ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

SOIL AND LAND SUITABILITY ASSESSMENT: BARALABA SOUTH PROJECT

1 NOVEMBER 2023
718107
VERSION 4.1

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EXECUTIVE SUMMARY

Environmental Earth Sciences QLD was commissioned by Baralaba Coal Company Pty Ltd to undertake a soil and land suitability assessment for the Baralaba South Project.

This report will assist in the development of the project and provide data to supplement the future mine planning and rehabilitation works. The survey is completed to the required strategic cropping land (SCL) assessment survey intensity in SCL trigger areas, and 1:50,000 over the remainder of the study area.

The Environmental Earth Sciences QLD soil and land suitability assessment provides:

- A description and mapping of the soil variation and distribution across the study area;
- An assessment of the soil for land suitability for grazing and rainfed cropping across the study area; and
- A validation assessment of areas included in the Department of Resources (previously Department of Natural Resources, Mines and Energy (DNRME) and Department of Environment and Resource Management (DERM) SCL trigger maps within in the study area.

A total of 125 ground observations were made across the study area to assess the underlying soil properties and facilitate collection of soil samples. Soil samples were analysed for various physical and chemical soil parameters by NATA accredited laboratories.

Seven soils in eight landscapes were described and mapped across the study area. The Baralaba South Project area is dominated by cracking clays in the Dawson River floodplain and texture-contrast soils on the gently undulating rises. Soil management considerations within the Baralaba South Project area include salinity and sodicity and associated erosion hazard.

Land suitability constraints within the study area relate to salinity and sodicity of the subsoil (the “B horizon”), including the effect of these constraints on soil water availability and rooting depth. Flood frequency is also a major constraint in the floodplain areas of Baralaba South Project. Nutrient levels across the study area were moderate to poor. Additionally, water erosion and surface condition of soils were significant restraints on cropping land suitability due to slope of land, dispersivity of surface soil and size of peds. The highest quality land for cropping was located on the floodplain of the Baralaba South Project area.

The Strategic Cropping Land assessment found that of the soils within SCL trigger areas, seven of the 13 unique mapping areas (UMAs) in the Baralaba South Project area passed the soil and landscape criteria for SCL.

The preliminary site investigation (PSI) for contaminated land identified arsenic (As) used for weed and termite control along the former railway line as a chemical of potential concern (CoPC). Concentrations of As in soil along the railway line do not exceed site specific criteria developed for As, and therefore are not considered to pose a hazard to health of workers or the environment. Concentrations of As (and all other heavy metals tested) in soil are also suitable for sensitive use (such as residential or child care centres and vegetable gardens).

No further assessment or management is considered necessary unless soil from the rail corridor is to be removed from the site (please see the report body for specific details).

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1 INTRODUCTION

Environmental Earth Sciences was engaged to conduct a soil and land suitability assessment the Baralaba South Project (BSP) on behalf of the Baralaba Coal Company Pty Ltd (Baralaba Coal Company [BCC]). The initial soil and land suitability assessment was conducted in 2012 for Cockatoo Coal, however the project did not proceed at that time. Further assessment was conducted in 2018 for the Mount Ramsay Coal Company Pty Ltd (now Baralaba Coal Company). The soil and land suitability report has been further updated in 2023 for Baralaba Coal Company Pty Ltd (the Proponent) of the BSP EIS to meet the Terms of Reference (ToR) for the Project.

The purpose of the report is to address a number of the ToR that relate to the soil and land components of the Environmental Impact Statement (EIS) pertaining to development of an open cut coal mine and associated infrastructure. This report includes an assessment of soil types, the quantity and quality of topsoil, strategic cropping land, land suitability and agricultural land classification, and a preliminary site investigation for contaminated land.

2 OBJECTIVES

The scope of the soil and land suitability assessment is for the BSP area and proposed realignment of the Moura-Baralaba Road to the east of the Mining Lease Application (MLA) 700057 boundary.

The ToR for the EIS relevant to the soil and land suitability assessment are:

6.2 Site description

6.2.2 Describe and illustrate the topography of the project site and surrounding area, and highlight any significant features shown on the maps. Maps should have contours at suitable increments relevant to the scale, location, potential impacts and type of project, shown with respect to Australian Height Datum (AHD) and drafted to GDA94.

6.2.4 Where appropriate, describe, map and illustrate soil types and profiles of the project area at a scale relevant to the proposed project. Describe the method(s) used for soil characterisation. Identify soils that would require particular management due to wetness, erosivity, depth, acidity, salinity or other feature.

8.1 Flora and fauna

8.1.3 Describe the topsoil resource on site and the quantity and quality of topsoil that would be available for rehabilitation. Describe how topsoil will be managed to minimise topsoil loss. The EIS must describe how topsoil will be stripped, salvaged and stockpiled and used for progressive and final rehabilitation.

8.8 Land

8.8.1 Describe potential impacts of the proposed land uses taking into consideration the proposed measures that would be used to avoid or minimise impacts. The impact prediction must address:

- … and land uses (including any site-specific accreditations e.g. organic, bio-dynamic, European Union cattle accreditation scheme (EUCAS) accreditation) in and around the project area, referring to regional plans and local government planning schemes;

- regional cumulative (reversible and irreversible impacts of existing and possible future resource developments (as described by approved plans and approvals, and other projects currently at referral staged of a related assessment under the *State Development and Public Works Organisation Act 1971,* SPA, EP Act, *Mineral Resources Act 1989* and the *Petroleum and Gas (Production Safety) Act 2004) on:*

    (a) Agricultural Land Classification Class A and B land

    (b) Land used for a priority agricultural land use in the priority agricultural area

    (c) Areas within the Dawson River Valley Important Agricultural Area used for an agricultural use

    (d) Areas of land mapped as strategic cropping land on a strategic cropping land trigger map; and

8.8.2 Address the requirements of the *Regional Planning Interests Act 2014,* including the requirements of the Central Queensland Regional Plan (October 2013).

8.8.3 Detail any known or potential sources of contaminated land that could be impacted by the project. Describe how any proposed land use may result in land becoming contaminated.

3 PROJECT DESCRIPTION

The BSP is located in the lower Bowen Basin of Central Queensland, approximately and 115 km west of Rockhampton and 8 km south of Baralaba. The Project targets the Baralaba Coal Measures and is a greenfield, open-cut metallurgical coal mine which would extract up to 2.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal to produce pulverised coal injection (PCI) coal for export to international markets over a life of 23 years with construction commencing in 2029.

Development of the Project would require the relocation of an approximate 4.5 km section of the Moura-Baralaba Road from within the MLA boundary to the east of the MLA.

3.1 Relevant Legislation

The following describes the key legislation applicable to the planning, approval, construction and operation of the Project relevant to the soil and land suitability assessment.

3.1.1 Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) is the key legislation for environmental management and protection in Queensland. The environmental values of land resources in Queensland are protected under the EP Act. The primary objectives of the EP Act is to protect environmental values and human health whilst allowing developments that improve the quality of life both now and in the future in a manner that maintains ecological processes.

3.1.2 Regional Planning Interests Act 2014

The *Regional Planning Interests Act 2014* commenced on 28th of March 2014 with the purpose to manage the impact of resource activities and other regulated activities on areas

of the State that contribute, or are likely to contribute, to Queensland's economic, social and environmental prosperity. The Act defines Strategic Cropping Land (SCL) and Priority Agricultural Areas (PAA).

3.1.3 Banana Shire Town Planning Scheme (2021)

The local government planning scheme for planned land-uses and mapped Good Quality Agricultural Land (GQAL) as defined in the outdated *Planning Guideline: "The identification of Good Quality Agricultural Land".* This is equivalent to the current State Planning Policy guidelines on Agricultural Land Classification.

3.1.4 State Planning Policy 2017

State Planning Policy 2017 (SPP) defines Agricultural Land Classification (ALC) Class A (Crop Land) and Class B (Limited Crop Land) are protected for sustainable agricultural use and are used to define the SCL trigger areas, outlined in the SPP Interactive Mapping System, or local government studies. ALCs are summarised and simplified from land suitability/capability data based upon the *Guidelines for land evaluation* and *Regional Land Suitability Frameworks for Queensland.*

3.1.5 Central Queensland Regional Plan (2013)

The Central Queensland Regional Plan provides strategic direction and policies to deliver regional outcomes which align with the state's interests in planning and development, which are outlined in the *State Planning Policy 2017*. The Central Queensland Regional Plan was prepared with a strong focus on resolving land use competition between the agricultural and the resource sectors and driving economic development.

4 GENERAL METHODOLOGY

The methodology for the soil survey was developed to enable the ToR of the EIS to be addressed. The individual methodology and resources are outlined in the sections below.

4.1 Background

4.1.1 References

The soil and land suitability assessment has been developed in reference to the following guidelines:

- Australian Soil and Land Survey: Guidelines for Survey Soil and Land Resources (McKenzie et al., 2008);
- Australian Soil Classification (Isbell, 2002);
- Australian Soil Survey and Land Survey Field Handbook (NCTS, 2009);

- Guidelines for agricultural land evaluation in Queensland, 2nd edition (DSITI and DNRM, 2014);
- How to demonstrate that land in the strategic cropping area does not meet the criteria for strategic cropping land, RPI Act Statutory Guideline 08/14 (DILGP, 2017);
- Regional Land Suitability Frameworks for Queensland (DNRM and DES, 2013);
- Erosion index - Best Practice Erosion and Sediment Control. International Erosion Control Association Australasia IECA (2008); and
- Soil Erodibility – Chapter 2 Site Assessment. Road Drainage Design Manual (RDDM, 2002).

4.1.2 Background Information

Listed below is the background information sources which were referred to in the desktop component of this study:

- Satellite imagery provided by the Proponent;
- LiDAR survey results of the site at 1 m intervals supplied by the Proponent;
- Geology datasets of 1:250,000 scale mapping from the Geological Survey of Queensland;
- Regional ecosystem data sets of 1:100,000 scale pre-clearing mapping from DES;
- Soil datasets of 1:2,000,000 and 1:1,000,000 scale mapping from DNRM;
- Climate data from the Bureau of Meteorology (BoM) Thangool Airport 1926 to 2019;
- Soils of the Banana Area, Central Queensland (Muller, 2008); and
- Strategic Cropping Land Trigger Map datasets from the DNRME.

4.2 Desktop Assessment

A desktop assessment was undertaken prior to commencing field works to construct a baseline conceptual site model of the soil and landscape characteristics of the site and identify the preliminary mapping units (PMUs) that would require ground observations during the fieldwork. The desktop assessment comprised the following:

- A review of the regulatory requirements relevant to the Project;
- Review of available topographic, geological and soil maps and associated reports for the survey area and surrounding region;
- Review of the satellite imagery of the study area;
- Identification of areas included in SCL trigger mapping from DNRME (January 2019); and
- Drafting of preliminary mapping units for validation during fieldwork.

4.2.1 Preliminary Mapping Units (PMU)

The drafting of PMUs for the study area was based upon aerial photography and image analysis, and a review of existing information. Existing mapping of soils, geology, topography, land zones and vegetation communities was analysed using a geographical information system (GIS). The PMUs identify tracts of land that are expected to share similar attributes as 'Soils' or 'Soil Landscapes' (for example, similar soil type, geology, vegetation type and landform), which can be separated from neighbouring tracts of land with a different pattern of similar attribute values. After fieldwork these PMUs were reviewed together with information obtained from ground observations and laboratory results to determine the soil mapping units and soils for the study area.

4.3 Fieldwork Methodology

The fieldwork targeted PMUs for ground observations, with the aim that every soil produced in the resultant map contains at least one detailed site description.

4.3.1 Ground Observation Densities and Types for Soil Survey

Ground observation densities and types required for soil surveys at the associated scales are included in the *Guidelines for Survey Soil and Land Resources* (McKenzie et al., 2008) 'the blue book'. Complex landscapes were surveyed at a higher field density relative to simple landscapes or those considered a low probability of being suitability classes 1 or 2 (based on topographical features and lithology).

The ground observations densities were adopted from the *Guidelines for Surveying Soil and Land Resources* (McKenzie et al., 2008), as required by the ToR for the EIS. Fieldwork aimed to ensure that every PMU received a ground observation; and that every soil produced in the resultant report and mapping contains at least one full morphological description with full laboratory analysis. The intensity for ground observations is included in Table 1.

Table 1: Ground Observation Intensity

	Ground observation types	Total Number	Percentage of Total
Detailed Soil Profile	**Full morphological description with full analysis** Detailed descriptions of one or more representative profile soil types (more for major soils) with full laboratory analysis for all horizons.	22	19%
	Full morphological description with diagnostic analysis Detailed profile descriptions for all horizons; adequate subsoil chemical analysis (diagnostic sampling and laboratory analysis) to identify and classify the soils.	34	30%
	Full morphological description Detailed profile descriptions for all horizons.	12	10%

	Ground observation types	Total Number	Percentage of Total
Check Sites	**Brief morphological description** **Less detailed soil descriptions to identify the soil; minimum description and recording.**	**26**	**23%**
	Brief surface observation Surface features check sites in large uniform areas and to establish soil boundaries. Check sites should have a minimum of data recorded to confirm the mapped soil type, such as location, landform, vegetation, surface characteristics, surface horizon characteristics, relevant notes, and soil type. May include single core or hand auger observation.	21	18%
Contaminated Land	**Contaminated Land – Preliminary Site Investigation** Soil observations within the former rail corridor for heavy metals analysis	4	-

Ground Observations for Strategic Cropping Land

The ground observation densities and types required for Strategic Cropping Land Assessments are as per those prescribed in *RPI Act Statutory Guideline 08/14: How to demonstrate that land in the strategic cropping area does not meet the criteria for strategic cropping land* (DILGP, 2017).

4.3.2 Field Descriptions

Ground observations were recorded with the information below.

Brief Surface Descriptions

Data was collected from all ground observation sites with reference to the Australian Soil and Land Survey Field Handbook (NCST 2009). At all sites this data included, but was not limited to:

- Geospatial location;
- Land use management;
- Landscape attributes (landform, vegetation, land degradation, erosion, micro-relief, etc.); and
- Soil surface condition.

Full Morphological Descriptions

Full morphological descriptions included the collection and recording of the following details:

- Horizon depths;

- Horizon designation;
- Horizon boundary type & distinctness;
- Field texture;
- Colour (Munsell chart);
- Mottles;
- Pedality (peds) & structure;
- Coarse fragments; and
- Segregations.

Auger hole or Undisturbed Cores

Site descriptions were made from either hand augered holes or undisturbed push-tube cores. Generally, soil profile descriptions were to depths of 1.0 (hand auger) to 1.8 m (push-tube) or until refusal, whichever was shallower.

4.3.3 Sampling and Laboratory Analysis

Laboratory samples were selected based upon the criteria and submitted for laboratory analysis for the analytes described below.

Sample Selection

Standard sample depths were (in metres) 0 to 0.1, 0.25 to 0.35, 0.55 to 0.65, 0.8 to 0.9, 1.1 to 1.2, 1.4 to 1.5, and 1.7 to 1.8, for uniform or gradational soils. However, for more differentiated soils (e.g. duplex/texture-contrast soils) these depths were modified to ensure that significant horizon boundaries were not crossed in the sample (for example an A2/B2 boundary). In collecting samples, the following practices were adopted:

- Samples did not span across significant horizon boundaries;
- Samples were not bulked between sites; and
- No sample interval exceeded 0.3 m.

Samples for chemical analysis were placed into bags with approximately 250-500 g required to adequately analyse samples.

Laboratory Analysis

Laboratory analysis was undertaken by a National Association of Testing Authorities (NATA) or Australian Soil and Plant Analysis Council (ASPAC) accredited laboratory. Different analytical suites were adopted based on site description. The analytical suites for the full morphological description with full analysis and full morphological description with diagnostic analysis sites are presented in Table 2 below. A quality analysis and quality control assessment of the laboratory data is provided in Appendix A. Full laboratory transcripts and chain of custody documentation are provided in Appendix B.

Table 2: Laboratory Analysis Summary

Site Type	Description		
Detailed Sites with Full Analysis	Full laboratory analysis was undertaken to develop soil mapping units that are representative of the different unique mapping areas across the study area.	Topsoils	Organic carbon, macronutrients (total nitrogen, available phosphorus), pH (1:5 water), electrical conductivity (EC), chloride, exchangeable cations, cation exchange capacity (CEC), exchangeable sodium percentage (ESP), particle size analysis (PSA), and Emerson (aggregate stability) test (selected samples only)
		Subsoils	pH (1:5 water), EC, chloride; exchangeable cations, CEC, ESP; PSA, and Emerson test (selected samples only)
Detailed Sites with Diagnostic Analysis (Including SCL Sites)	Adequate subsoil chemical analysis (diagnostic sampling) was undertaken to identify and classify the soils according to the 'key reference soils'	Diagnostic	pH (1:5 water), EC, exchangeable cations, CEC and ESP
		SCL Diagnostic	pH (1:5 water), EC, chloride of 0.25 to 0.35 m and 0.55 to 0.65 m samples. For some soils where physico-chemical limitations were expected, analysis of exchangeable cations was conducted on selected samples

4.4 Soil Classification Method

Soil types were grouped by parent material, representative landforms and geomorphological position in the landscape as 'Soil Landscapes'. The soil types were classified and named according to names and definitions of similar soils recorded prior soil surveys within the immediate region based on their morphological characteristics (below) and their type according to the Australian Soil Classification (ASC; Isbell, 2002):

- Number of horizons (soil layers) in the profile;
- Thickness and colour of horizons;
- Texture, texture-contrast, and structure type;
- Geochemistry;
- Geomorphological origin of the soil material (i.e. alluvial, colluvial, residual, etc.); and

- Relative position in the landscape.

4.5 Assessment Criteria

The assessment criteria adopted for this study for Strategic Cropping Land and Land Suitability are included in the relevant sections.

4.6 Mapping

Mapping of soil units was completed following the fieldwork to refine and modify the PMUs. Like the PMUs, the soil mapping units reflect variations in soil type, geology, landform, drainage and vegetation within the study area. The soil mapping units are defined by their 'Soil' name and are not considered to be unique in the sense that the same 'Soil' may be encountered more than once in different mapping units. However, the individual soil mapping units are assigned a unique code as 'unique mapping areas' (UMAs), with identification shown as the 1.XX numbers.

5 GENERAL SITE DESCRIPTION

5.1 Land Use

5.1.1 Land Use History

Historical land uses in the Baralaba and Moura region include agriculture and coal mining. Coal mining has had a long history in the Baralaba area, with the first mine opening in 1916.

Agricultural land uses have included cattle grazing and stud farms, dryland and irrigated cropping and improved pasture for grazing. The BSP area was extensively cleared in the past and various attempts were made to utilise the land for dryland and irrigated cropping and improved pasture, both on the flood plain and hillslopes.

A review of cropping history within the period 1 January 2009 to 31 December 2018 (the nominated period for the history of cropping test requirements) was undertaken to determine whether areas identified as SCL trigger areas met the requirements for the history of cropping test. The history of cropping test requires three cropping events (or attempts) within the nominated period.

For the assessment a Forage Report for crop frequency and type was generated and assessed in combination with field observations.

Evidence of attempts at cropping remain in the form of plough or ripping lines visible on satellite imagery, contour banks, an unused 600 m centre-pivot irrigator on the flood plain within the 'Broadmeadow' property (local landholder, pers. comm.), discarded farming equipment and improved pasture species growing within the study area.

No lots included in the study area had evidence of cropping within the assessed period of 1 January 2009 to 31 December 2018 (detailed interpretation presented in Appendix C).

5.1.2 Current Regional Land Use

The regional land use in the Baralaba area of the Bowen Basin region is generally rural, with some coal mining activities. Rural land uses are predominantly cattle grazing, with irrigated and rainfed broadacre cropping.

A large proportion of the prime agricultural land in the region surrounding the study area is located on the flood plain of the Dawson River and its tributaries and west of the river is described as a priority agricultural area (PAA, shown in Figure 1). The flood plain areas are used for irrigated and rainfed cropping and beef cattle grazing on improved pasture. Away from the flood plain, cattle area grazed on native or improved dryland pasture. The Banana Shire Town Planning Scheme, 2005, has the area zoned as rural land-use and includes the mining lease for coal mining.

The Baralaba North Mine is situated to the north of Baralaba and the Dawson Complex coal mine is located to the east of Moura.

5.1.3 Current Land Use Within the Study Area and Surrounds

Cattle grazing on improved pasture is the predominant land use within the Baralaba South study area (Figure 2). A portion of the site lies within the Dawson River Valley Important Agricultural Area (Figure 1). Tracks, fences, dams and yards are present across the area for the purposes of cattle grazing.

5.2 Climate

A summary of relevant climate data for Baralaba is presented in Table 3 below, with records taken from Baralaba Post Office (Site 039004). Average maximum temperatures are highest in January (summer), with a maximum average temperature of 34.3°C. July is the coldest month, with a mean minimum daily temperature of 7.4 °C.

The dominant winds in the vicinity of the study area are from the north-east and southerly quadrants. Winds from the north and north-east are dominant in spring and summer months, while winds from the south are dominant in autumn and winter.

Frosts are common during the winter months of June, July and August, and may be severe.

Table 3: Baralaba Summary Climate Statistics (BOM, 2023)

Month	Mean Daily Temp (°C)		Mean Rainfall (mm)	Mean Rain Days (>10mm)	Mean Relative Humidity (%)		Mean Wind Speed	
	Min	Max			9am	3pm	9am	3pm
January	21.3	34.3	96.2	2.8	65	43	7.0	7.7
February	21.2	33.4	115.6	3.1	69	46	6.9	7.8
March	19.3	32.5	73.5	2.2	67	41	7.1	7.6
April	16.0	30.3	44.8	1.2	67	42	7.5	7.6
May	12.2	26.5	41.7	1.2	69	42	7.2	7.4
June	8.9	23.5	34.9	1.2	74	46	7.1	8.2

Month	Mean Daily Temp (°C)		Mean Rainfall (mm)	Mean Rain Days (>10mm)	Mean Relative Humidity (%)		Mean Wind Speed	
	Min	Max			9am	3pm	9am	3pm
July	7.4	23.1	28.6	0.8	70	40	7.2	8.5
August	8.7	25.2	21.8	0.7	66	38	6.9	8.0
September	11.9	28.4	25.6	0.9	62	34	8.2	8.6
October	15.6	31.2	55.1	1.9	60	35	8.5	8.5
November	18.4	32.8	75.3	2.4	60	38	7.9	7.8
December	20.3	34.0	103.1	3.2	62	40	7.9	8.1
Annual	15.1	29.6	716.1	21.6	66	40	7.5	8.0

Notes:
1. Months with the highest and lowest average values recorded are indicated with red (highest) and blue (lowest) text.
2. Data sourced from Baralaba Post Office (039004)

5.3 Geology

The geological units encountered in and around the study area are presented in Table 4 and Figure 3 (Baralaba SG 55-4, Geoscience Australia 1966).

5.3.1 Bedrock

The main unit of direct relevance to the study area is that of the Baralaba Coal Measures (Pwb). They are late Permian aged sediments found in the central portion of the BSP area. They form part of the upper Bowen Coal Measures.

5.3.2 Surficial Units

The main units of direct relevance to the study area are the Quaternary Alluvium (Qa); the Cainozoic (Tertiary) depositional materials (Qr [previously Cz]), variously termed ‘soil’ and alluvium, but also include unconsolidated colluvial materials of different forms depending on local provenance.

Quaternary alluvial sediments are found in the flatter areas of the western and southern portion of the BSP area.

Table 4: Geological Units

Geological unit	Map code	Description
Quaternary alluvium	Qa	Alluvium/ alluvial sand, gravel, silt clay
	Qr (previously Cz)	Soil, alluvium/ alluvial sand, gravel, silt, clay.
Upper Permian Gyranda formation	Pwy	Calcareous lithic sandstone, siltstone, shale (plant fragments).

Geological unit	Map code	Description
Upper Cretaceous Extrusive	Kitr (previously Kui)	Trachyte

Relict Cainozoic alluvial and colluvial sediments are found in eastern parts of the BSP.

Cainozoic sediments include siltstone and mudstones interbedded with fine- to medium-grained lithic sandstones.

The colluvia of the 'Qr' unit in the BSP Area are dominated by the underlying Gyranda Formation (Pwy) sandstone and fine-textured sediments. These are also exposed further upslope against the extrusive trachytic materials (Kitr) of Mt Ramsay, both of which also provide source material for the colluvia here.

These geological provenances influence the type of soils that have evolved in these units.

5.4 Geomorphology and Landforms

5.4.1 Regional Geomorphology

Regional geomorphology and landforms are described here in terms of the CSIRO Land Systems series, in the study of the Dawson-Fitzroy Area (Perry, 1968) as Land Systems (LS), and by the Queensland DPI in the Land Management Manual for the Dawson / Callide Districts (Gillespie et. al., 1991; Shields and Gillespie, 1991; Shields, 1989) as Land Resource Areas. The topography of MLA 700057 is presented in Figure 4.

The study area is located within the catchment of the Dawson River and its tributaries and anabranches. The Dawson River is located to the west of the study area and flows northwards. Banana creek, a tributary, flows north-west around the southern boundary of the BSP area.

The region in the vicinity of the study area is dominated by the Dawson River valley and is characterised by undulating to level plains, with some low rolling hills between the main river valleys. The Land Systems around the study area comprise the 'Alluvial Plains' Land Resource Area:

- The Coolibah LS, comprising unstable recent alluvium of deep cracking clays and fine-textured alluvia in the more active channel zones; and
- The Juandah LS, comprising more stable older alluvium of the anabranches and low terraces with loamier soil, often texture-contrast forms.

Away from these alluvial plains the landforms are dominated by the undulating plains and low rolling hills of the 'Mixed Brigalow Plains' Land Resource Area. Those that occur through the study area are:

- The Dakenba LS, comprising low colluvial/alluvial slopes and plains of older, higher, flood alluvia mixing with colluvia of local sedimentary materials; and

- The Thomby LS, comprising colluvial, erosional slopes displaying both loamy texture-contrast soils and cracking clays in localised patterns.

