 1A area consists of 16 plots, two crop systems (annuals and perennials), and four soil treatments. Stage 1B is approximately 8.6 ha in area (of which about 4.0 ha has received irrigation), and involves four plots and a mix of annual and perennial pasture species.

This report presents the:

- Stage 1A and Stage 1B plot layouts;
- Mass balance results for the reporting period;
- Stage 1A soil testing results and interpretation;
- Stage 1B soil testing results and interpretation;
- Concluding remarks for the reporting period.

Since the previous reporting period, Stage 1A has:

- Received 18.5 megalitres (ML) of blended water with an average salinity of 1570 $\mu\text{S}/\text{cm}$;
- Received 50.04 ML of rainfall;
- Showed a decrease in salinity at depths greater than 20 cm;
- Showed increased sodium (Na^+) concentrations;
- Showed decreased calcium (Ca^{2+}) concentrations and calcium:magnesium (Ca:Mg);
- Showed increasing exchangeable sodium percentage (ESP).

In total, 73 per cent (%) of the water received by the Stage 1A area fell as rainfall, while the balance (27 %) was applied by irrigation of blended water. There was no evidence of adverse effects on soils from the irrigation of blended water or periodic rainfall.

It is important to note that as ESP increases, the electrolyte concentration of the blended water must also increase to maintain optimum soil permeability (discussion of these processes previously provided in Fodder King (2014a). Although soil structure in Stage 1A has significantly improved, increasing soil ESP and decreasing Ca:Mg trends will need to be addressed through a leaching management strategy and/or application of gypsum (refer to conclusions for recommendations).

Since the previous reporting period, Stage 1B has:

- Received zero ML of blended water;
- Received 16.68 ML of rainfall;
- Showed a decrease in salinity;
- Experienced a drop in Ca^{2+} levels of approximately 50 %;
- Showed a decrease in ESP.

In addition, the Stage 1B results show a decrease in both soil pH_{Ca} of one pH unit and organic C from 2.9 % to 0.9 %. These decreases in shallow soil attributes are likely due to zero blended irrigation water being applied whilst 417 millimetres (mm) of rainfall fell from 5th July – 31st December 2014.

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to conduct soil quality monitoring and reporting as part of the Tiedman Irrigation Program in accordance with the scope of services set out in the contract between Jacobs and AGL Upstream Investments P/L (the Client). That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

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1. Introduction

AGL Upstream Infrastructure Investments Pty Ltd (AGL) currently holds Petroleum Exploration Licence (PEL) 285. PEL 285 was granted under the provisions of the Petroleum (Onshore) Act 1991, for the undertaking of coal seam gas (CSG) exploration, assessment and production. In accordance with the PEL, AGL submitted a Review of Environmental Factors (REF) in 2011 for approval under Part 5 of the Environmental Planning and Assessment Act (1979) for CSG irrigation activities.

Conditional approval was granted to AGL by the Division of Resources and Energy (DRE) in July 2012 (and renewed in July 2014 by the Office of Coal Seam Gas (OCSG)) to implement a program (the Tiedman Irrigation Program (TIP)) for produced water storage, blending, and irrigation activities on AGL's Tiedman property at Stratford in New South Wales (NSW). The REF approval references are 12/14515 (July 2012) and 13/36641 (July 2014).

On 6 August 2014, the NSW Environment Protection Authority (EPA) issued Environment Protection Licence (EPL) 20358 that covers the approved CSG exploration, assessment and production activities across the Gloucester Gas Project (GGP). Soil and water monitoring and reporting associated with the TIP is captured under both these approvals.

In October 2014, AGL engaged Jacobs Group (Australia) Pty Ltd (Jacobs) to provide technical services and compliance reporting for the ongoing soil monitoring and compliance program. This is the fifth compliance report submitted under the DRE/OCSG approvals and the fourth irrigation program report. In accordance with Condition 6 a), detailed investigations and information regarding soil profiles, structure, descriptions and EM31 survey results will be provided in the next 6-monthly report.

1.1 Tiedman Irrigation Program

As per Condition 3 of the REF approval, a comprehensive Soil Quality Monitoring and Management Program (SQMMP) was developed (Fodder King, 2012) and approved by DRE prior to the commencement of the irrigation activities. The SQMMP has the following objectives:

- Develop and monitor the performance of soils on the irrigation area against baseline soil quality parameters.
- Develop, manage and monitor the water and salt balances.
- Monitor, act, and report on any adverse trends or impacts on soil structure and quality parameters.

TIP involves monitoring the soils across the approved irrigation areas following the application of a blend of produced and fresh water (blended water). The program will result in the reuse of up to 70 megalitres (ML) of produced water from exploration programs (irrigated as blended water) to support crop and pasture growth.

The produced water is derived from historical and current flow testing programs that were approved exploration activities. Blended water irrigation is only proposed for the reuse of produced water derived from exploration program activities. AGL has committed to desalination for the reuse of extracted water from the Gloucester Gas Project (Stage 1) development.

This report (Report 5) was prepared following sampling and analyses of the soils of the two main irrigation areas (Stage 1A and Stage 1B; refer **Figure 1-1**) after irrigation with blended water (Baseline 6 Soil Study) during the July 2014 and December 2014 reporting period. Soil sampling was undertaken between 25th and 27th November 2014, just prior to a major rainfall event in early December 2014.

1.2 Existing information

Baseline (parent) soil and water studies were conducted in 2011 before irrigation activities at the Tiedman property began. Irrigation activities commenced in April 2013 and have been continuously monitored to assess

the impacts of the blended water on the soils, water sources, and crops. All soil sampling events since early 2011 are referred to as 'baseline' as this irrigation program provides important information on soils, irrigation application rates and crops in advance of the irrigation reuse strategies proposed for the Stage 1 development. The following reports on the soil studies have been submitted to date:

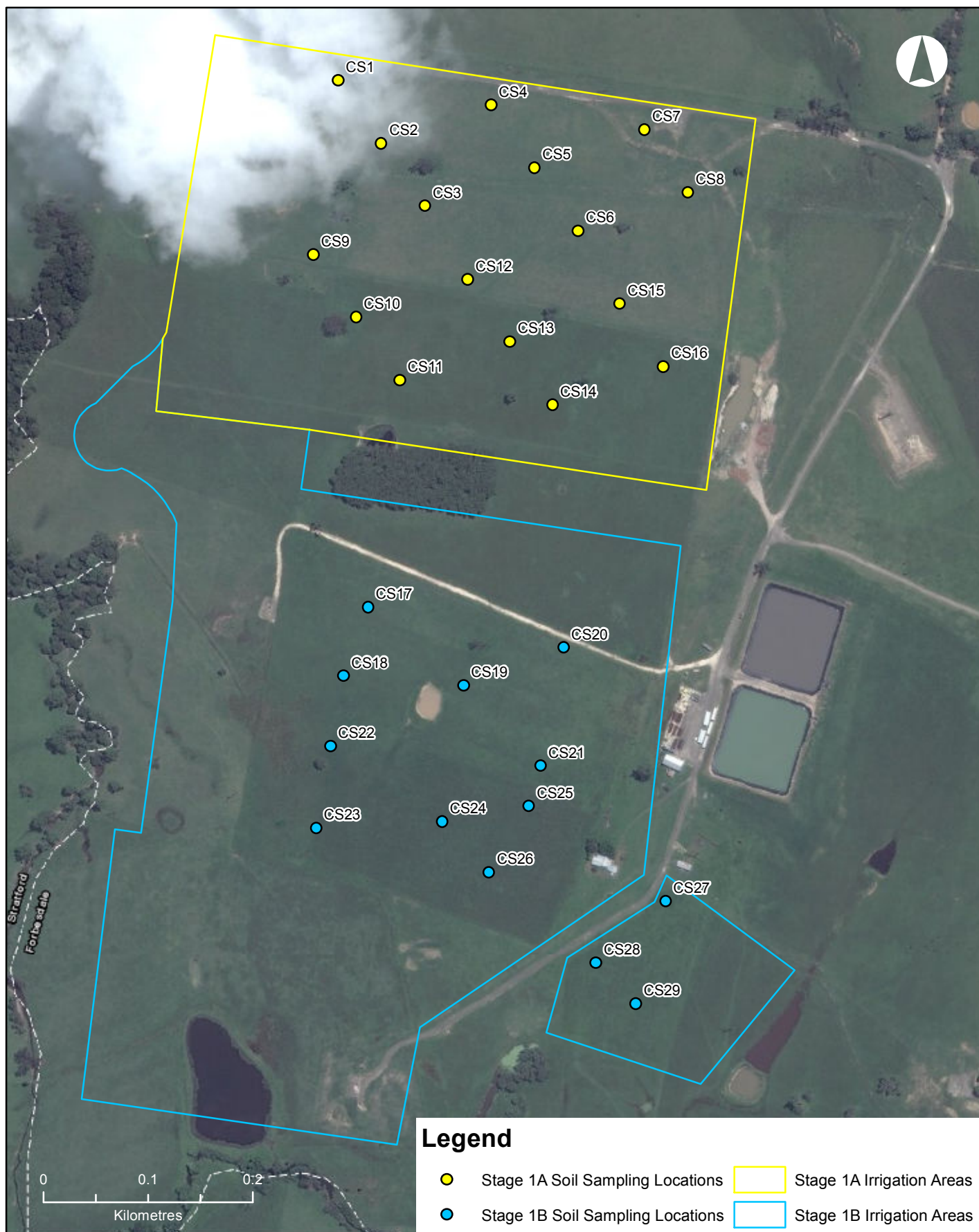
- Soil Quality Monitoring and Management Program (Fodder King, 2012).
- Soil Quality Monitoring and Management Program – Report 1: Pre-irrigation (Activities to 31 March 2013).
- Soil Quality Monitoring and Management Program – Report 2: Irrigation (Activities from 1 April to 30 June 2013).
- Summary Report 1 (Soil and cropping activities to 31 August 2013) - Tiedman Irrigation Trial.
- Soil Quality Monitoring and Management Program – Report 3: Irrigation (Activities from 1 July to 31 December 2013).
- Summary Report 2 (Soil and cropping activities from 1 September 2013 to 31 March 2014) - Tiedman Irrigation Program.
- Soil Quality Monitoring and Management Program – Report 4: Irrigation (Activities from 1 January to 4 July 2014) and Addendum.

1.3 Summary of previous studies and field activities

Table 1-1 presents summary information regarding the previous investigations, design studies and compliance reports conducted for the Tiedman Irrigation Program. The rainfall and irrigation applications are provided here to demonstrate that rainfall was generally more dominant than irrigation for the last two years.

Table 1-1 Previous studies and field activities for the Tiedman Irrigation Program

Baseline	OCSG Event	Reporting period	Report type	Rainfall (mm)	Stage 1A Irrigation (mm)	Stage 1B Irrigation (mm)	Comment
B1	-	Activities to 30 th June 2011	Parent soil baseline	-	-	-	Parent soil sampling and analysis prior to amelioration and irrigation. Investigations included test pitting, push core sampling, and an EM31 survey.
B2	Baseline	Activities from 1 st July 2012 to 31 st March 2013	Compliance report 1	739	Zero	354	Sampling of ameliorated soil prior to irrigation
B3	Irrigation 1	1 st April to 30 th June 2013	Compliance report 2	206	39	42	Sampling of soil after initial irrigation activities.
B4	Irrigation 2	1 st July to 31 st December 2013	Compliance report 3	231	270	279	Soil sampling after irrigation during reporting period.
B5	Irrigation 3	1 st January to 4 th July 2014	Compliance report 4	303	212	182	Soil sampling after irrigation during reporting period. Investigations included test pitting and a repeat EM31 survey.
B6	Irrigation 4	5 th July to 31 st December 2014	Compliance report 5 (this report)	417	154	Zero	Soil sampling after irrigation during reporting period.



Site ID	Easting	Northing	Site ID	Easting	Northing	Site ID	Easting	Northing	Site ID	Easting	Northing	Site ID	Easting	Northing	Site ID	Easting	Northing
CS1	402197	6449447	CS6	402427	6449303	CS11	402256	6449160	CS16	402508	6449173	CS21	402391	6448791	CS26	402342	6448690
CS2	402239	6449387	CS7	402490	6449400	CS12	402321	6449256	CS17	402226	6448943	CS23	402177	6448732	CS27	402511	6448662
CS3	402281	6449327	CS8	402532	6449340	CS13	402361	6449197	CS18	402203	6448878	CS22	402190	6448810	CS28	402444	6448603
CS4	402344	6449423	CS9	402174	6449280	CS14	402402	6449137	CS19	402317	6448868	CS24	402297	6448738	CS29	402482	6448564
CS5	402385	6449363	CS10	402215	6449221	CS15	402467	6449233	CS20	402413	6448904	CS25	402380	6448753			

1.4 Stage 1A irrigation area

1.4.1 Objectives

The active irrigation area within the Stage 1A area is 12 hectares (ha) in size and comprises 16 plots (of equal dimensions) 0.75 ha in size. The irrigation program involves two crop systems (annuals and perennials) and four soil treatments (as shown in Attach A.1). The objectives of the Stage 1A Irrigation program are to:

- Derive information about the use of blended water on improved soils in order to optimise the beneficial use of produced water;
- Provide information to optimise the design of a water treatment and storage system to match longer term beneficial re-use opportunities; and
- Achieve blended water application rates in the range of 3 to 5 ML/Ha/Year to minimise the overall 'footprint' of the project on the surrounding landscape.

1.4.2 Program activities

The program involves:

- Initial application and incorporation of ameliorants to the natural soils (complete);
- Irrigation of the ameliorated soils with blended water (ongoing);
- Regular sampling and testing of the soil samples (ongoing);
- Calculation of the mass and water balances (ongoing);
- Interpretation of, and reporting on, results of laboratory analyses.

The application of blended water to the Stage 1A area is subject to recommendations arising from daily water balance monitoring and anticipated weather conditions. For this reporting period, the irrigation application was 154 mm.

In the period from 5 July 2014 to 31 December 2014, approximately 18.5 ML of blended water was irrigated across the Stage 1A area. This blended water was taken from the Tiedman South dam (TSD) and applied using an overhead linear move irrigator.

No blended water was applied to the Stage 1B area from 5th July – 31st December 2014.

2. Mass balance results

2.1 Average rainfall patterns

The Tiedman irrigation site lies within a relatively high rainfall zone, with a mean rainfall of approximately 961 mm per annum (slightly summer-dominant). Rainfall data used to determine long-term annual average was based on the BOM site (Gloucester Post Office, 060015, 126 years). Actual rainfall data from the AGL weather station on Tiedmans, together with (in field) soil moisture probes is used to determine irrigation scheduling. The consideration of rainfall is a significant factor in determining the timing of when irrigation will be undertaken.

2.2 Rainfall and evapotranspiration

Figure 2-1 summarises rainfall and evapotranspiration (ETo) from 5th July - 31st December 2014 where 417 mm of rain occurred during the period (sourced from AGL weather station). Total rainfall across the Stage 1A (12.0 ha) and Stage 1B (4.0 ha) plot areas was 66.72 ML. The rainfall volume across the Stage 1A alone was 50.04 ML.

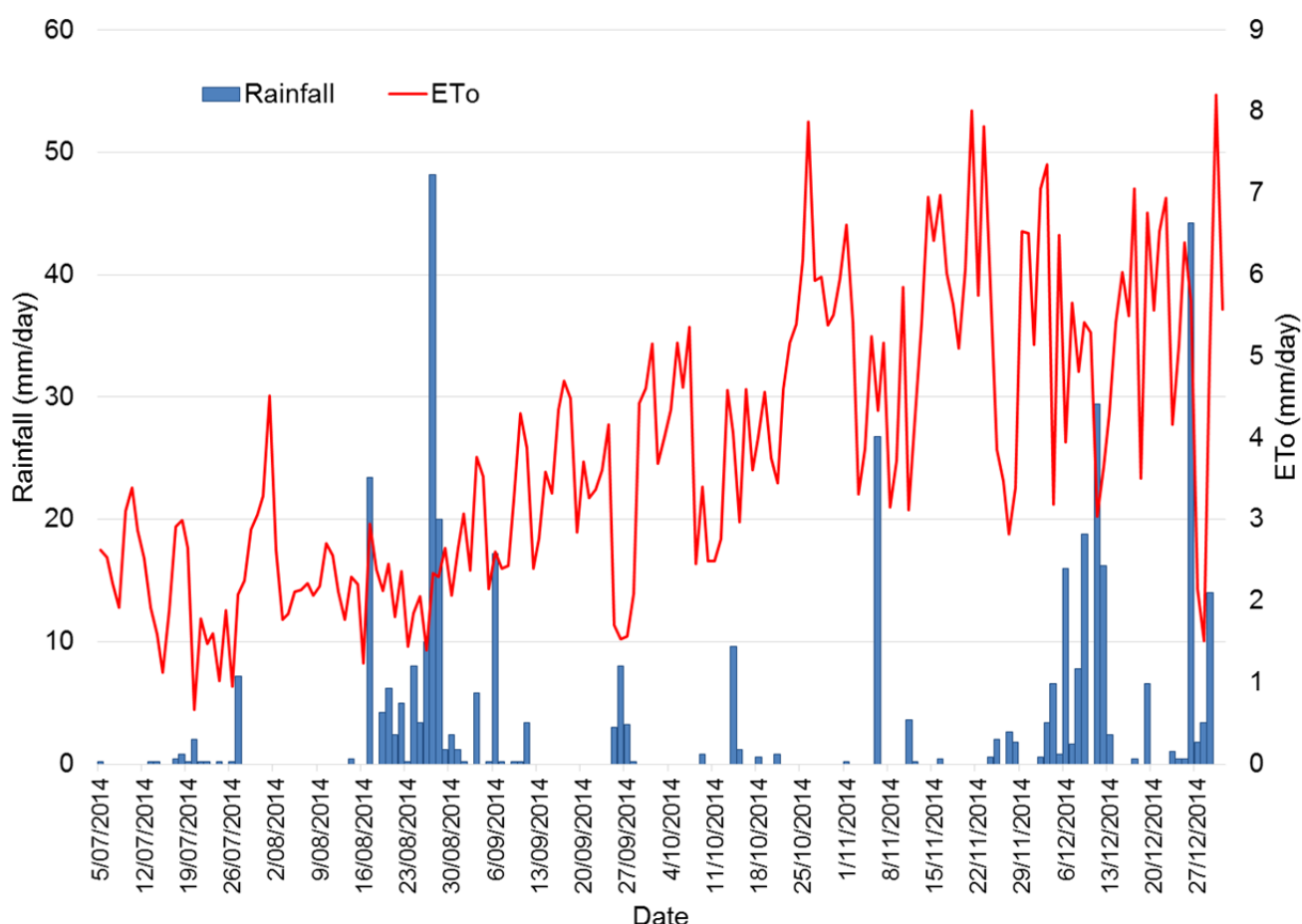


Figure 2-1: Rainfall (sourced from AGL weather station) and ETo at the Tiedman property (5th July – 31st December 2014)

There are no evapotranspiration data specific to the site (see explanation in Fodder King, 2011). Therefore, ETo was interpolated from regionally available data through the *iWater* service. During the reporting period, 27 per

cent (%) of the total water received across the Stage 1A area came from blended water while 73 % came from rainfall (refer to **Table 2-1**).

Table 2-1: Rainfall and irrigation for Stage 1A (5th July – 31st December 2014)

Units	Rainfall	Irrigation	Total
mm	417	154	571
ML	50.04	18.5	68.54
%	73	27	100

2.3 Irrigation scheduling and water balance

The water balance calculated in the following sections is based on *Environmental Guidelines: Use of Effluent for Irrigation* (DECC 2004).

2.3.1 Stage 1A

Applied CSG blended water (Q_{csg}) + Rainfall (Q_r) $\leq$ Evapotranspiration (ET) + Percolation (P) + Runoff (R) + Interception Loss (IL), where R is designed to be zero, therefore the daily water balance is:

$$Q_{csg} \leq ET + P + IL - Q_r$$

$$\text{Daily Irrigation Deficit (DID)} = ET + P + IL - (Q_r + Q_{csg})$$

Negative values mean irrigation should not be applied.

The cumulative DID (over seven-day periods) was used in conjunction with real-time soil moisture monitoring to determine if irrigation was possible at a given time. For example, a 25 mm rainfall event may offset six days (or more) of low ETo, and if the rainfall event saturates the soil, then irrigation does not occur.

Figure 2-2 summarises the DID, cumulative DID (seven-day) and applied irrigation of blended CSG water (5th July – 31st December 2014).

In addition to the water balance, real-time soil moisture monitoring ensured that irrigation was only applied when there was available “space” in the soil profile. **Figure 2-3** and **Figure 2-4** show the wetting and drying patterns of soil moisture sensor (MS) one (MS1) (outside the irrigation area) and soil moisture sensor five (MS5) (in deepest treatment zone within irrigation area).

The general similarity between irrigated and non-irrigated soils and their wetting and drying periods indicates that the structure of the receiving soil is being maintained and water is passing to the deeper parent soil. For example, comparison of **Figure 2-3** and **Figure 2-4** shows that water movement through the soil has not been significantly altered by irrigation. That is, the general wetting and drying periods in MS1 (due to rainfall shown by blue columns) are generally observed in MS5 trends. Water is either moving to deeper groundwater or being used by plants to create these similar patterns. However, irrigation (black columns) was applied to MS5 and, while the irrigation “spikes” increased the presence of soil water during this period, this allowed considerable water uptake by plants in the Stage 1A area.

Irrigation of blended water occurred intermittently from 5th July - 31st December 2014 as indicated by the water balance previously described. Approximately 18.5 ML of blended water was applied to the Stage 1A area during the period. The DID, cumulative DID, and soil moisture indicated that these were optimum irrigation opportunities that would result in zero runoff while maintaining soil moisture levels suitable for crop growth.