5.4.2 Local Geomorphology

The following is a summary of the geomorphological landscape that has been incorporated into the soil classification and description for this study area in the form of 'Soil Landscapes' that have been adapted from those previously described for the Baralaba North Project Area (Burgess, 2003; see the following section on Soils). This is outlined here on the basis of the geological units described in the previous section on Geology.

The Soil Landscapes are defined in terms of geomorphology and landforms and comprise the individual Soils that have been identified from the field survey.

Quaternary Alluvium

The alluvial landscape is associated with the flood plains of Banana Creek and the Dawson River. Elevation ranges from 90 to 100 m AHD.

- Soil Landscape 1: The active river channel of the Dawson River and its anabranches. This includes the channel banks and low-lying in-channel benches that are subject to frequent flooding. The dominant soils in this landscape are unstable, sometimes deep cracking clays (Vertosols) of upper catchment origin.

Soil Landscape 1 of Burgess (2003) does not occur in the Project area.

- Soil Landscape 2: The active channelled 'lower' floodplain of the Dawson River anabranches that is relatively low-lying and subject to regular flooding. The dominant soils in this landscape are unstable, sometimes deep cracking clays (Vertosols) of upper catchment origin. They often display well-developed melonhole and normal gilgai microrelief.
- Soil Landscape 3: Flood channels within the 'upper' floodplain represent both local and main channel flooding. These are backplain channels, flood channels, and chutes. The dominant soils in this landscape are the sometimes deep cracking clays (Vertosols) of upper catchment origin that remain wetter than the surrounding soils.
- Soil Landscape 4: The elevated, or 'upper' floodplain, which is typically level with extensive, swampy, backplains that include the channels of Soil Landscape 3. These areas are still commonly flooded from the combination of both local and regional inundation.

Soil Landscapes 5 & 6 of Burgess (2003) do not occur in the Project area.

Cainozoic Alluvium and Colluvium

Landscapes range from occasionally flooded older alluvia, major river terraces to gently undulating rises on colluvia. This landscape occurs through the central and eastern parts of the BSP Area, overlying the Baralaba Coal measure bedrock, and also abuts the bedrock slopes, as a pediment, of Mt Ramsey. Elevations range from 100 to 120 m AHD.

- Soil Landscape 7: Elevated level to gently undulating plains on unconsolidated colluvia, interdigitated with older alluvium. Soils developed in this landscape include non-sodic

and sodic texture-contrast soils (Chromosols and Sodosols) with cracking clays (Vertosols) that develop strong melonhole and normal gilgai microrelief, and gradational soils (Dermosols).

Soil Landscapes 8 & 9 of Burgess (2003) do not occur in the Project area.

6 SOILS

6.1 Soil Landscapes

Soil mapping has been undertaken by developing soil mapping units that consist of areas of contiguous soils around which boundaries may be drawn. These soil mapping units are composed of a particular dominant soil but may include other, sub-dominant soils, often of a different soil type and Australian Soil Classification (ASC) class, or unspecified minor soils.

A total of 7 soils on 8 soil landscapes, described from the 125 ground observations were undertaken. The spatial distribution of these soils is presented in Figure 5 with site locations shown in Figures 6 and 7. Details of ground observations are included in Appendix C; whilst summary laboratory data is included in the Tables appendix.

A summary of the soil mapping units which occur within the Project area is included below in Table 5. This table has been developed from the tables presented in Burgess (2010) and McClurg (2011a) which describe soil landscapes in the Baralaba North Project Area. Details of the reference soils are included in the following section together with the key soil features and management considerations.

Soil mapping units are defined by their 'Soil' name and are not considered to be unique in the sense that the same 'Soil' may be encountered more than once in different mapping units, such as where 'Langley' appears in soil landscapes 2b and 4b. The individual soil mapping units are assigned a unique code as 'unique mapping areas' (UMAs), with identification shown as the 1.XX numbers on figures.

Table 5: Soil Landscapes and Soils of the Study Area

Soil Landscape (SL code)	Soil Landscape description	Soil name*	Dominant vegetation
Soils derived from Quaternary alluvium (Qa)			
Active channelled lower floodplain of the Dawson River anabranches (relatively low-lying and subject to regular flooding).			
2a (Qa.lf1)	Hard-setting, silty surfaced, black cracking clay on active scroll plains and benches.	Isaac (Is)	Dawson gum, brigalow, sally wattle
2b (Qa.lf2)	Strongly self-mulching black cracking clay on level floodplains.	Langley (Lg)	Brigalow
Flood channels within upper floodplain; subject to both local and river inundation.			

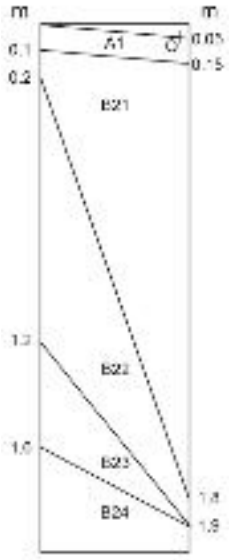
Soil Landscape (SL code)	Soil Landscape description	Soil name*	Dominant vegetation
3 (Qa.td1)	Hard-setting, poached, grey cracking clay within narrow terrace drainage lines.	Bluchers (Bc)	Coolibah, Dawson gum, brigalow, black tea-tree

Soil Landscape (SL code)	Soil Landscape description	Soil name*	Dominant vegetation
Elevated upper floodplain; level and extensive backplains; commonly flooded.			
4a (Qa.uf1)	Hard-setting to firm, silty, black non-cracking clay on indistinct levee deposits.	Stephens (St)	Poplar box, sally wattle
4b (Qa.uf2)	Strongly self-mulching, black cracking clay on level backplains.	Langley (Lg)	Brigalow
4c (Qa.uf3)	Firm to moderately self-mulching, black cracking clay on level to gently sloping backplains.	Tralee (Tl)	Brigalow
Soils derived from Cainozoic sediments (Cza)			
Elevated, level to gently undulating plains on unconsolidated Tertiary sediments.			
7a (Cz.gp1)	Moderately self-mulching, grey to brown cracking clay over mottled, grey saline subsoil. Includes melonhole phase.	Greycliffe (Gc)	Whipstick brigalow
7b (Cz.gp2)	Hard-setting, moderately deep, sandy loam surfaced, sporadically bleached, grey to brown texture-contrast soil with prismatic or columnar structure on gently undulating rises.	Thalberg (Tb)	Dawson gum – brigalow, with emergent bottle trees, sally wattle. Extensively cleared

Notes:
1. *Soil regional names have been adopted from Burgess (2003) and Muller (2008)

6.1.1 Bluchers

Soil Concept	A hard-setting, sometimes self-mulching, alkaline, grey Vertosol in drainage lines on recent alluvium		
Australian Soil Classification	Grey Vertosol	**Landform**	Floodplain
Geology/ lithology	Quaternary alluvium/ alluvium	**Microrelief**	nil to normal gilgai (VI 0.1-0.3 m)
Permeability	Very slow to slow	**Runoff**	Very slow
Effective Rooting Depth/ PAWC	0.8 m/ 100–125 mm	**Drainage**	Poorly to imperfectly drained
Surface Features	Cracking, poached; firm pedal to weakly self-mulching.		



Soil profile diagram

O2: Dense fibric organic matter. Brown (7.5YR 4/4). Clear boundary to -

A1: Black or grey (10YR 3/1, 2.5Y 4/1) medium to medium-heavy clay (occasionally silty), with moderate to strong sub-angular blocky structure (10-20 mm). Many fine roots. Field pH 7-8. Gradual boundary to -

B21: Black or grey (10YR 3/1, 5Y 4/1) medium to medium-heavy clay, with strong lenticular structure. Some fine roots. Field pH 7.5-9. Gradual boundary to -

B22: Black or grey (10YR 3/1, 5Y 4/1) medium to medium-heavy clay, with strong lenticular structure. 1-5% carbonate nodules (1-5 mm). Few fine roots. Field pH 8–9.5. Gradual boundary to -

B23: Grey or pale brown (10YR 5/1, 2.5 6/3) medium to medium-heavy clay, with strong lenticular structure. 10-20% reddish-yellow mottles. 1-5% carbonate nodules (1-5 mm). No roots. Field pH 8–9.5. Gradual boundary to -

B24: Light yellowish brown (2.5Y 6/3) medium clay, with strong lenticular structure. 10-20% reddish-yellow mottles. 1-5% carbonate nodules (1-5 mm). No roots. Field pH 8.

Vegetation Associations	Coolibah (*E. coolabah*), Dawson gum (*E. cambageana*), brigalow (*A. harpophylla*), black tea-tree (*Melaleuca bracteata*), umbrella cane grass (*Leptochloa digitata*), nardoo (*Marsilea hirsuta*)

Detailed sites with analysis: 131, 149, 141.
Detailed sites: 165.
Check sites: 112, 113, 137, 144.

Key features:

- pH: neutral to strongly alkaline;
- Salinity: non-saline in the upper profile to highly saline from 0.8 m;
- CEC: from 23 to 59 meq/100 g - eutrophic range - high potential to supply nutrients;
- Sodicity: moderate to strong at depth;
- Available P: moderate; total N: low;
- Emerson aggregate test: Class 3(1) to 4 - slightly dispersive;
- *K*-factor erosion potential: moderate to high;
- uniform cracking clay: medium to heavy clay, sometimes silty;
- cracking and coarse self-mulching surface, strong lenticular structure through the profile.

Soil stripping recommendations:

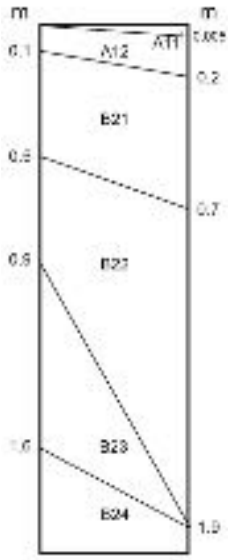
Material	Lower boundary depth range	Stripping comments
Topsoil	0.1-0.15 m	Soil material is non-sodic, non-saline, moderately alkaline and suitable for top-dressing use.
Root zone	0.5-0.8 m	Low to moderate salinity, moderate sodicity, highly alkaline. Suitable for use with application of appropriate amendments.
Marginal	0.8-1.2 m	Moderately saline, highly sodic material maybe re-used following application of appropriate amendments.
Unsuitable - saline		Highly saline material at depth is unsuitable for re-use.

Bluchers landscape and vegetation at site 144.

Bluchers soil surface condition at site 131.

6.1.2 Greycliffe (includes melonhole phase)

Soil Concept	Gilgaied, self-mulching, grey and brown Vertosols with mottled, grey saline subsoil on older alluvium.		
Australian Soil Classification	Grey or Brown Vertosol	**Landform**	Level to gently undulating plains
Geology/ lithology	Cainozoic alluvial sediments/ alluvium	**Microrelief**	Sparse to dense melonhole gilgai. VI 0.5-1.5 m, HI 10-50 m
Permeability	Very slow	**Runoff**	Very slow
Effective Rooting Depth/ PAWC	0.3-0.6 m/ <50 mm	**Drainage**	Poorly drained
Surface Features	Cracking, poached; firm pedal to coarse self-mulching. <2–5% subangular quartz and ironstone gravels 2–10 mm.		



Soil profile diagram

A11: Grey or brown (10YR 4/1, 10YR 4/3) medium to heavy clay. Strong granular peds, 2–5 mm. Field pH 6.5-8.5. Abrupt boundary to -

A12: Grey or brown (10YR 4/1, 10YR 4/3) medium to heavy clay. Strong subangular-blocky peds (5-10 mm). Field pH 8.5. Many fine roots. Gradual boundary to -

B21: Grey or brown (10YR 6/2, 10YR 4/3) medium to heavy clay. Strong lenticular peds. Occasional sand lenses. 2% carbonate nodules (1–2 mm), 2% fine gypsum crystals. Field pH 8.5-9. Few fine roots. Gradual boundary to –

B22: Grey or brown (10YR 6/2, 10YR 4/3) medium to heavy clay. Strong lenticular peds. Occasional sand lenses. 2% carbonate nodules (1–2 mm), 2% fine gypsum crystals, 1% manganese nodules (1 mm). Field pH 4.5-8.5. Few fine roots. Gradual boundary to –

B23: Pale grey or pale brown (10YR 7/2, 10YR 7/4) medium to heavy clay with reddish brown mottles. Strong lenticular peds. 2% fine gypsum crystals, 1% manganese nodules (1 mm). Field pH 4.5. No roots. Gradual boundary to -

B24: Pale grey or pale brown (10YR 7/2, 10YR 7/4) medium to heavy clay. Strong lenticular peds. Field pH 4.5. No roots.

Vegetation Associations	Brigalow – whipstick growth habit (*A. Harpophylla*), Dawson gum (*E. Cambageana*), lime bush (*Eremocitrus Glauca*), current bush (*Carissa Ovata*), buffel grass (*Cenchrus Ciliaris*). Extensively cleared.

Detailed sites with analysis: 175, 173, 175B.
Check sites: 172, 174, CS11, CS12, CS13, CS14, CS15, CS18.

Key features:

- pH: alkaline or strongly alkaline in the root zone, strongly acidic at depth;
- Salinity: soil surface is non-saline to slightly saline. Salinity increases to highly saline through the root zone and is extremely saline at depth;
- CEC from 23 to 50 meq/100 g, - eutrophic range - high potential to supply nutrients;
- Sodicity: surface soil is non-sodic, upper subsoil is highly sodic and lower subsoil is moderately sodic;
- Available P: low; Total N: low;
- Emerson aggregate test: Class 2(1) to 3(2) - slightly dispersive in the topsoil and moderately dispersive in the subsoil;
- *K*-factor erosion potential: high in the topsoil and moderate in the subsoil;
- uniform cracking clay: medium to heavy clay throughout;
- cracking to coarse self-mulching surface, strong lenticular structure throughout profile.

Soil stripping recommendations:

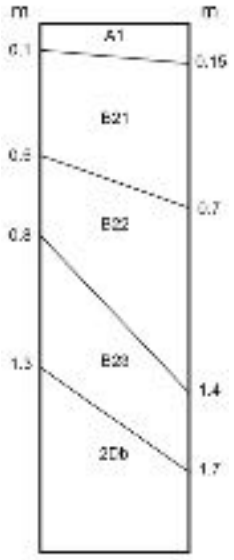
Material	Lower boundary depth range	Stripping comments
Topsoil	0.1-0.2 m	Non-saline and non-sodic material suitable for topdressing use if appropriately stabilised. Highly erodible due to low permeability resulting in overland flow.
Marginal	0.2-0.5 m	Highly sodic, moderately saline material may be used for topdressing if sodicity is appropriately managed using lime or gypsum.
Unsuitable - saline		Highly saline material in the lower subsoil is unsuitable for use as a topdressing material.

Greycliffe landscape and vegetation at site 175.

Greycliffe soil surface condition at site 173.

6.1.3 Isaac

Soil Concept	Firm or hard-setting, black Vertosols on channel benches and lower floodplain alluvium.		
Australian Soil Classification	Black Vertosol, Black Dermosol	**Landform**	Low-lying channel benches, lower floodplains
Geology/ lithology	Quaternary alluvium/ alluvium	**Microrelief**	Irregular depressions VI 0.1–0.3 m, HI 5–10 m
Permeability	Slow	**Runoff**	Slow to moderately rapid
Effective Rooting Depth/ PAWC	0.8 m/ 100–125 mm	**Drainage**	Imperfectly to moderately well-drained
Surface Features	Cracking with hard-setting or firm pedal surface		



Soil profile diagram

A1: Black (10YR 3/1) light clay to medium heavy clay. Moderate to strong subangular-blocky peds (5-10 mm). Field pH 5.5-7. Many fine roots. Gradual boundary to -

B21: Black or dark grey (10YR 3/1, 10YR 4/2) medium to heavy clay. Strong lenticular peds. 2% carbonate nodules (1–2 mm). Field pH 8-9. Few fine roots. Gradual boundary to –

B22: Grey or brown (10YR 5/1, 10YR 4/3) medium to heavy clay with yellow-brown mottles. Strong lenticular peds. 2-5% carbonate nodules (1–5 mm). Field pH 8.5-9. Few fine roots. Gradual boundary to –

B23: Dark grey or brown (10YR 4/1, 7.5YR 3/2) medium to heavy clay with grey mottles. Strong lenticular peds. Field pH 8-9. No roots. Gradual boundary to -

2Db: Dark greyish brown (2.5Y 4/2) light clay with strong blocky structure (5–10 mm). 50% shiny mangans on ped faces. Field pH 6.5.

Vegetation Associations	Dawson gum (*E. Cambageana*), brigalow (*A. Harpophylla*), Poplar box (*E. Populnea*), gum-topped bloodwood (*Corymbia Erythrophloia*), sally wattle (*A. Salicina*), buffel grass (*Cenchrus Ciliaris*), purple pigeon grass (*Setaria Incrassata*).

Detailed sites with analysis: 126, 127, 203B
Check sites: 128, 142, 203.

Key features:

- pH: neutral to moderately alkaline, increasing with depth;
- Salinity: non-saline to highly saline, increasing with depth;
- CEC from 20 to 43 meq/100 g, - eutrophic - high potential to supply nutrients;
- Sodicity: topsoil is non-sodic, upper subsoil is moderately sodic, while subsoil below 0.8 m is highly sodic;
- Available P: low to high; total N: low;
- Emerson aggregate test: Class 3(3) - moderately dispersive if mechanically disturbed;
- *K*-factor erosion potential - highly erodible;
- uniform cracking clay: medium to heavy clay throughout;
- firm pedal surface with strong lenticular structure through the profile.

Soil stripping recommendations:

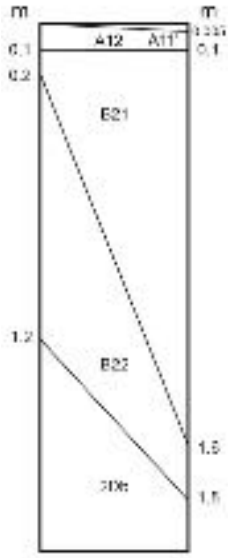
Material	Lower boundary depth range	Stripping comments
Topsoil	0.1-0.15 m	Non-saline, non-sodic. Soil is highly erodible due to low permeability.
Marginal	0.8 m	Moderately saline, moderately sodic. Soil material requires appropriate treatment and amendments for use as a topdressing material.
Unsuitable - saline		Highly saline material in the lower subsoil is unsuitable for use as a topdressing material.

Isaac landscape and vegetation at site 127.

Isaac soil surface condition at site 128.

6.1.4 Langley

Soil Concept	Self-mulching black Vertosols on level floodplain alluvium		
Australian Soil Classification	Grey/Black Vertosol	**Landform**	Low-lying, extensive river floodplains.
Geology/ lithology	Quaternary alluvium/ alluvium	**Microrelief**	Irregular depressions VI 0.1–0.3 m, HI 10–30 m
Permeability	Mod/Slow	**Runoff**	Very slow to slow
Effective Rooting Depth/ PAWC	0.8–1.0 m/ 125–150 mm	**Drainage**	Moderately well-drained
Surface Features	Cracking with fine to coarse self mulch.		



Soil profile diagram

A11: Black or dark grey (10YR 2/1, 10YR 4/1) medium to heavy clay. Strong granular peds, 2-5 mm. Field pH 7-9. Abrupt boundary to -

A12: Black or dark grey (10YR 3/2, 10YR 4/2) medium to heavy clay. Strong subangular-blocky peds (5-10 mm). Field pH 7-9. Many fine roots. Gradual boundary to -

B21: Black to brown (10YR 3/1, 10YR 5/3) medium to heavy clay. Strong lenticular peds. Occasional black mottles. <1-2% carbonate nodules (1-2 mm), Field pH 8.5-9.5. Few fine roots. Gradual boundary to –

B22: Black to brown (10YR 3/1, 10YR 5/3) medium to heavy clay. Strong lenticular peds. 2 - 5% carbonate nodules (1-2 mm), 2% fine gypsum crystals. Field pH 7.5-9.5. No roots. Gradual boundary to –

2Db: Brown (10YR 4/4) sandy clay. Weak granular peds. Field pH 7-9. No roots.

Vegetation Associations	Brigalow (*A. Harpophylla*), Dawson gum (*E. Cambageana*), buffell grass (*Cenchrus Ciliaris*), purple pigeon grass (*Setaria Incrassata*), goats head.

Detailed sites with analysis: 132, 139, 114, 115.
Detailed sites: 105, 121, 134, 140, 143.
Check sites: 104, 107, 108 118, 124, 133, 135.

Key features:

- pH: moderately to strongly alkaline, increasing with depth;
- Salinity: non-saline soil surface, with salinity at depth ranging from slightly saline to highly saline;
- CEC from 25 to 53 meq/100 g, - eutrophic high potential to supply nutrients;
- Sodicity: topsoil is non-sodic, upper subsoil is moderately sodic, lower subsoil is highly sodic below 0.8 m;
- Available P: high; total N: low;
- Emerson aggregate test: Class 3(4) to 4 - negligible dispersion;
- *K*-factor erosion potential: high erodibility due to low permeability and high silt content;
- uniform cracking clay: medium to heavy clay throughout;
- coarse self-mulching surface, strong lenticular structure throughout the profile.

Soil stripping recommendations:

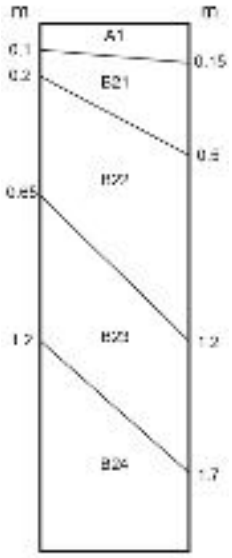
Material	Lower boundary depth range	Stripping comments
Topsoil	0.1-0.2 m	Non-sodic, non-saline material suitable for use as a topdressing material.
Root zone	0.5-0.8 m	Moderately sodic, non-saline material suitable for use as a topdressing material if appropriate amendments are applied.
Marginal	0.8-1.2 m	Highly sodic, moderately saline material suitable for use as a topdressing material if appropriate amendments are applied.
Unsuitable - saline		Highly saline material in the lower subsoil is unsuitable for use as a topdressing material.

Langley landscape and vegetation at site 105.

Langley soil surface condition at site 105.

6.1.5 Stephens

Soil Concept	Hard-setting, alkaline black Dermosols on recent alluvium and levees		
Australian Soil Classification	Black Dermosol	**Landform**	Slightly elevated levees and backplains.
Geology/ lithology	Quaternary alluvium/ alluvium	**Microrelief**	Nil
Permeability	Slow	**Runoff**	Slow
Effective Rooting Depth/ PAWC	0.6 m/ 75-100 mm	**Drainage**	Moderately well-drained
Surface Features	Hard-setting		



Soil profile diagram

A1: Black to dark grey (10YR 3/1, 10YR 4/2) silty clay loam to silty light clay with weak blocky structure (5–10 mm). Field pH 6-7. Many fine roots. Gradual boundary to -

B21: Dark grey to brown (10YR 4/1, 10YR 4/3) silty light clay to silty medium clay with moderate prismatic or blocky structure (10-20 mm). Field pH 7–8.5. Some fine roots. Gradual boundary to -

B22: Dark grey to brown (10YR 4/1, 10YR 4/4) silty light clay to silty medium clay with moderate blocky structure (10-20 mm). 1–5% carbonate nodules (1–5 mm). Field pH 7.5–8.5. Few fine roots. Gradual boundary to -

B23: Brown (10YR 4/4) silty light clay to silty medium clay with moderate subangular-blocky structure (10-20 mm), with dark brown to black mottles. 1–5% carbonate nodules (1–5 mm). Field pH 7.5–8.5. Occasional fine roots. Gradual boundary to-

B24: Brown (10YR 4/4) silty light clay to silty medium clay with moderate subangular-blocky structure (10-20 mm), with dark brown to black mottles. Field pH 7.5–8.5. Occasional fine roots.

Vegetation Associations

Poplar box (*E. Populnea*), Dawson gum (*E. Cambageana*), silver-leafed ironbark (*E. Melanophloia*), sally wattle (*A. Salicina*), brigalow (*A. Harpophylla*), kangaroo grass (*Themeda Triandra*), buffel grass (*Cenchrus Ciliaris*).

Detailed sites with analysis: 125, 305.
Detailed sites: 129, 222.
Check sites: 217, 218, 219, 221, 223, 226, 304.

Key features:

- pH: neutral to strongly alkaline, increasing with depth;
- Salinity: non-saline to highly saline, increasing with depth;
- CEC from 16 to 32 meq/100 g, - eutrophic range - high potential to supply nutrients;
- Sodicity: non-sodic in the topsoil to highly sodic in the subsoil;
- Available P: moderate to high; total N: low;
- Emerson aggregate test indicates moderate to high potential to disperse;
- *K*-factor erosion potential: high;
- uniform or gradational non-cracking clay: silty clay loam or light clay, grading to silty light or medium clay;
- hard-setting surface, weak blocky structured topsoil, moderate blocky to prismatic subsoil.

Soil stripping recommendations:

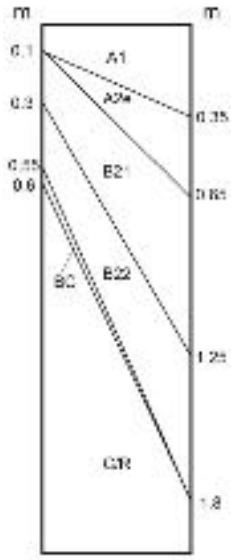
Material	Lower boundary depth range	Stripping comments
Topsoil	0.1-0.15 m	Non-saline, non-sodic. Soil is highly erodible due to low permeability and high silt content.
Marginal	0.5 m	Moderate salinity, moderate to high sodicity. Suitable for use with application of appropriate amendments.
Unsuitable - saline		Highly saline material in the lower subsoil is unsuitable for use as a topdressing material.

Stephens landscape and vegetation at site 125.

Stephens soil surface condition at site 129.

6.1.6 Thalberg

Soil Concept	Hard-setting, bleached, neutral to alkaline grey and brown Chromosols on gently undulating rises.		
Australian Soil Classification	Brown Chromosol/ Brown Sodosols	**Landform**	Gently undulating rises
Geology/ lithology	Unconsolidated Cainozoic alluvial-colluvial sediments; calcareous.	**Microrelief**	nil
Permeability	Slowly permeable	**Runoff**	Slow to moderately rapid
Effective Rooting Depth/ PAWC	0.75-1.25 m/ 100-125 mm	**Drainage**	Moderately well-drained
Surface Features	Hard-setting or firm surfaced sand to sandy loam. Subangular weathered sandstone and ironstone – 0 to 30%, 5 – 100 mm.		



Soil profile diagram

A1: Brown to very dark brown (10YR 4/3, 10YR 2/2) sandy loam to fine sandy loam, massive, many fine roots. Field pH 6-7.5. Gradual boundary to -

A2e: Very pale brown (dry - 10YR 7/3) sandy loam to fine sandy loam, massive, some fine roots. Field pH 6.5. Abrupt boundary to -

B21: Brown to pale brown (7.5YR 5/6, 10YR 6/3), with orange or grey mottled medium to medium-heavy clay. Strong columnar or prismatic (10–20 mm) structure. Clay skins on ped faces. Few fine roots. Field pH 6.5–8. Gradual boundary to -

B22: Brown to yellowish red (7.5YR 5/6, 5YR 5/6), with grey mottled medium to medium-heavy clay. Massive or weakly blocky (10–20 mm) structure. 2% subangular sandstone or ironstone gravels (2–5 mm). 2–20% soft carbonate, occasional soft manganese segregations. No roots. Field pH 7.5–9.5. Gradual boundary to -

BC: Brown to grey (7.5YR 5/4, 10YR 6/1), with grey mottled clayey weathered sandstone. 30% soft carbonate. No roots. Field pH 9–9.5. Gradual boundary to -

C/R: Weathered marly sandstone.

Vegetation Associations	Dawson gum (*E. Cambageana*), brigalow (*A. Harpophylla*), with emergent bottle trees (*Brachychiton Rupestris*), sally wattle (*A. Salicina*), white bauhinia (*Lysiphyllum Hookeri*), lime bush (*Eremocitrus Glauca*), current bush (*Carissa Ovata*), buffel grass (*Cenchrus Ciliaris*). Extensively cleared

Detailed sites with analysis: 146, 147, 150, 158, 170.
Detailed sites: 154, 161, 167 176, 177.
Check sites: 101, 102, 106, 109, 110, 116, 118, 119, 120, 122, 123, 156, 157, 160, 162, 171, 178, 179.

Key features:

- pH: neutral at the surface, increasing to strongly alkaline with depth;
- Salinity: non-saline in the root zone, may be slightly saline at depth;
- CEC from 1 to 26 meq/100 g, - dystrophic to mesotrophic range - low to moderate potential to supply nutrients;
- Sodicity: topsoil is non-sodic, subsoil ranges from non-sodic to moderately sodic;
- Available P: low; total N: low;
- Emerson aggregate test: Class 2(1) to 4 - dispersibility ranges from negligible to very high, with high dispersibility related to high ESP;
- *K*-factor erosion potential: moderate to high;
- texture-contrast soil: sandy loam to fine sandy loam topsoil and medium to heavy clay subsoil;
- massive topsoil, columnar or prismatic structure in upper subsoil, with blocky structure in lower subsoil.

Soil stripping recommendations:

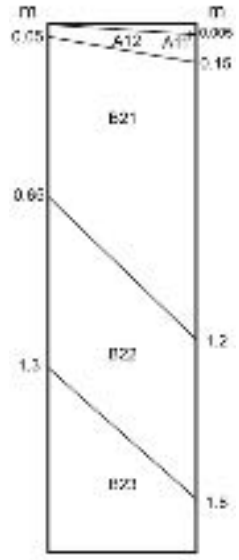
Material	Lower boundary depth range	Stripping comments
Topsoil	0.1-0.65 m	Sandy topsoil material is non-sodic and non-saline. Material has high erosion potential due to silt content and low permeability.
Root zone	0.55-1.8 m	Subsoil material non-saline. Sodicity ranges from low to moderate and may require application of amendments. Material has high erosion potential due to silt content and low permeability.

Thalberg landscape and vegetation at site 161.

Thalberg soil surface condition at site 160.

6.1.7 Tralee

Soil Concept	Self-mulching, alkaline, black, grey and brown Vertosols, sometimes gilgaied, on level alluvial floodplains.		
Australian Soil Classification	Black, Grey or Brown Vertosol	**Landform**	Level to slightly elevated floodplains.
Geology/ lithology	Quaternary alluvium/ alluvium	**Microrelief**	Irregular depressions VI 0.1–0.3 m, HI 10–30 m
Permeability	Very slow to slow	**Runoff**	Very slow to slow
Effective Rooting Depth/ PAWC	0.3 m/ 75 mm	**Drainage**	Imperfectly to moderately well-drained.
Surface Features	Hard-setting, cracking or poached with coarse self-mulching.		



Soil profile diagram

A11: Black or greyish brown (10YR 2/2, 10YR 4/2) medium to heavy clay. Strong granular peds, 2–5 mm. Field pH 7.5–8.5. Abrupt boundary to -

A12: Dark grey or greyish brown (10YR 3/2, 10YR 4/2) medium to heavy clay. Strong subangular-blocky peds (10-20 mm). Field pH 7.5-8.5. Many fine roots. Gradual boundary to -

B21: Dark grey or greyish brown (10YR 3/2, 10YR 4/2) medium to heavy clay. Strong lenticular peds. Occasional sand lenses. 2% soft carbonate or carbonate nodules (1–2 mm). Field pH 8.5-9. Few fine roots. Gradual boundary to –

B22: Grey or brown (10YR 5/1, 10YR 4/3) medium to heavy clay. Strong lenticular peds. Occasional sand lenses. <1-2% carbonate nodules (1–2 mm), 2% fine gypsum crystals. Field pH 7.5-9. Few fine roots. Gradual boundary to –

B23: Brown (7.5YR 5/4) medium to heavy clay. Strong lenticular peds. 2% soft carbonate. Field pH 9-10. No roots.

Vegetation Associations	Brigalow (*A. Harpophylla*), lime bush (*Carissa Ovata*), buffel grass (*Cenchrus Ciliaris*). Extensively cleared.

Detailed sites with analysis: 148, 153, 162, 153B, 111.
Detailed sites: 155.
Check sites: 145, 159, 164, 168.

Key features:

- pH: neutral to strongly alkaline, increasing with depth;
- Salinity: non-saline surface, highly saline through the root zone, increasing with depth;
- CEC from 13 to 31 meq/100 g, - eutrophic range - high potential to supply nutrients;
- Sodicity: topsoil is non-sodic or moderately sodic, subsoil is moderately to highly sodic;
- Available P: low to moderate; total N: low;
- Emerson aggregate test: Class 2(1) to 4 - topsoil is not dispersive, subsoil is highly dispersive;
- *K*-factor erosion potential: high;
- uniform cracking clay: medium to medium heavy clay throughout;
- coarse self mulch or hard-setting surface, strong subangular blocky structured topsoil, strong lenticular subsoil.

Soil stripping recommendations:

Material	Lower boundary depth range	Stripping comments
Topsoil	0.05-0.15 m	Soil material is non-saline, non-sodic or moderately sodic and suitable for topdressing use if appropriate amendments are applied.
Root zone	0.2-0.5 m	Low to moderate salinity, moderate sodicity. Suitable for use with application of appropriate amendments.
Unsuitable - saline		Highly saline, highly sodic material at depth is unsuitable for re-use.

Tralee landscape and vegetation at site 162.

Tralee soil surface condition at site 153.

6.2 Soil Erodibility

The key factors that are used to assess soil erodibility and dispersion for soils within the Project are presented in Table 6. Details on soil erodibility and dispersion are required as inputs to models to determine the erosion hazard for site disturbances and aid in the design of landforms such as spoil and waste rock dumps.

Soil erodibility K-factor (Roswell and Loch, 2002) is a measure of the susceptibility of soil particles to detach and be transported by rainfall and runoff. Dispersive soils require identification for planning and management of factors such as development for a plant growth medium, susceptibility to tunnel erosion, erosion potential, and the production of turbid runoff.

Table 6: Soil Erodibility

Soil	Site	Layer	*K*-factor	ESP[1]	Ca:Mg	EAT[2]	Salinity rating	Comments
Bluchers	149	Topsoil (0-0.1 m)	0.041	5.4	4.1	3(1)	Very low	High erodibility, non-sodic, slight dispersibility if mechanically disturbed
		Upper subsoil (0.25-0.35 m)	0.040	12.9	2.7	3(3)	Low	Moderate erodibility, sodic, moderate dispersibility if mechanically disturbed
		Lower subsoil (0.8-0.9 m)	0.042	20.0	1.1	4	Extreme	High erodibility, strongly sodic, negligible dispersibility but likely to become dispersive if salts are leached
Isaac	127	Topsoil (0-0.1m)	0.044	2.6	2.3	3(3)	Very low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
		Upper subsoil (0.2-0.3 m)	0.048	9.1	3.1	3(4)	Very low	High erodibility, sodic, moderate dispersibility if mechanically disturbed
		Lower subsoil (0.8-0.9 m)	0.045	16.6	2.7	3(3)	Moderate	High erodibility, strongly sodic, moderate dispersibility if mechanically disturbed
Greycliffe[3]	302	Topsoil (0-0.1 m)	0.051	3.9	3.9	3(2)	Very low	High erodibility, non-sodic, slight dispersibility if mechanically disturbed
		Upper subsoil (0.55-0.65m)	0.040	5.8	2.9	2(1)	Extreme	Moderate erodibility, non-sodic, high to moderate dispersibility
Langley	132	Topsoil (0-0.1 m)	0.040	4.0	3.5	4	Low	High erodibility, non-sodic, negligible dispersibility

Soil	Site	Layer	*K*-factor	ESP[1]	Ca:Mg	EAT[2]	Salinity rating	Comments
		Upper subsoil (0.2-0.3 m)	0.044	9.6	2.3	4	Low	High erodibility, sodic, negligible dispersibility
		Lower subsoil (0.8-0.9 m)	0.075	17.6	1.3	3(4)	Moderate	Very high erodibility, strongly sodic, moderate dispersibility if mechanically disturbed, likely to become dispersive if salts are leached
		Lower subsoil (0.8-0.9 m)	0.042	10.1	2.2	4	Moderate	High erodibility, sodic, negligible dispersibility
Stephens	125	Topsoil (0-0.1 m)	0.051	4.6	2.2	2(1)	Very low	High erodibility, non-sodic, high to moderate dispersibility
		Upper subsoil (0.25-0.35 m)	0.045	16.9	2.7	2(2)	Moderate	High erodibility, strongly sodic, high dispersibility
		Lower subsoil (0.8-0.9 m)	0.048	16.9	2.3	2(2)	High	High erodibility, strongly sodic, high dispersibility
Thalberg	146	Topsoil (0-0.1 m)	0.039	1.0	8.2	N.A.	Very low	Moderate erodibility, non-sodic
		Upper subsoil (0.2-0.3 m)	0.036	0.6	12.3	3(3)	Very low	Moderate erodibility, non-sodic, moderate dispersibility if mechanically disturbed
		Lower subsoil (0.8-0.9 m)	0.027	13.1	1.2	2(3)	Very low	Moderate erodibility, sodic, very high dispersibility
	147	Topsoil (0-0.1 m)	0.035	3.4	10.2	3(1)	Very low	Moderate erodibility, non-sodic, slight dispersibility if mechanically disturbed
		Upper subsoil (0.2-0.3 m)	0.040	4.2	4.9	3(4)	Very low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
		Lower subsoil (0.8-0.9 m)	0.022	9.5	1.8	2(1)	Low	Moderate erodibility, sodic, high to mod dispersibility

Soil	Site	Layer	*K*-factor	ESP[1]	Ca:Mg	EAT[2]	Salinity rating	Comments
	150	Topsoil (0-0.1 m)	0.033	1.2	4.7	3(1)	Very low	Moderate erodibility, non-sodic, slight dispersibility if mechanically disturbed
		Upper subsoil (0.55-0.65 m)	0.032	6.3	1.6	3(3)	Very low	Moderate erodibility, sodic, moderate dispersibility if mechanically disturbed
	158	Topsoil (0-0.1 m)	0.045	1.0	7.3	3(3)	Very low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
	158	Upper subsoil (0.55-0.65 m)	0.045	5.6	2.3	4	Moderate	High erodibility, non-sodic, negligible dispersibility
	161	Upper subsoil (0.4-0.5 m)	0.047	3.2	2.0	3(4)	Very low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
	167	Lower subsoil (0.7-0.8 m)	0.035	4.2	3.4	4	Low	Moderate erodibility, non-sodic, negligible dispersibility
	170	Topsoil (0-0.1 m)	0.037	1.8	3.6	N.A.	Very low	Moderate erodibility, non-sodic
		Upper subsoil (0.55-0.65 m)	0.035	5.1	9.6	N.A.	Very low	Moderate erodibility, non-sodic
	176	Upper subsoil (0.4-0.5 m)	0.040	3.5	1.8	3(3)	Low	High erodibility, non-sodic, moderate dispersibility if mechanically disturbed
	177	Upper subsoil (0.4-0.5 m)	0.037	5.0	1.5	3(4)	Very low	Moderate erodibility, non-sodic, moderate dispersibility if mechanically disturbed
Tralee	148	Topsoil (0-0.1 m)	0.051	3.6	3.3	4	Very low	High erodibility, non-sodic, negligible dispersibility
		Upper subsoil (0.25-0.35 m)	0.043	23.0	2.1	2(1)	Moderate	High erodibility, strongly sodic, high to moderate dispersibility
		Lower subsoil (0.8-0.9 m)	0.052	21.4	1.8	3(1)	High	High erodibility, strongly sodic, slight dispersibility if mechanically disturbed, likely

Soil	Site	Layer	*K*-factor	ESP[1]	Ca:Mg	EAT[2]	Salinity rating	Comments
								to become dispersive if salts are leached
	153	Upper subsoil (0.55-0.65 m)	0.027	21.6	1.7	2(3)	High	Moderate erodibility, strongly sodic, very high dispersibility
	162	Topsoil (0-0.1 m)	0.048	6.2	3.0	4	Low	High erodibility, sodic, negligible dispersibility
		Upper subsoil (0.55-0.65 m)	0.049	17.2	1.6	4	Extreme	High erodibility, strongly sodic, negligible dispersibility, likely to become dispersive if salts are leached

Notes:
1. Exchangeable sodium percentage
2. Emerson aggregate test
3. The soil erodibility factors for Greycliffe were assessed for a sample location outside the final disturbance area

7 STRATEGIC CROPPING LAND ASSESSMENT

7.1 Assessment Criteria

The assessment criteria adopted for this study for strategic cropping land (SCL) are based on the western cropping guidelines outlined in *Regional Planning Interests Act 2014*. Key features of the guidelines are the minimum area requirements (10 ha and greater than 80 m wide at the narrowest point). There are eight field criteria pertaining to slope, rockiness, gilgai micro-relief, soil depth, soil wetness, soil pH, salinity and soil water storage, described in *Regional Planning Interests Act Statutory Guideline 08/14: How to demonstrate that land in the strategic cropping area does not meet the criteria for strategic cropping land*. A summary of the criteria is provided in Table 7 below.

Table 7: Strategic Cropping Land Criteria (Western Cropping)

Criteria		Threshold	Method of Assessment Summary
UMA Size Requirement	Area	Min 10 ha	-
	Area Width	Min 80 m	-
1	Slope	<3%	Analysed using client supplied DEM. DEM was resampled prior to slope analysis. Areas that failed slope analysis were measured in the field using a dumpy level at exclusion sites

Criteria		Threshold	Method of Assessment Summary
2	Rockiness	<20% fragments >60 mm	Field estimation using the average of several linear transects. Where sites failed, photographic evidence of the surface conditions is provided in the borelogs.
3	Gilgai	<50% of land being gilgai of >500 mm in depth	Field measurements. For sites that failed this criteria, a survey using a GPS and dumpy level was conducted to confirm results.
4	Soil Depth	>600 mm	Field measurement of soil depth to physical barrier.
5	Soil Wetness	Favourable drainage	Bleaching or water logged soils noted through field colour and texture.
6	Soil pH	For rigid soils, the soil at 300 mm and 600 mm soil depth must be within the range of $pH_{1:5}$ 5.1 to $pH_{1:5}$ 8.9 inclusive. For non-rigid soils, the soil at 300 mm and 600 mm soil depth must be greater than $pH_{1:5}$ 5.0.	Laboratory determined pH at detailed analysed sites, confirmed by field tests.
7	Salinity	Chloride <800 mg/kg at 600 mm depth	Laboratory determined value.
8	Soil Water Storage	>100 mm for soil depths up to 1000 mm	Soil texture lookup table using laboratory particle size analysis.

7.2 Trigger Map Areas

A summary of the SCL trigger areas within the study area is shown in Figure 8. These trigger areas were assessed in individual UMAs with detailed and exclusion (Check) sites. The descriptions are provided in the borelogs in Appendix C.

7.3 Assessment

The comparison of field and laboratory results of detailed and check sites against the SCL criteria is presented in Table 8 below.

7.3.1 Criteria 1: Slope

To determine the validity of UMAs against Criteria 1, a combination of the Proponent provided Digital Elevation Model (DEM) (provided in Figure 9) and Check sites (Exclusion) were used.

The DEM was provided by the Proponent and contained 1m elevation information of a cell size 5m x 5m. This DEM was first resampled to 20m x 20m cell size and then used to outline

UMAs (or parts thereof) failing to meet Criteria 1. Slope data acquired from the DEM was validated through surface field measurements through the use of a dumpy level. Individual site measurements are presented in the borelogs in Appendix C.

Areas that only partially failed to meet Criteria 1 and with contiguous areas <3% slope larger than 10 ha (such as UMA 1.19) were assessed against other criteria through field assessment.

A summary of areas failing to meet Criteria 1, requiring no further assessment is presented in Table 8 below.

Table 8: SCL Trigger Areas assessed against Criteria 1

UMA	Area (ha)	Average Slope of UMA	Areas Slope >3%?	Remaining Areas <3% Greater than Contiguous 10 ha?	Field Sites Used for Validation of DEM	SCL Criteria 1
1.01	342	<1%	No	-	-	Pass
1.02	86	<1%	No	-	-	Pass
1.03	19	<1%	No	-	-	Pass
1.04	183	<1%	No	-	-	Pass
1.05	311	<1%	No	-	-	Pass
1.06	85	2.7%	Yes	No	119, 120, 150, 151, 152	Fail
1.07	16	<1%	No	-	-	Pass
1.08	62	2.4%	Yes	No	118, 154, 154B, 154C, 154C, 154D, 154E, 156, 158	Fail
1.10	72	4.0%	Yes	No	CS16, CS17, 102, 123, 160, 163, 166	Fail
1.12	87	<1%	No	-	-	Pass
1.13	106	<1%	No	-	-	Pass
1.16	41	<1%	No	-	-	Pass
1.19	94	1.6%	Yes	Yes	CS14, CS15, CS18, 174, 173, 175, 175B	Pass

Notes:
1. Shaded cells indicate criteria that failed.

7.3.2 Criteria 2: Rockiness

Surface rock fragments were estimated at all detailed and check (exclusion) sites by using the average of linear transects to determine whether there was >20% surface fragments larger than 60 mm. Where the site failed on this criterion photographic evidence is provided in the borelogs presented in Appendix C. A total of four sites (BH151, BH152, BH175B and CS14) failed to meet Criteria 2 based upon surface fragments.

7.3.3 Criteria 3: Gilgai

Gilgai was noted, and its form was recorded at all check (exclusion) and detailed sites. No sites failed SCL criteria for Gilgai.

7.3.4 Criteria 4: Soil Depth

All boreholes were advanced to a minimum depth of 1000 mm with soil depth recorded. Where refusal was met at shallower depths, a minimum of three holes were excavated in the immediate area and the maximum depth recorded as soil depth. No sites failed on soil depth criteria.

7.3.5 Criteria 5: Wetness

All soil boreholes were logged according to the Yellow Book with mottles and colours carefully logged in relation to the Munsell Soil Colour Chart. A total of five sites failed the wetness criteria by either being waterlogged (BH149 and BH162) or bleached (BH150, BH156, BH160).

Details of colours, mottles and soil conditions are presented in borelogs presented in Appendix C.

7.3.6 Criteria 6: Soil Acidity (pH)

All soil samples collected in the field had Raupach field pH recorded for individual soil horizons. Detailed analysed site soil samples were submitted for laboratory testing for pH (1:5). Soil pH at 300 mm and 600 mm have been reported in Table 11 below. All tested soils passed Criteria 6 for SCL assessment.

7.3.7 Criteria 7: Salinity

Salinity, in terms of chloride content, was assessed for soils at 600 mm deep in all analysed boreholes. Nine locations failed Criterion 7, with chloride content exceeding the threshold of 800 mg/kg. A summary of the chloride results at 600 mm is shown in Table 11 below.

7.3.8 Criteria 8: Soil Water Storage Capacity

For the soils at within the BSP, soil water storage was calculated using the soil texture lookup table (Table 9 below) using laboratory-based particle size analysis (hydrometer method), correcting for coarse (gravel) fractions. Physio-chemical limitations (presented in Table 10 below) were used to determine effective rooting depths of the soil profile. The assumption is that this limit to rooting is associated with a physical (for example hard pan,

impermeable, or waterlogged layer), or physico-chemical limitations that will constrain Plant Available Water Content (PAWC).

It is recognised that this assumption does not allow for other factors that may result in restrictions to rooting depth that are not related to limitations to PAWC. However, the potential for these are considered less common for this study area. Examples include vegetation species that only produce shallow roots, or crop pest/diseases.

A summary of the resulting soil water storage is presented in Table 11 below with detailed calculations presented in Table 22 in the Tables Appendix. A total of eighteen sites failed Criterion 8 (<100 mm). As a result, UMAs 1.07, 1.16 and 1.19 were determined not to be SCL based upon the results of soil water storage.

Table 9: Soil Texture Lookup Table

Soil Texture	Soil Water Storage
Sand; clayey sand; loamy sand	4 mm / 100 mm
Sandy loam	5 mm / 100 mm
Loam; silty loam; sandy clay loam	6 mm / 100 mm
Clay loam; sandy silty clay loam; silty clay loam	8 mm / 100 mm
Silty clay; clays with <45% clay	10 mm / 100 mm
Clays with >45% clay	12 mm / 100 mm

Table 10: Physico-chemical Limitations

Limitation	Threshold	
	Rigid	**Non-Rigid**
Chloride	800 mg/kg	
pH	<5.0 or >8.9[1]	<5.0
ESP	>15%[1]	N/A
Ca:Mg	<0.1[1]	N/A
Physical Barrier	Physical limitation to soil depth (e.g. bedrock, weathered rock, hard pans, gravel layers)	

Notes:
1. These values are only valid for rigid soils with a CEC value greater than 3 $cmol^+/kg$ and are not sandy loam or lighter textured soils.