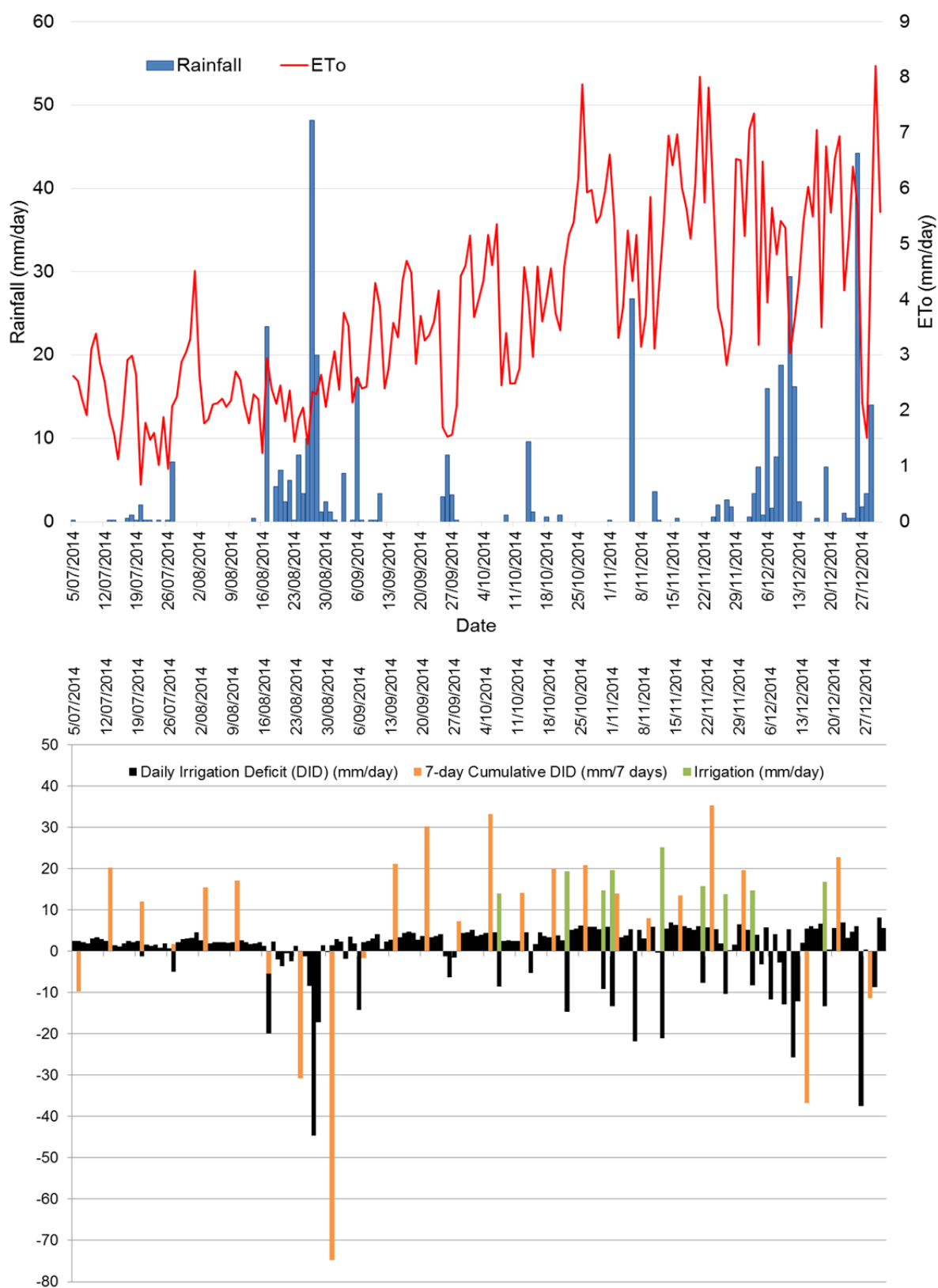


Figure 2-2: Stage 1A DID, seven-day cumulative DID and irrigation applied (5th July – 31st December 2014). Rainfall (sourced from AGL weather station) and ETo at the Tiedman property included as reference.

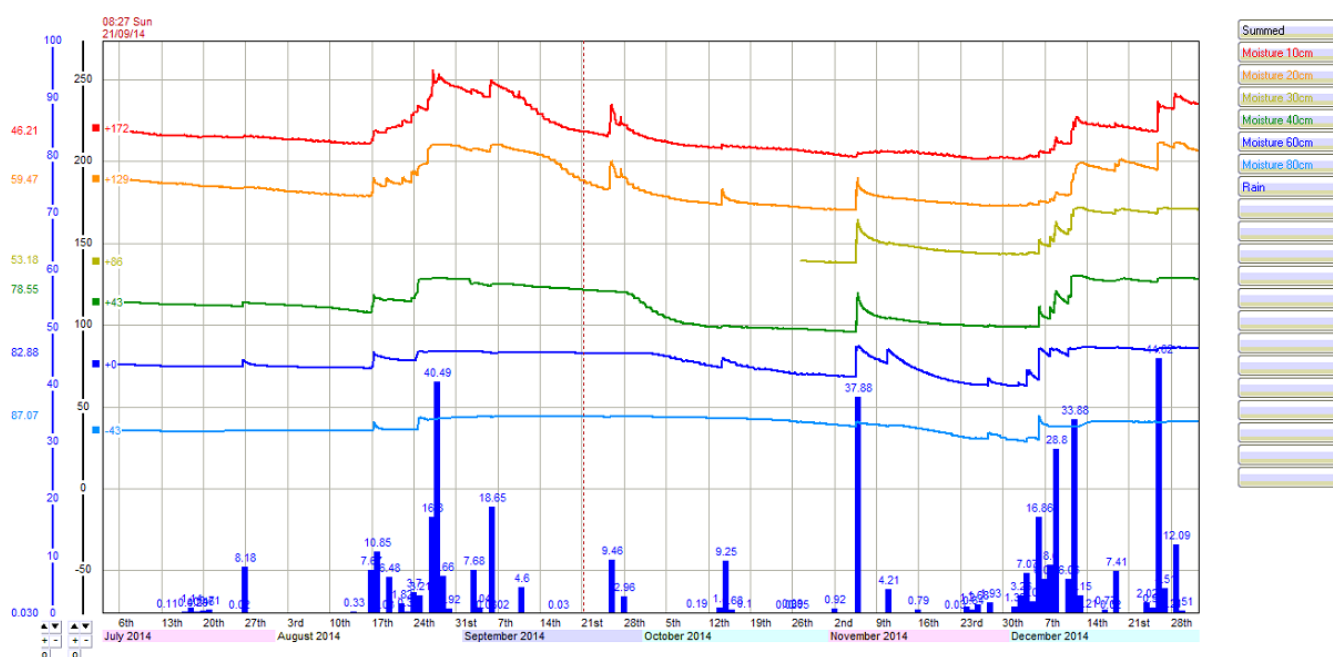


Figure 2-3: Soil moisture monitoring showing wetting and drying periods for MS1 (control, outside irrigation area) (5th July – 31st December 2014)

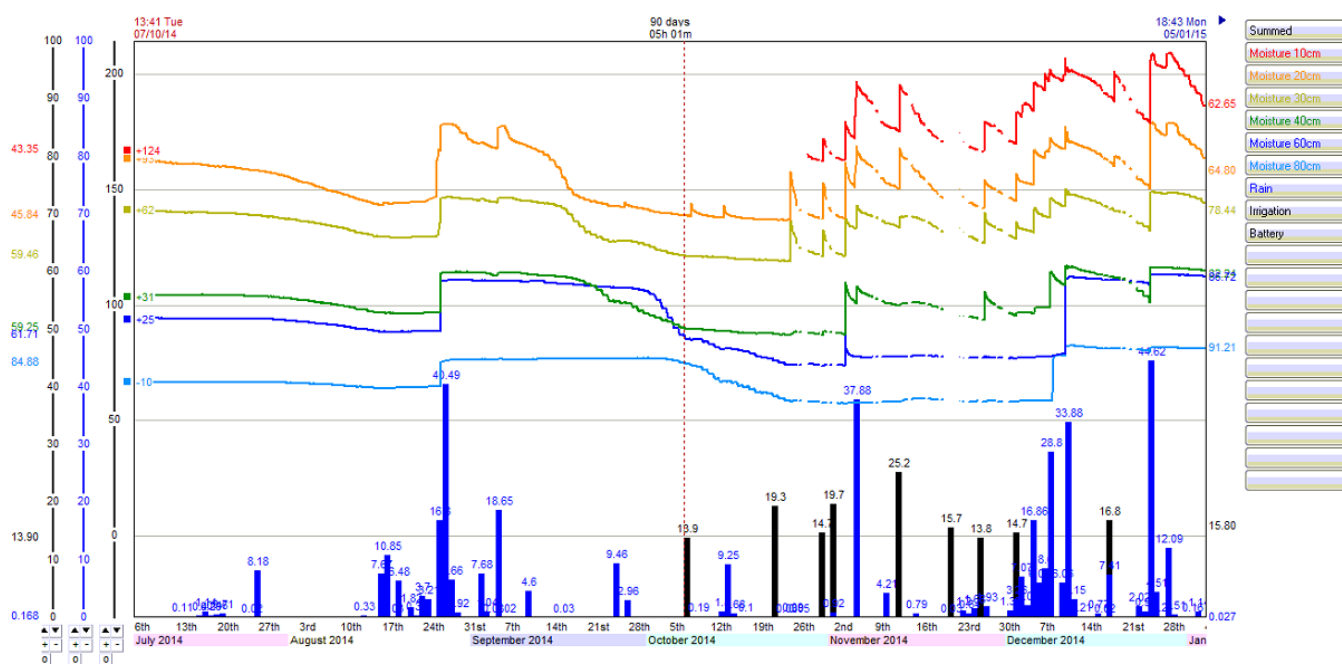


Figure 2-4: Soil moisture monitoring showing wetting and drying periods for MS5 (inside irrigation area) (5th July - 31st December 2014)

2.3.2 Stage 1B

No blended water was applied to Stage 1B from 5th July - 31st December 2014.

2.4 Irrigation water quality

Table 2-2 summarises water quality of the blended water used to irrigate Stage 1A from 5th July - 31st December 2014 (from Parsons Brinckerhoff 2015). The water quality results are from the August 2014 quarterly sampling event and are from the TSD.

The blended water (from August 2014) had an (laboratory) EC of 1570 $\mu\text{S}/\text{cm}$ (1.57 dS/m) which was close to the mixing-model design objective for water quality prior to irrigation (approximately 1500 $\mu\text{S}/\text{cm}$ or 1.5 dS/m). The water monitoring compliance reports utilise the ANZECC (2000) (irrigation) water quality guidelines, which have been adopted as the most appropriate criteria to assess the suitability of blended water for irrigation (pH between 6 and 9).

Sodium (Na^+), nutrients and total organic carbon (TOC) values are discussed further in **Section 2.5.1** with respect to mass balance results and potential impacts on site soils.

Table 2-2: Water quality of the blended water prior to irrigation (sampled from TSD on the 19/8/2014)

Parameter	Units	Value	Parameter	Units	Value
Electrical Conductivity (EC)	$\mu\text{S}/\text{cm}$ or decisiemens (dS)/metre (m)	1570 or 1.57	Iron (Fe various oxidation states)	mg/L	0.46
pH	pH units	8.4	Magnesium (Mg^{2+})	mg/L	3
Chloride (Cl^-)	milligrams (mg)/litre (L)	265	Manganese (Mn^{2+})	mg/L	0.003
Na^+	mg/L	318	Nitrate nitrogen (NO_3^-)	mg/L	0.02
Sodium Adsorption Ratio (SAR)	-	25.3	Total Kjeldahl Nitrogen (TKN)	mg/L	10.2
Total Alkalinity	mg CaCO_3/L	240	Total Phosphorus (total P)	mg/L	1.44
Bicarbonate Alkalinity (HCO_3^-)	mg CaCO_3/L	233	Orthophosphate (PO_4^{3-})	mg/L	<0.01
Carbonate Alkalinity (CO_3^{2-})	mg CaCO_3/L	7	Potassium (K)	mg/L	88
Aluminium (Al^{3+})	mg/L	0.32	Sulfate (SO_4^{2-})	mg/L	128
Boron (B)	mg/L	0.15	Zinc (Zn^{2+})	mg/L	0.021
Calcium (Ca^{2+})	mg/L	7	Total Dissolved Solids (TDS)	mg/L	1070
Copper (Cu^{2+})	mg/L	0.005	Total Organic Carbon (TOC)	mg/L	75
Fluoride (F^-)	mg/L	na			

Note – Water quality analysis sourced from Parsons Brinckerhoff (2015); na – not available

2.5 Sodium, nutrient and carbon balance

The aim of using mass balances was to determine how the Na^+ , nutrient and carbon (C) load in the applied water was accumulating in the receiving soil over time. Mass balance results are presented as mg/kilogram (kg) applied during the reporting period and are compared to soil data to determine changes over time.

2.5.1 Stage 1A

The mass of soil in Stage 1A was calculated as:

$$11.94 \text{ ha} = 119,400 \text{ m}^2 \times 0.333 \text{ m (average treatment depth)} \times 1200 \text{ kg/m}^3 \text{ or grams (g)/cm}^3 \text{ (soil bulk density)}$$

$$= 47,712,240 \text{ kg of soil in Stage 1A.}$$

Table 2-3 provides a summary of mass balances for Na^+ , nitrogen (N) and nitrate (NO_3^-), total phosphorus (total P), and TOC in both water and soil.

Approximately 123 mg/kg of Na^+ has been applied during the reporting period. Soil analysis over this period (discussed in Section 3) indicated that Na^+ ranged from approximately 257 mg/kg to 1499 mg/kg (to 120 cm) with an average of 542 mg/kg (Standard Deviation (SD) = 314). The 123 mg/kg applied during this period increased soil Na^+ compared to Baseline 5 however it is likely to have minor impact on soil structure and water movement through the soil at this time and is discussed in **Section 3.1.2**.

Nitrate nitrogen, total P and TOC have been applied in negligible quantities through irrigation applications during the reporting period.

Table 2-3: Stage 1A mass balance summary for Na^+ , NO_3^- , total N, total P and TOC (5th July - 31st December 2014)

Parameter	TSD Dam WQ (mg/L)	Irrigation (ML)	Total Applied (mg)	Site soil mass (kg)	Total Applied (mg/kg)
Na^+	318	18.48	5,876,640,000	47,712,240	123
NO_3^-	0.02	18.48	369,600	47,712,240	0.0
Total N	10.2	18.48	188,496,000	47,712,240	4.0
Total P	1.44	18.48	26,611,200	47,712,240	0.6
TOC	75	18.48	1,386,000,000	47,712,240	29

2.5.2 Stage 1B

No blended water was applied to Stage 1B from 5th July - 31st December 2014 so there is no mass balance information.

3. Stage 1A soil sampling and analysis

The following sections summarise the findings of the Baseline 6 Soil Study (conducted by Jacobs between 25th and 27th November 2014) and historic data sourced from the existing reports listed in **Section 1.2**, which are also available on the AGL website.

Analysis within the following sections discusses soil conditions against a 'desired range'. The definition of this term is consistent with Hazelton, P. and Murphy, B. (2007), whereby values are based on achieving higher crop yields and optimum conditions. They are not to be interpreted as absolute indicators of soil health.

3.1 Soil Sampling

The soils were sampled at one sampling location per plot (CS1 to CS16) on each of the 16 plots that comprise the Stage 1A area as shown in Attachment 1 (A.1). All soil samples were collected from within the slotted and ameliorated soil profile (where present). Soil samples were collected at 20 centimetres (cm) vertical depth intervals after hand augering to a depth of 1.2 metres (m), or until refusal on rock. Where the plots were slotted, samples were collected from the constructed slots to assess the migration of salts throughout the profile. Table 3-1 presents a summary of the sampling depths reached during hand augering within the Stage 1A area.

Table 3-1 Summary of sampling depths reached for Site 1A locations

Site ID	0 to 20 cm	20 to 40 cm	40 to 60 cm	60 to 80 cm	80 to 100 cm	100 to 120 cm	Comment
CS1	✓	✓	✓	✓	✓	✓	
CS2	✓	✓	✓	✓	✓	✓	
CS3	✓	✓	✓	✓	×	×	Refusal within soil profile
CS4	✓	✓	✓	✓	✓	✓	
CS5	✓	✓	✓	✓	×	×	Refusal within soil profile
CS6	✓	✓	✓	✓	✓	✓	
CS7	✓	✓	✓	✓	✓	×	Refusal within soil profile
CS8	✓	✓	✓	✓	×	×	Refusal within soil profile
CS9	✓	✓	✓	✓	×	×	Refusal within soil profile
CS10	✓	✓	✓	✓	✓ ¹	✓ ¹	Samples lost in transit to lab
CS11	✓	✓	✓	✓	×	×	Refusal within soil profile
CS12	✓	✓	✓	✓	✓	✓	
CS13	✓	✓	✓	✓	✓	✓	
CS14	✓	✓	✓	✓	✓	✓	
CS15	✓	✓	✓	✓	✓	×	Refusal within soil profile
CS16	✓	✓	✓	×	×	×	Refusal within soil profile

Notes: 1. Sampling depth reached, however, soil samples lost in transit to laboratory

The samples were transported to the Eastwest laboratory in Tamworth for analysis. During transportation to the laboratory, two samples (Site 1A CS-10-80-100cm and CS-10-100-120cm) went missing. Results for Plot 10 (CS-10) will therefore be reported up to a depth of 80 cm. Plot 10 did not undergo slotting for the irrigation program, rather soil ameliorant was spread on top to a height of 25 cm. Therefore any soil beneath this will be natural, undisturbed soil.

The soil parameters analysed by Eastwest are listed in Attachment 2 (A.2). A summary of the Stage 1A results is provided in Attachment 3 (A.3). Complete results for the sampling locations are provided in Attachment 4 (A.4).

Comparison of the Baseline 6 and Baseline 5 studies are shown in Attachment 5 (A.5). In addition, Baseline 6 results are also compared against Baseline 1 results (parent soil values).

3.1.1 Salinity

The electrical conductivity (EC_{1:5} soil/water) of a soil is a measure of its soluble salt content (salinity). It may be used to define plant and microbial activity thresholds in addition to being a useful indicator of dispersive clays and poor soil physical properties.

The extent to which salt accumulates in the soil will depend on the degree of leaching, which is controlled by the climatic influences of rainfall and evaporation, and soil permeability. Plant tolerances to salinity vary and will depend on the clay content of the material and the salinity of applied waters (which should be taken into account when using the EC_{1:5} soil/water method of measurement).

Consistent with findings by Fodder King (2014b), the salinity 'spike' resulting from the use of compost and the mixing of horizons in the parent soil has subsided. Importantly, the average EC_{1:5} for Baseline 6 indicate a decrease in EC_{1:5} at all depths greater than 20 cm compared to Baseline 5 results (refer to **Figure 3-1** and **Figure 3-2**). Hand augering at site CS3 during Baseline 6 activities reached refusal at the 60 to 80 cm sampling interval. CS3 (within Plot 3) is known to contain large amounts of rock, which in this instance inhibited sampling at the 80 to 100 cm and 100 to 120 cm intervals within the soil profile. The results up to 80 cm indicates a reduction in EC through the soil profile.

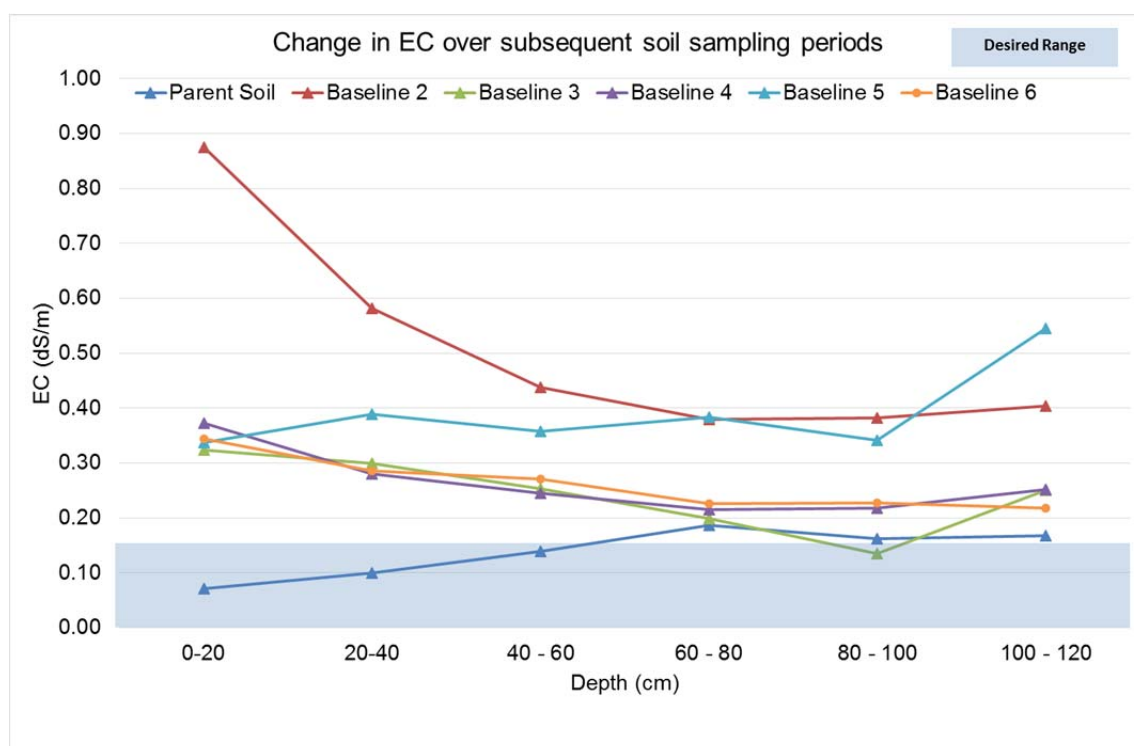


Figure 3-1: Change in (average) EC for all sites over subsequent sampling periods

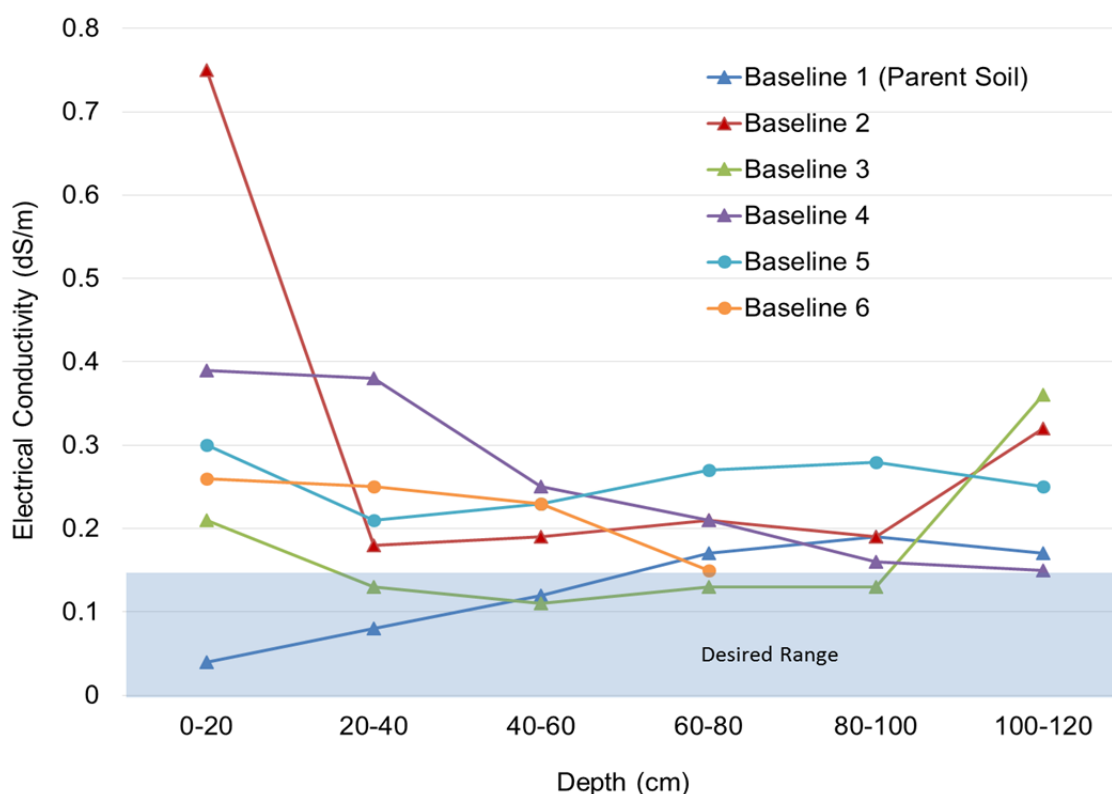


Figure 3-2 Change in EC for site CS3 (treatment depth = 120 cm) over subsequent sampling periods

3.1.1.1 Soluble chloride

The relative proportion of soluble chloride helps assess the response of saline (and alkaline) soils to the applied treatments. The chloride anion (Cl^-) is usually present in soil in association with Na^+ . Its high mobility makes it a valuable indicator of the direction of salt and water movement.