Table 11: Strategic Cropping Land Unique Mapping Area Assessment Summary

SCL Polygon / UMA	Soil (ASC)	Soil Structure	Location	Site Type	SCL Criteria										
					1	2	3	4	5	6a	6b	7	8	SCL Site Status Result	SCL UMA Result
					Slope	Rockiness	Gilgai	Soil Depth	Wetness	pH (300mm)	pH (600mm)	Salinity Chloride	Soil Water (Lookup)		
1.01	Langley (VE AB)	Non-rigid	105	Detailed	<1%	nil	nil	>1000 mm	Pass	8.39	9.03	75	120	Pass	Pass
			124	Check (Exclusion)	<1%	nil	25% at 300mm	>1000 mm	Pass					Pass	
			132	Detailed	<1%	nil	nil	>1000 mm	Pass	8.79	9.03	17	65	Fail	
			133	Check (Exclusion)	<1%	nil	nil	>1000 mm	Pass					Pass	
			134	Detailed	<1%	nil	25% at 200mm	>1000 mm	Pass	8.44	8.53	87	118	Pass	
			135	Check	<1%	nil	25% at 200mm	>1000 mm	Pass					Pass	
			136	Check	<1%	nil	nil							Pass	
			201	Detailed	<1%	nil	nil	>1000 mm	Pass	6.79	7.76	349	120	Pass	
1.02	Isaac	Non-rigid	CS05	Check	<1%	nil								Pass	Pass
			CS06	Check	<1%	nil								Pass	
			126	Detailed	<1%	nil	25% at 200mm	>1000 mm	Pass	8.83	8.68	510	120	Pass	
			127	Detailed	<1%	nil	25% at 200mm	>1000 mm	Pass	7.70	8.26	380	72	Fail	
			128	Detailed	<1%	nil	10% at 100mm	>1000 mm	Pass	8.86	8.82	632	114	Pass	
1.03	Stephens	Rigid	CS07	Check	<1%	nil								Pass	Pass
			CS08	Check	<1%	nil								Pass	
			125	Detailed	<1%	nil	nil	>1000 mm	Pass	8.55	8.82	860	40	Fail	
			129	Detailed	<1%	nil	10% at 100mm	>1000 mm	Pass	8.21	8.55	840	54	Fail	
			129B	Detailed	<1%	nil	nil	>1000 mm	Pass	7.44	8.57	565	109	Pass	
1.04	Bluchers (VE AD)	Non-rigid	113	Check (Exclusion)	<1%	nil	nil	>1000 mm	Pass					Pass	Pass
			131	Detailed	<1%	nil	nil	>1000 mm	Pass	8.77	9.03	16	120	Pass	
			137	Detailed	<1%	nil	Debil Debil at 300mm	>1000 mm	Pass	8.77	9.03	16	120	Pass	
			141	Detailed	<1%	nil	25% at 200mm	>1000 mm	Pass	8.12	8.57	41	120	Pass	

SCL Polygon / UMA	Soil (ASC)	Soil Structure	Location	Site Type	SCL Criteria									SCL Site Status Result	SCL UMA Result
					1	2	3	4	5	6a	6b	7	8		
					Slope	Rockiness	Gilgai	Soil Depth	Wetness	pH (300mm)	pH (600mm)	Salinity Chloride	Soil Water (Lookup)		
			144	Check (Exclusion)	<1%	nil	Blade Ploughed	>1000 mm	Pass					Pass	
			149	Detailed	<1%	nil	Blade Ploughed	>1000 mm	Waterlogged - 2.5YR 5/2 with 10-20% mottle 7.5YR 7/6 at 0.65m					Fail	
			165	Detailed	<1%	nil	Blade Ploughed	>1000 mm	Pass	8.94	8.76	380		Pass	
			180	Check (Exclusion)	<1%	nil	Swamp Hummock	>1000 mm	Pass					Pass	
1.05	Langley (VE AE)	Non-rigid	107	Check (Exclusion)	<1%	nil	nil	>1000 mm	Pass					Pass	
			108	Check (Exclusion)	<1%	nil	nil							Pass	
			117	Check (Exclusion)	<1%	nil	nil	>1000 mm	Pass					Pass	
			121	Detailed	<1%	2% 1-2mm	nil	>1000 mm	Pass	8.83	8.95	350	120	Pass	
			138	Check (Exclusion)	1%	nil	nil							Pass	Pass
			139	Detailed	1%	nil	25% at 100mm	>1000 mm	Pass	9.00	8.8	510	120	Pass	
			140	Detailed	1%	nil	50% at 200mm	>1000 mm	Pass	9.09	8.71	1200	54	Fail	
			159	Check (Exclusion)	<1%	nil	nil	>1000 mm	Pass					Pass	
1.06	Thalberg (CH AB)	Rigid	119	Check (Exclusion)	1%	nil	nil	>1000 mm	Pass					Pass	Fail (Wetness, rockiness and Slope)
			120	Detailed	5.30%	nil	nil	1000 mm	Pass					Fail	
			150	Detailed	2%	nil	nil	>1000 mm	Bleached 10YR 7/2 at 0.35 m	7.41	8.4	7	50	Fail	
			151	Check (Exclusion)	3.50%	30% 5-100mm	nil							Fail	
			152	Detailed	6.00%	20% 5-50mm	nil	>1000 mm	Pass					Fail	
1.07	Tralee	Non-rigid	CS09	Check	<1%	nil								Pass	Fail (Soil Water Storage)
			CS10	Check	1.00%	nil								Pass	
			153	Detailed	1.00%	nil	25% at 100mm	>1000 mm	Pass	8.85	8.59	930	66	Fail	

SCL Polygon / UMA	Soil (ASC)	Soil Structure	Location	Site Type	SCL Criteria										
					1	2	3	4	5	6a	6b	7	8	SCL Site Status Result	SCL UMA Result
					Slope	Rockiness	Gilgai	Soil Depth	Wetness	pH (300mm)	pH (600mm)	Salinity Chloride	Soil Water (Lookup)		
			155	Detailed	1.00%	1% 2-5mm	nil	>1000 mm	Pass	9.20	8.81	1200	66	Fail	
			153B	Detailed	1.00%	nil	nil	>1000 mm	Pass	8.88	8.85	786	58	Fail	
1.08	Thalberg	Rigid	118	Check (Exclusion)	2.00%	nil	nil							Pass	Fail (Slope)
			154	Detailed	3.73%	10% 5-50mm	nil	700 mm	Pass					Fail	
			154B	Check (Exclusion)	2.68%	10% 5 – 20mm								Pass	
			154C	Check (Exclusion)	3.10%	nil								Fail	
			154D	Check (Exclusion)	2.25%	10% 5 – 20mm								Pass	
			154E	Check (Exclusion)	3.63%	15% 5 – 100mm								Fail	
			156	Detailed	3.32%	nil	nil	600 mm	Bleached 10YR 7/2 at 0.10 m					Fail	
			158	Detailed	4.00%	10% 5-20mm	nil	650 mm	Pass					Fail	
1.10	Thalberg (CH AB)	Rigid	CS16	Check (Exclusion)	4.04%	nil								Fail	Fail (Slope)
			CS17	Check (Exclusion)	3.75%	nil								Fail	
			102	Detailed	1.00%	nil	nil	> 1000 mm	Pass					Pass	
			123	Detailed	6.00%	nil	nil	> 1000 mm	Pass					Fail	
			160	Detailed	6.00%	nil	nil	900 mm	Bleached 7.5YR 7/2 at 0.30m					Fail	
			163	Check (Exclusion)	3.50%	nil	nil							Fail	
			166	Check (Exclusion)	8.00%	nil	nil							Fail	
1.12	Isaac	Non-rigid	CS04	Check	<1%	nil	nil							Pass	Pass
			142	Detailed	<1%	nil	nil	700 mm	Pass	7.52	8.67	50	61	Fail	
			203	Detailed	<1%	nil	nil	> 1000 mm	Pass	7.05	7.67	96	120	Pass	
			203B	Detailed	<1%	nil	nil	> 1000 mm	Pass	7.47	8.49	324	120	Pass	
1.13	Tralee	Non-rigid	CS03	Check	<1%	nil	nil							Pass	Pass
			111	Detailed	<1%	nil	nil	> 1000 mm	Pass	8.96	9.02	168	112	Pass	
			148	Detailed	<1%	nil	nil	> 1000 mm	Pass	8.96	9.02	1200	38	Fail	

SCL Polygon / UMA	Soil (ASC)	Soil Structure	Location	Site Type	SCL Criteria										
					1	2	3	4	5	6a	6b	7	8	SCL Site Status Result	SCL UMA Result
					Slope	Rockiness	Gilgai	Soil Depth	Wetness	pH (300mm)	pH (600mm)	Salinity Chloride	Soil Water (Lookup)		
			162	Detailed	<1%	nil	25% at 100mm	> 1000 mm	Waterlogged - 10YR 5/1 with 10-20% mottle 7.5YR 6/6 at 0.65m	8.73	8	1100	52	Fail	
			164	Detailed	<1%	nil	nil	> 1000 mm	Pass					Pass	
1.16	Langley (VE AE)	Non-rigid	CS01	Check	<1%	nil	nil							Pass	Fail (Soil Water Storage)
			CS02	Check	<1%	nil	nil							Pass	
			114	Detailed	<1%	nil	nil	> 1000 mm	Pass	8.36	8.94	118	80	Fail	
			115	Detailed	1%	nil	nil	> 1000 mm	Pass	8.85	7.84	450	80	Fail	
			143	Detailed	<1%	nil	Blade Ploughed	> 1000 mm	Pass	8.81	8.89	591	83	Fail	
1.19	Greycliffe	Non-rigid	CS11	Check	1.00%	nil								Pass	Fail (Soil Water Storage, slope and rockiness)
			CS12	Check	2.00%	10% 2-50 mm								Pass	
			CS13	Check	3.17%	nil								Fail	
			CS14	Check (Exclusion)	<1%	> 20% 5-400 mm	nil							Fail	
			CS15	Check (Exclusion)	1%	nil	Blade Ploughed							Pass	
			CS18	Check (Exclusion)	3.18%	nil	nil							Fail	
			174	Detailed	1.00%	nil	Occasional Depressions 2m wide and 0.3 deep	> 1000 mm	Pass					Pass	
			173	Detailed	3.10%	10% 2-30 mm	50% Melonhole 05-1.0m	> 1000 mm	Pass	8.82	8.81	356	65	Fail	
			175	Detailed	1.00%	nil	<50% Melonhole 0.5-1.5m wide 200-500mm deep	> 1000 mm	Pass	8.74	7.37	1755	24	Fail	
			175B	Detailed	3.92%	>20% 15-150 mm	20% 3m wide and 5-10m deep	> 1000 mm	Pass	8.73	8.44	1541	12	Fail	

Note: Pink highlighted cells indicate failed individual SCL criteria. Red highlighted cells indicate soil location or unit fails SCL criteria.

7.4 Summary of Strategic Cropping Land Areas

Within the BSP Mining Lease Area, 13 UMAs (shown in Figure 8) were identified within the SCL trigger map area. Of these, seven were validated by the soil assessment for SCL, while six failed to meet the required criteria and were determined to be non-SCL. Areas meeting the criteria for SCL are shown in Figure 10. The outcomes of the assessment are presented in Table 11. A summary of the assessment for each SCL UMA is presented in Table 12 below. Borelogs and detailed results are presented in Appendix C.

Of the area mapped as SCL, proposed on-lease disturbance impacts

Table 12: Summary of Strategic Cropping Land Assessment

UMA	Soil	Soil Landscape	Area (ha)	Total Number of Sites	Area per Observation (ha)	SCL Status Using Criteria	Criteria that Fail
1.01	Langley	Qa.lf2	342	8	42.7	Pass	-
1.02	Isaac	Qa.lf1	86	5	17.2	Pass	-
1.03	Stephens	Qa.uf1	19	5	3.8	Pass	-
1.04	Bluchers	Qa.td1	183	8	22.9	Pass	-
1.05	Langley	Qa.uf2	311	8	38.9	Pass	-
1.06	Thalberg	Cz.gp2	85	5	17.0	Fail	Wetness and slope
1.07	Tralee	Qa.uf3	16	5	3.2	Fail	Soil water storage
1.08	Thalberg	Cz.gp2	62	8	7.8	Fail	Slope
1.10	Thalberg	Cz.gp2	72	7	10.3	Fail	Slope
1.12	Isaac	Qa.lf1	87	4	21.8	Pass	-
1.13	Tralee	Qa.uf3	106	5	21.2	Pass	-
1.16	Langley	Qa.uf2	41	5	8.2	Fail	Soil water storage
1.19	Greycliffe	Cz.gp1	94	10	9.4	Fail	Soil water storage

8 LAND SUITABILITY

Land suitability was assessed within the Queensland Regional Land Suitability Framework for the Inland Fitzroy and Southern Burdekin Area (DNRM, 2013). The site is not located within mapped priority agricultural area.

8.1 Assessment Criteria

8.1.1 Land Suitability

Land suitability refers to the fitness of land for a defined use. This is assessed by considering a range of factors including soil, landscape and climate to evaluate the potential productivity potential of a tract of land. A description of the Land Suitability Classes is presented in Table 13.

The assessment criteria for Land Suitability in Central Queensland is primarily based upon that included in the Land Suitability Assessment Techniques (DNRM, 2015; DNRM 2013). A summary of the land suitability criteria is provided in Table 35 in the tables Appendix.

In circumstances where these guidelines appear to misclassify the landscape units then land suitability criteria within Land resource assessment of the Windeyers Hill area, Isaac-Connors and Mackenzie River Catchments, Central Queensland (Burgess, 2003) are referred to for discussion purposes as this is a more recent publication and is considered relevant to the study area.

Table 13: Land Suitability Class

Class	Agricultural Definition	Conservation definition
1	Highly productive land requiring only simple management practices to maintain economic production.	Areas well suited for conservation uses must possess significant conservation benefits in the pre-mining environment and be capable of being returned to that use post-mining.
2	Land with limitations that either constrain production, or require more than the simple management practices of class 1 land to maintain economic production.	These areas are suited to conservation use in that a significant component of the pre-mining conservation values can be restored post-mining. There will however be some loss in conservation values where soil terrain or hydrological post-mining conditions may inhibit the full replication of the pre-mining values.
3	Land with limitations that either further constrain production, or require more than those management practices of class 2 land to maintain economic production.	These lands contain significant conservation values pre-mining; however restoration of all of these values may not be feasible. These areas could, however, be restored to a form of conservation use which provides alternative conservation benefits.
4	Currently unsuitable land. The limitations are so severe that the sustainable use of the land in the proposed manner is precluded. In some circumstances, the limitations may be surmountable	These lands contain limited conservation value pre-mining and/ or are incapable of being effectively restored post-mining to any alternative conservation use which provides

Class	Agricultural Definition	Conservation definition
	with changes to knowledge, economics or technology.	similar benefits. The area could, however, be restored to provide a stable form of use which does not impact on surrounding conservation values.
5	Land with extreme limitations that preclude any possibility of successful sustained use of the land in the proposed manner.	These lands contain no significant conservation values.

8.2 Regional Land Suitability Frameworks

The suitability framework provides the detail for assessing which crops are suitable for individual mapped areas of land or soil.

This framework is similar to previous system however is based on crops rather than cattle. The classes 1-5 remain the same, as defined below:

- Class 1: Suitable land with negligible limitations. This is highly productive land requiring only simple management practices to maintain economic production.
- Class 2: Suitable land with minor limitations which either reduce production or require more than the simple management practices of class 1 land to maintain economic production.
- Class 3: Suitable land with moderate limitations which either further lower production or require more than those management practices of class 2 land to maintain economic production.
- Class 4: Marginal land, which is presently considered unsuitable due to severe limitations. The long term significance of these limitations on the proposed land use is unknown or not quantified. The use of this land is dependent upon undertaking additional studies to determine whether the effect of the limitation(s) can be reduced to achieve sustained economic production.
- Class 5: Unsuitable land with extreme limitations that preclude its use.

This framework is based on limitations of land packages. Each limitation has a number of physical attributes associated. These attributes are the deciding factor in which suitability subclass the package is assigned. Each attribute has a quantitative value that can be physically measured for in the field. Categorisation into each subclass 1-5 are based on the field measured values of the physical properties, for each land class.

8.3 Agricultural Land Class

Agricultural land classes (ALC) is a classification system developed in Queensland, similar to land capability, which assesses land suitability for specific types of agricultural production (DSITI and DNRM, 2014). The system consists of classes that have been designed to assess land on the basis of suitability and potential for agricultural production. The agricultural suitability classes are described in Table 14. The ALCs are determined based

upon the results of the land suitability classes assigned to each UMA and the variety of crops which the land is suitable.

Table 14: Definition of Agricultural Land Classes

Class	Description
A	Crop land - Land that is suitable for current and potential crops with limitations to production that ranges from none to moderate.
B	Limited crop land - Land that is marginal for current and potential crops due to severe limitations; and suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for cropping.
C	Pasture land – Suitable for grazing pastures
D	Non-agricultural land - Land not suitable for agricultural uses due to extreme limitations. This may be undisturbed land with significant habitat, conservation and/or catchment values or land that may be unsuitable because of very steep slopes, shallow soils, rock outcrop or poor drainage.

8.4 Results of Land Suitability

Results of the land suitability assessment for the soil mapping units across the study area are presented in Table 15, together with an indication of the most limiting factor. The full assessment is presented in Table 36. All soil landscapes in study area have been classified as a 4 or 5 suitability class. Langley was the most suitable soil assessed with a suitability class of 4. The most limiting factor common to all landscapes is soil water availability (M) as plant yield is severely affected by water stress.

Additionally, wetness due to limitations in site drainage prevent the area from being considered suitable for crop use, along with water erosion due to slope and the dispersive nature of soil in Tralee, Bluchers and Stephens soil types. Surface condition was a major limitation on Greycliffe soils as the ped size was too large for productive crops (>10 mm).

Table 15: Land Suitability Class Summary

Soil Landscape	Soil	Limiting factor/s	Suitability Class	Agricultural Land Class (ALC)
2a Qa.lf1	Isaac	soil water availability, wetness	5	C
2b Qa.lf2	Langley	soil water availability, wetness	4	C
3 Qa.td1	Bluchers	Soil water availability, water erosion	5	C
4a Qa.uf1	Stephens	Soil water availability, water erosion	5	C
4b Qa.uf2	Langley	Soil water availability, surface condition	4	C

Soil Landscape	Soil	Limiting factor/s	Suitability Class	Agricultural Land Class (ALC)
7a Cz.gp1	Greycliffe	Soil water availability, surface condition, wetness	5	C
7b Cz.gp2	Thalberg	Soil water availability, water erosion	5	C

8.5 Summary of Land Suitability

The suitability assessment indicates that the land has either extreme limitations that preclude it from crop use or would require significant inputs to be considered suitable. Land suitability constraints within the study area relate to salinity and sodicity of the subsoil (the “B horizon”), including the effect of these constraints on plant water availability. The highest quality land for cropping was located on the floodplain of the BSP area consisting of Langley soil type.

9 PRELIMINARY SITE INVESTIGATION

9.1 Objective

A preliminary site investigation (PSI) was conducted on the study area including the BSP. The aim of the PSI is to determine whether any potentially contaminating activities have taken place within the study area.

9.2 Methodology

This objective was achieved through the following scope of work:

- Conducting a desktop review of the study area;
- Undertaking a site inspection of the study area;
- Undertaking a limited soil sampling program within areas identified in the desktop review and site inspection as potentially contaminated; and
- Preparing a report detailing the results of the investigation with reference to relevant human health and environmental guidelines along with implications for the future development.

9.2.1 Chemicals of Potential Concern

The chemicals of potential concern (CoPC) were arsenic (As), which was sprayed along rail lines for weed and timber control, and copper (Cu) and chromium (Cr), which are also used for treatment of the timber sleepers on the rail line.

9.2.2 Soil Investigation Levels

Based on the proposed land use, the adopted in the assessment for screening analytical results is 'commercial / industrial' health investigation level for commercial industrial premises (HIL-D) (Table 16). The most likely exposure pathway to humans would be for construction workers building the mine.

Ecological investigation levels (EILs) are derived based on the potential that the analyte may be phytotoxic, however exceedance of an EIL does not necessarily indicate environmental harm. For example, mineralisation resulting in the concentration of metals in the landscape is a natural process and the environment is capable of adapting to address the apparent increase in concentration without harm. Furthermore, all plant species are not the same and the uptake and toxicity of analytes will vary between species. As a result of these uncertainties, EILs have been adopted in this assessment to prompt consideration of the potential source and associated environmental hazard from the analyte.

The EILs adopted for soil analytes in this assessment are for Commercial and Industrial land use and are presented in Table 16. Calculation of Ambient Background Concentration (ABC) used site conditions of total Fe – 1.07%, CEC – 10 meq/100g and pH 7.5.

Table 16: Environmental Investigation Levels for Soil

Analyte	Human Receptors Commercial / Industrial (HIL-D) [1]	Environmental Receptors Commercial / Industrial (EIL)[2]	Calculated Background Ranges
	mg/kg	mg/kg	mg/kg
Arsenic (As)	3,000	160	1 – 50
Cadmium (Cd)	900	-	0.04 – 2
Chromium (Cr VI)	3,600	750	-
Copper (Cu)	240,000	300	1 – 200
Lead (Pb)	1,500	1,800	<2 – 200
Manganese (Mn)	60,000	-	850
Mercury (Hg)	730	-	0.001 – 0.1
Zinc (Zn)	400,000	655	10 – 300

Notes:

1. NEPC 2013, National Environment Protection (Assessment of Site Contamination) Measure, Schedule B1: Guideline on the Investigation Levels for Soil and Groundwater Amended 2013
2. EILs were calculated by summing added contaminant limits and ambient background concentrations. This was determined using Tables 1B(1-5), Schedule B1, NEPC (2013) and background calculated as per Hamon et al (2004).

9.3 Results

9.3.1 Desktop Review

Environmental Management Register / Contaminated Land Register

Searches of the Department of Environment and Science (DES) Environmental Management Register (EMR) and Contaminated Land Register (CLR) for the soil survey study area and surrounds indicated that four lots were found to be on the EMR and none on the CLR. Four were listed for livestock dip/spray race and one also listed for petroleum product or oil; these results are presented in Table 17. Review of the affected lots in relation to the study area found that the notifiable activities related to the EMR/CLR listings occur on lots surrounding the study area and are not within the mining lease. The closest notifiable activity related to EMR listings is a cattle dip located in the northern part of Lot 140 Plan FN503, which directly borders the site to the North.

The absence of the former railway line running through the site from the EMR/CLR is unusual, as by default QR rail land is normally on the EMR/CLR for arsenic that was used for weed and termite control along railway lines. The likely reason for the non-inclusion of the railway line is that the Baralaba to Moura section was closed and decommissioned prior to the establishment of the EMR/CLR registers that came into effect after the EP Act 1994.

Table 17: EMR/CLR

Area	LOT	Plan	EMR/CLR status	Notifiable Activity	Date
Alberta	5	KM50	not included	Nil	2/5/2019
Baralaba	6	KM50	Included (EMR):	Livestock Dip or Spray Race Petroleum Product or Oil Storage	2/5/2019
Baralaba	4	FN514	not included	Nil	2/5/2019
Baralaba	25	FN130	not included	Nil	2/5/2019
Baralaba	11	FN153	not included	Nil	2/5/2019
Baralaba	2	FN121	not included	Nil	2/5/2019
Baralaba	3	FN110	Not included	Nil	2/5/2019
Baralaba	5	FN110	Not included	Nil	2/5/2019
Baralaba	4	FN110	Not included	Nil	2/5/2019
Baralaba	1	PER200304	Not included	Nil	2/5/2019
Baralaba	8	FN215	Not included	Nil	2/5/2019
Baralaba	62	SP119257	Not included	Nil	2/5/2019
Baralaba	15	FN217	Not included	Nil	2/5/2019

Area	LOT	Plan	EMR/CLR status	Notifiable Activity	Date
Baralaba	61	SP119257	Not included	Nil	2/5/2019
Baralaba	26	FN153	Not included	Nil	2/5/2019
Baralaba	141	FN137	Not included	Nil	2/5/2019
Baralaba	77	FN312	Not included	Nil	2/5/2019
Baralaba	78	FN153	Not included	Nil	2/5/2019
Baralaba	27	FN153	Not included	Nil	2/5/2019
Baralaba	79	FN106	Not included	Nil	2/5/2019
Baralaba	145	FN502	Not included	Nil	2/5/2019
Baralaba	140	FN503	Included (EMR)	Livestock Dip or Spray Race	2/5/2019
Baralaba	12	FN514	Not included	Nil	2/5/2019
Baralaba	2	RP801031	Not included	Nil	2/5/2019
Baralaba	133	FN143	Not included	Nil	2/5/2019
Baralaba	132	FN156	Not included	Nil	2/5/2019
Baralaba	28	FN154	Included (EMR)	Livestock Dip or Spray Race	2/5/2019
Baralaba	135	FN143	Not included	Nil	2/5/2019
Baralaba	156	FN504	Not included	Nil	2/5/2019
Baralaba	34	FN217	Not included	Nil	2/5/2019
Baralaba	5	RP856832	Not included	Nil	2/5/2019
Baralaba	8	FN215	Not included	Nil	2/5/2019
Baralaba	7	KM220	Included (EMR)	Livestock Dip or Spray Race	2/5/2019
Baralaba	20	FN503	Not included	Nil	2/5/2019
Baralaba	1	FN109	Not included	Nil	2/5/2019
Baralaba	2	FN109	Not included	Nil	2/5/2019
Baralaba	13	FN514	Not included	Nil	2/5/2019
Baralaba	21	FN502	Not included	Nil	2/5/2019
Baralaba	31	SP119256	Not included	Nil	2/5/2019
Baralaba	1	RP801031	Not included	Nil	2/5/2019

In order to assess potential contamination, soil samples were collected from locations along the former railway line within the study area. Samples were collected from the soil surface (0-0.1 m) and at 0.4-0.5 m depth, from natural soil.

Historical Photographs

A review of aerial photographs and other available imagery of the site is presented in Table 18. The first aerial photograph is a satellite image from 1953. There does not appear to be any industrial or commercial use as the site is undeveloped. Copies of aerial photographs are provided in Appendix E. Post 1995, adjacent land is irrigated and likely used for agricultural purposes.

Table 18: Historical aerial Photographs

Year	Scale/Height	Colour/B&W	Notes
1953	1:25,000	B&W	The site appears to be vacant.
1965	1:40,000	B&W	Site appears as per 1953
1968	1:40,000	B&W	Site appears as per 1953
1972	1:100,000	B&W	Low quality image, site appears as per 1953
1975	1:40,000	B&W	site appears as per 1953
1975	1:40,000	B&W	site appears as per 1953
1983	1:25,000	B&W	site appears as per 1953
1994	1:40,000	B&W	First sign of agricultural works - centre pivot irrigation appears adjacent to site
1999	1:25,000	Colour	site appears as per 1994
2002	Google Earth	Colour	site appears as per 1953
2006	Google Earth	Colour	Some image data missing
2009	Google Earth	Colour	Some image data missing
2013	Google Earth	Colour	Increased agriculture adjacent – more centre pivot irrigators
2017	Google Earth	Colour	Site appears as per 2013

9.3.2 Field observations

The location of the former railway line is evident along western side of the site. While the tracks and bridges have been removed, sleepers, gravel and foreign fill material remain. In some locations this material has been scraped into piles, while elsewhere the gravel and sleepers remain in position with the tracks removed. Examples of the current state of the former railway line are presented in Plate 1 and 2.

The former railway line is mostly fenced. Some portions are used for grazing, or moving cattle between paddocks. In some locations a dirt track runs along the former track location, while other areas are impassable to vehicles due to regrowth vegetation and piles of sleepers, gravel and fill.

Soil samples were collected at regular intervals along the former railway line. Sampling locations included within the former tracks, adjacent to the tracks and stockpiled material

within the rail corridor. Sample locations are presented in Figure 6 and lot identifiers in Table 19.

Table 19: Transport Corridor Lots Assessed

Lot on Plan	Area (ha)	Sample locations
1 on FN109	4.1	136
2 on FN109	4.9	130
2 on FN121	4.2	138, 202

The remainder of the study area was inspected in the course of the soil and land suitability assessment. Specific activities which may have triggered the requirement for further investigation include cattle dips, farm dumps, incinerators and chemical or fuel storage. No such activities were identified.

9.3.3 Soil Analytical Results

Six primary soil samples were analysed for total arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), and zinc (Zn). Two blind duplicates and two split duplicates (secondary soil samples) were also analysed for quality control (QC) purposes. Results of these analyses are presented in Table 20 Heavy Metals, in the Tables appendix. Laboratory transcripts are presented in Appendix B.

Total Fe concentrations were used to model the range of possible natural background concentrations (after Hamon et al., 2004). This modelling approach is based on the relationship between Fe and other metals in 758 soil samples from around the world. The upper limit of expected natural concentrations is presented in Table 20 below for As, Cr, Cu, Pb and Zn.