Plant growth may also be inhibited by either high absolute levels or a high proportion (relative levels) of “salts” in solution. These effects may be evidenced at levels below those that would affect plant growth from a high total soluble salt concentration. Where gypsum is present Cl^- is a more robust indicator of salinity than EC. The Cl^- values for the Stage 1A samples were well below the 800 mg/kg threshold above which plant growth may be affected.

3.1.2 Sodium and exchangeable sodium percentage

The exchangeable sodium percentage (ESP) is defined as the proportion of Na^+ in relation to total exchangeable cations, or cation exchange capacity (CEC) and is considered an indicator for sodic (potentially dispersive) soils. The ESP can be measured, however, it is also easily calculated using the following equation:

$$ESP = \text{Exchangeable Na}^+ (\text{meq/100 g}) / \text{CEC} (\text{meq/100 g}) \times 100$$

High levels of exchangeable Na^+ (sodicity) are typically a consequence of widespread salt accumulation in the landscape, however not all sodic soils are saline. Sodic materials that are low in salt are most susceptible to dispersion (Shaw, 1999), resulting in a decrease in soil permeability and porosity. This general degradation of soil physical condition (structure) will limit the movement of air, water and nutrients in the soil as well as inhibit pasture and crop root growth. The soils beneath the Stage 1A irrigation area are naturally sodic and saline (Fodder King, 2012).

Compared to Baseline 5 results, the average Na^+ values have increased in all the Stage 1A soils at all depths. As a result, the ESPs have also increased and were above what is considered the desirable level of 6 % to 80 cm depth (refer to the composite changes shown in **Figure 3-3**). Although an $\text{ESP} > 6$ is a general indication that the soil is sodic, dispersion, and the onset of adverse effects on the soil physical condition, has been shown to occur in soils with an ESP of 5 or less (Rengasamy and Churchman, 1999).

With the exception of the parent soil, the ESP increased from Baseline 5 results at all depths, and exceed the Baseline 1 values (parent soil). Additional soil monitoring after a series of large rainfall events will clarify the effectiveness of deep leaching due to rainfall. A succession of large rainfall events did not occur during the monitoring period (the soil sampling for this period occurred between 25th and 27th November 2014 before the early December rainfall event).

In addition to the electrolyte concentration of any irrigation waters, the effect of ESP on clay dispersion is also influenced by other soil properties such as organic matter content, clay mineralogy, cations, and oxide content (Rengasamy and Churchman 1999; McKenzie et al. 2004). Excessively high or low concentrations of Na^+ may affect the nutritional requirements of germinating plants.

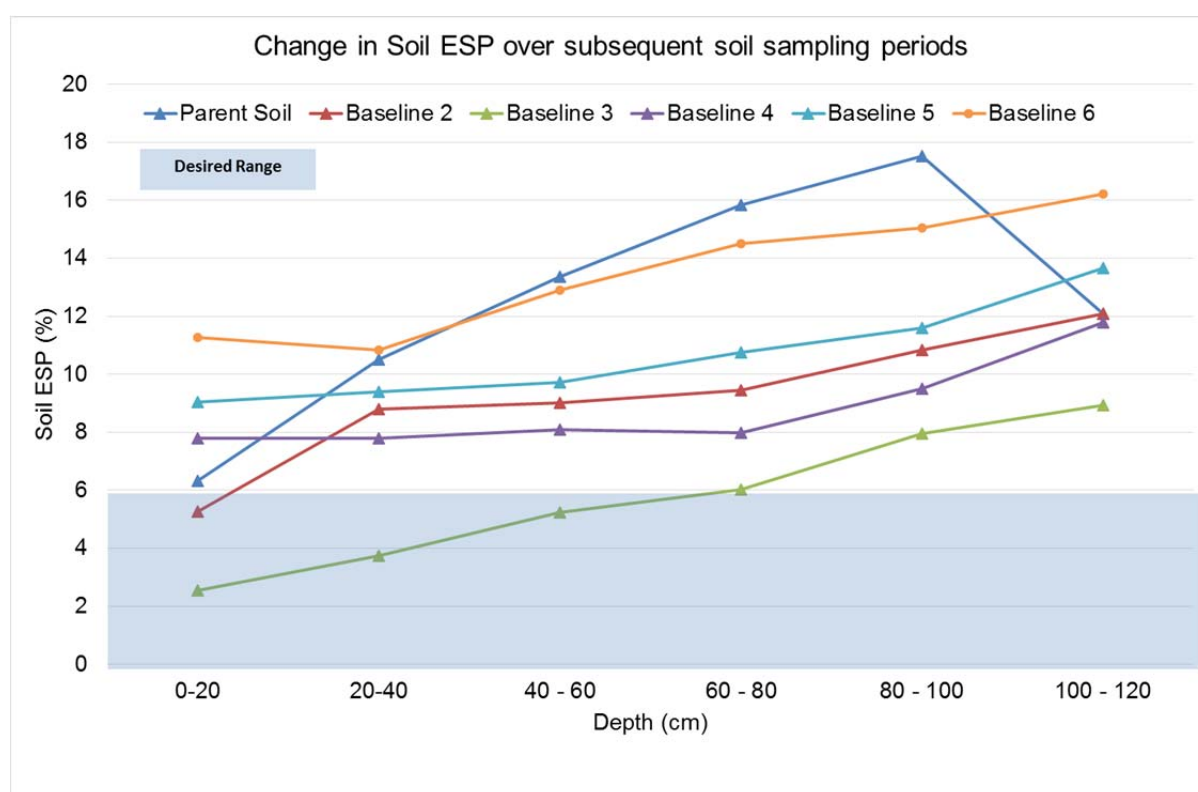


Figure 3-3: Change in (average) ESP for all sites over subsequent soil sampling periods

3.1.3 Nitrate nitrogen

Nitrogen (N) occurs in several (immobile) forms in soil and generally has to be in a mineralised (mobile) form for plant uptake. Nitrification, the conversion of ammonium-N (NH_4^+) to highly mobile nitrate-N (NO_3^-) via nitrite-N (NO_2^-) is performed primarily by soil-living bacteria. In addition to converting immobile N into an available N, the conversion of nitrites to nitrates is important because the accumulation of nitrites in soil is toxic to plants. Nitrate-N is the dominant source of soil mineral N and is commonly used to estimate plant-available N.

The NO_3^- levels below 20 cm depth at all sites are low (averaging 5 mg/kg), due to crop uptake however, it is important to note that NO_3^- levels of soil materials may fluctuate widely, depending on rainfall, the season (time of sampling), and depth over which the sample is taken. Generally, NO_3^- levels less than 8 mg/kg would be considered low and respond favourably to a nitrogenous fertiliser for cropping (Hazelton and Murphy 2007).

3.1.4 Calcium and magnesium

Compared to Baseline 5 results, calcium (Ca^{2+}) levels, and Ca:Mg ratios (calculated as mg/kg) have decreased in for the Stage 1A soils at all depths. Coupled with increasing Na^+ levels, this has contributed to increasing soil ESP. The average Ca:Mg for the 0-20 cm depth samples is 1.2 mg/kg. The average for the >20 cm samples is extremely low at 0.28 mg/kg. A Ca:Mg of around 2 is considered to represent the minimum requirement, and 3 to 6 is optimal for plant growth. Gypsum is an effective method of raising low Ca^{2+} , but the Ca:Mg balance must be maintained.

As with most soil amendments, incorporation of gypsum requires specific attention. Because it is soluble in water, gypsum will move into the soil with rain or irrigation water. The purity (sulphur content) and water content of the gypsum to be applied will dictate the depth of incorporation, and application rate, as will the fineness and Cl^- content (Hazelton and Murphy 2007).

3.1.5 Effective cation exchange capacity

The amounts and relative proportions of the exchangeable cations (Na^+ , Ca^{2+} , K^+ , Mg^{2+} , Al^{3+} and H^+) in soil have important effects on both soil physical and soil chemical properties. As previously discussed, high levels of exchangeable Na^+ will result in clay dispersion, reducing water movement and affecting near-surface aeration. In contrast, exchangeable Ca^{2+} flocculates colloids and will reduce dispersive tendencies. Excessively high or low concentrations of one or the other of the cations may result in nutritional disturbances to germinating plants.

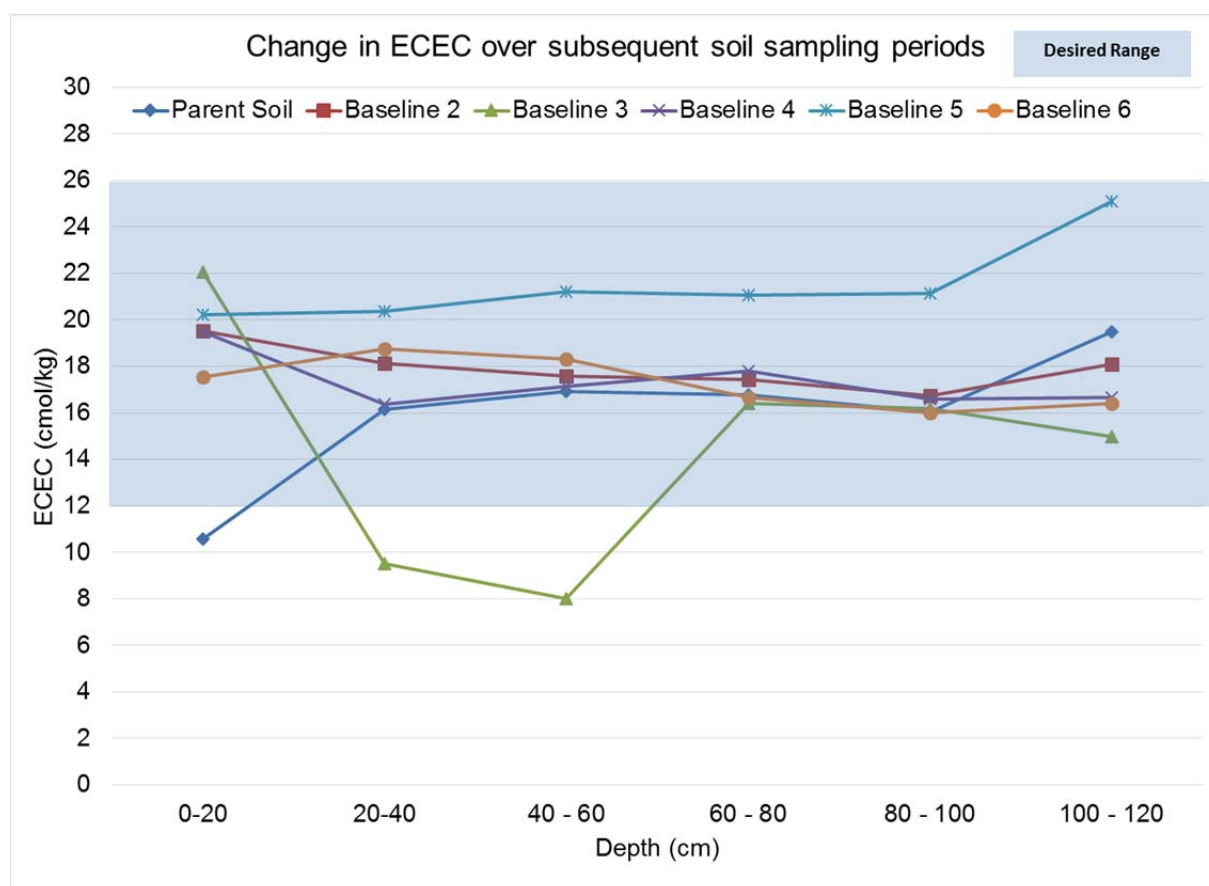


Figure 3-4: Change in (average) ECEC for all sites over subsequent sampling periods

The total amount of exchangeable cations that can be held by a soil is designated by the effective cation exchange capacity (ECEC). Since the Baseline 4 study, the ECECs of the Stage 1A soils have stabilised near the surface and are, on average, moderate (12-25 millequivalents (meq)/100 g) at all sites (and throughout the

soil profile) due to the addition of lime after Baseline 2 (refer to **Figure 3-4**). Baseline 3 results at 20-40 cm and 40-60 cm depth are the exception at 8 and 10 meq/100 g, but would still be considered moderate.

Assessment of Baseline 5 against Baseline 6 (and previous Baselines) indicates a higher level of ECEC at the majority of depth intervals. This is likely caused by the addition of lime after Baseline 2 washing through the soil profile. It is likely that by Baseline 6, Ca^{2+} concentrations have depleted causing ECEC to reduce. The reduction in Ca^{2+} between Baseline 5 and Baseline 6 can be seen in Table 3-2 results.

3.1.6 Soil structure

Soil amendment and application of blended water has the potential to impact on soil structure. Close scrutiny has been applied to the TIP with respect to maintaining soil structure and monitoring changes in soil chemistry and the water quality of applied waters (irrigation and rainfall).

Maintenance of soil structure can be interpreted from the leaching dynamics between each of the soil sampling campaigns. For example, the first 6 columns (in blue) in **Table 3-2** show average results for Baseline 1 (B1), Baseline 2 (B2), Baseline 3 (B3), Baseline 4 (B4), Baseline 5 (B5) and Baseline 6 (B6). The 6 middle columns (in yellow) show the relative difference between each Baseline soil survey. The last 6 columns (in grey) show the relative difference between each Baseline compared to Baseline 1 (parent soil).

Table 3-2 indicates that, when compared to B1, Na^+ generally decreased for B2 and B3 then increased in B4, B5 and B6. Similar trends can be observed in the soil ESP results which are a result of the balance between Na^+ and Ca^{2+} and Mg^{2+} . Calcium has decreased throughout the profile and, by proxy, has increased soil ESP. There is a trend in increasing soil ESP which can be seen in the grey columns, that is, the difference between the baseline surveys and the parent soil is decreasing as more Na^+ is applied through irrigation.

Another key to maintaining soil structure is the SAR of applied waters (irrigation and rainfall) and the subsequent impact on clay dispersion or flocculation. Clay dispersion is one end of diffuse double layer (DDL) theory where clay particles separate into single platelets; clay particle flocculation is where many platelets align together to form clusters. Both depend on the electrolyte concentration of the applied waters and the antecedent ESP of the receiving soil (refer Chapter 2 in Lucas 2009).

The degree of clay dispersion that may occur has a direct effect on permeability and, as a result, downward soil water movement. Therefore maintaining clay (micro-aggregate) stability will promote suitable infiltration rates. Lucas (2009) describes the soil ESP/effluent SAR continuum for micro-aggregate/soil pore stability which predicts clay particle behaviour in a soil of known ESP and irrigated with a water of known SAR.

Different electrolyte concentrations from blended irrigation water and from rainfall will initiate changes in clay particle behaviour (flocculation to dispersion) in the receiving soil over time. For example, the average soil ESP in the upper 40 cm of the soil profile was 9.2 in Baseline 5. The SAR of irrigation waters was approximately 12.9 during the same period. For Baseline 6, the average soil ESP in the upper 40cm of the soil profile has increased to 11.05. The SAR of the irrigation water was approximately 25.2 for this period. Based on the equation in **Figure 3-5**, the threshold concentration (C_{TH}) that maintains micro-aggregate stability would be:

Baseline 5 - $C_{TH} = (0.56 \times 9.2) + (0.6) = 5.8$; and Baseline 6 - $C_{TH} = (0.56 \times 11.05) + (0.6) = 6.8$

Note that the $\text{ESP} = \text{SAR}$ between 0-32 and soil ESP is used in the equations in **Figure 3-3**. The applied blended water with a SAR of 12.9 and 25.2 exceeds the C_{TH} indicating that while soil structure would be maintained there would be a small (expected) decrease in infiltration rate.

Since the beginning of the irrigation program and in view of (recent) increasing soil ESP at the site, a key question is: *Has soil structure been significantly altered?* **Figure 3-6** conceptually shows the predicted susceptibility of clay dispersion (loss of soil structure) over time from irrigation with blended water and rainfall.

Table 3-2: Leaching dynamics between Baseline Soil Studies

Changes in Na (mg/kg)		B1	B2	B3	B4	B5	B6	B2-B1	B3-B2	B4-B3	B5-B4	B6-B5	B2-B1	B3-B1	B4-B1	B5-B1	B6-B1
cm																	
0-20		135	239	128	342	407	445	104	-111	213	66	38	104	-7	207	272	310
20-40		381	356	153	273	423	464	-25	-203	121	150	41	-25	-228	-108	42	83
40 - 60		527	361	181	306	464	551	-166	-180	125	158	86	-166	-346	-221	-63	24
60 - 80		606	383	220	331	524	563	-223	-163	112	193	39	-223	-387	-275	-82	-43
80 - 100		643	426	298	367	567	570	-217	-129	69	201	3	-217	-345	-276	-76	-73
100 - 120		624	501	308	456	784	652	-123	-193	148	328	-132	-123	-316	-168	160	28
Changes in ESP (%)		B1	B2	B3	B4	B5	B6	B2-B1	B3-B2	B4-B3	B5-B4	B6-B5	B2-B1	B3-B1	B4-B1	B5-B1	B6-B1
cm																	
0-20		6.2	5.3	2.5	7.8	9.0	11.3	-0.9	-2.8	5.2	1.3	2	-0.9	-3.7	1.6	2.8	5
20-40		10.5	8.6	3.8	7.8	9.4	10.8	-1.9	-4.8	4.0	1.6	1	-1.9	-6.7	-2.7	-1.1	0
40 - 60		13.5	8.9	5.2	8.1	9.7	12.9	-4.6	-3.7	2.9	1.6	3	-4.6	-8.3	-5.4	-3.8	-1
60 - 80		15.7	9.6	6.0	8.0	10.8	14.5	-6.1	-3.5	2.0	2.8	4	-6.1	-9.7	-7.7	-5.0	-1
80 - 100		17.4	11.1	7.9	9.5	11.6	15.1	-6.4	-3.1	1.6	2.1	3	-6.4	-9.5	-7.9	-5.8	-2
100 - 120		13.9	12.0	8.9	11.8	13.7	16.2	-1.9	-3.1	2.9	1.9	3	-1.9	-5.0	-2.2	-0.3	2
Changes in Ca (mg/kg)		B1	B2	B3	B4	B5	B6	B2-B1	B3-B2	B4-B3	B5-B4	B6-B5	B2-B1	B3-B1	B4-B1	B5-B1	B6-B1
cm																	
0-20		570	2364	2981	2351	2439	1499	1794	617	-630	88	-940	1794	2411	1781	1869	929
20-40		360	1456	2094	1586	1783	623	1096	638	-508	197	-1159	1096	1734	1226	1423	263
40 - 60		259	1243	1385	1361	1421	347	984	142	-25	60	-1074	984	1126	1102	1161	88
60 - 80		292	1088	1075	1219	1420	271	796	-14	144	201	-1150	796	783	927	1128	-21
80 - 100		165	943	443	1106	1249	257	779	-500	663	143	-992	779	278	941	1084	92
100 - 120		147	903	370	897	1773	256	756	-533	527	876	-1517	756	223	750	1626	109
Changes in Mg (mg/kg)		B1	B2	B3	B4	B5	B6	B2-B1	B3-B2	B4-B3	B5-B4	B6-B5	B2-B1	B3-B1	B4-B1	B5-B1	B6-B1
cm																	
0-20		625	1135	688	655	664	814	510	-447	-33	8	151	1135	687	655	39	189
20-40		1360	1337	801	797	1077	1229	-23	-536	-4	280	152	1337	801	797	-283	-131
40 - 60		1520	1507	884	982	1281	1329	-12	-623	98	299	47	1507	884	982	-239	-191
60 - 80		1449	1519	1033	1087	1262	1251	71	-487	54	176	-12	1519	1032	1087	-186	-198
80 - 100		1420	1446	1279	1089	1369	1195	26	-168	-190	280	-174	1446	1279	1089	-51	-225
100 - 120		1360	1434	1183	1195	1491	1271	74	-252	13	296	-221	1434	1183	1195	131	-90
Changes in Ca/Mg		B1	B2	B3	B4	B5	B6	B2-B1	B3-B2	B4-B3	B5-B4	B6-B5	B2-B1	B3-B1	B4-B1	B5-B1	B6-B1
cm																	
0-20		0.7	2.1	2.8	2.3	2.3	1.2	1.5	0.7	-0.6	0.1	-1.1	1.5	2.2	1.6	1.7	0.6
20-40		0.2	0.9	1.8	1.4	1.1	0.3	0.8	0.9	-0.4	-0.3	-0.7	0.8	1.6	1.3	0.9	0.2
40 - 60		0.1	0.8	1.0	0.9	0.7	0.2	0.7	0.2	-0.1	-0.3	-0.5	0.7	0.9	0.8	0.6	0.1
60 - 80		0.1	0.7	0.7	0.8	0.7	0.1	0.6	0.0	0.1	-0.1	-0.5	0.6	0.6	0.7	0.5	0.0
80 - 100		0.1	0.6	0.2	0.8	0.5	0.1	0.5	-0.4	0.6	-0.2	-0.4	0.5	0.2	0.7	0.5	0.0
100 - 120		0.1	0.4	0.2	0.5	0.7	0.1	0.4	-0.2	0.3	0.2	-0.6	0.4	0.1	0.4	0.6	0.1
Rainfall (mm)		528	82	113	273	213	470	82	113	273	213	470	82	113	273	213	470
Irrigation (mm)		0	0	39	276	187	154	0	39	276	187	154	0	39	276	187	154

Key: B1 = Baseline 1 soil sampling (parent soil), B2 = Baseline 2 soil sampling, B3 = Baseline 3 soil sampling, B4 = Baseline 4 soil sampling, B5 = Baseline 5 soil sampling, B6 = Baseline 6 soil sampling