Table 20: Heavy Metal Results

Site	Depth	Cu	Pb	Zn	Cd	Cr VI	Fe	Mn	As	Hg
		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg	mg/kg
130	0-0.1	27	10	35	<0.5	<0.5	1.4	240	48	0.02
130	0.4-0.5	17	20	41	<0.5	-	2.1	2,200	4	0.025
136	0-0.1	14	22	35	<0.5	<0.5	2.1	960	6	0.055
136	0.4-0.5	19	16	61	<0.5	<0.5	2.1	690	6.5	0.035
138	0-0.1	27	7.5	28	<0.5	-	1.4	360	7	0.025
202	0-0.1	16	10	49	<0.5	-	1.4	420	14	0.015
EIL (C/I)		300	1,800	655	-	750		-	160	-
HIL (D)		240,000	1,500	400,000	900	3,600		60,000	3,000	730

Plate 1: Site 136 – piles of gravel and sleepers

Plate 2: Site 138 – cleared railway line.

9.4 Discussion

Mean concentrations of As, Cr, Cu, Pb and Zn in samples from the study area are lower than or within the modelled range, and lower than the EIL.

Arsenic

Initial results showed that one sample contained As above the background concentration, however below the EIL and HIL. Subsoil (0.4-0.5 m) samples at the locations were tested. Arsenic concentrations in subsoil samples were less than the EIL, indicating that As was confined to the surface soil.

Leach tests were conducted on samples with relatively elevated As to assess bioavailability. Leaches conducted were:

- TCLP leach - mimicking potential for As to be solubilised and leach to groundwater;
- EDTA leach - mimicking effect of plant root exudates to solubilise nutrients for uptake.

The results of the leach test are used to determine adjusted site specific criteria. The TCLP and EDTA leach results are used to determine adjusted criteria for environmental exposure (EILs) as they measure availability to the environment. Results from leach tests are presented in Table 21.

Since As concentration are within the guidelines for the adjusted EIL, As is not considered to be an environmental (or human health) risk within the study area.

Table 21: Arsenic Bioavailability Leach Tests

Site	Depth	Total As	TCLP (1:20)	Availability	Adjusted EIL
		mg/kg	mg/L	%	mg/kg
130	0-0.1	48	0.08	3.3	606

Site	Depth	Total As	EDTA (10:25)	Availability	Adjusted EIL
		mg/kg	mg/L	%	mg/kg
130	0-0.1	48	3.4	17.7	113

Chromium
All samples analysed had Cr VI concentrations below the detection limit (<0.5 mg/kg) and not of concern to humans or the environment.

9.4.1 Data Quality

An evaluation of the quality assurance (QA) and quality control (QC) procedures and results was conducted to determine the quality of the data obtained.

A new pair of nitrile gloves was donned prior to collection of each sample, with each soil sample stored in a laboratory-supplied plastic bag. The hand auger was decontaminated between sample locations. On this basis, field QA procedures were considered appropriate and bias of the dataset by cross-contamination is considered unlikely.

The laboratories (SAL [primary laboratory] and SGS [secondary laboratory]) which conducted the analysis of soil samples were NATA registered, with all tests conducted in accordance with the NATA accreditation.

The number of duplicate/split pairs collected during the assessment (one per twenty samples for duplicates and splits) was consistent with guidance provided in AS4482.1 (Standards Australia, 2005). Trip blank samples were not considered appropriate for this investigation given that samples were not analysed for volatile organic compounds. On this basis, this QA protocol is considered sufficient to allow appropriate assessment of data quality.

Based on the discussion presented within this section, Environmental Earth Sciences considers that the field QA procedures and QC results indicate that the soil data quality is acceptable for the purposes of this evaluation. Based on the above discussion, all primary sample results have been used in the data evaluation and modelling.

9.5 Conclusion

The assessment of heavy metal contamination within the former railway corridor indicated that elevated As concentrations are present in some locations as a result of spraying As onto the tracks for weed and termite control.

An assessment of As bioavailability was conducted to determine environmental impacts. Arsenic concentrations did not exceed the criteria for human health or the environment (plant phytotoxicity and potential leaching to groundwater).

Concentrations of other metals were not of concern to human health or the environment.

Soil within the former railway corridor is therefore considered to not pose an environmental or human health risk within the intended land use as a haul road or coal conveyor, or for any future use.

9.6 Recommendations

9.6.1 Soil

Soil within the former railway corridor is considered to not pose an environmental or human health risk within the intended use for mining. This includes the in-situ soil along the former railway line, and soil that may be moved and re-used within the rail corridor in developing the mine.

As none of the assessed Lots are on the EMR/ CLR, there are no disposal or transport restrictions for relocation of this soil. However, if soil is to be removed from the railway corridor, it should be tested for the suite of nine heavy metals detailed in this report to ensure it is suitable for use in the intended destination. Concentrations detected in soil to be removed from the site should be compared to the guideline values reported herein.

9.6.2 Railway rubbish

Sleepers, metal items and other hard rubbish remains along some sections of the railway corridor. These items should be collected and disposed of appropriately. Timber sleepers would have been treated for termite control and may contain elevated Cu, Cr and As.

9.6.3 Unexpected contamination

In the process of clearing the former railway line for mine development, unexpected contamination may be identified. If evidence of unexpected contamination is identified, work is to cease in that area and action taken to appropriately delineate the contaminated soil or fill material. Examples of such material could include (but are not limited to):

- buried or hidden rubbish, including containers that may have held chemicals or oil;
- previously unidentified fill material, other than gravel (i.e. ash); or
- odorous or oily stained soil or fill material.

This material must be managed or remediated and validated under supervision of a Suitably Qualified Person (SAQP). The administering authority is to be notified immediately by telephone, as well as by written notification within 24 hours of detection and advised of appropriate remedial action.

10 REPORT SUMMARY

This soil and land suitability report for the BSP addresses the Terms of Reference for the Project EIS, as described in the Scope and Relevant Terms of Reference (ToR). A summary of how these ToR are addressed is presented below.

10.1 Topography (ToR 6.22)

The landscape and topography of the study area, as relevant to soil and land suitability, are described through Sections 5.4 and 8.1.1.

The study area is located within and adjacent to the Dawson River flood plain, which has shaped the landscape and topography. Sections 5.3 and 5.4 describe the landscape in relation to geology, geomorphology and landforms. Soils and soil landscapes are described in Section 6.0.

10.2 Soils (ToR 8.1.3)

Soils and soil landscapes identified in the study area are described in Section 6.

A total of 13 unique mapping areas (or UMAs) were identified across the Baralaba South Coal Project. These mapping units are represented by seven different soils within eight Soil Landscapes, which have been described in detail, together with their key attributes. Management considerations are also described for each soil if these materials are disturbed (for example, erodibility, fertility, quantity of usable materials).

10.3 Land Use (ToR 8.8.1)

10.3.1 Land Use

The land use of the study area, both current and historical is described in Section 5.1, Figure 1 shows the site's proximity to priority agricultural areas and highlight areas within the Dawson River Valley Important Agricultural Area. Cattle grazing, cropping and coal mining are the dominant land uses in the region.

10.3.2 Strategic Cropping Land

The land use assessment includes a strategic cropping land assessment (Section 7.0) for the BSP.

A field assessment of strategic cropping land was completed in conjunction with the original soil survey in 2012 and updated results (to meet the standards of current strategic cropping land assessment) collected in 2019.

Within the BSP, 13 UMAs were identified within the strategic cropping land trigger map area. Of these, six failed the soil criteria on the basis of slope, drainage, salinity and soil water storage. Seven UMAs passed the criteria for strategic cropping land.

10.3.3 Land Suitability and Agricultural Land Classification

A land suitability assessment was conducted for the Project area, and is described in Section 8.0.

Agricultural land suitability of soils within the BSP ranged from class 5 to class 4 for cropping.

Common limitations to land suitability within the study area included flooding, salinity, water availability and nutrient deficiency.

10.3.4 Contaminated Land

A preliminary site investigation for contaminated land was conducted for the study area, and is presented in Section 9. Four were listed for livestock dip/spray race and one listed for petroleum product or oil. There are no listings on the EMR/CLR for the site itself, the areas listed are in the site surrounds, with lot 140 Plan FN503 directly bordering to the North. The former railway line was also identified as a potentially contaminating activity.

A soil assessment of the former railway line identified arsenic (As) used for weed and termite control along the former railway line as a chemical of potential concern (CoPC). Concentrations of As in soil along the railway line do not exceed health or environmental criteria developed for As, and do not pose a hazard to health of workers or the environment.

11 LIMITATIONS

This report has been prepared by Environmental Earth Sciences QLD ACN 109 442 284 in response to and subject to the following limitations:

1. The specific instructions received from the Proponent;

2. The specific scope of works issued to the Proponent and included in Section 3 (Scope of Work) of this report;

3. May not be relied upon by any third party not named in this report for any purpose except with the prior written consent of Environmental Earth Sciences QLD (which consent may or may not be given at the discretion of Environmental Earth Sciences QLD);

4. This report comprises the formal report, documentation sections, tables, figures and appendices as referred to in the index to this report and must not be released to any third party or copied in part without all the material included in this report for any reason;

5. The report only relates to the site referred to in the scope of works being located at Baralaba South Project (“the site”);

6. The report relates to the site as at the date of the report as conditions may change thereafter due to natural processes and/or site activities;

7. No warranty or guarantee is made in regard to any other use than as specified in the scope of works and only applies to the depth tested and reported in this report;

8. Fill, soil, groundwater and rock to the depth tested on the site may be fit for the use specified in this report. Unless it is expressly stated in this report, the fill, soil and/or rock may not be suitable for classification as clean fill if deposited off site;

9. This report is not a geotechnical or planning report suitable for planning or zoning purposes; and

10. Our General Limitations set out at the back of the body of this report.

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13 GLOSSARY OF TERMS

The following descriptions are of terms used in the text of this report.

Alluvial. Describes material deposited by, or in transit in, flowing water.

Background. The natural level of a property.

Baseline. An initial value of a measure.

Biodegradation. A biochemical process of microbial oxidation of complex organic compounds, to simpler chemical products. Micro-organisms derive the energy and cell carbon for growth from oxidation of organic compounds.

Bore. A hydraulic structure that facilitates the monitoring of groundwater level, collection of groundwater samples, or the extraction (or injection) of groundwater. Also known as a well, monitoring well or piezometer, although piezometers are typically of small diameter and only used for measuring the groundwater elevation or potentiometric surface.

Borehole. An uncased well drill hole.

Cation Exchange Capacity (CEC). The maximum positive charge required to balance the negative charge on colloids (clays and other charged particles). The units are milli-equivalents per 100 grams of material or centimoles of charge per kilogram of exchanger.

Clay. A soil material composed of particles finer than 0.002 mm. When used as a soil texture group such soils contain at least 35% clay.

Colluvial. Unconsolidated soil and rock material moved down-slope by gravity.

Contaminant. Generally, any chemical species introduced into the soil or water. More particularly relates to those species that render soil or water unfit for beneficial use.

Contamination. Is considered to have occurred when the concentration of a specific element or compound is established as being greater than the normally expected (or actually quantified) background concentration.

Discrete sample. Samples collected from different locations and depths that will not be composited but analysed individually.

Dispersion. A process by which species in solution mix with a second solution, thus reducing in concentration. In particular, relates to the reduction in concentration resulting from the movement of flowing groundwater.

Electrical Conductivity (EC). The EC of water is a measure of its ability to conduct an electric current. This property is related to the ionic content of the sample, which is in turn a function of the total dissolved (ionisable) solids (TDS) concentration. An estimate of TDS in fresh water can be obtained by multiplying EC by 0.65.

Fluvial. A material deposited by, or in transit, in streams or watercourses.

Fracture. A break in the geological formation, e.g. a shear or a fault.

Gradational. The lower boundary between soil layers (horizons) has a gradual transition to the next layer. The solum (soil horizon) becomes gradually more clayey with depth.

Gradient. The rate of inclination of a slope. The degree of deviation from the horizontal; also refers to pressure.

Groundwater Elevation. The elevation of the groundwater surface measured relative to a specified datum such as the Australian Height Datum (mAHD) or an arbitrary survey datum onsite, or “reduced level” (mRL).

Head space. The air space at the top of a soil or water sample.

Heavy Metals. All metallic elements whose atomic mass exceeds that of calcium (20) and includes lead (Pb), copper (Cu), Zinc (Zn), cadmium (Cd), and tin (Sn).

Heterogeneous. A condition of having different characteristics in proximate locations. Non-uniform. (Opposite of homogeneous).

Horizon. An individual soil layer, based on texture and colour, which differs from those above and below.

Hydrocarbon. A molecule consisting of carbon and hydrogen atoms only, such as found in petroleum.

Hydrocarbon, volatile. A hydrocarbon with a low boiling point (high vapour pressure). Normally taken to mean those with ten (or less) carbon atoms per molecule.

Infiltration. The passage of water, under the influence of gravity, from the land surface into the subsurface.

Ionic Exchange. Adsorption occurs when a particle with a charge imbalance, neutralises this charge by the attraction (and subsequent adherence of) ions of opposite charge from solution. There are two types of such a charge: pH dependent; and pH independent or crystalline charge. Metal hydroxides and oxy-hydroxides represent examples of the former type, whilst clay minerals are representative of the latter and are normally associated with cation exchange.

Ions. An ion is a charged element or compound as a result of an excess or deficit of electrons. Positively charged ions are called cations, whilst negatively charged ions are called anions. Cations are written with superscript +, whilst anions use - as the superscript. The major aqueous ions are those that dominate total dissolved solids (TDS). These ions include: Cl-, SO42-, HCO3-, Na+, Ca2+, Mg2+, K+, NH4+, NO3-, NO2-, F-, PO43- and the heavy metals.

Lithic. Containing large amounts of fragments derived from previously formed rocks.

Mottled. Masses, blobs or blotches of sub-dominant, varying colours in the soil matrix.

Nodulation. Are hard, usually small, accumulation of precipitated iron and/or manganese in the soil profile, usually a result of past alternating periods of oxidation/reduction.

Nodule. A small, concretionary (hard) deposit, usually of iron and/or manganese.

Organics. Chemical compounds comprising atoms of carbon, hydrogen and others (commonly oxygen, nitrogen, phosphorus, sulfur). Opposite is inorganic, referring to chemical species not containing carbon.

Oxidation. Was originally referred only to the addition of oxygen to elements. However oxidation now encompasses the broader concept of the loss of electrons by electron transfer to other ions.

pH. A logarithmic index for the concentration of hydrogen ions in an aqueous solution, which is used as a measure of acidity.

Polycyclic aromatic Hydrocarbons (PAHs). Complex organic molecules which originate typically in the combustion of organic compounds.

Precipitation (chemical). There are two types of precipitation, pH dependent precipitation and solubility controlled precipitation. As the pH is raised beyond a threshold level the precipitation of metal cations such as oxy-hydroxides and hydroxides occur. As the pH is raised further precipitation continues until there are very few metal cations remaining in solution. This reaction is entirely reversible. Solubility controlled precipitation occurs between two ions when, at a given temperature and pressure, the concentration of one of the ions exceeds a certain level.

Profile. The solum. This includes the soil A and B horizons and is basically the depth of soil to weathered rock.

QA/QC. Quality Assurance / Quality Control.

Redox. REDuction-OXidation state of a chemical or solution.

Remediation. The restoration of land or groundwater contaminated by pollutants, to a state suitable for other, beneficial uses.

Representative Sample. Assumed not to be significantly different than the population of samples available. In many investigations samples are often collected to represent the worst case situation.

Subsoil. Subsurface material comprising the B and C horizons of soils with distinct profiles. They often have brighter colours and higher clay content than topsoils.

Texture. The size of particles in the soil. Texture is divided into six groups, depending on the amount of coarse sand, fine sand, silt and clay in the soil.

Topsoil. Part of the soil profile, typically the A1 horizon, containing material which is usually darker, more fertile and better structured than the underlying layers.

Toxicity. The inherent potential or capacity of a material to cause adverse effects in a living organism.

Unsaturated Zone. The zone between the land surface and the water table, in which the rock or soil pores contain both air and water (water in the unsaturated zone is present at less than atmospheric pressure). It includes the root zone, intermediate zone and capillary fringe. Saturated bodies such as perched groundwater may exist in the unsaturated zone. Also referred to as the Vadose Zone.

ENVIRONMENTAL EARTH SCIENCES GENERAL LIMITATIONS

Scope of services
The work presented in this report is Environmental Earth Sciences response to the specific scope of works requested by, planned with and approved by the client. It cannot be relied on by any other third party for any purpose except with our prior written consent. Client may distribute this report to other parties and in doing so warrants that the report is suitable for the purpose it was intended for. However, any party wishing to rely on this report should contact us to determine the suitability of this report for their specific purpose.

Data should not be separated from the report
A report is provided inclusive of all documentation sections, limitations, tables, figures and appendices and should not be provided or copied in part without all supporting documentation for any reason, because misinterpretation may occur.

Subsurface conditions change
Understanding an environmental study will reduce exposure to the risk of the presence of contaminated soil and or groundwater. However, contaminants may be present in areas that were not investigated, or may migrate to other areas. Analysis cannot cover every type of contaminant that could possibly be present. When combined with field observations, field measurements and professional judgement, this approach increases the probability of identifying contaminated soil and or groundwater. Under no circumstances can it be considered that these findings represent the actual condition of the site at all points.

Environmental studies identify actual sub-surface conditions only at those points where samples are taken, when they are taken. Actual conditions between sampling locations differ from those inferred because no professional, no matter how qualified, and no sub-surface exploration program, no matter how comprehensive, can reveal what is hidden below the ground surface. The actual interface between materials may be far more gradual or abrupt than an assessment indicates. Actual conditions in areas not sampled may differ from that predicted. Nothing can be done to prevent the unanticipated. However, steps can be taken to help minimize the impact. For this reason, site owners should retain our services.

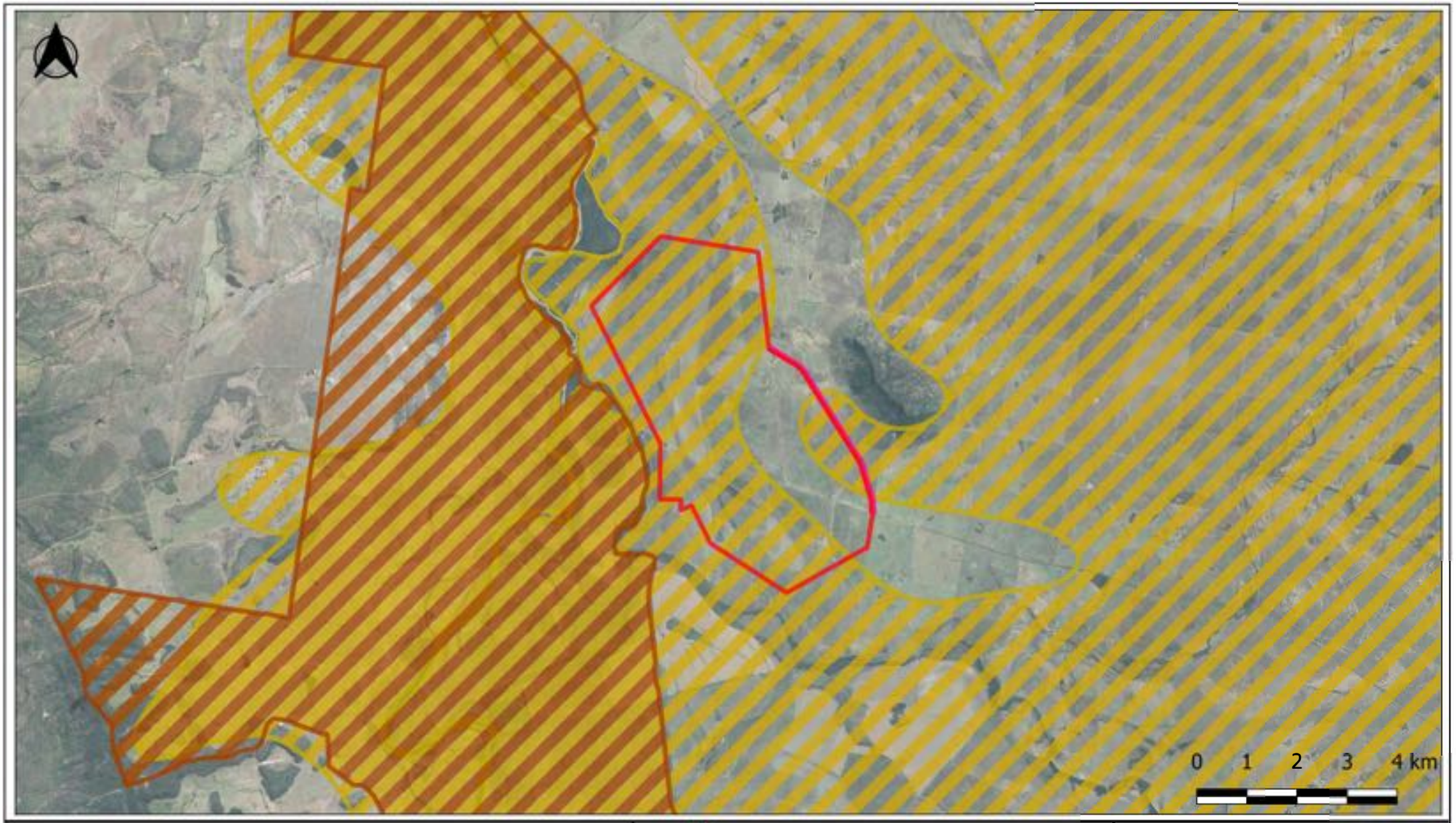
Problems with interpretation by others
Advice and interpretation is provided on the basis that subsequent work will be undertaken by Environmental Earth Sciences QLD. This will identify variances, maintain consistency in how data is interpreted, conduct additional tests that may be necessary and recommend solutions to problems encountered on site. Other parties may misinterpret our work and we cannot be responsible for how the information in this report is used. If further data is collected or comes to light we reserve the right to alter their conclusions.

Obtain regulatory approval
The investigation and remediation of contaminated sites is a field in which legislation and interpretation of legislation is changing rapidly. Our interpretation of the investigation findings should not be taken to be that of any other party. When approval from a statutory authority is required for a project, that approval should be directly sought by the client.

Limit of liability
This study has been carried out to a particular scope of works at a specified site and should not be used for any other purpose. This report is provided on the condition that Environmental Earth Sciences QLD disclaims all liability to any person or entity other than the client in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by any such person in reliance, whether in whole or in part, on the contents of this report. Furthermore, Environmental Earth Sciences QLD disclaims all liability in respect of anything done or omitted to be done and of the consequence of anything done or omitted to be done by the client, or any such person in reliance, whether in whole or any part of the contents of this report of all matters not stated in the brief outlined in Environmental Earth Sciences QLD's proposal number and according to Environmental Earth Sciences general terms and conditions and special terms and conditions for contaminated sites.

To the maximum extent permitted by law, we exclude all liability of whatever nature, whether in contract, tort or otherwise, for the acts, omissions or default, whether negligent or otherwise for any loss or damage whatsoever that may arise in any way in connection with the supply of services. Under circumstances where liability cannot be excluded, such liability is limited to the value of the purchased service.