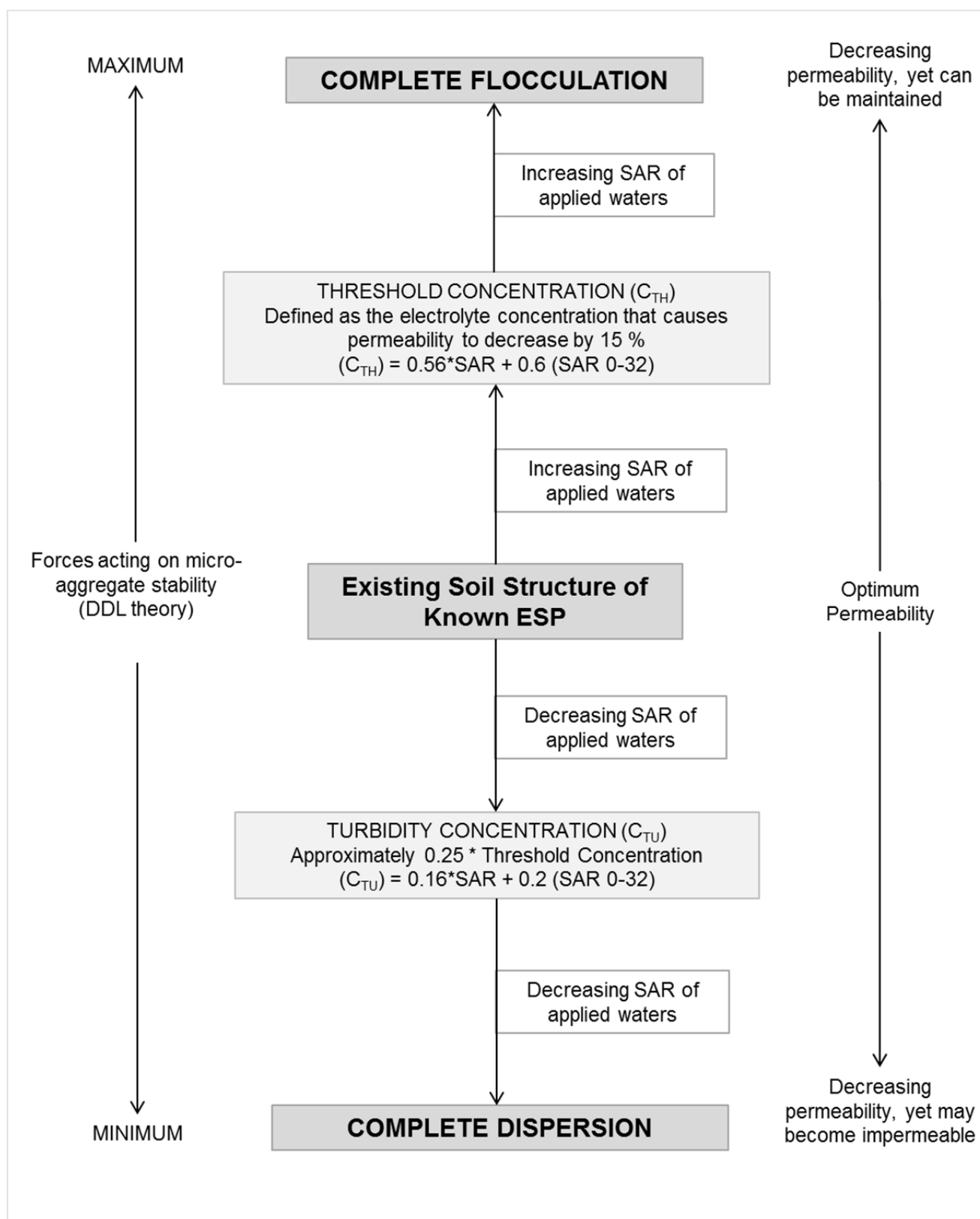


Figure 3-5: Soil ESP/effluent SAR continuum for micro-aggregate/soil pore stability (from Lucas 2009)

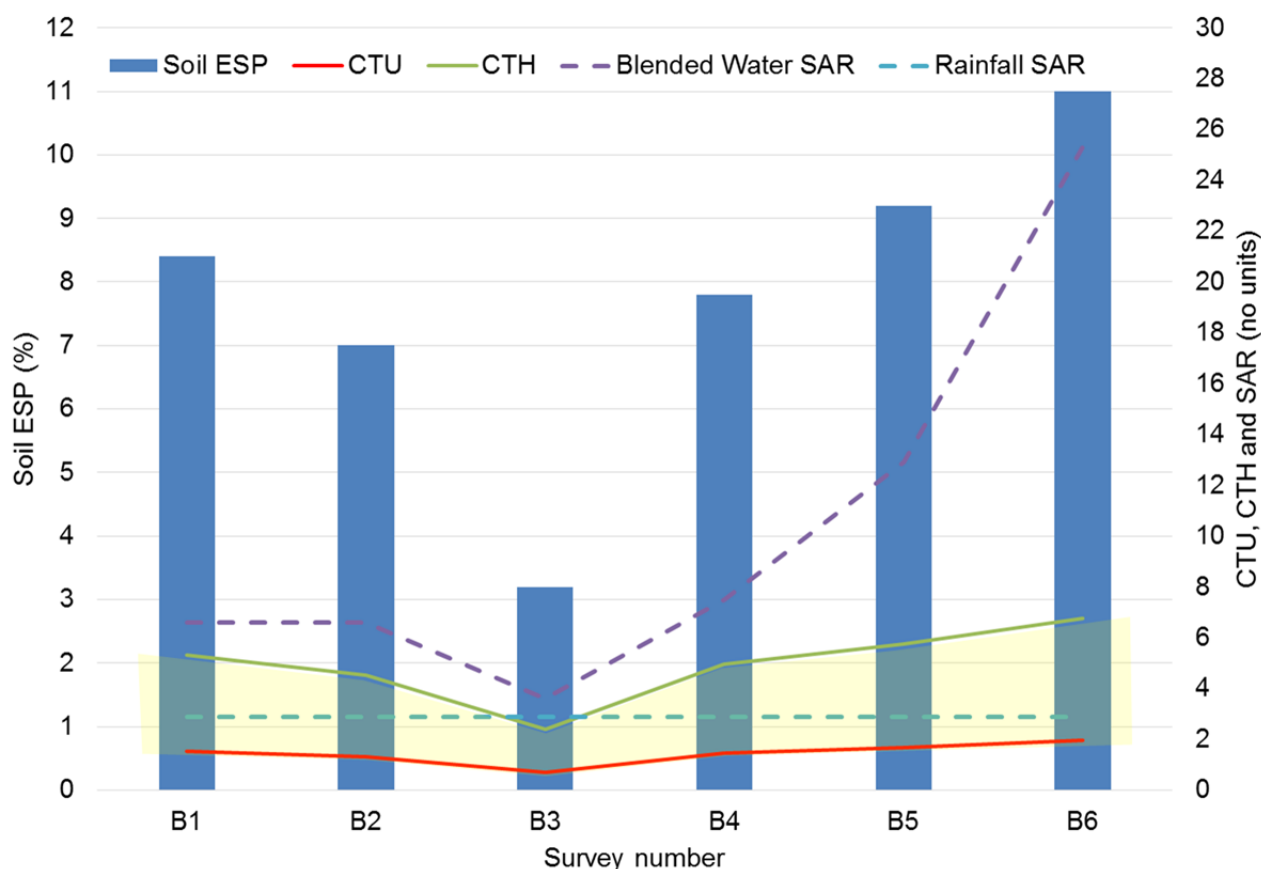


Figure 3-6: Conceptualisation of predicted susceptibility of clay dispersion from irrigation with blended CSG water and rainfall

How to read the graph (**Figure 3-6**):

1. Both the C_{TU} and C_{TH} lines will move up or down dependent on soil ESP, but the C_{TH} will always be above the C_{TU} and provides a “zone” of optimum permeability (light yellow shading) and stable soil structure;
2. Blended water SAR is highly variable while rainfall SAR remains relatively constant. Note: Rainfall will cause the most damage to a high ESP soil (> 18 in this case as the C_{TU} and rainfall SAR would then be the same and dispersion will follow);
3. At current soil ESP values the soil structure is being maintained but towards the C_{TH} end of the continuum. Further increases in soil ESP will trend towards poorer soil structure under the existing irrigation/rainfall regime.

The columns represent soil ESP at 0 - 40 cm depth, and are an average of all soil sites (CS1 – CS16). The C_{TU} (red solid line) and C_{TH} (green solid line) are based on soil ESP and equations in **Figure 3-5** and, similar to soil ESP, also fluctuate over time. The purple dotted line represents the SAR of blended water applied to the site (variable SAR) and the light blue dotted line represents the SAR of rainfall (relatively constant SAR).

If Na^+ is allowed to accumulate over time, the soil ESP would gradually rise and micro-aggregate/soil pore stability would be reflected in the changing C_{TH} and C_{TU} . For example, if soil ESP increased to 20 % in the upper 40 cm of the soil profile then the corresponding C_{TH} and C_{TU} would be 12.6 and 4.2. This means that rainfall would cause complete dispersion of surface micro-aggregates that would block soil pore spaces and severely reduce infiltration in the upper 10 cm of the soil profile.

It is important to note that as ESP increases, the electrolyte concentration of the applied solution must also increase to maintain optimum permeability. Discussion of these processes has been previously provided in Fodder King (2014a).

The soil structure in Stage 1A has significantly improved from the amendments (Baseline 2) however increasing soil ESP trends should be addressed in the near future (for example through a leaching management strategy and/or application of gypsum).

3.1.7 Summary of other analyses

3.1.7.1 Total organic carbon

The organic components of the soil are important in maintaining soil structure, in slightly increasing the soil's water holding capacity, and holding a small store of N, P, S and trace elements in organic forms. The total organic carbon (TOC) of the Stage 1A soils range from moderate (1.0 to 1.8 %) to high (1.8 – 3.0 %) with an average of 1.4 %.

3.1.7.2 Phosphorus (Colwell)

Phosphorus is essential to both plants and animals (particularly microorganisms) and exists in various forms in the soil. Extractable phosphorus (P) defines the labile (water soluble) P in soils that is readily available for plant absorption. The availability of P will have a significant impact on crop and pasture establishment on the Stage 1A and Stage 1B land areas, being particularly important for establishing roots. The P levels in the Stage 1A soils are very high in the surface (averaging 67 mg/kg) samples (0- 20 cm) and moderate to high at depth (averaging 23 mg/kg below 20 cm).

3.2 Soil Water

Soil water is monitored via the paired piezometers within and surrounding the Stage 1A irrigation area. This is not groundwater as the regional water table is deeper (more detail is presented in Parsons Brinckerhoff, 2015). AGL and PB have advised that no water was present in the dual piezometers when inspected during the routine November 2014 sampling event.

The lack of soil water suggests that there was high evapotranspiration and “deficit irrigation” was effective.

4. Stage 1B soil sampling and analysis

Stage 1B land area has no previous history of cropping or substantial soil improvement, although improved pasture was briefly irrigated in 2009 when small amounts of produced water were irrigated under an earlier REF approval (details provided in AGL 2010). Some soil sampling and monitoring was completed as part of this earlier irrigation program.

The Stage 1B irrigation area is approximately 4.0 ha and is located to the south of the Stage 1A area. Even though a larger area was nominated in the SQMMP, the larger Stage 1B area has never been irrigated under the current program. The Stage 1B irrigation area (actual and originally proposed) is shown in Attachment 6 (A.6).

The Stage 1B area includes 10 sampling locations (CS17 to CS26) in its western zone, and three locations (CS27 to CS29) in its southern zone (as outlined in the SQMMP and the TIP EPL conditions). Soil samples were collected using a hand auger (to 120 cm soil depth) in order to minimise disturbance. The samples were collected on the 25th November 2014 and combined to create composite samples (in accordance with the EPL condition). Soil samples were collected at 20 centimetres (cm) vertical depth intervals after hand augering to a depth of 1.2 metres (m), or until refusal on rock. Each 20 cm interval sample was combined with the corresponding samples for the other Site IDs on a plastic tarp and mixed thoroughly. A sample representative of all sites at the 20 cm interval was packaged and analysed. This is the sampling approach defined as 'Special Method 6' in EPL 20358 (Condition M2.5).

Table 4-1 presents a summary of the depth reached for each location in the Site 1B area.

Table 4-1 Summary of sampling depth reached for Site 1B locations

Site ID	0 to 20 cm	20 to 40 cm	40 to 60 cm	60 to 80 cm	80 to 100 cm	100 to 120 cm	Comment
	Composite 1	Composite 2	Composite 3	Composite 4	Composite 5	Composite 6	
CS17	✓	✓	✓	✓	✓	×	Refusal within soil profile
CS18	✓	✓	✓	✓	✓	✓	
CS19	✓	✓	✓	✓	×	×	Refusal within soil profile
CS20	✓	✓	✓	✓	×	×	Refusal within soil profile
CS21	✓	✓	✓	✓	×	×	Refusal within soil profile
CS22	✓	✓	✓	✓	✓	✓	
CS23	✓	✓	✓	✓	✓	×	Refusal within soil profile
CS24	✓	✓	✓	✓	✓	✓	
CS25	✓	✓	✓	✓	×	×	Refusal within soil profile
CS26	✓	✓	✓	✓	✓	✓	
CS27	✓	✓	✓	✓	×	×	Refusal within soil profile
CS28	✓	✓	✓	✓	✓	✓	
CS29	✓	✓	✓	✓	✓	✓	

The summarised soil test results are shown in Attachment 7 (A.7). Full sample results from each of the sampling locations in Stage 1B can be found in Attachment 4 (A.4).

Note that no blended water was applied to the Stage 1B area from 5th July – 31st December 2014.

Summary of key findings – November 2014 (Baseline 6) vs May 2014 (Baseline 5)

November 2014 (non-irrigated soils) vs May 2014 (irrigated soils) key findings include (to 20 cm depth):

- Decrease in soil EC (0.24 to 0.14 dS/cm)
- Decrease in soil pH (CaCl₂) (5.4 to 4.6)
- Decrease in soil ESP (16.7 % to 11.3 %)
- Organic C decreased from 2.9 % to 0.9 %
- Ca²⁺ decreased from 1056 to 695 mg/kg
- ECEC slightly decreased from 11.4 to 10.1 meq/100g

These decreases in shallow soil attributes are likely due to zero blended irrigation water while 417 mm of rainfall occurred from 5th July – 31st December 2014.

Summary of key findings – November 2014 (Baseline 6) vs April 2013 (parent soil) (Baseline 1)

November 2014 vs April 2013 (parent soil) key findings include (to 20 cm):

- Decrease in soil EC (0.21 to 0.14 dS/cm)
- Negligible change in soil pH (CaCl₂) (4.6 to 4.6)
- Decrease in soil ESP (17 % to 11.3 %)
- Organic C decreased from 2.8 % to 0.9 %
- Ca²⁺ increased from 431 to 695 mg/kg due to lime addition
- ECEC increased from 6.3 to 10.1 meq/100g

5. Conclusions

For the Reporting Period 5th July to 31st December, Stage 1A was the primary focus of the Tiedman Irrigation Program. During this reporting period, water balance calculations show that 27% of the water applied to the Stage 1A area was blended water while 73% was natural rainfall. No blended water was applied to the Stage 1B area. The conclusions from the November 2014 soil sampling program for the Reporting Period 5th July to 31st December are as follows. Results are compared to the Baseline 5 event (previous 6-monthly period):

5.1 Stage 1A area

- 18.5 ML of blended water was irrigated during the reporting period;
- Water balance management and environmental protective measures resulted in all the blended water being utilised within the irrigation area;
- Salinity (EC_{1:5}) has decreased at depths greater than 20cm across all soil sampling sites, though salinity remains above the parent levels;
- Sodium (Na⁺) concentrations have increased at depths greater than 20 cm across all soil sampling sites with no obvious adverse effect on soil structure;
- Exchangeable sodium percentage (ESP) has increased indicating that, while Na⁺ is mobilising through the profiles, movement may be limited by the decreased permeability of the subsoils;
- Calcium (Ca²⁺) has decreased (as has Ca:Mg) and magnesium (Mg⁺) has remained stable;
- The net mass balance indicates salts are gradually accumulating in the soil profile. However, this is likely to reduce with the decrease in irrigation operations over the next 12 months;
- There is no evidence of adverse effects to soil structure caused by the irrigation with blended water.

5.2 Stage 1B area

- Zero blended water was applied during the reporting period;
- Salinity (EC_{1:5}) has decreased across all soil sampling sites at shallow soil depths (0-20 cm);
- A drop in Ca²⁺ levels of approximately 50 % has occurred;
- A decrease in ESP has occurred;
- A decrease in soil pH_{Ca} of one pH unit has occurred;
- A drop in TOC of over 60 % to 0.9 % has occurred.

These decreases in shallow soil attributes are likely due to zero blended irrigation water being applied while 417 mm of rainfall occurred during the period from 5th July – 31st December 2014.

5.3 Recommendations

Gypsum application should be undertaken at the Site1A irrigation area to improve the Ca²⁺ levels within the soil profile. The amount (i.e. kg/ha) should be determined and undertaken within the next six months if irrigation practices are to continue at Site 1A. Monitoring is to continue as per conditions associated with the approved CSG exploration, assessment and production activities across the Gloucester Gas Project (GGP).

Site 1B does not require treatment if irrigation practices are not occurring within the area. Monitoring should continue as per conditions associated with the CSG exploration approvals for the TIP (REF approvals and EPL conditions).

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- Rengasamy, P. and Churchman G. J. (1999) Cation exchange capacity, exchangeable cations and sodicity. In 'Soil analysis and interpretation manual'. (Eds K Peverill, et al.) pp. 35–50. (CSIRO Publishing: Melbourne)

Attachments

Attachment 1 (**A.1**) Stage 1A Plot Layout and Soil Monitoring Locations

Attachment 2 (**A.2**) Soil Parameters Measured for the Baseline 6 Soil Study

Attachment 3 (**A.3**) Stage 1A Baseline 6 Soil Study Results (25th-27th November 2014) Summary for Reporting Period 5th July – 31st December 2014

Attachment 4 (**A.4**) Soil Sampling Results Raw Data

Attachment 5 (**A.5**) Comparison of Baseline Soil Study Results (November 2014)

Attachment 5 (**A.6**) Stage 1B Plot Layout

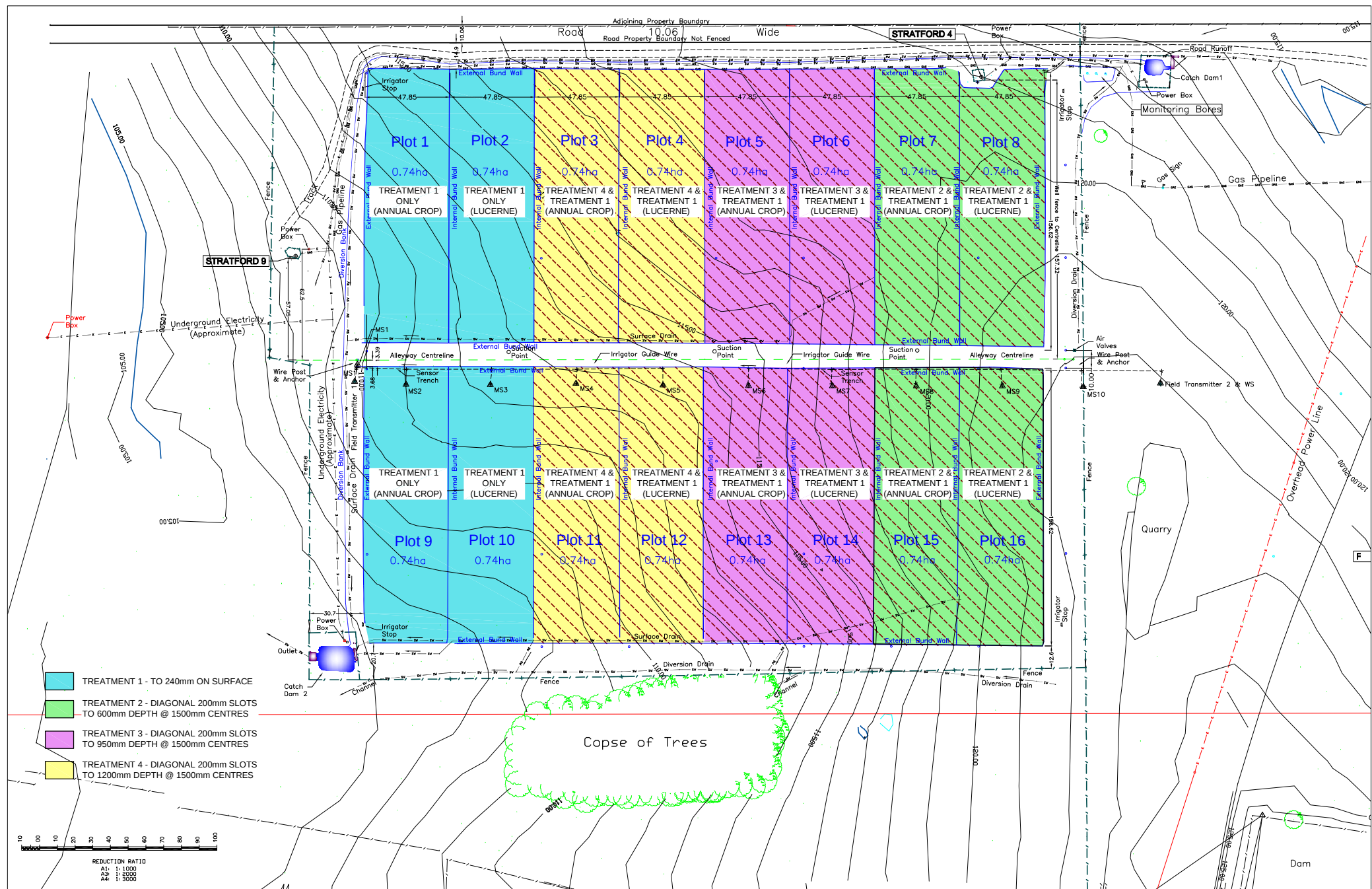
Attachment 6 (**A.7**) Stage 1B Baseline 6 Soil Study Results (25th-27th November 2014) Summary for Reporting Period 5th July – 31st December 2014

A.1 Stage 1A Plot Layout



Legend

● Stage 1A Soil Sampling Locations □ Stage 1A Irrigation Areas



Plot Date: 7 May 2013
J:\2012\12161 Fetterplace Civil, AGL site, Gloucester\ACAD\WAE\12161 AGL WAE v01 2013-05-08.dwg

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D 6-May-13	FINAL WAE (BY FODDER KING AND AGL)	FK	FK
C 24-Apr-13	SPLIT SHEET 01	FK	FK
B 5-Apr-13	PLOT AREA TEXT	FK	FK
A 7-Feb-13	INITIAL ISSUE	MH	MH
Rv	DATE	REVISIONS	REC. APPR.

SURVEY: M Hanlon	A1	DATUM: AHD
DESIGN: M Hanlon	ORIGIN: PM55266 RL 124.736	CONTOUR INTERVAL: 0.25m
DRAWN: M Hanlon	APPROVED: PROJ MAN	
CHECKED: M Hanlon		
SURVEY FILE: Gloucester\12161\WAE Survey 2012-12-20.dwg		

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Natural Resources
Planning
Surveying
Civil Engineering
Environmental Engineering

CLIENT: FODDER KING & FETTERPLACE CIVIL
PROJECT: AGL - GLOUCESTER - IRRIGATION TEST PLOT
TIEDMANS IRRIGATION TRIAL
STAGE 1A TRIAL PLOT LAYOUT
WORKS AS EXECUTED

DATE: 7 February 2013

DRAWING No.:

SHEET 01A
GLO-ENG-DWG-G-401

A.2 Soil Parameters Measured for the Baseline 6 Soil Study

Soil parameter	Units
Chloride (soluble)	mg/kg
Electrical Conductivity (1:5 soil/water)	dS/m
pH (1:5 soil/water) and pH (1:5 soil/ CaCl ₂)	pH units
Organic Carbon (OC)	%
Nitrate Nitrogen (NO ₃ ⁻)	mg/kg
Phosphorus (Colwell)	mg/kg
Phosphorus Buffer Index (PBI)	-
Sulphur	mg/kg
Copper	mg/kg
Zinc	mg/kg
Manganese	mg/kg
Iron	mg/kg
Boron	mg/kg
Potassium	mg/kg or meq/100 g
Calcium	mg/kg or meq/100 g
Magnesium	mg/kg or meq/100 g
Sodium	mg/kg or meq/100 g
Aluminium	mg/kg or meq/100 g
Potassium	%
Calcium	%
Magnesium	%
Sodium	%
Aluminium	%
Effective Cation Exchange Capacity (ECEC)	meq/100 g
Calcium:Magnesium	-
Soil Texture (Field)	-
Soil Colour (Munsell)	-
Soil Bulk Density	kg/m ³ or g/cm ³
Saturated Hydraulic Conductivity	mm/hr ⁻¹
Porosity Total	Calculated
Porosity Capillary	Calculated
Porosity Air Filled	Calculated
Air Dry Soil Moisture (ADMC)	Air-dry content
Particle Size Analysis (PSA)	%

A.3 Stage 1A Baseline 6 Soil Study Results (25-27th November 2014) Summary for Reporting Period 5th July – 31st December 2014.

Stage 1A Baseline 6 Soil Study Results Summary (collected 25th - 27th November 2014)

Average values

Depth	EC (1:5)	pH	NO3	Org-C	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	ECEC	Ca/Mg	ESP
cm	dS/m	CaCl2	mg/kg	%	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	Cmol/kg	ratio	%
0-20	0.34	5.42	13	1.4	0.61	7.50	6.79	1.933	0.70	239	1499	814	445	4	3.4	42.0	39.2	11.3	4.0	17.5	1.2	11.3
20-40	0.29	4.54	5	0.6	0.42	3.12	10.25	2.018	2.97	164	623	1229	464	15	2.4	16.7	54.6	10.8	15.5	18.8	0.3	10.8
40 - 60	0.27	4.46	5	0.4	0.36	1.74	11.07	2.396	2.73	141	347	1329	551	15	2.1	9.8	60.6	12.9	14.7	18.3	0.2	12.9
60 - 80	0.23	4.51	4	0.2	0.31	1.36	10.43	2.449	2.11	122	271	1251	563	13	1.9	8.1	62.8	14.5	12.7	16.6	0.1	14.5
80 - 100	0.23	4.48	3	0.2	0.31	1.29	9.96	2.481	1.98	120	257	1195	570	14	2.0	7.3	61.5	15.1	14.3	16.0	0.1	15.1
100 - 120	0.22	4.70	4	0.2	0.32	1.28	10.59	2.836	1.39	123	256	1271	652	11	2.0	7.7	62.9	16.2	11.2	16.4	0.1	16.2

Maximum values

Depth	EC (1:5)	pH	NO3	Org-C	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	ECEC	Ca/Mg	ESP
cm	dS/m	CaCl2	mg/kg	%	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	Cmol/kg	ratio	%
0-20	1.04	7.05	44	2.82	1.53	16.60	11.60	2.47	4.44	595	3311	1389	567	22	8	63	55	15	22	26.2	2.75	14.8
20-40	0.73	6.81	9	1.22	1.11	8.01	16.40	3.30	7.64	431	1601	1964	758	37	7	45	69	16	37	28.6	1.06	16.3
40 - 60	0.67	6.64	9	0.98	0.63	5.32	17.60	4.46	6.81	247	1063	2111	1026	46	4	35	72	21	46	27.7	0.68	20.5
60 - 80	0.59	5.66	8	0.44	0.49	3.45	18.00	5.16	7.58	193	690	2162	1187	54	4	23	73	22	54	26.2	0.36	21.6
80 - 100	0.61	6.81	6	0.61	0.42	4.64	15.30	4.63	6.23	165	927	1830	1066	51	3	19	69	20	51	24.9	0.30	19.5
100 - 120	0.52	7.02	6	0.38	0.43	2.53	15.80	5.30	3.96	166	505	1899	1218	44	3	11	68	23	44	23.4	0.17	22.7

Minimum values

Depth	EC (1:5)	pH	NO3	Org-C	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	ECEC	Ca/Mg	ESP
cm	dS/m	CaCl2	mg/kg	%	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	Cmol/kg	ratio	%
0-20	0.19	4.29	5.2	0.61	0.3	3.2	3.89	1.35	0	117	639	467	311	0	2	16	23	8	0	10.8	0.32	8.3
20-40	0.16	4.06	1.7	0.36	0.22	1.3	4.79	1.3	0.01	86	260	575	299	0	1	7	32	7	0	14.0	0.12	7.2
40 - 60	0.12	3.8	1.2	0.17	0.18	0.58	4.92	1.13	0.01	71	116	590	259	0	1	4	34	8	0	9.7	0.06	7.7
60 - 80	0.08	3.81	0.8	0.11	0.13	0.45	4.36	0.98	0.01	50	91	523	226	0	1	3	31	7	0	8.4	0.05	7.0
80 - 100	0.07	3.72	0.6	0.05	0.14	0.44	4.03	1.05	0	54	87	484	241	0	1	4	33	9	0	10.4	0.06	8.6
100 - 120	0.06	3.76	0.6	0.06	0.2	0.38	3.55	0.81	0	77	76	426	186	0	1	4	40	9	0	9.0	0.07	9.0

Standard deviation

Depth	EC (1:5)	pH	NO3	Org-C	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	ECEC	Ca/Mg	ESP
cm	dS/m	CaCl2	mg/kg	%	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	Cmol/kg	ratio	%
0-20	0.20	0.99	9.4	0.61	0.36	3.46	2.12	0.34	1.18	139	690	254	77	6	2	12	10	2	6	3.92	0.67	1.8
20-40	0.13	0.69	2.0	0.26	0.22	1.67	3.02	0.62	2.27	85	335	362	142	11	1	9	10	2	11	4.51	0.23	2.4
40 - 60	0.14	0.63	1.9	0.24	0.12	1.33	3.59	1.05	2.24	48	266	431	241	12	1	8	10	4	12	5.13	0.16	3.6
60 - 80	0.13	0.51	1.8	0.11	0.12	1.00	3.65	1.21	2.24	46	201	438	278	14	1	6	10	4	14	5.22	0.09	4.3
80 - 100	0.16	0.90	1.9	0.18	0.10	1.31	3.64	1.20	1.76	40	262	436	277	15	1	5	11	4	15	4.82	0.08	3.9
100 - 120	0.16	1.06	2.0	0.11	0.09	0.65	4.31	1.64	1.32	36	129	518	377	15	1	3	10	5	15	5.64	0.03	5.0

A.4 Soil Sampling Results Raw Data (25-27th November 2014)

ANALYSIS REPORT SOIL

PROJECT NO: EW140790

Date of Issue: 03/02/2015

Customer: JACOBS ENGINEERING

Report No: 2

Address: PO Box 312 Flinders Lane
MELBOURNE VIC 8009

Date Recieved: 2/12/2014

Matrix: Soil

Attention: Lauren Stephens

Location: -

Phone: 03 8668 3333

Sampler ID: Client

Fax:

Date of Sampling: 25/11/2014

Email: lauren.stephens@jacobs.com

Sample Condition: Acceptable

Comments:

CL = Clay Loam; CS = Clayey Sand; FSC = Fine Sandy Clay; FSCL = Fine Sandy Clay Loam; LC = Light Clay; LMC = Light Medium Clay; MC = Medium Clay and SC = Sandy Clay

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.



Signed:

Stephanie Cameron

Laboratory Operations Manager



East West is certified by the Australian-Asian Soil & Plant Analysis Council to perform various soil and plant tissue analysis. The tests reported herein have been performed in accordance with our terms of accreditation.

This report must not be reproduced except in full and EWEA takes no responsibility of the end use of the results within this report.

This analysis relates to the sample submitted and it is the client's responsibility to make certain the sample is representative of the matrix to be tested.

Samples will be discarded one month after the date of this report. Please advise if you wish to have your sample/s returned.

Results you can rely on.

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS1-0-20cm	1A-CS1-20-40cm	1A-CS1-40-60cm	1A-CS1-60-80cm
					0-20cm	20-40cm	40-60cm	60-80cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-1	140790-2	140790-3	140790-4
Water Retention	30cm tension	ASTM F1815-97	%	na	28.9	26.8	31.4	29.8
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.22	4.90	5.10	5.28
pH (1:5 in CaCl2)	Electrode	R&L 4B2	pH units	na	4.52	4.06	4.08	4.14
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	115	162	159	147
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.23	0.24	0.18	0.16
E.C.e	Calc	R&L 3A1	dS/m	na	1.9	2.1	1.5	0.9
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	10.7	4.6	5.0	3.7
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.94	0.49	0.39	0.22
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	287	468	369	221
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	3.6	2.9	4.7	2.39
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	52.7	48.8	24.1	17.8
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	158	146	72.3	53.4
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.21	0.12	0.37	0.39
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.01	0.45	0.53	0.63
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	9.4	1.3	0.7	0.9
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	142	62.9	66.6	57.6
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.46	0.32	0.25	0.18
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	98.6	688	502	492
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	231	105	137	141
Texture	Field	Northcote	Class	na	CL	CL	LMC	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 4/3	10YR 5/4	10YR 5/4	10YR 6/4
Colour (wet interior)	Dry	Munsell	Class	na	10YR 4/3	10YR 5/6	10YR 5/2	10YR 7/1
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.29	1.23	1.26	1.25
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	15.8	19.6	6.6	10.3
Porosity Total	Calc	ASTM F1815-97	%	na	52.0	48.7	51.1	54.3
Porosity Capillary	Calc	ASTM F1815-97	%	na	37.1	29.3	39.5	37.4
Porosity Air Filled	Calc	ASTM F1815-97	%	na	14.8	19.4	11.6	16.9
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	18.6	25.9	25.1	20.5
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS1-0-20cm	1A-CS1-20-40cm	1A-CS1-40-60cm	1A-CS1-60-80cm
					0-20cm	20-40cm	40-60cm	60-80cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-1	140790-2	140790-3	140790-4
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	7.77	36.9	28.9	26.6
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	1.10	7.64	5.58	5.47
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	128	87.9	99.2	111
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	1264	619	330	245
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	600	990	1207	1386
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	311	345	401	460
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	9.59	7.24	9.04	9.74
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.35	1.50	1.74	2.00
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	44.8	14.9	8.56	5.97
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	6.32	3.10	1.65	1.23
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	35.5	39.8	52.2	56.3
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	5.00	8.25	10.1	11.6
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	2.33	1.09	1.32	1.39
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.33	0.23	0.25	0.28
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	1.26	0.38	0.16	0.11
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.07	0.03	0.03	0.02
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	14.1	20.7	19.3	20.5
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	4.6	4.7	5.0	0.0
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	13.3	11.1	10.3	5.6
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	35.8	31.4	34.4	43.2
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	15.2	13.7	12.6	14.7
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	31.2	39.1	37.8	36.5

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS1-80-100cm	1A-CS1-100-120cm	1A-CS2-0-20cm	1A-CS2-20-40cm
DEPTH (cm)					80-100cm	100-120cm	0-20cm	20-40cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-5	140790-6	140790-7	140790-8
Water Retention	30cm tension	ASTM F1815-97	%	na	24.6	23.9	30.1	25.4
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.47	5.54	5.33	5.13
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.29	4.41	4.37	4.22
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	215	214	160	119
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.18	0.18	0.22	0.16
E.C.e	Calc	R&L 3A1	dS/m	na	1.5	1.5	1.9	1.4
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	3.7	3.9	7.0	5.3
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.10	0.06	0.61	0.39
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	79.8	70.2	192	182
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	2.0	6.4	10.5	5.2
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	6.1	4.8	27.2	24.6
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	18.3	14.4	81.6	73.8
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.54	0.45	0.43	0.33
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.64	0.63	0.88	0.61
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	0.7	1.1	5.4	2.8
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	36.0	33.0	101	66.5
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.09	0.08	0.38	0.26
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	138	78.0	207	391
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	129	110	172	92.0
Texture	Field	Northcote	Class	na	LMC	SC	CL	CL
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/4	10YR 6/6	10YR 4/3	10YR 4/4
Colour (wet interior)	Dry	Munsell	Class	na	10YR 6/1	10YR 6/1	10YR 6/6	10YR 5/6
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.43	1.35	1.28	1.44
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	1.7	1.9	5.0	5.7
Porosity Total	Calc	ASTM F1815-97	%	na	42.5	41.3	45.3	43.5
Porosity Capillary	Calc	ASTM F1815-97	%	na	35.2	32.2	38.7	36.5
Porosity Air Filled	Calc	ASTM F1815-97	%	na	7.3	9.1	6.6	7.0
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	17.8	13.4	14.4	17.4
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS1-80-100cm	1A-CS1-100-120cm	1A-CS2-0-20cm	1A-CS2-20-40cm
					80-100cm	100-120cm	0-20cm	20-40cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-5	140790-6	140790-7	140790-8
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	8.63	6.10	13.6	26.6
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	1.53	0.87	2.30	4.34
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	94.8	77.3	142	85.6
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	208	232	1084	514
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1475	1151	841	938
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	612	548	415	321
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	15.0	16.8	10.7	8.54
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.66	2.38	1.80	1.40
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	5.85	8.17	32.1	15.7
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.04	1.16	5.42	2.57
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	69.2	67.6	41.5	47.8
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	12.3	9.59	7.01	7.82
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.37	1.40	2.15	1.34
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.24	0.20	0.36	0.22
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.08	0.12	0.77	0.33
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.02	0.02	0.05	0.03
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	17.8	14.2	16.9	16.3
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.0	0.0	1.9	0.7
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	9.5	29.6	13.4	14.3
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	46.9	41.8	34.8	33.5
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	15.2	9.5	16.0	11.6
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	28.3	19.0	33.9	39.9

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS2-40-60cm	1A-CS2-60-80cm	1A-CS2-80-100cm	1A-CS2-100-120cm
DEPTH (cm)					40-60cm	60-80cm	80-100cm	100-120cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-9	140790-10	140790-11	140790-12
Water Retention	30cm tension	ASTM F1815-97	%	na	25.5	23.5	21.7	23.9
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.36	5.50	5.65	5.87
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.20	4.20	4.38	4.64
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	121	129	108	103
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.15	0.14	0.11	0.12
E.C.e	Calc	R&L 3A1	dS/m	na	1.3	1.2	0.9	2.8
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	4.1	4.3	4.8	6.3
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.21	0.17	0.05	0.12
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	126	97.1	44.2	39.9
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	2.8	2.3	19.7	11.3
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	20.8	17.7	12.4	12.4
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	62.4	53.1	37.2	37.2
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.38	0.16	0.28	0.25
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.55	0.44	0.54	0.60
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	0.7	0.8	1.1	1.9
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	70.3	41.4	15.5	24.1
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.14	0.12	0.06	0.09
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	314	249	137	51.0
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	121	95.7	72.3	101
Texture	Field	Northcote	Class	na	CL	FSCL	SC	CS
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 5/3	10YR 5/4	10YR 6/4	10YR 5/6
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/6	10YR 5/4	10YR 6/4	10YR 5/6
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.47	1.47	1.41	1.42
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	4.3	1.7	2.9	3.0
Porosity Total	Calc	ASTM F1815-97	%	na	42.1	37.2	43.5	44.8
Porosity Capillary	Calc	ASTM F1815-97	%	na	37.6	34.7	30.6	34.1
Porosity Air Filled	Calc	ASTM F1815-97	%	na	4.5	2.5	12.8	10.7
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	16.9	14.6	14.3	14.4
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS2-40-60cm	1A-CS2-60-80cm	1A-CS2-80-100cm	1A-CS2-100-120cm	
					DEPTH (cm)				40-60cm
Test Parameter		Method Description	Method Reference	Units	LOR	140790-9	140790-10	140790-11	140790-12
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA	
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA	
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA	
Aluminium Saturation	Calculation	R&L 15J1	%	na	23.9	24.3	14.6	5.28	
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	3.49	2.77	1.52	0.57	
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	79.5	49.6	53.7	76.6	
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	148	109	105	212	
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1014	799	808	864	
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	391	301	344	394	
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	11.7	11.5	14.4	16.0	
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.70	1.31	1.50	1.71	
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	5.07	4.78	5.04	9.87	
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.74	0.55	0.53	1.06	
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	57.9	58.4	64.7	67.1	
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	8.45	6.66	6.73	7.20	
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.40	1.12	1.32	1.83	
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.20	0.13	0.14	0.20	
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.09	0.08	0.08	0.15	
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.02	0.02	0.02	0.03	
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	14.6	11.4	10.4	10.7	
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.5	0.0	0.0	0.1	
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	11.8	25.4	47.5	48.0	
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	44.5	42.1	29.4	31.9	
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	14.4	12.5	7.7	7.1	
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	28.8	19.9	15.4	12.8	

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS3-0-20cm	1A-CS3-20-40cm	1A-CS3-40-60cm	1A-CS3-60-80cm
					0-20cm	20-40cm	40-60cm	60-80cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-13	140790-14	140790-15	140790-16
Water Retention	30cm tension	ASTM F1815-97	%	na	26.8	34.5	26.5	32.4
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.18	5.27	5.41	5.84
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.29	4.28	4.32	4.54
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	170	209	144	99.7
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.26	0.25	0.23	0.15
E.C.e	Calc	R&L 3A1	dS/m	na	2.2	2.2	2.0	1.3
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	5.2	4.9	3.9	4.4
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.68	0.45	0.31	0.11
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	277	385	190	64.3
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	7.8	4.7	2.0	6.1
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	43.2	24.2	18.3	18.0
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	130	72.6	54.9	54.0
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.40	0.40	0.20	0.55
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.64	0.59	0.41	0.71
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	1.4	0.6	0.4	0.8
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	127	58.1	41.0	27.8
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.22	0.18	0.13	0.08
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	400	563	331	69.0
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	123	138	136	116
Texture	Field	Northcote	Class	na	LC	LMC	LMC	FSC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 3/2	10YR 5/6	10YR 6/4	10YR 6/4
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/6	10YR 5/6	10YR 6/4	10YR 6/3
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.39	1.23	1.37	1.36
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	6.9	5.0	0.4	2.0
Porosity Total	Calc	ASTM F1815-97	%	na	43.9	49.4	44.9	47.2
Porosity Capillary	Calc	ASTM F1815-97	%	na	37.1	42.5	36.3	43.8
Porosity Air Filled	Calc	ASTM F1815-97	%	na	6.8	7.0	8.7	3.4
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	19.9	30.3	23.5	13.1
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS3-0-20cm	1A-CS3-20-40cm	1A-CS3-40-60cm	1A-CS3-60-80cm
					0-20cm	20-40cm	40-60cm	60-80cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-13	140790-14	140790-15	140790-16
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	22.2	24.7	20.7	7.11
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	4.44	6.26	3.68	0.77
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	117	123	85.0	50.3
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	639	344	160	111
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1196	1729	1322	919
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	477	593	479	386
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	10.4	10.2	11.7	15.6
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.07	2.58	2.08	1.68
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	16.0	6.80	4.50	5.14
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	3.20	1.72	0.80	0.56
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	49.9	57.0	61.9	71.0
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	9.97	14.4	11.0	7.66
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.50	1.25	1.22	1.20
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.30	0.32	0.22	0.13
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.32	0.12	0.07	0.07
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.03	0.02	0.02	0.02
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	20.0	25.3	17.8	10.8
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	4.3	0.4	0.0	0.0
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	9.0	1.9	1.7	6.7
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	38.7	21.4	41.9	54.6
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	15.8	19.8	19.0	17.5
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	32.1	56.5	37.3	21.2

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS4-0-20cm	1A-CS4-20-40cm	1A-CS4-40-60cm	1A-CS4-60-80cm
					0-20cm	20-40cm	40-60cm	60-80cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-17	140790-18	140790-19	140790-20
Water Retention	30cm tension	ASTM F1815-97	%	na	29.4	31.9	31.9	31.1
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	6.46	5.14	5.22	5.28
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	6.27	4.38	4.27	4.31
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	203	208	302	332
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.45	0.36	0.40	0.38
E.C.e	Calc	R&L 3A1	dS/m	na	3.9	3.1	3.4	3.3
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	10.0	4.0	4.0	4.2
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	1.57	0.47	0.34	0.23
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	144	252	228	131
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	152	21.1	3.5	5.80
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	136	21.0	65.3	36.2
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	408	63.0	196	109
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.35	0.10	0.12	0.24
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	3.76	0.54	0.41	0.38
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	12.5	1.2	0.4	0.4
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	152	36.9	16.2	17.1
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.54	0.27	0.11	0.09
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	282	148	149	161
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	2004	528	256	162
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	762	1222	1422	1421
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	346	595	901	1059
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	0.4	399	502	259
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	332	148	141	152
Texture	Field	Northcote	Class	na	CL	LC	LMC	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 3/3	10YR 5/4	5YR 5/8	5YR 5/8
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/6	10YR 5/6	5YR 5/8	5YR 5/8
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.31	1.26	1.15	1.19
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	47.2	23.9	3.5	1.9
Porosity Total	Calc	ASTM F1815-97	%	na	49.4	49.7	53.6	51.9
Porosity Capillary	Calc	ASTM F1815-97	%	na	38.6	40.3	36.7	37.1
Porosity Air Filled	Calc	ASTM F1815-97	%	na	10.9	9.4	16.9	14.8
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	15.8	16.6	21.5	20.6
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	3.89	1.88	1.66	2.01