FIGURES



LEGEND

Mine Lease Area
- MLA700057

Road Corridor
- Proposed Realignment of Moura Baralaba Road Corridor

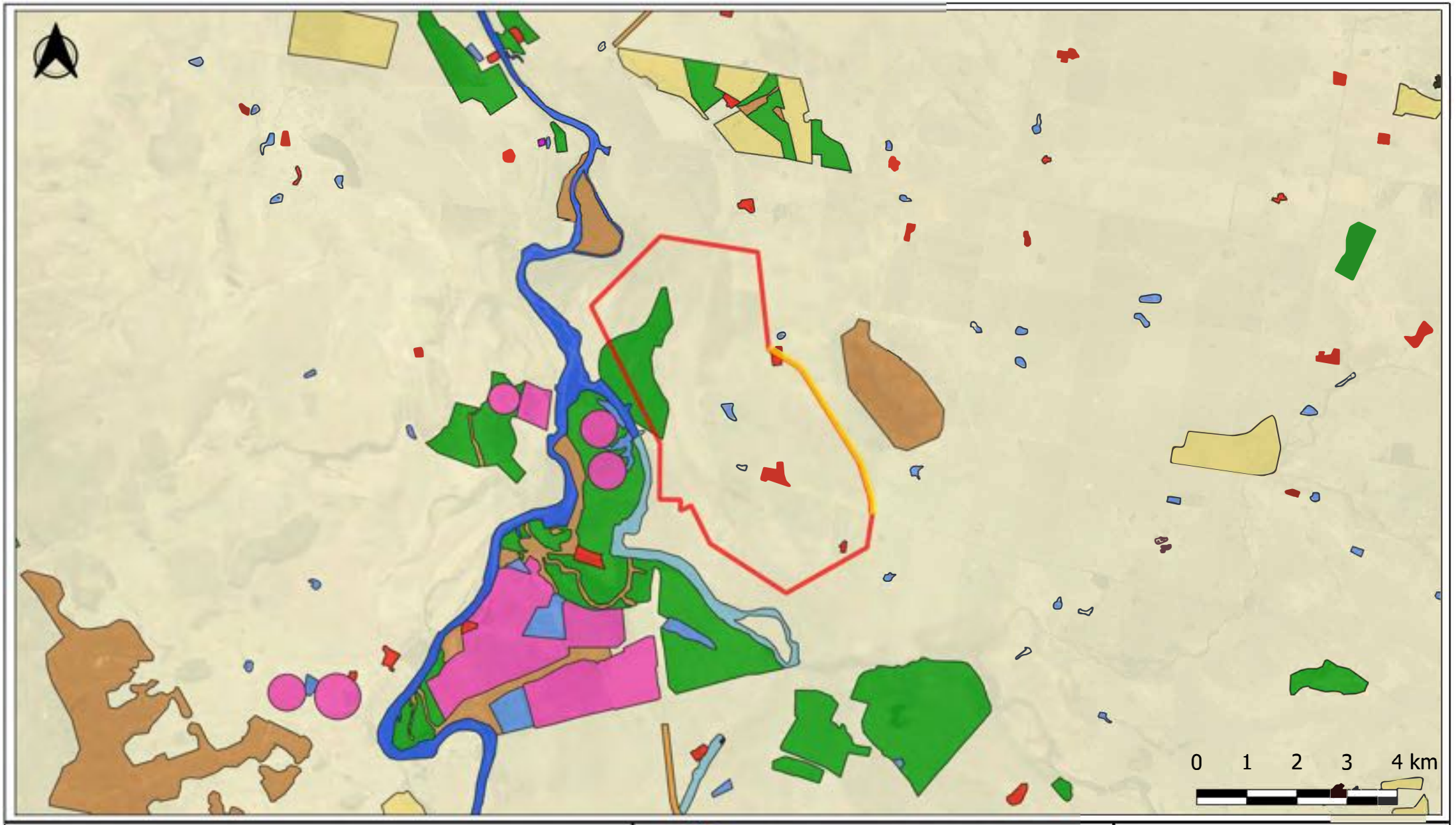
Regional Planning
- Priority Agrigultural Area (RPI Act)

Agricultural Land Audit
- Dawson River Valley Important Agricultural Area

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title:	**Priority Agriculural Areas**
Location:	**Baralaba South Project Area, QLD**
Client: **Baralaba Coal Company**	Job No: **718107**
Project Man: **MCK**	Scale: **As Shown**
Drawn By: **MCK**	Date: **November 2019**

Figure 1



LEGEND

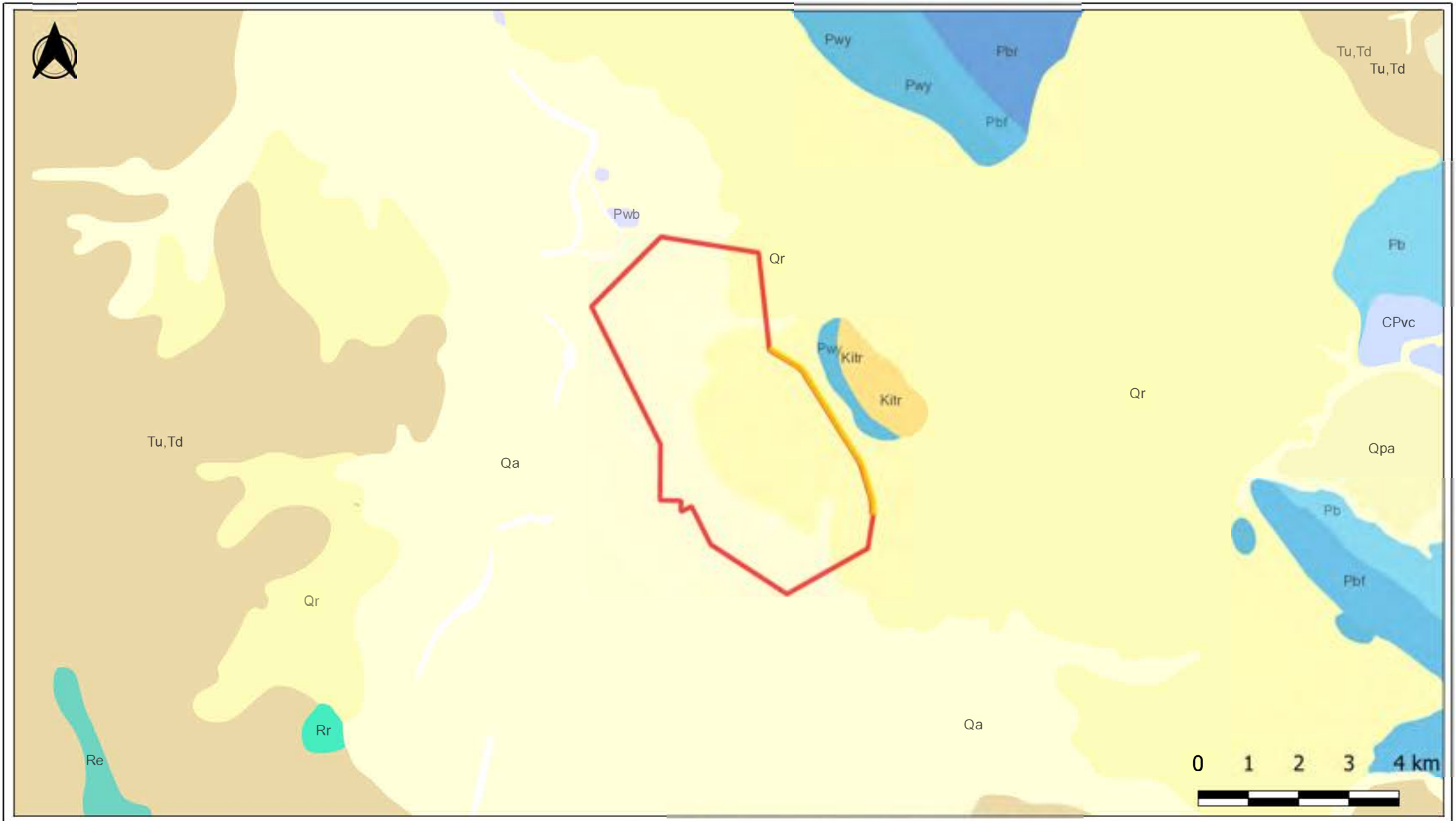
Mine Lease Area
- MLA700057
- Proposed Realignment of Moura Baralaba Road Corridor

Land Use Map (DES, 2023)
- Cropping
- Grazing irrigated modified pastures
- Grazing modified pastures
- Grazing native vegetation
- Intensive animal production
- Irrigated cropping
- Irrigated perennial horticulture
- Lake
- Manufacturing and industrial
- Marsh/wetland
- Mining
- Other minimal use
- Production native forests
- Reservoir/dam
- Residential and farm infrastructure
- River
- Services
- Transport and communication
- Utilities

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title: **Current Land Use (DES, 2023)**	
Location: **Baralaba South Project Area, QLD**	
Client: **Baralaba Coal Company**	Job No: **718107**
Project Man: **MCK**	Scale: **As Shown**
Drawn By: **MCK**	Date: **September 2023**

Figure 2



LEGEND

Mine Lease Area
- MLA700057
- Proposed Realignment of Moura Baralaba Road Corridor

Detailed Surface Geology (1:100,000)
- Qa - Quaternary Alluvium
- Qr (Previously Cz) - Quaternary Alluvium
- Qpa - Quaternary Alluvium
- CPvc - Camboon Volcanics
- Pwb - Baralaba Coal Measures
- Pb - Back Creek Group
- Pbf - Flat Top Formation
- Pbr - Barfield Formation
- Pwy - Gyranda Subgroup
- Rr - Rewan Group
- Re - Clematis Group
- Tu, Td - Duaringa Formation
- Kitr (Previously Kui) - Mt Ramsay Trachyte

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title:	**Detailed Surface Geology**
Location:	**Baralaba South Project Area, QLD**
Client: **Baralaba Coal Company**	Job No: **718107**
Project Man: **MCK**	Scale: **As Shown**
Drawn By: **MCK**	Date: **November 2019**

Figure 3

LEGEND

Mine Site Information

MLA700057

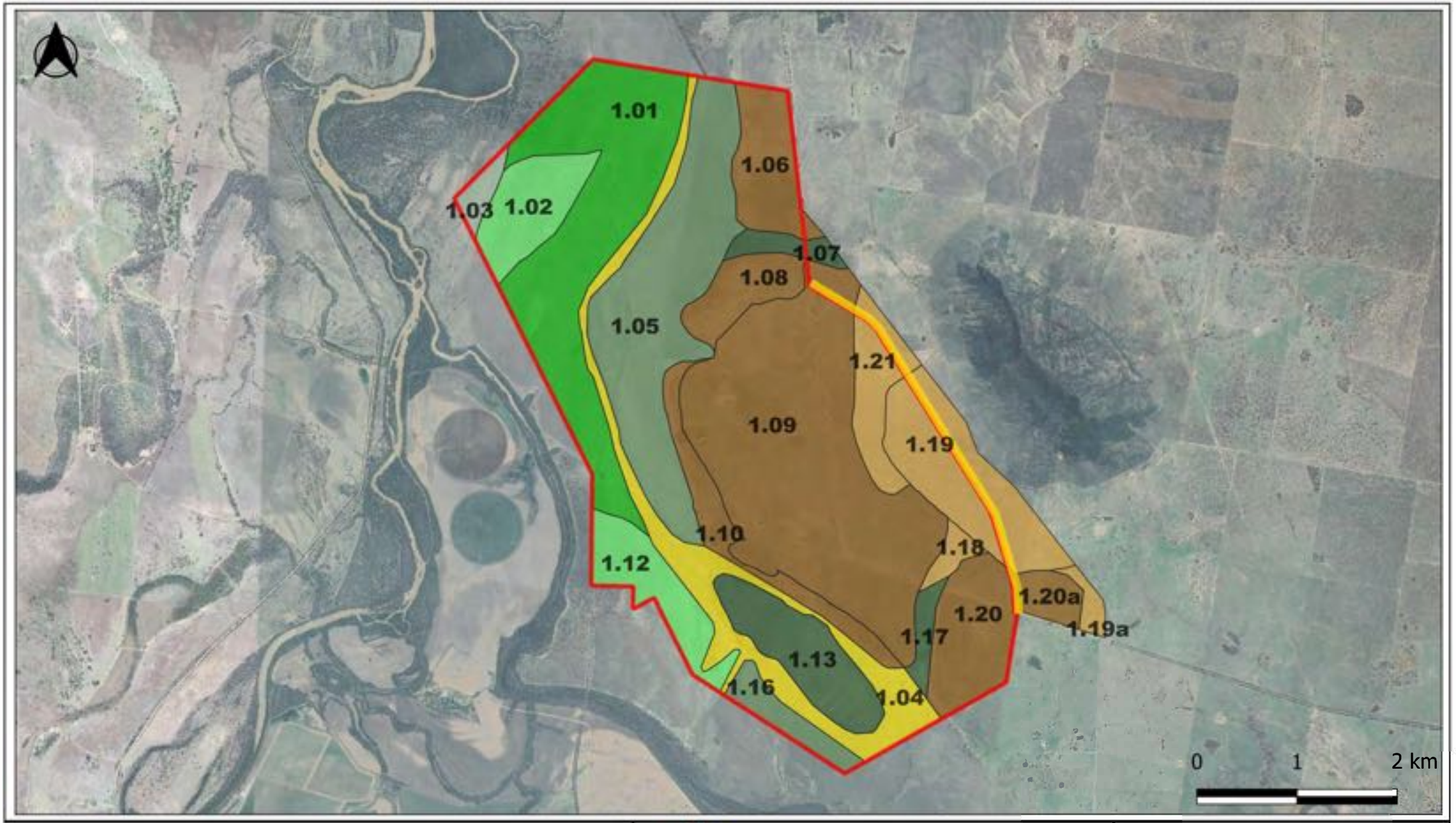
Proposed Realignment of Moura Baralaba Road Corridor

Topographic Contour - 2m (Client Supplied)

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title:	**Site Topography**
Location:	**Baralaba South Project Area, QLD**
Client: **Baralaba Coal Company**	Job No: **718107**
Project Man: **MCK**	Scale: **As Shown**
Drawn By: **MCK**	Date: **December 2019**

Figure 4



LEGEND

Mine Site Information

- MLA700057
- Proposed Realignment of Moura Baralaba Road Corridor

Soil Landscapes

- 2a - Isaac
- 2b - Langley
- 3 - Bluchers
- 4a - Stephens
- 4b - Langley
- 4c - Tralee
- 7a - Greycliffe
- 7b - Thalberg
- 1.## Area UMA Identification

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title:	**Soil Landscape Map**
Location:	**Baralaba South Project Area, QLD**
Client: **Baralaba Coal Company**	Job No: **718107**
Project Man: **MCK**	Scale: **As Shown**
Drawn By: **MCK**	Date: **December 2019**

Figure 5

LEGEND

Mine Site Information

MLA700057

Proposed Realignment of Moura Baralaba Road Corridor

Site Survey Locations and Sampling Locations

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title:	**Land Suitability Survey and Soil Sampling Locations**
Location:	**Baralaba South Project Area, QLD**
Client: **Baralaba Coal Company**	Job No: **718107**
Project Man: **MCK**	Scale: **As Shown**
Drawn By: **MCK**	Date: **November 2019**

Figure 6

LEGEND

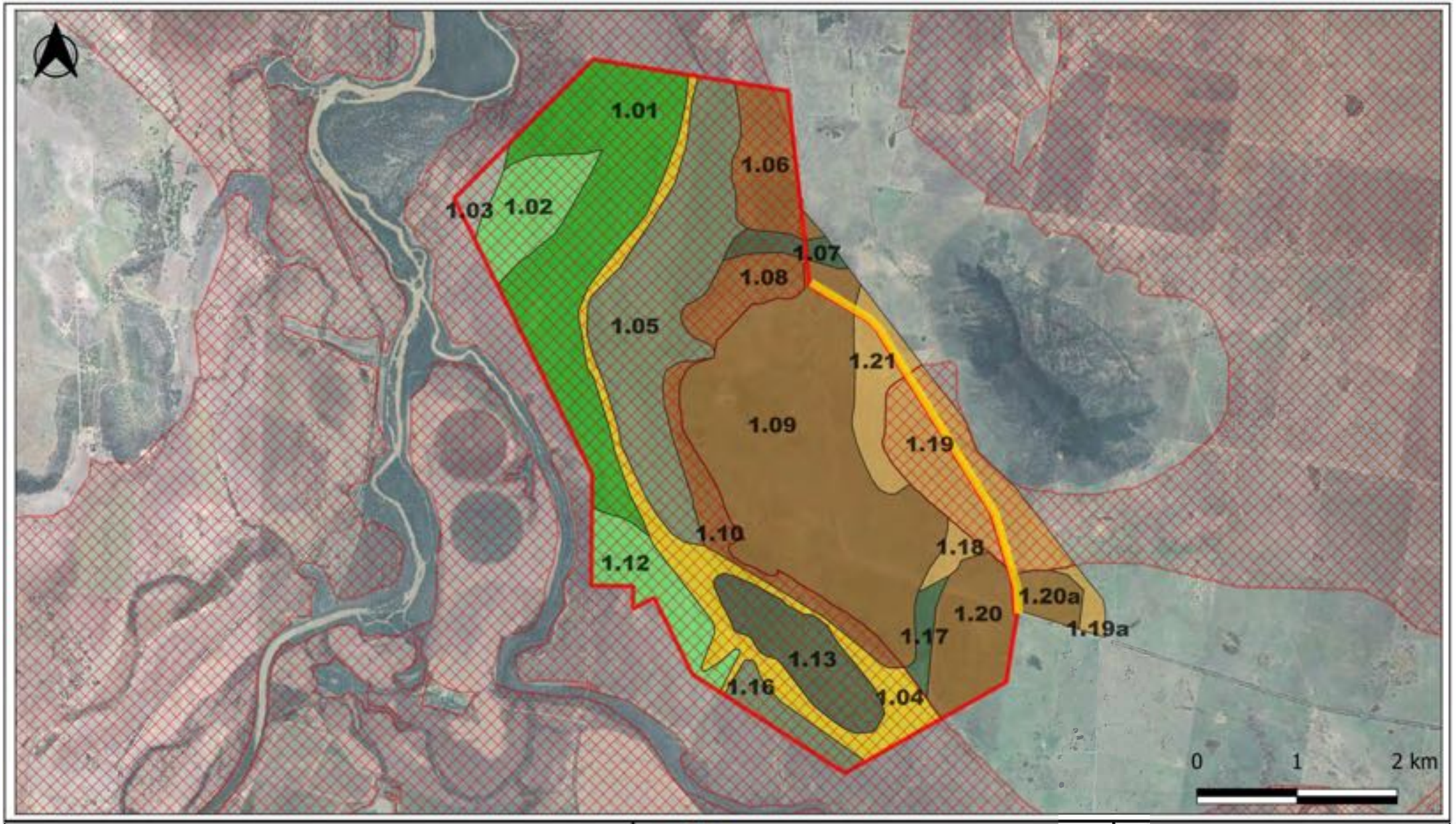
Mine Site Information

- MLA700057
- Proposed Realignment of Moura Baralaba Road Corridor
- Site Survey Locations (EES, 2012)
- Site Survey Locations (EES, 2019)

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title:	**Land Suitability Survey and Soil Sampling Locations (By Year)**
Location:	**Baralaba South Project Area, QLD**
Client: **Baralaba Coal Company**	Job No: **718107**
Project Man: **MCK**	Scale: **As Shown**
Drawn By: **MCK**	Date: **November 2019**

Figure 7



LEGEND

Mine Site Information

- MLA700057
- SCL Trigger Map
- Proposed Realignment of Moura Baralaba Road Corridor

Soil Landscapes

- 2a - Isaac
- 2b - Langley
- 3 - Bluchers
- 4a - Stephens
- 4b - Langley
- 4c - Tralee
- 7a - Greycliffe
- 7b - Thalberg
- 1.## Area UMA Identification

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title: **Strategic Cropping Land Trigger Map**

Location: **Baralaba South Project Area, QLD**

Client: **Baralaba Coal Company**

Job No: **718107**

Project Man: **MCK**

Scale: **As Shown**

Drawn By: **MCK**

Date: **December 2019**

Figure 8

LEGEND

Mine Lease Area

Strategic Cropping Land Trigger Map

MLA700057

Road Corridor

Proposed Realignment of Moura Baralaba Road Corridor

Classified Slope

<3%

>3%

3-4%

4-5%

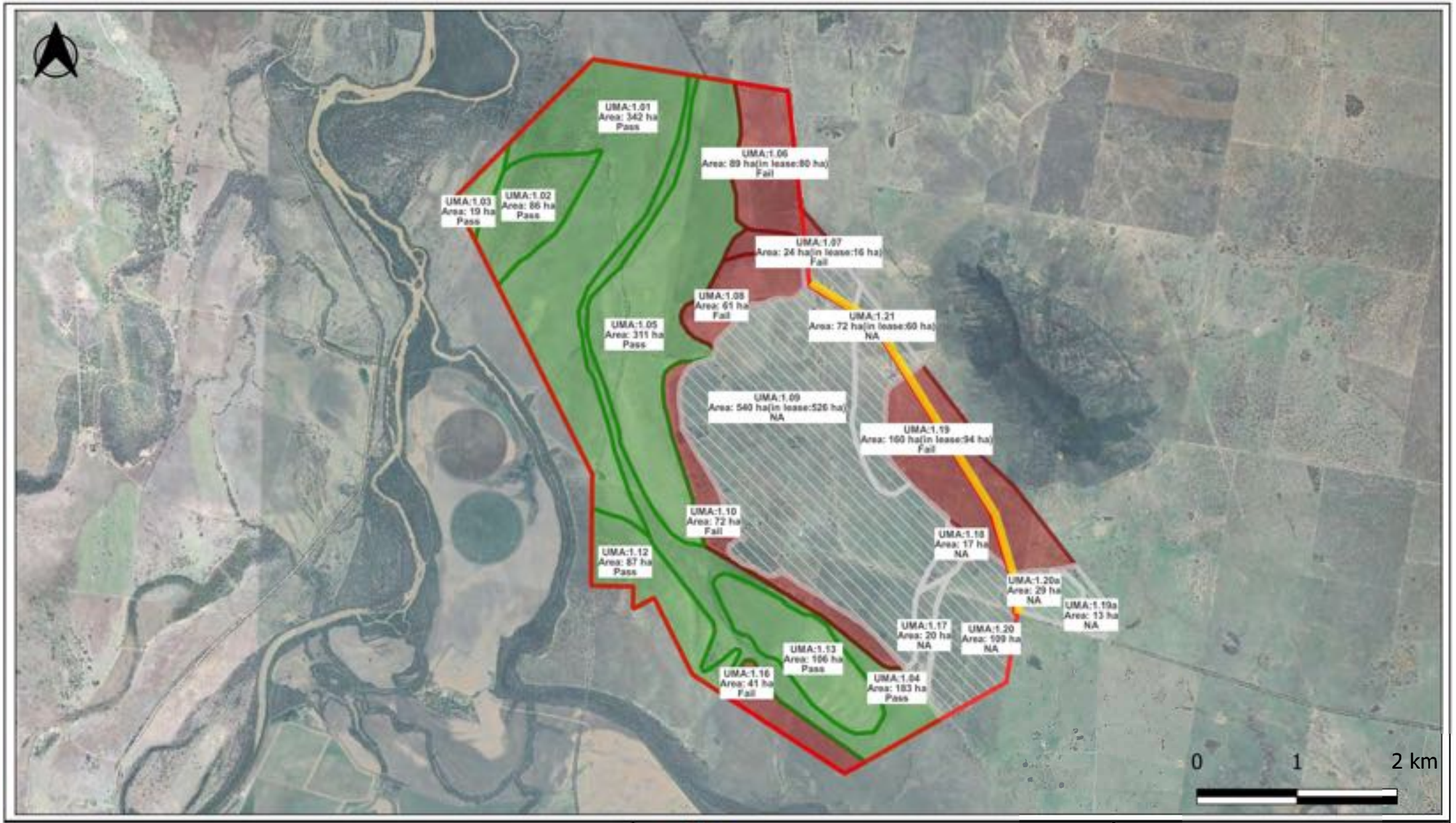
5-6%

>6%

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title:	**Slope Analysis (Based Upon Client Supplied DEM)**
Location:	**Baralaba South Project Area, QLD**
Client: **Baralaba Coal Company**	Job No: **718107**
Project Man: **MCK**	Scale: **As Shown**
Drawn By: **MCK**	Date: **November 2019**

Figure 9



LEGEND

Mine Site Information

- MLA700057
- Proposed Realignment of Moura Baralaba Road Corridor

SCL Criteria Pass or Fail

- Fails to Meet SCL Criteria
- NA
- Passess SCL Criteria

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Title:	**Strategic Cropping Land Assessment Summary**
Location:	**Baralaba South Project Area, QLD**
Client: **Baralaba Coal Company**	Job No: **718107**
Project Man: **MCK**	Scale: **As Shown**
Drawn By: **MCK**	Date: **December 2019**

Figure 10

TABLES

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Table 22: Soil Water Storage (SWS) Calculations

UMA	Site	Soil Landscape	Soil Structure	Sample ID	Chloride	pH	CEC	ESP	Ca:Mg	Gravel	Clay	Silt	Fine Sand	Coarse Sand	Soil Texture NCST 2009	Physico-Chemical Barrier Present?	Look Up Table (SWS/100mm)	Depth of Layer (From borelogs)	SWS	Total	SCL Status
				Unit	mg/kg	-	meq	%	Less than	%	%	%	%	%				x 100mm	mm		
1.01	105	Langley	non-rigid	BH105/0.0-0.1	49	5.74	39.1	13.93	1.58	1.5	66.2	18.2	15.5	0	CLAY	N	12	1	12	120	PASS
	105		non-rigid	BH105/0.25-0.35	31	8.53	31.7	2.7	3.61	2.6	62.4	13	24.6	0	CLAY	N	12	2.5	30		
	105		non-rigid	BH105/0.55-0.65	75	8.4	30.9		2.97	1	66.1	18	16	0	CLAY	N	12	4.5	54		
	105		non-rigid	BH105/0.8-0.9	150	8.82	38.2	8.41	1.83	2.4	65	20.6	14.4	0	CLAY	N	12	2	24		
1.13	111	Tralee	non-rigid	BH111/0.0-0.1	50	8.74	52.12	1.8	4.7	0	51.4	29.8	18.8	0	SILTY CLAY	N	10	1.5	15	112	PASS
	111		non-rigid	BH111/0.25-0.35	47	8.96	52.1	4.1	3.9	0.1	52.7	24.4	22.9	0	CLAY	N	12	4	48		
	111		non-rigid	BH111/0.55-0.65	168	9.02	53.26	8.7	3.1	0.2	51.3	26.2	22.5	0	SILTY CLAY	N	10	2.5	25		
	111		non-rigid	BH111/0.8-0.9	614	8.89	57.36	14.4	2.6	0	54.9	23.8	21.3	0	CLAY	N	12	2	24		
1.16	114	Langley	non-rigid	BH114/0.0-0.1	70	8.39	30.15	4.8	3.9	0	37.8	25.5	39.8	0	CLAY LOAM	N	8	1	8	80	FAIL
	114		non-rigid	BH114/0.25-0.35	33	8.36	30.02	4.7	3.7	0	39.9	27.7	32.3	0	CLAY LOAM	N	8	3	24		
	114		non-rigid	BH114/0.55-0.65	118	8.94	32.53	9.4	3.2	0	39.6	15.2	45.1	0	SANDY CLAY	N	8	4	32		
	114		non-rigid	BH114/0.8-0.9	455	9.09	44.84	13.2	3.5	0.4	38.8	24.5	36.7	0	CLAY LOAM	N	8	2	16		
1.16	115	Langley	non-rigid	BH115/0.0-0.1	12	8.33	35.5	3.02	3.1	0.3	49.7	31.6	18.8	0	SILTY CLAY	N	10	1	10	80	FAIL
	115		non-rigid	BH115/0.25-0.35	170	8.85	33	7.05	1.77	0.1	57.9	25.4	16.7	0	SILTY CLAY	N	10	3	30		
	115		non-rigid	BH115/0.55-0.65	450	7.84	33.5	6.72	1.91	0.5	53	30.7	16.3	0	SILTY CLAY	N	10	4	40		
	115		non-rigid	BH115/0.8-0.9	1100	7.81	27.6	9.08	1.23	0.6	58.8	33.2	8	0	SILTY CLAY	Y	10	2	0		
1.05	121	Langley	non-rigid	BH121/0.0-0.1	2	8.26	46.1		5.88	0.8	56.8	18.5	24.6	0	CLAY	N	12	1	12	120	PASS
	121		non-rigid	BH121/0.25-0.35	20	8.83	36.2		3.79	0.7	62.2	22.6	15.2	0	CLAY	N	12	2.5	30		
	121		non-rigid	BH121/0.55-0.65	350	8.95	41.6		2.55	2.4	63.6	19.4	17	0	CLAY	N	12	3	36		
	121		non-rigid	BH121/0.8-0.9	720	8.72	32.4		2.14	1.1	64.2	23.4	12.4	0	CLAY	N	12	3.5	42		
1.03	125	Stephens	Rigid	Site 125 Depth 0.0-0.1m	27	7.53	31.9	3.68	2.24	9	28	38	22	3	CLAY LOAM	N	8	1	8	40	FAIL
	125		Rigid	Site 125 Depth 0.25-0.35m	320	8.55	25.2	1.79	2.65	13	27	36	21	3	CLAY LOAM	N	8	4	32		
	125		Rigid	Site 125 Depth 0.55-0.65m	860	8.82	24.9	2.48													
	125		Rigid	Site 125 Depth 0.8-0.9m	890	8.72	25.5	5.1	2.33	4	29	45	19	3	CLAY LOAM	Y	8	5	0		
1.02	126	Isaac	non-rigid	BH126/0.0-0.1	46	7.82	43.8		2.89	0	59	18	23.1	0	CLAY	N	12	1	12	120	PASS
	126		non-rigid	BH126/0.25-0.35	94	8.83				0.2	59.5	23.3	17.3	0	CLAY	N	12	3.5	42		

UMA	Site	Soil Landscape	Soil Structure	Sample ID	Chloride	pH	CEC	ESP	Ca:Mg	Gravel	Clay	Silt	Fine Sand	Coarse Sand	Soil Texture NCST 2009	Physico-Chemical Barrier Present?	Look Up Table (SWS/100mm)	Depth of Layer (From borelogs)	SWS	Total	SCL Status
				Unit	mg/kg	-	meq	%	Less than	%	%	%	%	%				x 100mm	mm		
	126		non-rigid	BH126/0.55-0.65	510	8.68				2.8	58.1	25	16.9	0	CLAY	N	12	3.5	42		
	126		non-rigid	BH126/0.8-0.9	720	8.65				5.4	58.3	21.1	20.6	0	CLAY	N	12	2	24		
1.02	127	Isaac	non-rigid	Site 127 Depth 0.0-0.1m	42	6.37	41.8	4.1	2.33	4	33	38	21	3	CLAY LOAM	N	8	1	8	72	FAIL
	127		non-rigid	Site 127 Depth 0.2-0.3m	51	7.70	26.4	17.12	3.06	4	38	39	17	2	SILTY CLAY LOAM	N	8	8	64		
	127		non-rigid	Site 127 Depth 0.5-0.6m	380	8.26	29.3		2.92												
	127		non-rigid	Site 127 Depth 0.8-0.9m	880	7.87	27	10.94	2.69	2	43	44	11	1	SILTY CLAY	Y	10	1	0		
1.02	128	Isaac	non-rigid	BH128/0.0-0.1	35	8.85	50	4.4	3.4	0.4	53.1	22.6	24.3	0	CLAY	N	12	1	12	114	PASS
	128		non-rigid	BH128/0.25-0.35	290	8.86	48.67	9.1	2.6	0.9	61.7	20.8	17.5	0	CLAY	N	12	4	48		
	128		non-rigid	BH128/0.55-0.65	632	8.82	45.69	14.9	2	0.6	56.1	25.8	18.1	0	SILTY CLAY	N	10	3	30		
	128		non-rigid	BH128/0.8-0.9	589	8.94	42.59	15.1	2.2	3.1	45.8	24.9	29.4	0	CLAY	N	12	2	24		
1.08	129	Stephens	Rigid	BH129/0.0-0.1	22	6.86				0	28.9	24.5	46.5	0	SANDY CLAY LOAM	N	6	1	6	54	FAIL
	129		Rigid	BH129/0.25-0.35	230	8.21				0	50.3	19.3	30.5	0	CLAY	N	12	4	48		
	129		Rigid	BH129/0.55-0.65	840	8.55	34.79	16	1.5	0.7	46.3	18.7	34.9	0	CLAY	Y	12	3	0		
	129		Rigid	BH129/0.8-0.9	930	8.65				1.5	37.2	19.9	42.9	0	CLAY LOAM	Y	8	2	0		
1.04	131	Bluchers	non-rigid	BH131/0.0-0.1	23	8.21	50.3		5	0.1	70.2	14	15.9	0	CLAY	N	12	1	12	120	PASS
	131		non-rigid	BH131/0.1-0.2	15	8.77				0.1	70	17.1	12.9	0	CLAY	N	12	1	12		
	131		non-rigid	BH131/0.55-0.65	16	9.03				0.3	66.6	14.7	18.7	0	CLAY	N	12	6	72		
	131		non-rigid	BH131/0.8-0.9	28	9.11				0.2	63.6	20.7	15.7	0	CLAY	N	12	2	24		
1.01	132	Langley	non-rigid	Site 132 Depth 0.0-0.1m	24	8.22	38.7	3.47	3.45	5	38	40	12	5	SILTY CLAY	N	10	1	10	65	FAIL
	132		non-rigid	Site 132 Depth 0.2-0.3m	11	8.79	31.4	7.2	2.31	**1**	45	49	3	2	SILTY CLAY	N	10	2	20		
	132		non-rigid	Site 132 Depth 0.8-0.9m	45	9.20	32.7	12.53	1.2	6	13	14	64	2	SANDY LOAM	N	5	7	35		
1.01	134	Langley	non-rigid	BH134/0.0-0.1	42	7.71	31.7		3.65	0	52	38.7	9.3	0	SILTY CLAY	N	10	1	10	118	PASS
	134		non-rigid	BH134/0.25-0.35	81	8.44	35.5		3.7	0.4	75.5	19.4	5.1	0	CLAY	N	12	3	36		
	134		non-rigid	BH134/0.55-0.65	87	8.53	36		2.73	0.2	71.8	17.7	10.5	0	CLAY	N	12	3	36		
	134		non-rigid	BH134/0.8-0.9	390	8.29	34.1		2.24	0	73.8	20.7	5.5	0	CLAY	N	12	3	36		
1.05	139	Langley	non-rigid	BH139/0.0-0.1	21	8.22	33.6			0.1	60.4	20.4	19.2	0	CLAY	N	12	1	12	120	PASS
	139		non-rigid	BH139/0.25-0.35	57	9				0.3	56.9	23.5	19.7	0	CLAY	N	12	3.5	42		

UMA	Site	Soil Landscape	Soil Structure	Sample ID	Chloride	pH	CEC	ESP	Ca:Mg	Gravel	Clay	Silt	Fine Sand	Coarse Sand	Soil Texture NCST 2009	Physico-Chemical Barrier Present?	Look Up Table (SWS/100mm)	Depth of Layer (From borelogs)	SWS	Total	SCL Status
				Unit	mg/kg	-	meq	%	Less than	%	%	%	%	%				x 100mm	mm		
	139		non-rigid	BH139/0.55-0.65	510	8.8				0.1	60.8	17.6	21.6	0	CLAY	N	12	3.5	42		
	139		non-rigid	BH139/0.8-0.9	110	7.94				0.9	60.1	20.9	19	0	CLAY	N	12	2	24		
1.05	140	Langley	non-rigid	BH140/0.0-0.1	22	8.75	35.7			0.2	56.1	23.8	20	0	CLAY	N	12	2	24	54	FAIL
	140		non-rigid	BH140/0.25-0.35	240	9.09	32			0	55.2	23.1	21.7	0	CLAY	N	12	2.5	30		
	140		non-rigid	BH140/0.55-0.65	1200	8.71	30.2			0.3	57.5	24	18.5	0	CLAY	Y	12	2	0		
	140		non-rigid	BH140/0.8-0.9	2400	8.06	31.2			0.1	60.2	23.6	16.2	0	CLAY	Y	12	3.5	0		
1.04	141	Bluchers	non-rigid	BH141/0.0-0.1	86	7.53	54.75	2.4	3.7	0	61.6	16.2	22.1	0	CLAY	N	12	2.5	30	120	PASS
	141		non-rigid	BH141/0.25-0.35	32	8.12	55.78	3.6	3.7	0	75.1	14.8	10.1	0	CLAY	N	12	3	36		
	141		non-rigid	BH141/0.55-0.65	41	8.57	53.24	5.9	3.3	0	76.5	13.1	10.4	0	CLAY	N	12	2.5	30		
	141		non-rigid	BH141/0.8-0.9	101	8.94	56.71	9.3	3	0	73.6	17.2	9.1	0	CLAY	N	12	2	24		
1.12	142	Isaac	non-rigid	BH142/0.0-0.1	41	7.78	33.25	3	3.4	0	31.8	19.4	48.8	0	SANDY CLAY LOAM	N	6	1	6	61	FAIL
	142		non-rigid	BH142/0.25-0.35	12	7.52	33.29	2.1	3.4	0	44.7	17.2	38.1	0	CLAY	N	10	2.5	25		
	142		non-rigid	BH142/0.55-0.65	50	8.67	43.68	4.1	4	0	44.1	16	39.9	0	CLAY	N	10	3	30		
1.16	143	Langley	non-rigid	BH143/0.0-0.1	208	8.97	49.91	10.2	2.6	1.1	57	21.9	21.1	0	CLAY	N	12	1.5	18	83	FAIL
	143		non-rigid	BH143/0.25-0.35	54	8.81	48.45	4.6	3.4	0.1	51.4	35.6	13	0	SILTY CLAY	N	10	3.5	35		
	143		non-rigid	BH143/0.55-0.65	591	8.89	49.43	15.3	2.2	0.3	55.8	26.1	18.1	0	SILTY CLAY	N	10	3	30		
	143		non-rigid	BH143/0.8-0.9	950	8.77	48.83	19.8	1.9	2.3	61.3	25.1	13.6	0	SILTY CLAY	Y	10	2	0		
1.13	148	Tralee	non-rigid	Site 148 Depth 0.0-0.1m	8	7.89	13.3	2.28	3.32	4	20	27	26	24	SANDY CLAY LOAM	N	6	1	6	38	FAIL
	148		non-rigid	Site 148 Depth 0.25-0.35m	740	8.96	19.3	10.77	2.09	**1**	29	35	25	10	CLAY LOAM	N	8	4	32		
	148		non-rigid	Site 148 Depth 0.55-0.65m	1200	9.02	19.3		2.09							Y					
	148		non-rigid	Site 148 Depth 0.8-0.9m	1300	9.04	17.3	10.87	1.78	3	31	32	24	9	CLAY LOAM	Y	8	5	0		
1.15	149	Bluchers	non-rigid	Site 149 Depth 0.0-0.1m	26	8.38	26.3	6.87	4.12	4	41	37	14	3	CLAY	N	12	1.2	14.4	67.4	FAIL
	149		non-rigid	Site 149 Depth 0.25-0.35m	74	9.00	24.7	14.86	2.69	2	49	42	5	2	SILTY CLAY	N	10	5.3	53		
	149		non-rigid	Site 149 Depth 0.8-0.9m	950	7.83	23.9	12.95	1.05	1	46	42	8	2	SILTY CLAY	Y	10	3.5	0		
1.06	150	Thalberg	Rigid	Site 150 Depth 0.00-0.1	9	6.77	8.37	13.16	4.65	4	8	16	9	63	SANDY LOAM	N	5	5.5	27.5	50	FAIL
	150		Rigid	Site 150 Depth 0.55-0.65	7	8.40	8.24	7	1.61	13	13	12	8	53	SANDY LOAM	N	5	4.5	22.5		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

UMA	Site	Soil Landscape	Soil Structure	Sample ID	Chloride	pH	CEC	ESP	Ca:Mg	Gravel	Clay	Silt	Fine Sand	Coarse Sand	Soil Texture NCST 2009	Physico-Chemical Barrier Present?	Look Up Table (SWS/100mm)	Depth of Layer (From borelogs)	SWS	Total	SCL Status
				Unit	mg/kg	-	meq	%	Less than	%	%	%	%	%				x 100mm	mm		
1.07	153	Tralee	non-rigid	Site 153 0.00-0.05	23	8.10	30.3	1.19	3.66	2	-	-	-	-	Clay	N	12	0.5	6	66	FAIL
	153		non-rigid	Site 153 0.25-0.35	160	8.85	26.5		2.21						Clay	N	12	5	60		
	153		non-rigid	Site 153 0.55-0.65	930	8.59	26.5	15.42	1.57	20	36	31	10	3	CLAY	Y	12	4.5	0		
1.07	155	Tralee	non-rigid	BH155/0.0-0.1	16	8.51	26.1	3.21	5.73	0.3	42	19.8	38.2	0	CLAY	N	12	1.5	18	66	FAIL
	155		non-rigid	BH155/0.25-0.35	310	9.2				0.6	40.2	17.5	42.4	0	CLAY	N	12	4	48		
	155		non-rigid	BH155/0.55-0.65	1200	8.81				0.5	42.4	19.8	37.8	0	CLAY	Y	12	1.5	0		
	155		non-rigid	BH155/0.8-0.9	1400	8.66				0.4	43.3	17.3	39.4	0	CLAY	Y	12	3	0		
1.08	158	Thalberg	Rigid	Site 158 0.00-0.1	6	7.75	13.1	2.06	4.17	10	16	29	17	28	LOAM	N	6	1	6	50	FAIL
	158		Rigid	Site 158 0.55-0.65	280	8.82	16.7	2.88	2.59	11	29	33	9	19	CLAY LOAM	N	8	5.5	44		
1.13	162	Tralee	non-rigid	Site 162 0.00-0.1	45	8.88	31.3	5.57	2.98	21	29	31	16	3	CLAY LOAM	N	8	6.5	52	52	FAIL
	162		non-rigid	Site 162 0.25-0.35	630	8.73	29.2		1.93												
	162		non-rigid	Site 162 0.55-0.65	1100	8.00	29.2	10.94	1.93	19	33	34	13	2	SILTY CLAY	Y	10	3.5	0		
1.19	170	Thalberg	Rigid	Site 170 0.00-0.1	3	6.94				2	7	12	20	59	LOAMY FINE SAND	N	4	1	4	49	FAIL
	170		Rigid	Site 170 0.55-0.65	3	5.80				**1**	13	13	15	58	SANDY LOAM	N	5	9	45		
1.19	173	Greycliffe	non-rigid	BH173/0.0-0.1	53	7.18	28.28	0.8	5.6	0.3	33.3	16.7	50.1	0	SANDY CLAY LOAM	N	6	1	6	65	FAIL
	173		non-rigid	BH173/0.25-0.35	297	8.82	42.72	7.9	4.2	1	37.9	17.2	44.9	0	SANDY CLAY	N	8	5.5	44		
	173		non-rigid	BH173/0.55-0.65	356	8.81	42.84	16.8	2.8	0.7	42.4	14.5	43.1	0	CLAY	N	10	1.5	15		
	173		non-rigid	BH173/0.8-0.9	1033	8.77	39.74	22.5	1.9	1.5	41.6	10.2	48.3	0	SANDY CLAY	Y	8	3	0		
1.19	175	Greycliffe	non-rigid	BH175/0.0-0.1	130	8.34	31.86	10.8	1.8	0.5	46.6	18.3	35	0	CLAY	N	12	1	12	24	FAIL
	175		non-rigid	BH175/0.25-0.35	227	8.74	32.97	15.7	1.7	0	43.7	18.8	37.4	0	CLAY	N	12	1	12		
	175		non-rigid	BH175/0.55-0.65	1755	7.37	32.41	34.2	1.2	0	52.7	19.4	27.9	0	CLAY	Y	12	3.5	0		
	175		non-rigid	BH175/0.8-0.9	2039	5.85	31.37	38.3	1	0	41.5	22	36.5	0	CLAY	Y	10	4.5	0		
1.01	201	Langley	non-rigid	BH201/0.0-0.1	656	6.5	40.96	4.2	2.4	0	46.1	21.7	32.2	0	CLAY	N	12	1	12	120	PASS
	201		non-rigid	BH201/0.25-0.35	251	6.79	39.34	3	2.7	0	49.3	16.1	34.6	0	CLAY	N	12	4	48		
	201		non-rigid	BH201/0.55-0.65	349	7.76	46.21	4.3	3.2	0	54.3	16.1	29.5	0	CLAY	N	12	3	36		
	201		non-rigid	BH201/0.8-0.9	737	8.41	51.07	7.6	3.4	1	46.3	18	35.7	0	CLAY	N	12	2	24		
1.12	203	Isaac	non-rigid	BH203/0.0-0.1	105	6.6	35.01	1.8	2.4	0.4	58.1	20.9	21	0	CLAY	N	12	2.5	30	120	PASS
	203		non-rigid	BH203/0.25-0.35	113	7.05	36.68	2.4	2.3	0	52.1	24.9	23	0	CLAY	N	12	3	36		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

UMA	Site	Soil Landscape	Soil Structure	Sample ID	Chloride	pH	CEC	ESP	Ca:Mg	Gravel	Clay	Silt	Fine Sand	Coarse Sand	Soil Texture NCST 2009	Physico-Chemical Barrier Present?	Look Up Table (SWS/100mm)	Depth of Layer (From borelogs)	SWS	Total	SCL Status
				Unit	mg/kg	-	meq	%	Less than	%	%	%	%	%				x 100mm	mm		
	203		non-rigid	BH203/0.55-0.65	96	7.67	38.56	4	2.4	0	54.1	24.7	21.2	0	CLAY	N	12	1.5	18		
	203		non-rigid	BH203/0.8-0.9	191	8.13	39.91	6	2.4	0.1	58	21.5	20.5	0	CLAY	N	12	3	36		
1.03	129B	Stephens	Rigid	BH129B/0.0-0.1	124	6.8	26.37	6.2	2	0	40	29.9	30.1	0	SILTY CLAY	N	10	1	10	109	PASS
	129B		Rigid	BH129B/0.25-0.35	327	7.44	41.04	9.9	1.8	0.1	53.1	23.9	23	0	CLAY	N	12	2	24		
	129B		Rigid	BH129B/0.55-0.65	565	8.57	50.75	11.1	2.2	1.8	52.6	24.9	22.5	0	CLAY	N	12	2.5	30		
	129B		Rigid	BH129B/0.8-0.9	622	8.79	49.61	10.8	2.6	2.7	52	26.2	21.8	0	SILTY CLAY	N	10	4.5	45		
1.07	153B	Tralee	non-rigid	BH153B/0.0-0.1	33	7.82	28.76	1.8	31	0.5	40.2	32.9	26.9	0	SILTY CLAY LOAM	N	8	1.5	12	58	FAIL
	153B		non-rigid	BH153B/0.25-0.35	59	8.88	40.44	5.6	4.3	0.4	43.8	10.2	46	0	SANDY CLAY	N	8	2	16		
	153B		non-rigid	BH153B/0.55-0.65	786	8.85	38.62	21.9	2.6	1.1	44.3	22.5	33.1	0	CLAY	N	12	2.5	30		
	153B		non-rigid	BH153B/0.8-0.9	1034	8.7	49.91	23.8	2.4	1.2	47.4	23	29.6	0	CLAY	Y	12	4	0		
1.19	175B	Greycliffe	non-rigid	BH175B/0.0-0.1	173	8.76	49.67	4.6	4.3	0.9	51.5	15.4	33.1	0	CLAY	N	12	1	12	12	FAIL
	175B		non-rigid	BH175B0.25-0.35	1059	8.73	51.95	14.5	2.6	0.3	55	18	27	0	CLAY	Y	12	3	0		
	175B		non-rigid	BH175B/0.55-0.65	1541	8.44	43.88	27.3	1.2	0.3	48.6	24.9	26.5	0	CLAY	Y	12	3	0		
	175B		non-rigid	BH175B/0.8-0.9	1438	6.07	33.81	32.7	1	0.5	42.8	26.1	31.1	0	CLAY	Y	10	3	0		
1.12	203B	Isaac	non-rigid	BH203B/0.0-0.1	55	6.76	35.12	1.2	2.7	0.3	56.5	15.9	27.6	0	CLAY	N	12	1	12	120	PASS
	203B		non-rigid	BH203B/0.25-0.35	58	7.47	37.44	2.1	2.7	1.6	62.3	17.1	20.6	0	CLAY	N	12	4.5	54		
	203B		non-rigid	BH203B/0.55-0.65	324	8.49	44.15	6.3	2.7	1.1	61.4	17.7	20.9	0	CLAY	N	12	2.5	30		
	203B		non-rigid	BH203B/0.8-0.9	536	8.4	43.34	7.6	2.5	1.1	54.4	18.3	27.3	0	CLAY	N	12	2	24		

Note: Pink highlighted cells indicate failed SCL criteria. Red text indicates chemical limitation which may impact soil water storage.

SOIL INTERPRETATION

Table 23: Analytical Rationale

Test	Application	Justification
pH	Nutrient availability, nutrient fixation, toxicities (Al, Mn), liming; sodicity and correlation with other physical, chemical and biological properties	Measurement of pH is a useful indicator of various soil properties (e.g. values >8.5 usually indicate high exchangeable sodium levels and the presence of carbonates) and if lime application is a required management measure.
Electrical Conductivity	Appraisal of salinity hazard in soil substrates or groundwater and total soluble salts	The measure of electrical conductivity is used as a means of appraising soil salinity. The electrical conductance increases with soluble salt content and thus allows simple interpretation of readings.
Chloride Content	Appraisal of salinity hazard	The chloride anion is usually present in soil associated with sodium. It is highly mobile making it a valuable indicator of salt and water movement.
Cation Exchange Capacity and Exchangeable Ca, Mg, Na (Cations)	Nutrient status, calculation of exchangeable sodium percentage (ESP), assessment of other physical and chemical properties, dispersivity, shrink – swell, water movement and aeration	The amounts and relative proportions of the exchangeable cations in soil have important effects on both physical and chemical properties. High levels of exchangeable sodium cause dispersion and increased swelling, reducing water movement and affecting near surface aeration whereas exchangeable calcium flocculates colloids and will reduce swelling tendencies. Excessively high or low concentrations of one or the other of the cations may impact soil nutrient availability.
Heavy Metals	Detection of heavy metals	The analysis of arsenic, cadmium, chromium, copper, manganese, lead, nickel and mercury will assess natural concentrations of these select heavy metals in the soil.
Available Nitrogen and Phosphate	Presence of nitrogen and phosphate in their available form for plant uptake	Testing for these analytes provides an indication of the general fertility of soils and thus their suitability as a topdressing agent.
Particle Size Distribution (<2 mm)	Nutrient retention, exchange properties, erodibility, water retention, workability, permeability, sealing, drainage, interpretation of most other physical and chemical properties and soil qualities	Particle size distribution data provides an assessment of the composition of a soil (based upon the dominant grain size within a soil). This assists with confirmation of field observations as well as providing better grounds for identification of soil types and water holding capacity.
Aggregate Stability (Emerson Aggregate Test)	Susceptibility to surface sealing under rainfall or irrigation, effect of raindrop impact and slaking, permeability, infiltration, aeration, seedling emergence and correlation with other properties	This test provides information relating to the dispersivity of soil and its preponderance to becoming erosive under natural conditions. Therefore it is an important test in assessing options for ongoing management for excavated and stockpiled materials.

Table 24: Soil Salinity Classification

Soil salinity rating	$EC_{1:5}$ (dS/m) for a range of soil clay contents				Plant response
	10-20% clay	20-40% clay	40-60% clay	60-80% clay	
Very low	<0.07	<0.09	<0.12	<0.15	
Low	0.07-0.15	0.09-0.19	0.12-0.24	0.15-0.3	Moderately sensitive crops
Moderate	0.15-0.34	0.19-0.45	0.24-0.56	0.3-0.7	Moderately tolerant crops
High	0.34-0.63	0.45-0.76	0.56-0.96	0.7-1.18	Tolerant crops
Very high	0.63-0.93	0.76-1.21	0.96-1.53	1.18-1.87	Very tolerant crops
Extreme	>0.93	>1.21	>1.53	>1.87	Too saline

Notes:
1. Queensland Department of Natural Resources (1997) Soil salinity handbook

Table 25: Emerson Aggregate Class

Emerson aggregate class	Dispersibility
Classes 1 and 2(3)	Very high
Class 2(2)	High
Class 2(1)	High to moderate
Classes 3(4) and 3(3)	Moderate
Classes 3(2), 3(1) and 5	Slight
Classes 4, 6, 7 and 8	Negligible/ aggregated

Notes:

1. Source: Hazelton and Murphy (2013) Interpreting soil test results.
2. Dispersion subclasses for Emerson Aggregate Test (EAT) classes 2 and 3 (shown in brackets): (1) Slight milkiness, (2) Obvious milkiness, less than 50% of the aggregate affected, (3) Obvious milkiness, greater than 50% of the aggregate affected, and (4) Total dispersion leaving only sand grains.

Table 26: Emerson Aggregate Class Interpretation

Class	Slaking	Definition
Class 1	Slakes	Air dried crumbs of soil show a strong dispersing reaction. A colloidal cloud covers nearly the whole of the bottom of the beaker, usually in a very thin layer. The reaction should be evident within 10 minutes. In extreme cases all the water in the beaker becomes cloudy, leaving only a coarse residue in a cloud of clay.
Class 2		Air dried crumbs of soil show a moderate to slight reaction. A moderate reaction consists of an easily recognisable cloud of colloids in suspension, usually spreading in thin streaks on the bottom of the beaker. A slight reaction consists of the bare hint of cloud in water at the surface of the crumbs.
Class 3		The soil remoulded at the plastic limit disperses in water
Class 4		The remoulded soil does not disperse in water. Calcium carbonate (calcite) or calcium sulfate (gypsum) is present.
Class 5		The remoulded soil does not disperse in water and the 1:5 soil/water suspension remains dispersed after 5 minutes.
Class 6		The remoulded soil does not disperse in water and the 1:5 soil/water suspension begins to flocculate after 5 minutes.
Class 7	Does not slake	The air dried crumbs of soil remain coherent in water and swells.
Class 8		The air dried crumbs of soil remain coherent in water and do not swell.

Note:
1. Australian Standard 1289.3.8.1 (1997) Emerson dispersion class

Table 27: Soil Organic Matter

Soil organic matter (%)	Rating	Interpretation
<0.7	extremely low	Subsoils or severely eroded, degraded surface soils
0.7 - 1.0	very low	Very poor structural condition, very low structural stability
1.0 - 1.7	low	Poor to moderate structural condition, low to moderate structural stability
1.7 - 3.0	moderate	Average structural condition, average structural stability
3.0 - 5.15	high	Good structural condition, high structural stability
>5.15	very high	Good structural condition, high structural stability and soils probably water repellent.