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS4-0-20cm	1A-CS4-20-40cm	1A-CS4-40-60cm	1A-CS4-60-80cm
					0-20cm	20-40cm	40-60cm	60-80cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-17	140790-18	140790-19	140790-20
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	53.9	13.1	5.56	3.94
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	34.1	50.4	51.5	57.6
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	8.09	12.8	17.0	22.4
Aluminium Saturation	Calculation	R&L 15J1	%	na	0.02	19.1	21.1	12.3
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	0.72	0.38	0.38	0.41
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	10.0	2.64	1.28	0.81
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	6.35	10.2	11.9	11.8
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	1.50	2.59	3.92	4.60
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.00	4.43	5.58	2.88
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	18.6	20.2	23.0	20.5
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	1.58	0.26	0.11	0.07
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	286	146	151	155
Exchangeable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	2069	651	291	191
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	856	1506	1797	1770
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	379	608	919	1031
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	8.30	11.4	15.1	19.1
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.65	2.64	4.00	4.48
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	52.1	14.0	5.51	4.07
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	10.3	3.26	1.46	0.96
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	35.9	54.0	56.7	62.9
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	7.13	12.6	15.0	14.8
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	3.69	1.61	1.47	1.69
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.73	0.37	0.39	0.40
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	1.45	0.26	0.10	0.06
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.10	0.03	0.03	0.03
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	19.9	23.3	26.4	23.5
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	10.4	3.5	0.0	0.5
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	14.5	9.6	2.0	2.7
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	37.2	30.6	21.4	21.2
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	13.4	13.3	16.8	21.1
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	24.5	43.0	59.8	54.5

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS4-80-100cm	1A-CS4-100-120cm	1A-CS5-0-20cm	1A-CS5-20-40cm
					80-100cm	100-120cm	0-20cm	20-40cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-21	140790-22	140790-23	140790-24
Water Retention	30cm tension	ASTM F1815-97	%	na	25.5	26.3	31.9	29.1
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.58	5.79	5.69	5.43
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.34	4.55	4.95	4.52
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	217	192	139	111
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.23	0.21	0.27	0.23
E.C.e	Calc	R&L 3A1	dS/m	na	2.0	1.8	2.3	2.0
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	5.7	5.7	8.5	5.4
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.12	0.14	0.83	0.54
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	87.0	72.5	144	128
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	5.9	21.2	23.9	13.2
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	21.1	20.3	86.4	45.4
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	63.3	60.9	259	136
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.38	0.56	0.26	0.32
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.59	0.81	0.93	0.88
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	0.8	1.3	16.7	11.2
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	30.1	33.1	173	140
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.08	0.09	0.33	0.23
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	127	59.4	4.6	68.0
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	125	132	256	180
Texture	Field	Northcote	Class	na	LMC	FSC	CL	FSCL
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/3	10YR 6/6	10YR 3/3	10YR 5/6
Colour (wet interior)	Dry	Munsell	Class	na	10YR 7/1	10YR 6/2	10YR 4/2	10YR 6/2
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.30	1.37	1.26	1.28
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	1.7	2.8	13.3	3.8
Porosity Total	Calc	ASTM F1815-97	%	na	50.4	45.7	50.6	48.3
Porosity Capillary	Calc	ASTM F1815-97	%	na	33.1	36.0	40.1	37.2
Porosity Air Filled	Calc	ASTM F1815-97	%	na	17.3	9.7	10.5	11.0
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	16.3	15.5	21.0	23.2
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS4-80-100cm	1A-CS4-100-120cm	1A-CS5-0-20cm	1A-CS5-20-40cm
DEPTH (cm)					80-100cm	100-120cm	0-20cm	20-40cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-21	140790-22	140790-23	140790-24
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	7.78	3.72	0.29	4.77
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	1.41	0.66	0.05	0.76
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	119	121	204	139
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	177	262	1245	615
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1440	1440	1057	1185
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	811	798	431	408
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	19.5	19.5	10.7	11.2
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	3.53	3.47	1.87	1.77
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	4.88	7.38	35.6	19.4
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.89	1.31	6.23	3.08
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	66.2	67.6	50.4	62.4
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	12.0	12.0	8.81	9.88
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.68	1.75	2.99	2.25
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.31	0.31	0.52	0.36
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.07	0.11	0.71	0.31
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.03	0.03	0.06	0.04
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	18.1	17.7	17.5	15.8
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.1	0.2	4.3	1.6
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	8.6	10.9	15.0	11.6
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	37.5	39.6	38.6	41.8
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	23.1	23.7	14.6	13.6
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	30.6	25.7	27.5	31.3

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS5-40-60cm	1A-CS5-60-80cm	1A-CS6-0-20cm	1A-CS6-20-40cm
DEPTH (cm)					40-60cm	60-80cm	0-20cm	20-40cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-25	140790-26	140790-27	140790-28
Water Retention	30cm tension	ASTM F1815-97	%	na	26.3	25.3	30.5	35.2
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.70	6.05	5.47	5.13
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.67	5.13	4.63	4.37
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	100	105	189	267
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.17	0.17	0.29	0.36
E.C.e	Calc	R&L 3A1	dS/m	na	1.5	1.5	2.5	3.1
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	5.6	5.5	7.0	5.5
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.42	0.27	0.82	0.51
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	199	77.4	196	375
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	10.2	13.5	12.1	4.1
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	23.2	27.6	54.5	59.8
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	69.6	82.8	164	179
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.37	0.35	0.21	0.14
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.85	1.54	0.62	0.41
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	11.4	19.0	6.9	1.4
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	196	168	74.7	46.5
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.24	0.20	0.36	0.23
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	171
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	618
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	1575
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	650
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	32.8	3.9	81.5	452
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	181	147	247	185
Texture	Field	Northcote	Class	na	SC	SC	LC	LC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 5/4	10YR 6/4	10YR 5/4	10YR 5/6
Colour (wet interior)	Dry	Munsell	Class	na	10YR 6/4	10YR 6/4	10YR 5/6	10YR 6/6
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.39	1.40	1.25	1.15
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	3.5	1.5	6.3	12.0
Porosity Total	Calc	ASTM F1815-97	%	na	44.7	45.0	50.2	55.8
Porosity Capillary	Calc	ASTM F1815-97	%	na	36.6	35.4	37.9	40.4
Porosity Air Filled	Calc	ASTM F1815-97	%	na	8.0	9.6	12.3	15.3
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	18.6	21.3	12.9	25.0
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	1.79

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS5-40-60cm	1A-CS5-60-80cm	1A-CS6-0-20cm	1A-CS6-20-40cm
					40-60cm	60-80cm	0-20cm	20-40cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-25	140790-26	140790-27	140790-28
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	12.6
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	53.6
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	11.5
Aluminium Saturation	Calculation	R&L 15J1	%	na	2.51	0.28	4.28	17.5
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	0.44
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	3.09
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	13.1
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	2.83
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.36	0.04	0.91	5.02
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	24.5
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	0.24
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	127	121	197	178
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	462	690	1153	787
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1173	1151	1389	1964
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	400	419	554	659
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	12.0	12.0	11.4	10.0
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.74	1.82	2.41	2.87
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	15.9	22.7	27.2	13.7
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.31	3.45	5.77	3.94
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	67.3	63.0	54.7	57.1
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	9.78	9.59	11.6	16.4
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	2.24	2.04	2.39	1.59
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.33	0.31	0.51	0.46
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.24	0.36	0.50	0.24
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.03	0.03	0.04	0.03
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	14.5	15.2	21.2	28.6
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	21.4	26.0	1.1	0.1
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	29.6	27.5	13.7	3.0
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	31.8	29.6	30.6	19.0
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	3.5	5.5	17.4	14.9
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	13.6	11.5	37.3	62.9

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS6-40-60cm	1A-CS6-60-80cm	1A-CS6-80-100cm	1A-CS6-100-120cm
					40-60cm	60-80cm	80-100cm	100-120cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-29	140790-30	140790-31	140790-32
Water Retention	30cm tension	ASTM F1815-97	%	na	34.5	30.8	28.7	29.7
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.13	5.28	5.31	5.34
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.28	4.28	4.25	4.30
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	348	194	352	406
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.39	0.32	0.31	0.35
E.C.e	Calc	R&L 3A1	dS/m	na	3.4	2.8	2.7	3.0
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	5.3	4.1	4.0	3.5
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.41	0.19	0.16	0.12
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	367	154	91.6	90.3
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	3.9	4.9	1.8	4.7
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	44.9	29.9	15.5	15.4
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	135	89.7	46.5	46.2
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.17	0.26	0.49	0.49
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.46	0.58	0.94	1.20
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	0.6	0.9	0.9	1.1
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	36.9	25.3	44.3	33.8
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.11	0.14	0.10	0.08
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	189	142	154	164
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	332	230	162	192
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	1755	1503	1407	1619
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	842	770	891	1011
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	350	294	188	140
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	184	154	157	210
Texture	Field	Northcote	Class	na	LMC	LMC	LMC	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 5/4	10YR 6/4	10YR 6/6	10YR 6/6
Colour (wet interior)	Dry	Munsell	Class	na	10YR 6/4	10YR 5/6	10YR 6/2	10YR 6/2
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.14	1.30	1.35	1.36
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	2.3	1.0	1.5	1.1
Porosity Total	Calc	ASTM F1815-97	%	na	54.9	47.5	43.4	46.0
Porosity Capillary	Calc	ASTM F1815-97	%	na	39.4	40.0	38.7	40.4
Porosity Air Filled	Calc	ASTM F1815-97	%	na	15.5	7.4	4.7	5.6
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	27.2	19.2	17.0	15.1
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	1.99	1.76	2.09	2.02

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS6-40-60cm	1A-CS6-60-80cm	1A-CS6-80-100cm	1A-CS6-100-120cm
					40-60cm	60-80cm	80-100cm	100-120cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-29	140790-30	140790-31	140790-32
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	6.83	5.57	4.29	4.61
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	60.1	60.6	62.1	64.8
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	15.1	16.2	20.5	21.1
Aluminium Saturation	Calculation	R&L 15J1	%	na	14.0	13.7	10.3	6.66
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	0.48	0.36	0.39	0.42
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	1.66	1.15	0.81	0.96
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	14.6	12.5	11.7	13.5
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	3.66	3.35	3.87	4.40
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	3.89	3.27	2.09	1.56
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	24.3	20.7	18.9	20.8
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	0.11	0.09	0.07	0.07
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	181	140	147	166
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	408	266	170	213
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	2111	1838	1600	1899
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	863	812	827	1033
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	13.5	14.8	17.8	19.2
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	3.75	3.53	3.60	4.49
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	7.35	5.59	4.20	4.56
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.04	1.33	0.85	1.07
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	63.4	64.3	65.9	67.7
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	17.6	15.3	13.3	15.8
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.67	1.51	1.86	1.82
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.46	0.36	0.38	0.43
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.12	0.09	0.06	0.07
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.03	0.02	0.03	0.03
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	27.7	23.8	20.2	23.4
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.1	0.1	0.4	0.1
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	2.3	1.2	2.1	4.5
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	16.8	38.9	49.5	27.2
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	17.7	18.7	19.9	29.3
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	63.1	41.1	28.0	39.0

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS7-0-20cm	1A-CS7-20-40cm	1A-CS7-40-60cm	1A-CS7-60-80cm
					0-20cm	20-40cm	40-60cm	60-80cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-33	140790-34	140790-35	140790-36
Water Retention	30cm tension	ASTM F1815-97	%	na	30.7	33.2	34.3	31.6
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	7.64	5.18	5.16	5.38
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	7.05	4.36	4.19	4.33
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	206	175	228	252
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.42	0.28	0.29	0.29
E.C.e	Calc	R&L 3A1	dS/m	na	3.6	2.4	2.3	2.5
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	44.2	8.5	6.5	7.9
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	2.04	0.72	0.47	0.42
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	135	561	461	143
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	185	17.6	15.8	23.1
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	28.4	54.4	40.6	39.9
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	85.2	163	122	120
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.46	0.12	0.10	0.39
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	6.66	0.99	0.54	1.00
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	11.9	7.3	1.3	2.8
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	81.8	113	47.0	69.7
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.80	0.33	0.21	0.15
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	390	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	2823	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	605	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	474	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	3.2	281	402	108
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	548	257	195	147
Texture	Field	Northcote	Class	na	CL	CL	LC	LC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 3/2	10YR 5/3	10YR 5/4	10YR 5/4
Colour (wet interior)	Dry	Munsell	Class	na	10YR 6/4	10YR 6/4	10YR 5/8	10YR 6/2
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.21	1.19	1.26	1.15
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	12.4	3.4	1.1	2.2
Porosity Total	Calc	ASTM F1815-97	%	na	50.1	52.4	52.6	52.6
Porosity Capillary	Calc	ASTM F1815-97	%	na	37.1	39.3	43.1	36.4
Porosity Air Filled	Calc	ASTM F1815-97	%	na	13.0	13.1	9.5	16.1
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	19.8	23.2	26.8	18.6
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	4.49	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS7-0-20cm	1A-CS7-20-40cm	1A-CS7-40-60cm	1A-CS7-60-80cm
DEPTH (cm)					0-20cm	20-40cm	40-60cm	60-80cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-33	140790-34	140790-35	140790-36
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	63.4	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	22.7	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	9.26	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	0.14	13.1	17.7	6.26
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	1.00	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	14.1	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	5.04	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	2.06	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.04	3.12	4.47	1.20
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	22.3	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	2.80	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	439	208	183	164
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	3311	989	505	495
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	722	1557	1766	1439
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	567	538	706	712
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	9.41	9.78	12.2	16.1
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.47	2.34	3.07	3.10
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	63.2	20.7	10.0	12.9
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	16.6	4.95	2.53	2.48
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	23.0	54.3	58.3	62.5
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	6.02	13.0	14.7	12.0
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	4.30	2.23	1.86	2.19
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.13	0.53	0.47	0.42
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	2.75	0.38	0.17	0.21
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.19	0.04	0.03	0.04
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	26.2	23.9	25.2	19.2
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	2.7	0.5	0.2	7.4
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	13.9	1.5	3.2	19.5
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	36.6	17.5	21.8	28.3
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	18.8	18.6	20.3	15.2
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	28.0	61.9	54.5	29.6

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS7-80-100cm	1A-CS8-0-20cm	1A-CS8-20-40cm	1A-CS8-40-60cm
DEPTH (cm)					80-100cm	0-20cm	20-40cm	40-60cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-37	140790-38	140790-39	140790-40
Water Retention	30cm tension	ASTM F1815-97	%	na	24.3	29.3	27.5	24.2
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.50	7.18	5.59	5.66
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.34	6.48	4.67	4.64
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	173	143	176	185
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.18	0.30	0.28	0.28
E.C.e	Calc	R&L 3A1	dS/m	na	1.5	2.6	2.4	2.4
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	3.7	17.3	2.8	2.0
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.14	1.43	0.36	0.17
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	71.4	112	113	64.6
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	6.8	54.2	11.6	6.70
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	23.6	30.6	46.9	43.1
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	70.8	91.8	141	129
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.30	0.36	0.24	0.45
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.59	1.81	0.67	0.84
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	1.9	9.5	2.1	1.0
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	28.9	77.3	61.6	45.0
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.09	0.85	0.24	0.14
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	56.7	0.6	71.6	27.3
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	86.0	294	148	224
Texture	Field	Northcote	Class	na	FSC	CL	LMC	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/6	10YR 3/2	10YR 6/2	10YR 6/4
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/8	10YR 5/6	10YR 5/4	10YR 6/3
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.40	1.27	1.34	1.42
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	1.9	11.5	1.4	2.5
Porosity Total	Calc	ASTM F1815-97	%	na	41.0	46.3	48.0	43.6
Porosity Capillary	Calc	ASTM F1815-97	%	na	34.0	37.1	36.7	34.3
Porosity Air Filled	Calc	ASTM F1815-97	%	na	7.0	9.3	11.3	9.2
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	13.3	8.4	13.9	10.7
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS7-80-100cm	1A-CS8-0-20cm	1A-CS8-20-40cm	1A-CS8-40-60cm
					80-100cm	0-20cm	20-40cm	40-60cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-37	140790-38	140790-39	140790-40
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	5.99	0.04	4.35	1.85
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.63	0.01	0.80	0.30
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	67.0	245	123	109
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	175	1915	385	148
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	836	707	1512	1407
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	431	500	614	772
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	17.8	11.9	14.6	20.5
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.87	2.17	2.67	3.36
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	8.32	52.4	10.5	4.51
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.88	9.58	1.93	0.74
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	66.2	32.2	68.8	71.5
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	6.97	5.89	12.6	11.7
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.63	3.44	1.72	1.70
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.17	0.63	0.32	0.28
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.13	1.63	0.15	0.06
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.02	0.11	0.03	0.02
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	10.5	18.3	18.3	16.4
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.2	3.4	0.2	0.1
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	33.0	9.3	3.6	6.8
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	31.4	45.5	44.3	64.6
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	12.9	15.4	15.3	10.5
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	22.6	26.4	36.6	17.9

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS8-60-80cm	1A-CS9-0-20cm	1A-CS9-20-40cm	1A-CS9-40-60cm
					60-80cm	0-20cm	20-40cm	40-60cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-41	140790-42	140790-43	140790-44
Water Retention	30cm tension	ASTM F1815-97	%	na	22.9	29.6	28.1	23.0
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	6.34	5.45	5.16	5.32
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	5.66	4.59	4.23	4.26
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	116	139	149	146
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.21	0.27	0.22	0.20
E.C.e	Calc	R&L 3A1	dS/m	na	1.8	2.2	1.9	1.7
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	3.5	17.4	8.4	4.9
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.24	1.18	0.44	0.20
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	54.7	181	202	133
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	12.8	34.2	8.84	5.5
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	26.5	48.5	34.6	27.6
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	79.5	146	104	82.8
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.02	0.44	0.78	0.88
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.55	1.32	0.78	0.78
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	8.7	10.1	5.5	4.6
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	50.4	182	88.2	50.6
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.24	0.52	0.26	0.14
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	3.7	49.6	203	127
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	179	219	162	208
Texture	Field	Northcote	Class	na	FSC	CL	CL	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/4	10YR 4/3	10YR 5/4	10YR 6/4
Colour (wet interior)	Dry	Munsell	Class	na	10YR 6/4	10YR 5/6	10YR 5/4	10YR 6/6
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.32	1.24	1.32	1.35
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	1.3	2.8	1.5	2.3
Porosity Total	Calc	ASTM F1815-97	%	na	50.4	52.0	44.7	43.7
Porosity Capillary	Calc	ASTM F1815-97	%	na	39.2	36.8	37.1	31.1
Porosity Air Filled	Calc	ASTM F1815-97	%	na	11.2	15.2	7.6	12.5
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	12.1	22.1	21.2	16.4
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS8-60-80cm	1A-CS9-0-20cm	1A-CS9-20-40cm	1A-CS9-40-60cm
					60-80cm	0-20cm	20-40cm	40-60cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-41	140790-42	140790-43	140790-44
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	0.31	3.71	15.6	9.90
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.04	0.55	2.26	1.41
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	113	159	116	114
Exchangeable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	290	1000	260	116
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1066	832	1064	1206
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	568	449	401	442
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	18.8	13.2	12.1	13.5
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.47	1.95	1.74	1.92
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	11.0	33.7	8.99	4.07
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.45	5.00	1.30	0.58
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	67.6	46.7	61.3	70.5
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	8.88	6.93	8.87	10.1
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	2.21	2.75	2.06	2.05
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.29	0.41	0.30	0.29
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.16	0.72	0.15	0.06
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.03	0.06	0.03	0.03
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	13.1	14.8	14.5	14.3
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.0	1.0	0.4	1.4
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	8.9	5.8	4.4	3.1
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	68.1	38.3	32.8	49.0
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	8.5	18.3	20.1	19.0
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	14.4	36.6	42.3	27.5

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS9-60-80cm	1A-CS10-0-20cm	1A-CS10-20-40cm	1A-CS10-40-60cm
DEPTH (cm)					60-80cm	0-20cm	20-40cm	40-60cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-45	140790-46	140790-47	140790-48
Water Retention	30cm tension	ASTM F1815-97	%	na	23.0	25.1	24.1	22.5
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.48	6.01	5.45	5.44
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.37	5.10	4.52	4.52
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	129	122	135	267
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.17	0.19	0.23	0.31
E.C.e	Calc	R&L 3A1	dS/m	na	1.4	1.6	2.0	2.7
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	3.9	0.5	6.4	3.6
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.16	0.94	0.54	0.23
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	92.5	122	171	103
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	8.0	46.4	19.2	5.4
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	25.0	22.8	29.5	47.2
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	75.0	68.4	88.5	142
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.21	0.78	0.42	0.62
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.06	1.57	0.79	0.70
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	5.0	7.2	5.3	4.5
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	50.2	185	132	44.4
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.09	0.40	0.29	0.12
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	136
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	155
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	1289
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	715
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	68.8	1.29	72.3	57.0
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	276	256	221	151
Texture	Field	Northcote	Class	na	LMC	FSCL	LC	FSC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/6	10YR 4/2	10YR 4/3	10YR 6/4
Colour (wet interior)	Dry	Munsell	Class	na	10YR 6/1	10YR 6/6	10YR 5/6	10YR 6/6
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.33	1.33	1.31	1.18
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	1.5	0.7	0.7	0.8
Porosity Total	Calc	ASTM F1815-97	%	na	45.1	45.3	45.4	52.4
Porosity Capillary	Calc	ASTM F1815-97	%	na	30.5	33.4	31.6	26.5
Porosity Air Filled	Calc	ASTM F1815-97	%	na	14.6	11.9	13.9	25.9
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	15.0	15.9	19.4	20.0
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	2.23

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS9-60-80cm	1A-CS10-0-20cm	1A-CS10-20-40cm	1A-CS10-40-60cm
					60-80cm	0-20cm	20-40cm	40-60cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-45	140790-46	140790-47	140790-48
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	4.97
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	68.8
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	19.9
Aluminium Saturation	Calculation	R&L 15J1	%	na	5.20	0.13	5.75	3.96
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	0.35
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	0.78
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	10.7
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	3.11
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.76	0.01	0.80	0.63
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	15.6
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	0.07
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	130	146	150	143
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	124	788	411	138
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1259	581	1062	1360
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	575	368	432	682
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	17.0	14.9	13.4	18.5
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.50	1.60	1.88	2.97
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	4.21	36.6	14.7	4.32
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.62	3.94	2.06	0.69
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	71.3	45.0	63.3	70.9
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	10.5	4.84	8.85	11.3
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	2.27	3.48	2.75	2.29
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.33	0.37	0.38	0.37
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.06	0.81	0.23	0.06
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.03	0.08	0.04	0.03
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	14.7	10.8	14.0	16.0
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.6	5.8	0.8	0.1
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	4.6	16.4	17.2	18.4
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	48.9	38.3	33.0	35.7
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	20.5	16.4	19.0	16.0
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	25.4	23.0	29.9	29.9

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS10-60-80cm	1A-CS11-0-20cm	1A-CS11-20-40cm	1A-CS11-40-60cm
					DEPTH (cm)	60-80cm	0-20cm	20-40cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-49	140790-50	140790-51	140790-52
Water Retention	30cm tension	ASTM F1815-97	%	na	19.0	31.2	31.6	26.0
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.87	5.60	5.18	5.48
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.96	4.68	4.22	4.29
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	179	107	119	69.7
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.23	0.21	0.18	0.12
E.C.e	Calc	R&L 3A1	dS/m	na	2.0	1.7	1.5	1.0
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	3.8	7.4	2.8	2.9
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.12	1.02	0.44	0.20
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	58.7	175	222	110
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	6.2	24.2	3.4	4.5
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	28.9	31.5	20.8	8.2
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	86.7	94.5	62.4	24.6
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.70	0.99	0.65	0.60
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.74	1.33	0.83	0.90
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	4.6	9.1	5.2	4.6
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	24.8	122	87.8	65.4
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.06	0.43	0.24	0.12
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	8.2	30.5	180	71.0
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	139	178	136	126
Texture	Field	Northcote	Class	na	FSC	CL	FSCL	SC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/4	10YR 5/3	10YR 5/8	10YR 6/8
Colour (wet interior)	Dry	Munsell	Class	na	10YR 6/6	10YR 5/6	10YR 5/8	10YR 5/6
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.30	1.20	1.33	1.15
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	0.6	17.7	4.4	3.6
Porosity Total	Calc	ASTM F1815-97	%	na	52.9	55.6	52.0	57.3
Porosity Capillary	Calc	ASTM F1815-97	%	na	24.6	37.5	41.9	29.9
Porosity Air Filled	Calc	ASTM F1815-97	%	na	28.3	18.0	10.1	27.5
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	13.4	17.9	28.8	7.7
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS10-60-80cm	1A-CS11-0-20cm	1A-CS11-20-40cm	1A-CS11-40-60cm	
					DEPTH (cm)				
Test Parameter		Method Description	Method Reference	Units	LOR	140790-49	140790-50	140790-51	140790-52
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	0.70	2.63	13.9	8.18	
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.09	0.34	2.00	0.79	
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	72.6	123	100	71.1	
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	90.8	811	355	172	
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1144	782	1046	792	
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	650	380	369	280	
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	21.6	12.8	11.2	12.6	
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.83	1.65	1.60	1.22	
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	3.47	31.5	12.4	8.91	
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.45	4.06	1.78	0.86	
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	72.8	50.6	60.7	68.4	
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	9.53	6.52	8.72	6.60	
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.42	2.45	1.79	1.89	
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.19	0.32	0.26	0.18	
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.05	0.62	0.20	0.13	
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.02	0.05	0.03	0.03	
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	13.1	12.9	14.4	9.65	
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.0	0.4	0.1	0.0	
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	30.7	16.4	20.2	53.0	
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	32.9	36.1	31.8	23.1	
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	14.8	20.6	14.4	7.0	
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	21.5	26.5	33.6	16.9	

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS11-60-80cm	1A-CS12-0-20cm	1A-CS12-20-40cm	1A-CS12-40-60cm
DEPTH (cm)					60-80cm	0-20cm	20-40cm	40-60cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-53	140790-54	140790-55	140790-56
Water Retention	30cm tension	ASTM F1815-97	%	na	24.9	29.7	26.7	32.1
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.74	7.31	5.84	5.38
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.42	6.96	5.47	4.82
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	35.3	301	439	523
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.08	1.04	0.73	0.67
E.C.e	Calc	R&L 3A1	dS/m	na	0.7	8.9	6.3	6.0
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	2.7	11.5	5.9	2.5
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.11	1.99	0.67	0.41
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	74.5	257	137	170
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	6.7	257	47.2	14.2
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	6.1	609	299	177
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	18.3	1827	897	531
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.56	1.10	0.66	0.56
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.96	7.81	1.49	0.81
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	4.8	20.2	8.0	4.9
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	35.4	136	106	46.8
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.09	0.93	0.34	0.17
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	450	205	151
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	2390	752	380
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	597	1348	1847
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	376	535	944
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	34.8	1.3	0.6	29.4
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	127	893	308	172
Texture	Field	Northcote	Class	na	SC	FSCL	CL	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/8	10YR 4/6	10YR 5/3	10YR 5/8
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/2	10YR 4/6	10YR 5/3	10YR 5/8
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.24	1.23	1.41	1.27
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	5.9	7.4	5.2	0.4
Porosity Total	Calc	ASTM F1815-97	%	na	53.5	53.5	46.7	52.9
Porosity Capillary	Calc	ASTM F1815-97	%	na	30.9	36.5	37.7	40.8
Porosity Air Filled	Calc	ASTM F1815-97	%	na	22.6	17.0	9.0	12.1
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	12.3	13.8	13.8	24.9
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	5.85	2.94	1.75

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS11-60-80cm	1A-CS12-0-20cm	1A-CS12-20-40cm	1A-CS12-40-60cm	
					DEPTH (cm)				
Test Parameter		Method Description	Method Reference	Units	LOR	140790-53	140790-54	140790-55	140790-56
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	60.6	21.1	8.59	
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	25.2	62.9	69.6	
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	8.29	13.0	18.6	
Aluminium Saturation	Calculation	R&L 15J1	%	na	4.62	0.07	0.03	1.32	
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	1.15	0.53	0.39	
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	12.0	3.76	1.90	
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	4.98	11.2	15.4	
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	1.63	2.33	4.10	
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.39	0.01	0.01	0.33	
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	19.7	17.9	22.1	
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	2.40	0.33	0.12	
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	62.8	595	240	173	
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	133	2413	778	386	
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	721	698	1496	2100	
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	264	534	758	1026	
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	13.7	10.7	16.3	18.1	
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.15	2.32	3.30	4.46	
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	7.95	55.5	19.2	7.83	
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.67	12.1	3.89	1.93	
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	71.8	26.8	61.5	71.0	
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	6.01	5.82	12.5	17.5	
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.92	7.02	3.04	1.80	
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.16	1.53	0.62	0.44	
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.11	2.07	0.31	0.11	
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.03	0.26	0.05	0.03	
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	8.37	21.7	20.3	24.7	
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.0	5.2	0.7	0.4	
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	63.8	15.6	10.6	4.4	
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	13.7	42.1	31.8	24.6	
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	8.4	21.2	14.4	15.5	
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	14.1	16.0	42.4	55.1	

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS12-60-80cm	1A-CS12-80-100cm	1A-CS12-100-120cm	1A-CS13-0-20cm
DEPTH (cm)					60-80cm	80-100cm	100-120cm	0-20cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-57	140790-58	140790-59	140790-60
Water Retention	30cm tension	ASTM F1815-97	%	na	30.3	30.8	29.3	31.5
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.84	7.42	7.86	5.45
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	5.25	6.81	7.02	4.79
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	488	424	328	222
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.59	0.61	0.52	0.35
E.C.e	Calc	R&L 3A1	dS/m	na	4.9	5.2	4.5	3.0
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	2.3	5.5	4.6	9.7
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.35	0.61	0.24	1.35
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	145	110	86.8	244
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	25.4	110	66.3	53.4
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	122	123	136	90.8
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	366	369	408	272
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.78	0.93	0.69	0.68
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.49	2.63	1.72	1.57
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	5.2	5.5	5.5	19.7
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	49.1	41.3	20.0	141
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.10	0.16	0.13	0.41
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	144	156	154	208
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	465	986	649	1540
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	1830	1596	1699	1026
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	1110	1023	1226	551
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	1.1	0.2	0.1	20.8
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	192	243	207	271
Texture	Field	Northcote	Class	na	LMC	LC	LMC	CL
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/6	10YR 6/6	10YR 6/4	10YR 3/3
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/6	10YR 6/6	10YR 7/6	10YR 4/2
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.36	1.41	1.41	1.25
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	0.5	0.9	0.5	4.4
Porosity Total	Calc	ASTM F1815-97	%	na	50.1	48.9	47.4	52.2
Porosity Capillary	Calc	ASTM F1815-97	%	na	41.1	43.2	41.2	39.4
Porosity Air Filled	Calc	ASTM F1815-97	%	na	9.0	5.6	6.1	12.9
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	24.3	22.5	19.0	27.8
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	1.62	1.73	1.71	2.75

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS12-60-80cm	1A-CS12-80-100cm	1A-CS12-100-120cm	1A-CS13-0-20cm
DEPTH (cm)					60-80cm	80-100cm	100-120cm	0-20cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-57	140790-58	140790-59	140790-60
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	10.2	21.4	14.0	39.7
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	66.9	57.6	61.2	44.0
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	21.2	19.3	23.0	12.3
Aluminium Saturation	Calculation	R&L 15J1	%	na	0.05	0.01	0.00	1.17
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	0.37	0.40	0.39	0.53
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	2.33	4.93	3.25	7.70
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	15.3	13.3	14.2	8.55
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	4.83	4.45	5.33	2.40
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.01	0.00	0.00	0.23
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	22.8	23.1	23.1	19.4
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	0.15	0.37	0.23	0.90
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	170	165	153	192
Exchangeable Calcium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	20	517	927	505	1570
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	2162	1830	1810	1053
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	1187	1066	1218	543
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	19.7	18.6	22.7	12.0
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	5.16	4.63	5.30	2.36
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	9.86	18.6	10.8	39.8
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.59	4.64	2.53	7.85
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	68.7	61.1	64.7	44.5
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	18.0	15.3	15.1	8.78
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.66	1.70	1.68	2.50
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.44	0.42	0.39	0.49
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.14	0.30	0.17	0.89
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.02	0.03	0.03	0.06
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	26.2	24.9	23.3	19.7
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.4	0.8	0.1	10.2
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	2.0	2.3	1.3	10.6
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	25.7	33.3	31.2	31.3
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	17.1	23.4	30.7	14.8
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	54.8	40.2	36.7	33.1

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS13-20-40cm	1A-CS13-40-60cm	1A-CS13-60-80cm	1A-CS13-80-100cm
					20-40cm	40-60cm	60-80cm	80-100cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-61	140790-62	140790-63	140790-64
Water Retention	30cm tension	ASTM F1815-97	%	na	28.1	33.0	32.0	31.0
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.02	5.23	5.19	5.36
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.26	4.31	4.19	4.17
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	165	140	78.7	50.1
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.25	0.21	0.17	0.12
E.C.e	Calc	R&L 3A1	dS/m	na	2.2	1.6	1.3	1.0
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	5.3	5.5	1.7	1.7
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.81	0.95	0.44	0.40
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	400	338	213	183
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	15.1	27.3	9.0	6.9
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	63.2	44.8	27.9	18.4
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	190	134	83.7	55.2
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.56	0.47	0.81	1.65
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.20	1.46	2.28	3.35
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	15.3	16.6	12.6	5.9
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	112	113	140	122
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.34	0.34	0.25	0.18
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	236	205	263	195
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	227	199	209	228
Texture	Field	Northcote	Class	na	LMC	MC	MC	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 4/3	10YR 5/4	10YR 5/4	10YR 5/6
Colour (wet interior)	Dry	Munsell	Class	na	10YR 4/1	10YR 5/2	10YR 5/3	10YR 6/2
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.38	1.21	1.32	1.34
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	3.0	2.5	2.3	2.2
Porosity Total	Calc	ASTM F1815-97	%	na	47.0	54.0	49.0	48.0
Porosity Capillary	Calc	ASTM F1815-97	%	na	39.0	40.0	42.0	41.2
Porosity Air Filled	Calc	ASTM F1815-97	%	na	8.1	14.0	7.0	7.0
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	31.5	29.0	34.6	20.3
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS13-20-40cm	1A-CS13-40-60cm	1A-CS13-60-80cm	1A-CS13-80-100cm
					20-40cm	40-60cm	60-80cm	80-100cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-61	140790-62	140790-63	140790-64
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	14.4	12.2	16.3	13.4
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	2.62	2.28	2.92	2.17
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	147	154	136	137
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	780	815	577	344
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1158	1229	1231	1255
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	369	370	342	349
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	8.84	8.65	8.31	9.36
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.60	1.61	1.49	1.52
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	21.5	21.9	16.1	10.6
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	3.90	4.08	2.89	1.72
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	53.2	55.1	57.3	64.5
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	9.65	10.2	10.3	10.5
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	2.08	2.12	1.95	2.17
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.38	0.39	0.35	0.35
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.40	0.40	0.28	0.16
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.04	0.04	0.03	0.03
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	18.2	18.6	17.9	16.2
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	7.7	6.1	2.5	0.6
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	10.0	7.3	3.5	1.4
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	29.8	24.4	33.1	37.7
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	14.2	14.5	20.7	27.8
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	38.2	47.8	40.2	32.4

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS13-100-120cm	1A-CS14-0-20cm	1A-CS14-20-40cm	1A-CS14-40-60cm
DEPTH (cm)					100-120cm	0-20cm	20-40cm	40-60cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-65	140790-66	140790-67	140790-68
Water Retention	30cm tension	ASTM F1815-97	%	na	28.0	33.1	36.0	32.3
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.50	5.80	4.78	4.80
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.20	5.29	4.07	3.80
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	47.7	278	176	122
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.09	0.39	0.26	0.17
E.C.e	Calc	R&L 3A1	dS/m	na	0.8	3.4	2.2	1.5
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	1.8	14.4	8.3	8.5
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.38	2.82	1.15	0.52
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	183	403	740	599
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	9.1	58.6	12.3	4.6
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	13.7	82.0	53.8	25.4
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	41.1	246	161	76.2
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.65	0.95	0.52	0.39
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	3.83	3.85	0.91	0.80
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	7.4	35.5	7.7	5.3
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	118	141	185	75.3
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.18	0.77	0.40	0.33
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	407	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	1506	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	446	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	411	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	188	5.0	418	613
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	221	526	448	360
Texture	Field	Northcote	Class	na	LMC	CL	LC	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/4	10YR 4/2	10YR 3/1	10YR 4/3
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/1	10YR 4/2	10YR 4/4	10YR 5/2
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.36	1.17	1.16	1.24
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	1.0	18.0	20.2	0.6
Porosity Total	Calc	ASTM F1815-97	%	na	48.0	52.3	54.4	53.2
Porosity Capillary	Calc	ASTM F1815-97	%	na	38.0	39.0	41.4	40.2
Porosity Air Filled	Calc	ASTM F1815-97	%	na	10.0	14.0	13.0	13.0
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	22.5	17.5	27.6	33.7
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	7.38	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS13-100-120cm	1A-CS14-0-20cm	1A-CS14-20-40cm	1A-CS14-40-60cm
					100-120cm	0-20cm	20-40cm	40-60cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-65	140790-66	140790-67	140790-68
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	53.3	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	26.3	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	12.6	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	12.7	0.37	31.3	46.4
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	1.04	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	7.53	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	3.72	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	1.79	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	2.09	0.06	4.64	6.81
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	14.1	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	2.03	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	150	453	431	247
Exchangeable Calcium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	20	294	1556	600	241
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1305	474	575	590
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	389	437	299	259
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	10.2	12.8	8.76	7.66
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.69	1.90	1.30	1.13
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	8.90	52.4	20.2	8.20
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.47	7.78	3.00	1.21
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	65.9	26.6	32.3	33.5
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	10.9	3.95	4.79	4.92
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	2.33	7.82	7.45	4.31
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.38	1.16	1.11	0.63
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.14	1.97	0.63	0.25
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.04	0.29	0.23	0.13
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	16.5	14.8	14.8	14.7
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.0	3.6	0.5	0.8
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	1.1	15.6	7.8	3.8
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	40.9	29.7	25.0	22.1
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	29.5	17.3	11.3	13.4
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	28.5	33.7	55.4	59.9

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS14-60-80cm	1A-CS14-80-100cm	1A-CS14-100-120cm	1A-CS15-0-20cm
DEPTH (cm)					60-80cm	80-100cm	100-120cm	0-20cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-69	140790-70	140790-71	140790-72
Water Retention	30cm tension	ASTM F1815-97	%	na	33.0	29.0	25.2	26.0
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	4.92	5.04	5.08	6.37
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	3.81	3.72	3.76	5.96
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	83.7	58.3	54.3	210
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.10	0.07	0.06	0.34
E.C.e	Calc	R&L 3A1	dS/m	na	0.9	0.6	0.5	2.9
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	6.3	1.1	0.6	15.1
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.36	0.27	0.09	1.89
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	380	241	175	135
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	5.5	11.1	14.6	64.9
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	11.3	8.3	6.5	78.4
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	33.9	24.9	19.5	235
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.44	0.58	0.67	0.80
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.78	0.96	1.43	3.21
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	4.4	4.5	4.5	45.2
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	49.2	58.9	52.0	226
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.26	0.15	0.10	0.43
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	169
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	1562
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	466
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	368
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	682	561	356	96.0
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	310	237	209	239
Texture	Field	Northcote	Class	na	LMC	LMC	FSC	CL
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 5/4	10YR 6/6	10YR 6/6	10YR 5/2
Colour (wet interior)	Dry	Munsell	Class	na	10YR 6/1	10YR 6/1	10YR 6/1	10YR 5/2
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.23	1.35	1.32	1.32
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	0.6	0.6	0.6	3.1
Porosity Total	Calc	ASTM F1815-97	%	na	53.0	49.0	49.5	44.3
Porosity Capillary	Calc	ASTM F1815-97	%	na	40.5	38.3	33.3	34.3
Porosity Air Filled	Calc	ASTM F1815-97	%	na	12.4	10.4	16.2	10.0
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	34.5	26.1	21.8	14.9
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	2.93

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS14-60-80cm	1A-CS14-80-100cm	1A-CS14-100-120cm	1A-CS15-0-20cm
DEPTH (cm)					60-80cm	80-100cm	100-120cm	0-20cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-69	140790-70	140790-71	140790-72
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	52.8
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	26.3
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	10.8
Aluminium Saturation	Calculation	R&L 15J1	%	na	54.2	51.3	44.0	7.75
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	0.43
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	7.81
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	3.88
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	1.60
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	7.58	6.23	3.96	1.07
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	14.8
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	2.01
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	193	160	116	161
Exchangeable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	115	87.0	76.4	1327
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	523	484	426	467
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	226	241	186	404
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	7.02	8.62	8.99	12.8
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.98	1.05	0.81	1.76
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	4.11	3.58	4.25	48.2
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.58	0.44	0.38	6.64
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	31.2	33.2	39.5	28.3
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	4.36	4.03	3.55	3.89
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	3.54	3.37	3.31	3.00
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.49	0.41	0.30	0.41
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.13	0.11	0.11	1.70
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.11	0.10	0.08	0.11
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	14.0	12.2	8.99	13.8
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	0.8	0.3	0.0	9.3
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	4.4	21.6	30.8	13.7
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	22.3	25.8	29.1	34.4
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	14.3	14.1	11.5	17.7
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	58.2	38.2	28.5	24.9

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS15-20-40cm	1A-CS15-40-60cm	1A-CS15-60-80cm	1A-CS15-80-100cm
					20-40cm	40-60cm	60-80cm	80-100cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-73	140790-74	140790-75	140790-76
Water Retention	30cm tension	ASTM F1815-97	%	na	30.0	33.2	30.0	29.0
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.02	5.08	5.04	4.81
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.17	4.10	4.08	3.98
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	167	160	166	190
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.24	0.21	0.23	0.24
E.C.e	Calc	R&L 3A1	dS/m	na	2.1	1.8	2.0	1.9
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	1.7	1.2	0.8	0.6
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.43	0.46	0.25	0.21
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	261	291	223	188
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	14.5	9.3	15.7	16.8
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	53.1	39.3	47.4	63.0
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	159	118	142	189
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.48	0.51	0.62	0.86
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.14	1.19	1.37	1.69
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	6.7	5.0	4.5	5.3
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	103	65.8	37.9	53.1
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.21	0.16	0.12	0.09
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	250	360	311	202
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	171	196	280	239
Texture	Field	Northcote	Class	na	LMC	LMC	LMC	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 5/2	10YR 5/3	10YR 5/6	10YR 5/6
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/3	10YR 5/6	10YR 5/6	10YR 6/1
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.34	1.20	1.31	1.24
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	1.1	0.7	0.6	3.1
Porosity Total	Calc	ASTM F1815-97	%	na	47.4	53.0	50.5	54.0
Porosity Capillary	Calc	ASTM F1815-97	%	na	40.0	40.0	38.3	36.0
Porosity Air Filled	Calc	ASTM F1815-97	%	na	8.3	13.1	12.3	18.1
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	17.5	26.3	25.7	24.3
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS15-20-40cm	1A-CS15-40-60cm	1A-CS15-60-80cm	1A-CS15-80-100cm
					20-40cm	40-60cm	60-80cm	80-100cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-73	140790-74	140790-75	140790-76
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	19.6	22.8	19.3	16.4
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	2.78	4.00	3.46	2.24
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	123	148	168	132
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	280	169	107	120
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	970	1242	1351	1026
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	370	456	516	453
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	11.3	11.3	12.5	14.4
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.61	1.98	2.24	1.97
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	9.87	4.81	2.98	4.38
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.40	0.85	0.54	0.60
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	57.0	59.0	62.8	62.4
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	8.08	10.4	11.3	8.55
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	2.22	2.16	2.40	2.47
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.32	0.38	0.43	0.34
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.17	0.08	0.05	0.07
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.04	0.04	0.04	0.04
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	14.2	17.6	17.9	13.7
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	6.8	1.1	0.8	8.3
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	9.1	6.5	8.2	8.5
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	29.4	26.2	26.0	40.6
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	9.7	15.7	21.0	16.1
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	45.0	50.6	44.1	26.5

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS16-0-20cm	1A-CS16-20-40cm	1A-CS16-40-60cm	1B composite 0-20cm
					0-20cm	20-40cm	40-60cm	0-20cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-77	140790-78	140790-79	140790-80
Water Retention	30cm tension	ASTM F1815-97	%	na	28.2	28.1	28.4	NA
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	7.37	7.37	7.13	5.67
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	6.79	6.81	6.64	4.59
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	111	164	245	68.5
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.27	0.31	0.36	0.12
E.C.e	Calc	R&L 3A1	dS/m	na	2.3	2.7	3.1	1.0
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	11.7	6.7	7.4	7.4
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	1.67	1.22	0.98	2.15
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	114	145	111	156
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	110	116	84.4	39.0
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	27.8	56.8	77.0	14.3
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	83.4	170	231	42.9
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.80	0.89	1.14	1.24
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	3.95	2.78	2.59	3.96
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	12.0	15.0	11.8	33.4
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	102	132	128	310
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.45	0.34	0.28	0.54
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	218	202	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	1660	1106	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	846	928	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	330	296	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	4.0	0.6	0.8	16.7
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	387	392	326	351
Texture	Field	Northcote	Class	na	CL	CL	LMC	CL
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 4/2	10YR 4/2	10YR 4/3	10YR 4/2
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/4	10YR 5/4	10YR 4/3	10YR 5/6
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.34	1.36	1.34	NA
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	3.6	3.0	8.8	NA
Porosity Total	Calc	ASTM F1815-97	%	na	47.0	47.0	46.0	NA
Porosity Capillary	Calc	ASTM F1815-97	%	na	38.0	38.3	38.3	NA
Porosity Air Filled	Calc	ASTM F1815-97	%	na	9.0	9.0	8.0	NA
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	12.8	12.0	14.9	NA
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	3.22	3.44	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1A-CS16-0-20cm	1A-CS16-20-40cm	1A-CS16-40-60cm	1B composite 0-20cm
					0-20cm	20-40cm	40-60cm	0-20cm
DEPTH (cm)								
Test Parameter	Method Description	Method Reference	Units	LOR	140790-77	140790-78	140790-79	140790-80
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	47.8	36.7	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	40.6	51.3	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	8.27	8.54	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	0.25	0.04	0.06	1.84
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	0.56	0.52	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	8.30	5.53	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	7.05	7.73	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	1.43	1.29	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.04	0.01	0.01	0.19
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	17.4	15.1	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	1.18	0.72	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	234	228	197	220
Exchangeable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	1831	1601	1063	695
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	771	905	940	568
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	367	342	367	258
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	8.95	8.44	10.5	11.1
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.60	1.49	1.60	1.12
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	51.4	45.4	34.8	34.5
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	9.16	8.01	5.32	3.48
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	36.1	42.8	51.3	47.0
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	6.43	7.54	7.83	4.73
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	3.37	3.32	3.31	5.60
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.60	0.58	0.51	0.56
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	1.42	1.06	0.68	0.73
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.09	0.08	0.06	0.12
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	17.8	17.6	15.3	10.1
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	1.6	3.3	2.8	NA
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	14.2	12.9	16.9	NA
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	33.5	32.9	37.2	NA
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	17.4	14.6	10.7	NA
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	33.2	36.3	32.4	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID DEPTH (cm)					1B composite 20- 40cm	1B composite 40- 60cm	1B composite 60- 80cm	1B composite 80- 100cm
					20-40cm	40-60cm	60-80cm	80-100cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-81	140790-82	140790-83	140790-84
Water Retention	30cm tension	ASTM F1815-97	%	na	NA	NA	NA	NA
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.46	5.28	5.27	5.35
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.29	4.27	4.28	4.43
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	111	236	279	505
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.14	0.25	0.32	0.45
E.C.e	Calc	R&L 3A1	dS/m	na	1.2	2.2	2.8	3.4
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	2.0	1.3	0.6	0.7
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.90	0.57	0.42	0.20
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	239	229	164	88.2
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	19.9	13.9	30.4	22.1
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	15.1	22.6	28.9	37.7
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	45.3	67.8	86.7	113
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.88	0.73	0.65	0.88
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.62	1.07	0.90	1.13
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	11.0	6.2	5.1	4.9
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	162	105	115	61.6
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.28	0.17	0.14	0.06
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	143	126
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA	283	184
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA	1164	1109
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA	730	928
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	125	152	104	29.0
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	266	284	201	190
Texture	Field	Northcote	Class	na	LMC	LMC	LMC	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 4/1	10YR 4/3	10YR 6/4	10YR 6/4
Colour (wet interior)	Dry	Munsell	Class	na	10YR 4/1	10YR 5/6	10YR 5/4	10YR 6/3
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	NA	NA	NA	NA
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	NA	NA	NA	NA
Porosity Total	Calc	ASTM F1815-97	%	na	NA	NA	NA	NA
Porosity Capillary	Calc	ASTM F1815-97	%	na	NA	NA	NA	NA
Porosity Air Filled	Calc	ASTM F1815-97	%	na	NA	NA	NA	NA
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	NA	NA	NA	NA
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA	2.32	2.18

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1B composite 20- 40cm	1B composite 40- 60cm	1B composite 60- 80cm	1B composite 80- 100cm
DEPTH (cm)					20-40cm	40-60cm	60-80cm	80-100cm
Test Parameter	Method Description	Method Reference	Units	LOR	140790-81	140790-82	140790-83	140790-84
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA	8.95	6.20
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA	61.3	62.3
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA	20.1	27.2
Aluminium Saturation	Calculation	R&L 15J1	%	na	9.66	10.0	7.07	2.02
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	0.37	0.32
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	1.42	0.92
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	9.70	9.24
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	3.17	4.03
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	1.39	1.69	1.16	0.32
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	15.8	14.8
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA	0.15	0.10
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	173	196	142	126
Exchangable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	482	324	280	190
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	989	1252	1213	1237
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	434	607	763	933
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	13.1	15.6	20.3	25.4
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.89	2.64	3.32	4.06
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	16.8	9.59	8.57	5.95
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	2.41	1.62	1.40	0.95
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	57.3	61.8	61.8	64.6
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	8.24	10.4	10.1	10.3
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	3.09	2.98	2.23	2.02
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.44	0.50	0.36	0.32
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.29	0.16	0.14	0.09
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.05	0.05	0.04	0.03
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	14.4	16.9	16.3	16.0
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	NA	NA	NA	NA
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	NA	NA	NA	NA
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	NA	NA	NA	NA
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	NA	NA	NA	NA
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	NA	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1B composite 100-120cm	DUP A	DUP B	DUP C
DEPTH (cm)					100-120cm	-	-	-
Test Parameter	Method Description	Method Reference	Units	LOR	140790-85	140790-86	140790-87	140790-88
Water Retention	30cm tension	ASTM F1815-97	%	na	NA	31.3	32.0	31.5
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	5.63	5.32	5.80	4.98
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	4.80	4.49	5.07	4.23
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	790	164	195	169
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.58	0.25	0.29	0.27
E.C.e	Calc	R&L 3A1	dS/m	na	5.0	2.3	2.5	2.3
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	0.9	6.4	10.6	4.4
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.14	0.86	1.31	0.61
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	83.7	247	152	219
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	14.4	28.1	49.9	10.8
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	48.4	54.1	65.9	52.4
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	145	162	198	157
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.95	0.54	0.58	0.39
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.15	1.08	1.48	1.12
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	5.3	6.7	19.7	7.6
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	46.5	155	110	139
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.07	0.24	0.57	0.24
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	142	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	146	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	1302	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	1090	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	4.2	112	3.0	139
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	211	194	318	155
Texture	Field	Northcote	Class	na	LMC	CL	CL	CL
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/3	10YR 5/3	10YR 5/2	10YR 5/3
Colour (wet interior)	Dry	Munsell	Class	na	10YR 7/3	10YR 5/6	10YR 5/6	10YR 5/6
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	NA	1.35	1.33	1.40
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	NA	9.5	3.3	3.3
Porosity Total	Calc	ASTM F1815-97	%	na	NA	48.1	48.0	47.2
Porosity Capillary	Calc	ASTM F1815-97	%	na	NA	42.3	42.5	44.1
Porosity Air Filled	Calc	ASTM F1815-97	%	na	NA	6.0	5.4	3.1
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	NA	20.8	18.3	14.6
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	2.18	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					1B composite 100-120cm	DUP A	DUP B	DUP C
DEPTH (cm)					100-120cm	-	-	-
Test Parameter	Method Description	Method Reference	Units	LOR	140790-85	140790-86	140790-87	140790-88
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	4.36	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	64.9	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	28.3	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	0.27	8.27	0.22	13.7
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	0.36	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	0.73	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	10.9	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	4.74	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.05	1.24	0.03	1.54
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	16.7	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	0.07	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	142	119	197	114
Exchangeable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	150	711	1014	337
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	1381	950	936	762
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	1133	467	465	329
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	28.0	13.5	13.1	12.7
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	4.93	2.03	2.02	1.43
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	4.26	23.6	32.9	14.9
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.75	3.56	5.07	1.69
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	65.4	52.6	50.6	56.2
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	11.5	7.92	7.80	6.35
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	2.07	2.03	3.27	2.59
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.36	0.31	0.51	0.29
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.07	0.45	0.65	0.27
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.03	0.04	0.06	0.05
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	17.6	15.1	15.4	11.3
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	NA	3.1	0.9	5.6
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	NA	11.2	12.4	14.8
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	NA	36.3	30.5	33.5
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	NA	17.7	16.7	16.4
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	NA	31.6	39.5	29.7

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					DUP D	DUP E	DUP F	DUP G
DEPTH (cm)					-	-	-	-
Test Parameter	Method Description	Method Reference	Units	LOR	140790-89	140790-90	140790-91	140790-92
Water Retention	30cm tension	ASTM F1815-97	%	na	31.0	26.0	25.0	30.0
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	6.13	5.32	5.45	5.00
pH (1:5 in CaCl2)	Electrode	R&L 4B2	pH units	na	5.83	4.29	4.30	4.30
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	515	139	93.0	168
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.66	0.19	0.14	0.24
E.C.e	Calc	R&L 3A1	dS/m	na	5.7	1.6	1.1	1.9
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	3.6	4.2	1.5	3.6
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	0.43	0.24	0.23	0.94
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	162	115	121	320
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	40.3	17.2	17.5	17.1
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	154	37.5	9.4	52.7
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	462	113	28.2	158
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.60	0.87	0.45	0.33
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	1.75	0.84	0.77	1.28
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	5.4	4.9	4.7	15.7
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	47.7	61.1	74.7	94.8
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.13	0.14	0.12	0.30
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	179	NA	NA	NA
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	635	NA	NA	NA
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	1478	NA	NA	NA
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	479	NA	NA	NA
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	2.3	106	85.0	264
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	269	205	161	202
Texture	Field	Northcote	Class	na	LMC	LMC	SC	LMC
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 6/4	10YR 6/6	10YR 6/8	10YR 4/3
Colour (wet interior)	Dry	Munsell	Class	na	10YR 6/8	10YR 6/8	10YR 6/8	5YR 5/8
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.28	1.40	1.34	1.29
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	0.6	0.5	1.1	0.5
Porosity Total	Calc	ASTM F1815-97	%	na	50.3	48.0	48.2	51.0
Porosity Capillary	Calc	ASTM F1815-97	%	na	39.2	36.0	33.3	39.0
Porosity Air Filled	Calc	ASTM F1815-97	%	na	11.1	12.1	15.0	12.3
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	23.4	16.7	16.0	35.6
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	2.54	NA	NA	NA

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					DUP D	DUP E	DUP F	DUP G
DEPTH (cm)					-	-	-	-
Test Parameter	Method Description	Method Reference	Units	LOR	140790-89	140790-90	140790-91	140790-92
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	17.6	NA	NA	NA
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	68.2	NA	NA	NA
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	11.5	NA	NA	NA
Aluminium Saturation	Calculation	R&L 15J1	%	na	0.10	8.21	9.30	16.6
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	0.46	NA	NA	NA
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	3.18	NA	NA	NA
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	12.3	NA	NA	NA
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	2.08	NA	NA	NA
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.03	1.18	0.94	2.93
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	18.1	NA	NA	NA
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	0.26	NA	NA	NA
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	193	121	66.4	139
Exchangeable Calcium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	20	697	159	183	717
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	2108	1210	825	1120
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	1151	456	287	348
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	18.8	13.8	12.3	8.54
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	5.00	1.98	1.25	1.51
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	13.1	5.54	9.01	20.2
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	3.49	0.80	0.92	3.59
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	66.1	70.3	67.7	52.7
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	17.6	10.1	6.88	9.33
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	1.86	2.16	1.68	2.01
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.49	0.31	0.17	0.36
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.20	0.08	0.13	0.38
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.03	0.03	0.02	0.04
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	26.6	14.3	10.2	17.7
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	1.4	0.0	0.0	7.1
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	4.0	3.2	51.9	8.4
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	19.9	50.8	22.2	27.3
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	17.3	17.8	6.7	15.0
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	57.4	28.2	19.1	42.2

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					DUP H	DUP I		
DEPTH (cm)					-	-		
Test Parameter	Method Description	Method Reference	Units	LOR	140790-93	140790-94		
Water Retention	30cm tension	ASTM F1815-97	%	na	26.3	NA		
pH (1:5 in H2O)	Electrode	R&L 4A2	pH units	na	7.35	5.27		
pH (1:5 in CaCl2)	Electrode	R&L4B2	pH units	na	6.96	4.34		
Chloride Soluble	Electrode	R&L 5A2	mg/kg	5	137	233		
Electrical Conductivity	Electrode	R&L 3A1	dS/m	0.01	0.28	0.27		
E.C.e	Calc	R&L 3A1	dS/m	na	2.2	2.3		
Extractable Nitrate-N	H2O/UV-Vis	PMS-08	mg/kg	0.5	8.2	1.2		
Organic Carbon (LECO)	LECO	R&L 6B3	%	0.05	1.46	0.44		
Phosphorus Buffer Index	UV-Vis	PMS-12	mg/kg	na	124	198		
Phosphorus	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	108	16.5		
Sulphate-Sulphur	KCl40/ICP	R&L 10D1	mg/kg	3	41.9	32.7		
Sulphate	KCl40/ICP	R&L 10D1	mg/kg	9	126	98.1		
Extractable Copper	DTPA/ICP	R&L 12A1	mg/kg	0.1	0.74	0.57		
Extractable Zinc	DTPA/ICP	R&L 12A1	mg/kg	0.1	3.01	0.86		
Extractable Manganese	DTPA/ICP	R&L 12A1	mg/kg	0.4	15.3	5.4		
Extractable Iron	DTPA/ICP	R&L 12A1	mg/kg	0.4	127	83.4		
Extractable Boron	Hot CaCl2/ICP	R&L 12C2	mg/kg	0.05	0.36	0.20		
Exchangeable Potassium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA		
Exchangeable Calcium	NH4Cl/ICP	R&L 15A2	mg/kg	20	NA	NA		
Exchangeable Magnesium	NH4Cl/ICP	R&L 15A2	mg/kg	10	NA	NA		
Exchangeable Sodium	NH4Cl/ICP	R&L 15A2	mg/kg	5	NA	NA		
Exchangeable Aluminium	KCl/ICP	R&L 15G1	mg/kg	na	2.0	141		
Potassium (Colwell)	Bicarb/ICP	R&L 18A1	mg/kg	10	359	206		
Texture	Field	Northcote	Class	na	CL	LMC		
Colour (wet exterior)	Dry	Munsell	Class	na	10YR 4/2	10YR 5/6		
Colour (wet interior)	Dry	Munsell	Class	na	10YR 5/4	5YR 5/8		
Bulk Density	Recompacted	ASTM F1815-97	mg/m3	na	1.39	NA		
Saturated Hydraulic Conductivity	30cm tension	ASTM F1815-97	mm/hr	na	5.0	NA		
Porosity Total	Calc	ASTM F1815-97	%	na	47.2	NA		
Porosity Capillary	Calc	ASTM F1815-97	%	na	36.4	NA		
Porosity Air Filled	Calc	ASTM F1815-97	%	na	11.0	NA		
Air Dry Soil Moisture (ADMC)	Air-dry content	R&L 2A1	%	na	12.5	NA		
Exchangeable Potassium %	Calculation	R&L 15J1/A2	%	na	NA	NA		

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					DUP H	DUP I		
DEPTH (cm)					-	-		
Test Parameter	Method Description	Method Reference	Units	LOR	140790-93	140790-94		
Exchangeable Calcium %	Calculation	R&L 15J1/A2	%	na	NA	NA		
Exchangeable Magnesium %	Calculation	R&L 15J1/A2	%	na	NA	NA		
Exchangeable Sodium %	Calculation	R&L 15J1/A2	%	na	NA	NA		
Aluminium Saturation	Calculation	R&L 15J1	%	na	0.13	8.28		
Exchangeable Potassium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA		
Exchangeable Calcium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA		
Exchangeable Magnesium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA		
Exchangeable Sodium	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA		
Exchangeable Aluminium	Calculation	R&L 15J1	Cmol/kg	0.2	0.02	1.57		
ECEC	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA		
Ca/Mg Ratio	Calculation	R&L 15J1/A2	Cmol/kg	na	NA	NA		
Exchangeable Potassium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	213	155		
Exchangeable Calcium	NH4OAc /ICP-OES	R&L 15D3	mg/kg	20	1634	358		
Exchangeable Magnesium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	10	831	1432		
Exchangeable Sodium	NH4OAc/ICP-OES	R&L 15D3	mg/kg	5	322	746		
Exchangeable Sodium %	Calculation	R&L 15J1/D3	%	na	8.20	17.1		
Exchangeable Sodium	Calculation	R&L 15J1/D3	Cmol/kg	na	1.40	3.24		
Exchangeable Calcium %	Calculation	R&L 15J1/D3	%	na	47.9	9.46		
Exchangeable Calcium	Calculation	R&L 15J1/D3	Cmol/kg	na	8.17	1.79		
Exchangeable Magnesium %	Calculation	R&L 15J1/D3	%	na	40.6	63.0		
Exchangeable Magnesium	Calculation	R&L 15J1/D3	Cmol/kg	na	6.93	11.9		
Exchangeable Potassium %	Calculation	R&L 15J1/D3	%	na	3.20	2.10		
Exchangeable Potassium	Calculation	R&L 15J1/D3	Cmol/kg	na	0.55	0.40		
Ca/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	1.18	0.15		
K/Mg Ratio	Calculation	R&L 15J1/D3	Cmol/kg	na	0.08	0.03		
ECEC	Calculation	R&L 15J1/D3	Cmol/kg	na	17.1	18.9		
Gravel >2.0mm	Sieve	ASTMD422-63	%	na	3.2	NA		
Coarse Sand 0.2-2.0mm	Sieve	ASTMD422-63	%	na	12.2	NA		
Fine Sand 0.02-0.2mm	Sieve	ASTMD422-63	%	na	33.3	NA		
Silt 0.002-0.02mm	Hydrometer	ASTMD422-63	%	na	15.7	NA		
Clay <0.002mm	Hydrometer	ASTMD422-63	%	na	35.5	NA		

ANALYSIS REPORT

PROJECT NO: EW140790

Location: -

CLIENT SAMPLE ID					DUP H	DUP I		
DEPTH (cm)					-	-		
Test Parameter	Method Description	Method Reference	Units	LOR	140790-93	140790-94		

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NB: LOR is the Lowest Obtainable Reading.

DOCUMENT END

A.5 Comparison of Baseline Soil Study Results

Comparison of Baseline Soil Study Results

Baseline 6 (25th November 2014) - Baseline 5 (19th May 2014)

Depth	EC (1:5)	pH	NO3	Org-C	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	ECEC	Ca/Mg	ESP
cm	dS/m	CaCl2	mg/kg	%	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	Cmol/kg	ratio	%
0-20	0.01	-1.16	-15.09	-1.10	-0.19	-4.67	1.33	0.16	0.68	-76	-940	151	38	2	-1	-17	11	2	4	-2.70	-1.10	2.22
20-40	-0.10	-1.26	-3.81	-0.72	-0.29	-5.78	1.39	0.18	2.92	-116	-1159	152	41	11	-1	-26	10	1	15	-1.60	-0.74	1.44
40 - 60	-0.09	-0.98	-4.12	-0.42	-0.19	-5.35	0.53	0.38	1.71	-73	-1074	47	86	-76	0	-22	10	3	9	-2.91	-0.50	3.18
60 - 80	-0.16	-1.47	-3.20	-0.54	-0.18	-5.73	0.05	0.17	1.30	-72	-1150	-12	39	-60	-1	-23	12	4	8	-4.42	-0.53	3.75
80 - 100	-0.11	-1.45	-2.15	-0.44	-0.18	-4.94	-1.30	0.01	1.30	-73	-992	-174	3	-47	0	-19	7	3	10	-5.14	-0.41	3.45
100 - 120	-0.33	-2.22	-8.38	-0.61	-0.25	-7.56	-1.68	-0.57	1.38	-99	-1517	-221	-132	11	0	-25	12	3	11	-8.70	-0.58	2.57

Baseline 6 (25th November 2014) - Parent Soil (Baseline 1 – 9th June 2011) (based on average values)

Depth	EC (1:5)	pH	NO3	Org-C	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	K	Ca	Mg	Na	Al	ECEC	Ca/Mg	ESP
cm	dS/m	CaCl2	mg/kg	%	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	Cmol/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	%	%	%	Cmol/kg	ratio	%
0-20	0.24	0.79	-0.87	-0.84	0.21	4.26	1.57	1.31	0.49	82	851	180	302	-14	-1	9	-14	5	2	7.85	0.49	4.95
20-40	0.20	0.17	3.11	0.04	0.02	1.31	-1.07	0.36	2.49	6	261	-148	83	-28	0	5	-17	0	12	3.10	0.16	0.30
40 - 60	0.13	-0.16	1.69	0.04	-0.01	0.44	-1.43	0.10	2.26	-3	88	-191	24	-27	0	2	-13	0	11	1.37	0.05	-0.45
60 - 80	0.04	-0.30	1.80	-0.03	-0.05	-0.10	-1.48	-0.19	1.70	-21	-21	-198	-43	-24	0	0	-8	-1	10	-0.14	-0.02	-1.32
80 - 100	0.07	-0.42	1.06	-0.02	-0.03	0.47	-1.72	-0.32	1.59	-12	92	-225	-73	-21	0	2	-10	-2	11	-0.03	0.04	-2.46
100 - 120	-0.18	-0.88	-8.14	-0.60	-0.06	-3.22	-0.32	0.66	1.25	-23	-647	-55	151	-1	0	-16	2	4	10	-1.70	-0.30	4.12

A.6 Stage 1 B Plot Layout



Legend

● Stage 1B □ Stage 1B Irrigation Areas

A.7 Stage 1 B Baseline 6 Soil Study Results (25-27th November 2014) Summary for Reporting Period 5th July – 31st December 2014.

Stage 1B

Depth cm	EC (1:5) dS/m	pH CaCl2	NO3 mg/kg	Org-C %	K Cmol/kg	Ca Cmol/kg	Mg Cmol/kg	Na Cmol/kg	Al Cmol/kg	K mg/kg	Ca mg/kg	Mg mg/kg	Na mg/kg	Al mg/kg	K %	Ca %	Mg %	Na %	Al %	ECEC Cmol/kg	Ca/Mg ratio	ESP %
0-20cm	0.12	4.59	7.4	2.15	0.56	3.48	4.73	1.12	0.19	220	695	568	258	17	6	34	47	11	2	10.1	0.73	11.1
20-40cm	0.14	4.29	2	0.9	0.44	2.41	8.24	1.89	1.39	173	482	989	434	125	3	17	57	13	10	14.4	0.29	13.1
40-60cm	0.25	4.27	1.3	0.57	0.5	1.62	10.4	2.64	1.69	196	324	1252	607	152	3	10	62	16	10	16.9	0.16	15.6
60-80cm	0.32	4.28	0.6	0.42	0.36	1.4	10.1	3.32	1.16	142	280	1213	763	104	2	9	62	20	7	16.3	0.14	20.4
80-100cm	0.45	4.43	0.7	0.2	0.32	0.95	10.3	4.06	0.32	126	190	1237	933	29	2	6	64	25	2	16	0.09	25.4
100-120cm	0.58	4.8	0.9	0.14	0.36	0.75	11.5	4.93	0.05	142	150	1381	1133	4	2	4	65	28	0	17.6	0.07	28.0