Note:
1. Source: Hazelton and Murphy (2013) Interpreting soil test results.

Table 28: Soil pH Rating

Rating	pH (1:5)
Extremely acid	<4.5
Very strongly acid	4.5-5
Strongly acid	5.1-5.5
Moderately acid	5.6-6
Slightly acid	6.1-6.5
Neutral	6.6-7.3
Mildly alkaline	7.4-7.8
Moderately alkaline	7.9-8.4
Strongly alkaline	8.5-9.0
Very strongly alkaline	9.1-12

Note:
1. Sourced from Bruce and Rayment (1982)

Table 29: Soil Salinity Rating - EC and Chloride

Rating	EC (dS/m)	Chloride (mg/kg)
Non-saline	<2	<100
Slightly saline	2-4	100-300
Moderately saline	4-8	300-600
Highly saline	8-16	600-2000
Extremely saline	>16	>2000

Note: Hazelton and Murphy (2013) Interpreting soil test results

Table 30: Sodicity Rating

Rating	Exchangeable Sodium Percentage
Non-sodic (nSod)	<6
Marginally sodic to sodic (mSod)	6-14
Strongly sodic (sSod)	>14

Note: Hazelton and Murphy (2007) Interpreting soil test results

Table 31: Calcium:Magnesium Ratio Rating

Rating	Ca:Mg ratio
Dispersive	<0.1
Potentially dispersive	<0.5
Calcium deficient	<1
Calcium low	1-4
Calcium and magnesium balanced	4-6
Magnesium low	6-10
Magnesium deficient	10-50

Note: Hazelton and Murphy (2007) Interpreting soil test results

Table 32: Soil Fertility Ratings

Analyte	Reference	Unit	Very Low	Low	Moderate	High	Very High
Effective Cation Exchange Capacity (ECEC)		meq/100g	<6	6-12	12-25	25-40	>40
Exchangeable Calcium	1	meq/100g	<2	2-5	5-10	10-20	>20
Exchangeable Magnesium	1	meq/100g	<0.3	0.3-1	1-3	3-8	>8
Exchangeable Potassium	1	meq/100g	<0.2	0.2-0.3	0.3-0.7	0.7-2	>2
Exchangeable Sodium	1	meq/100g	<0.1	0.1-0.3	0.3-0.7	0.7-2	>2
Exchangeable Aluminium	1	meq/100g					
Organic Matter	1	%	<0.7	1-1.7	1.7-3	3-5.15	>5.15
TOC	1	%	<0.6	0.6-1	1-1.8	1.8-3	>3
Nitrogen (Total)	1	mg/kg	<500 (0.05%)	500-1500 (0.05 – 0.15%)	1500-2500 (0.15-0.25%)	2500-5000 (0.25 – 0.5%)	>5000 (>0.5%)
Nitrate (as NO_3^-)	2	mg/kg	<5	5-10	10-25	25-50	>50
Phosphorus (Colwell) - Heavy Clay	1	mg/kg		<30	30-80	>80	
Phosphorus (Colwell) - Clay loam	1	mg/kg		<18	18-40	>40	
Phosphorus (Colwell) - Loams	1	mg/kg		<16	16-30	>30	
Phosphorus (Colwell) - Sandy Loams	1	mg/kg		<14	14-20	>20	

Analyte	Reference	Unit	Very Low	Low	Moderate	High	Very High
Phosphorus (Acid Extractable)	1	mg/kg	<10	10-20	20-40	40-100	>100
Potassium (Acid Extractable)	3	mg/kg	<39.1	39.1-78.2	78.2-195.5	195.5-391	>391
Sulfate as S	2	mg/kg	<5	5-10	10-20	20-100	>100
Boron	4	mg/kg	<0.5	0.5-1	1-2	2-5	>5
Copper	4	mg/kg	<0.1	0.1-0.3	0.3-5	5-15	>15
Iron	4	mg/kg	<2.5	2.6-5	5.1-7.5	7.6-10	>10
Manganese	4	mg/kg	<1	1-2	2-50	50-500	>15
Zinc (pH >7)	4	mg/kg	<0.3	0.3-0.8	0.8-5	5-15	>15
Zinc (pH >7)	4	mg/kg	<0.2	0.2-0.5	0.5-5	42,125	>15

Data sourced from:

Hazelton and Murphy (2013)

Rayment and Bruce (1984)

Rayment and Lyons (2011)

Baker and Eldershaw (1993)

Table 33: Exchangeable Cations Assessment

Soil name	Site	Depth (m)	pH	CEC	Exchangeable Cations (meq/100 g)					Ca/Mg ratio		Exchangeable sodium percentage (ESP)	
					Na	K	Ca	Mg	Al	Value (unitless)	Interpretation	Value	Interpretation
				meq / L								%	
Bluchers	141	0-0.1	7.6	59.4	1.18	1.35	46.3	10.6	-	4.35	Bal	2	nSod
		0.25-0.35	8.79	40.8	3.28	0.87	30.4	12.8	-	2.37	CaL	8	mSod
		0.55-0.65	8.93	33.8	4.57	0.68	21.6	12.2	-	1.77	CaL	13.5	mSod
		0.8-0.9	8.75	24.1	6.04	0.8	22.8	14.6	-	1.56	CaL	25.1	sSod
		1.1-1.2	8.6	24.3	6.08	0.78	20.1	13.9	-	1.44	CaL	25	sSod
	149	0.0-0.1	8.38	26.3	1.41	1.82	38.1	9.26	-	4.12	Bal	5.4	nSod
		0.25-0.35	9	24.7	3.19	0.83	30.9	11.5	-	2.69	CaL	12.9	mSod
		0.55-0.65	8.76	25	5.49	0.76	16.3	14.4	-	1.13	CaL	22	sSod
		0.8-0.9	7.83	23.9	4.78	0.64	16.1	15.4	-	1.05	CaL	20	sSod
		1.1-1.2	7.66	27.6	4.72	0.69	16.8	17.4	-	0.96	CaDef	17.1	sSod
		1.4-1.5	7.62	27.8	4.91	0.77	16.4	19.3	-	0.85	CaDef	17.7	sSod
	131	0-0.1	8.21	50.3	0.74	0.82	40.6	8.12	-	5	Bal	1.5	nSod
Greycliffe	175	0-0.1	9	28.2	2.74	0.69	19.4	11.1	-	1.75	CaL	9.7	mSod
		0.25-0.35	8.59	30	5.45	0.84	16.8	13.5	-	1.25	CaL	18.2	sSod
		0.55-0.65	8.08	49.8	2.89	0.54	34.5	11.9	-	2.9	CaL	5.8	nSod
		0.8-0.9	8.12	41.9	4.07	0.88	23	13.9	-	1.66	CaL	9.7	mSod
		1.4-1.5	5.35	29.9	4.31	0.72	12.3	12.4	0.15	0.99	CaDef	14.4	sSod

Soil name	Site	Depth (m)	pH	CEC	Exchangeable Cations (meq/100 g)					Ca/Mg ratio		Exchangeable sodium percentage (ESP)	
					Na	K	Ca	Mg	Al	Value (unitless)	Interpretation	Value	Interpretation
				meq / L								%	
	175B	0-0.1	8.76	49.7	2.37	0.82	37.8	8.78	-	4.3	Bal	4.6	nSod
		0.25-0.35	8.73	52	7.53	0.52	31.73	12.17	-	2.6	CaL	14.5	sSod
		0.55-0.65	8.44	43.9	11.99	0.42	17.26	14.21	-	1.2	CaL	27.3	sSod
		0.8-0.9	6.07	33.8	11.04	0.34	10.94	11.49	-	1	CaL	32.7	sSod
	173	0-0.1	7.18	28.3	0.2	1.18	22.78	4.10	-	5.6	Bal	0.8	nSod
		0.25-0.35	8.82	42.7	3.38	0.52	31.32	7.50	-	4.2	Bal	7.9	mSod
		0.55-0.65	8.81	42.8	7.19	0.50	25.92	9.24	-	2.8	CaL	16.8	sSod
		0.8-0.9	8.7	39.74	8.94	0.48	20.00	10.31	-	1.9	CaL	22.5	sSod
Isaac		0-0.1	8.85	3.42	2.21	0.69	36.46	10.65	-	3.4	CaL	4.4	nSod
		0.2-0.3	8.86	2.61	4.44	0.62	31.55	12.07	-	2.6	CaL	9.1	mSod
		0.5-0.6	8.82	2.03	6.80	0.61	25.64	12.64	-	2.0	CaL	14.9	sSod
		0.8-0.9	8.94	2.20	6.43	0.54	24.49	11.13	-	2.2	CaL	15.1	sSod
	127	0-0.1	6.37	41.8	1.1	2.63	26.6	11.4	-	2.33	CaL	2.6	nSod
		0.2-0.3	7.7	26.4	2.4	1.29	36.7	12	-	3.06	CaL	9.1	mSod
		0.5-0.6	8.26	29.3	3.87	1.12	37.3	12.8	-	2.92	CaL	13.2	mSod
		0.8-0.9	7.87	27	4.49	0.76	35.3	13.1	-	2.69	CaL	16.6	sSod
		1.1-1.2	8.49	21.1	3.72	0.68	34.3	12.7	-	2.71	CaL	17.6	sSod
		1.4-1.5	8.44	20.5	3.44	0.54	27	11.3	-	2.39	CaL	16.8	sSod
	126	0-0.1	7.82	43.8	0.82	0.8	31.4	10.9	-	2.89	CaL	1.9	nSod

Soil name	Site	Depth (m)	pH	CEC	Exchangeable Cations (meq/100 g)					Ca/Mg ratio		Exchangeable sodium percentage (ESP)	
					Na	K	Ca	Mg	Al	Value (unitless)	Interpretation	Value	Interpretation
				meq / L								%	
	142	0-0.1	7.78	33.24	0.99	0.81	24.23	7.2	-	3.36	CaL	3.0	nSod
		0.25-0.35	7.52	33.29	0.71	0.96	24.39	7.2	-	3.37	CaL	2.1	nSod
		0.55-0.65	8.67	43.68	1.79	0.62	33.04	8.2	-	4.01	Bal	4.0	nSod
	203	0-0.1	6.6	35.01	0.62	1.49	23.25	9.7	-	2.41	CaL	1.8	nSod
		0.25-0.35	7.05	36.68	0.89	1.14	24.23	10.4	-	2.33	CaL	2.4	nSod
		0.55-0.65	7.67	38.56	1.53	0.84	25.52	10.7	-	2.39	CaL	4.0	nSod
		0.8-0.9	8.13	39.91	2.40	0.70	25.89	10.9	-	2.37	CaL	6.0	mSod
	203B	0-0.1	6.76	35.12	0.44	1.59	24.02	9.1	-	2.65	CaL	1.2	nSod
		0.25-0.35	7.47	37.44	0.79	1.27	25.72	9.7	-	2.66	CaL	2.1	nSod
		0.55-0.65	8.49	44.15	2.80	0.92	29.48	10.9	-	2.69	CaL	6.3	mSod
		0.8-0.9	8.4	43.34	3.28	0.86	28.13	11.07	-	2.54	CaL	7.6	mSod
Langley	105	0-0.1	8.06	53.8	0.87	1.33	41.5	10.1	-	4.09	Bal	1.6	nSod
		0.25-0.35	8.53	31.7	2.45	0.95	36.4	10.1	-	3.61	CaL	7.7	mSod
		0.55-0.65	8.4	30.9	3.25	0.76	29.6	9.98	-	2.97	CaL	10.5	mSod
		0.8-0.9	8.82	38.2	3.84	0.81	26.5	14.5	-	1.83	CaL	10.1	mSod
		1.1-1.2	8.82	32.9	3.56	0.57	21.2	12	-	1.77	CaL	10.8	mSod
	115	0-0.1	8.33	35.5	1.23	1.68	28.6	9.22	-	3.1	CaL	3.5	nSod
		0.25-0.35	8.85	33	2.74	0.85	22.5	12.8	-	1.77	CaL	8.3	mSod
		0.55-0.65	7.84	33.5	2.94	0.91	26.2	13.7	-	1.91	CaL	8.8	mSod

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Soil name	Site	Depth (m)	pH	CEC	Exchangeable Cations (meq/100 g)					Ca/Mg ratio		Exchangeable sodium percentage (ESP)	
					Na	K	Ca	Mg	Al	Value (unitless)	Interpretation	Value	Interpretation
				meq / L								%	
		0.8-0.9	7.81	27.6	3.36	0.76	18.1	14.8	-	1.23	CaL	12.2	mSod
		1.1-1.2	8	25.5	4.7	0.74	11.8	15.3	-	0.77	CaDef	18.4	sSod
	121	0-0.1	8.26	46.1	1.15	2.74	42	7.15	-	5.88	Bal	2.5	nSod
		0.25-0.35	8.83	36.2	2.06	0.86	32.2	8.48	-	3.79	CaL	5.7	nSod
		0.55-0.65	8.95	41.6	4.75	0.73	28.3	11.1	-	2.55	CaL	11.4	mSod
		0.8-0.9	8.72	32.4	5.57	0.76	26.8	12.5	-	2.14	CaL	17.2	sSod
	132	0.0-0.1	8.22	38.7	1.55	2	31.9	9.24	-	3.45	CaL	4	nSod
		0.2-0.3	8.79	31.4	3.03	0.76	26.7	11.6	-	2.31	CaL	9.6	mSod
	114	0-0.1	8.39	30.15	1.44	0.62	22.31	5.78	-	3.86	CaL	4.77	nSod
		0.25-0.35	8.36	30.02	1.41	0.67	22.06	5.89	-	3.75	CaL	4.68	nSod
		0.55-0.65	8.94	32.53	3.05	0.54	22.03	6.91	-	3.19	CaL	9.38	mSod
		0.8-0.9	9.09	44.84	5.93	0.50	29.91	8.50	-	3.52	CaL	13.22	mSod
	132	0.5-0.6	8.99	33.5	3.64	0.82	24.1	15	-	1.61	CaL	10.9	mSod
		0.8-0.9	9.2	32.7	5.77	0.87	22.5	16.9	-	1.34	CaL	17.6	sSod
		1.1-1.2	9.1	34	5.36	0.87	18.1	15.1	-	1.2	CaL	15.8	sSod
	134	0-0.1	7.71	31.7	1.31	1.45	37.6	10.3	-	3.65	CaL	4.1	nSod
		0.25-0.35	8.44	35.5	1.97	0.78	45.6	12.3	-	3.7	CaL	5.5	nSod
		0.55-0.65	8.53	36	2.94	0.76	38.3	14	-	2.73	CaL	8.2	mSod
		0.8-0.9	8.29	34.1	3.4	0.64	32.1	14.3	-	2.24	CaL	10	mSod

Soil name	Site	Depth (m)	pH	CEC	Exchangeable Cations (meq/100 g)					Ca/Mg ratio		Exchangeable sodium percentage (ESP)	
					Na	K	Ca	Mg	Al	Value (unitless)	Interpretation	Value	Interpretation
				meq / L								%	
	140	0-0.1	8.75	35.7	1.92	1.16	42.2	9.48	-	4.45	Bal	5.4	nSod
		0.25-0.35	9.09	32	4.41	0.67	30.8	11.7	-	2.63	CaL	13.8	mSod
		0.55-0.65	8.71	30.2	6.53	0.78	28.1	14.2	-	1.98	CaL	21.6	sSod
		0.8-0.9	8.06	31.2	5.13	0.77	28.5	15	-	1.9	CaL	16.4	sSod
	139	0-0.1	8.22	33.6	1.73	2.4	23.6	6.2	-	3.81	CaL	5.1	nSod
	143	0-0.1	8.97	49.91	5.12	0.58	31.81	12.40	-	2.57	CaL	49.91	mSod
		0.25-0.35	8.81	48.45	2.23	0.77	35.07	10.39	-	3.38	CaL	48.45	nSod
		0.55-0.65	8.89	49.43	7.55	0.59	28.29	13.00	-	2.18	CaL	49.43	sSod
		0.8-0.9	8.77	48.83	9.66	0.63	25.26	13.28	-	1.90	CaL	48.83	sSod
Stephens	125	0-0.1	7.53	31.9	1.47	1.95	19.7	8.79	-	2.24	CaL	4.6	nSod
		0.25-0.35	8.55	25.2	4.25	0.36	25.9	9.78	-	2.65	CaL	16.9	sSod
		0.55-0.65	8.82	24.9	4.23	0.39	26	10.5	-	2.48	CaL	17	sSod
		0.8-0.9	8.72	25.5	4.3	0.41	24.3	10.4	-	2.33	CaL	16.9	sSod
		1.1-1.2	8.46	25	4.29	0.51	22.9	9.96	-	2.3	CaL	17.2	sSod
		1.4-1.5	7.86	23.8	3.59	0.47	18.7	8.54	-	2.19	CaL	15.1	sSod
	129B	0-0.1	6.8	26.37	1.64	0.73	15.87	8.13	-	2	CaL	6.2	mSod
		0.25-0.35	8.57	50.75	4.97	0.54	23.41	12.97	-	1.8	CaL	9.9	mSod
		0.55-0.65	8.55	34.9	5.56	0.45	17.44	11.34	-	1.5	CaL	16	sSod
		0.8-0.9	8.79	49.61	5.35	0.52	31.53	12.21	-	2.6	CaL	10.8	mSod

Soil name	Site	Depth (m)	pH	CEC	Exchangeable Cations (meq/100 g)					Ca/Mg ratio		Exchangeable sodium percentage (ESP)	
					Na	K	Ca	Mg	Al	Value (unitless)	Interpretation	Value	Interpretation
				meq / L								%	
Thalberg	146	0.0-0.1	7.29	10.2	0.1	0.83	8.23	1.01	-	8.18	MgL	1	nSod
		0.8-0.9	8.55	11.6	1.52	0.36	9.49	8.23	-	1.15	CaL	13.1	mSod
		0.2-0.3	7.2	3.23	0.02	0.11	2.87	0.23	-	12.34	MgDef	0.6	nSod
		0.5-0.6	7.24	14.2	1.12	0.37	6.97	5.78	-	1.21	CaL	7.9	mSod
	147	0.0-0.1	7.81	15.2	0.52	0.98	22	2.16	-	10.2	MgDef	3.4	nSod
		0.2-0.3	8.5	12.9	0.54	0.45	20.3	4.17	-	4.86	Bal	4.2	nSod
		0.5-0.6	9.05	12.4	0.74	0.5	14.3	6.26	-	2.29	CaL	6	nSod
		0.8-0.9	9.52	14.4	1.37	0.48	14.2	8.11	-	1.75	CaL	9.5	mSod
		1.1-1.2	9.66	15.7	2.81	0.33	12.1	9.63	-	1.26	CaL	17.9	sSod
	150	0-0.1	6.77	8.37	0.1	0.16	6.68	1.44	-	4.65	Bal	1.2	nSod
		0.35-0.45	7.41	1.99	0.04	0.02	1.77	0.16	-	10.93	MgDef	2	nSod
		0.55-0.65	8.4	8.24	0.52	0.15	4.17	2.59	-	1.61	CaL	6.3	mSod
		0.8-0.9	9.1	13.5	1.1	0.22	6.2	8.24	-	0.75	CaDef	8.1	mSod
	158	0-0.1	7.75	26	0.25	0.79	22	3.01	-	7.28	MgL	1	nSod
		0.25-0.35	8.71	19	0.95	0.52	19.8	4.8	-	4.13	Bal	5	nSod
		0.55-0.65	8.82	15.9	0.89	0.36	16	6.91	-	2.32	CaL	5.6	nSod
	170	0-0.1	6.94	3.36	0.06	0.33	2.32	0.65	-	3.55	CaL	1.8	nSod
		0.2-0.3	6.21	1.91	0.06	0.21	1.46	0.19	-	7.88	MgL	3.1	nSod

Soil name	Site	Depth (m)	pH	CEC	Exchangeable Cations (meq/100 g)					Ca/Mg ratio		Exchangeable sodium percentage (ESP)	
					Na	K	Ca	Mg	Al	Value (unitless)	Interpretation	Value	Interpretation
				meq / L								%	
		0.55-0.65	5.8	0.98	0.05	0.1	0.75	0.08	-	9.59	MgL	5.1	nSod
		0.8-0.9	5.49	1.06	0.05	0.05	0.46	0.05	0.45	8.94	MgL	4.7	nSod
		1.1-1.2	5.43	1.67	0.06	0.06	0.76	0.09	0.7	8.66	MgL	3.6	nSod
		1.4-1.5	4.77	6.94	0.06	0.11	1.47	0.98	4.32	1.5	CaL	0.9	nSod
	161	0.4-0.5	7.38	18.8	0.61	0.11	12.1	5.95	-	2.04	CaL	3.2	nSod
	167	0.7-0.8	8.7	19.4	0.81	0.65	14.2	4.11	-	3.44	CaL	4.2	nSod
	176	0.4-0.5	9.16	17.5	0.61	0.08	10.7	6.08	-	1.76	CaL	3.5	nSod
	177	0.4-0.5	6.94	10.6	0.53	0.16	6.22	4.12	-	1.51	CaL	5	nSod
Tralee	111	0.0-0.1	8.74	52.12	0.96	0.79	41.46	8.92	-	4.65	Bal	52.12	nSod
		0.25-0.35	8.96	52.10	2.14	0.75	39.15	10.06	-	3.89	CaL	52.10	nSod
		0.55-0.65	9.02	53.26	4.63	0.64	36.17	11.82	-	3.06	CaL	53.26	mSod
		0.8-0.9	8.89	57.36	8.28	0.65	35.08	13.35	-	2.63	CaL	57.36	mSod
	148	0.0-0.1	7.89	13.3	0.48	1.04	15	4.5	-	3.32	CaL	3.6	nSod
		0.25-0.35	8.96	19.3	4.43	0.32	24.6	11.8	-	2.09	CaL	23	sSod
		0.55-0.65	9.02	15	3.84	0.31	19.1	11.4	-	1.68	CaL	25.6	sSod
		0.8-0.9	9.04	17.3	3.7	0.83	18.9	10.6	-	1.78	CaL	21.4	sSod
		1.1-1.2	9.08	19.8	5.19	0.61	19.9	12	-	1.66	CaL	26.2	sSod
		1.4-1.5	8.88	20.6	3.72	0.41	17.5	10.4	-	1.68	CaL	18.1	sSod
	153	0-0.05	8.1	30.3	0.36	0.7	22.9	6.27	-	3.66	CaL	1.2	nSod

Soil name	Site	Depth (m)	pH	CEC	Exchangeable Cations (meq/100 g)					Ca/Mg ratio		Exchangeable sodium percentage (ESP)	
					Na	K	Ca	Mg	Al	Value (unitless)	Interpretation	Value	Interpretation
				meq / L								%	
		0.25-0.35	8.85	26.5	2.69	0.34	22.6	10.2	-	2.21	CaL	10.2	mSod
		0.55-0.65	8.59	27.1	5.86	0.35	19.4	12.4	-	1.57	CaL	21.6	sSod
		0.8-0.9	8.49	26.9	5.76	0.38	15.8	11.7	-	1.35	CaL	21.4	sSod
	153B	0-0.1	7.82	28.76	0.51	0.91	20.73	6.61	-	3.14	CaL	28.76	nSod
		0.25-0.35	8.88	40.44	2.25	0.47	30.57	7.16	-	4.27	Bal	40.44	nSod
		0.55-0.65	8.85	38.62	8.47	0.41	21.58	8.16	-	2.64	CaL	38.62	sSod
		0.8-0.9	8.7	39.90	9.51	0.44	21.04	8.91	-	2.36	CaL	39.90	sSod
	162	0-0.1	8.88	31.3	1.93	2.16	22.9	7.66	-	2.98	CaL	6.2	mSod
		0.25-0.35	8.73	29.2	3.58	0.93	19.6	10.2	-	1.93	CaL	12.3	mSod
		0.55-0.65	8	26.3	4.52	0.98	22.1	13.7	-	1.61	CaL	17.2	sSod
		0.8-0.9	7.77	27.3	3.69	0.79	18.3	12.8	-	1.44	CaL	13.5	mSod
	155	0-0.1	8.51	26.1	1.23	0.67	31	5.4	-	5.73	Bal	4.7	nSod

Notes:
1. Interpretation Criteria is provided in Tables 28 to 33

Table 34: Soil Nutritional and Salinity Assessment

Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
Bluchers (VE AD)	131	0.0-0.1	8.21	M Alk	0.12	L	23	NS	718	L	64	M	1	L
		0.25-0.35	8.77	S Alk	0.15	L	15	NS	-	-	-	-	-	-
		0.55-0.65	9.03	S Alk	0.22	L	16	NS	-	-	-	-	-	-
		0.8-0.9	9.11	S Alk	0.24	M	28	NS	-	-	-	-	-	-
	149	0.0-0.1	8.38	M Alk	0.1	VL	26	NS	835	L	48	M	1	L
		0.25-0.35	9	S Alk	0.21	L	74	NS	-	-	-	-	-	-
		0.55-0.65	8.76	S Alk	0.52	M	470	MS	-	-	-	-	-	-
		0.8-0.9	7.83	M Alk	2.9	ExH	950	HS	-	-	-	-	-	-
		1.1-1.2	7.66	Neut	3.2	ExH	1700	HS	-	-	-	-	-	-
		1.4-1.5	7.62	Neut	2.71	ExH	1900	HS	-	-	-	-	-	-
	141	0.0-0.1	7.6	Neut	0.11	VL	62	NS	-	-	-	-	-	-
		0.25-0.35	8.79	S Alk	0.15	L	13	NS	-	-	-	-	-	-
		0.55-0.65	8.93	S Alk	0.2	L	85	NS	-	-	-	-	-	-
		0.8-0.9	8.75	S Alk	0.25	M	230	SS	-	-	-	-	-	-
		1.1-1.2	8.6	S Alk	0.26	M	360	MS	-	-	-	-	-	-
	165	0.0-0.1	8.66	S Alk	0.13	L	11	NS	-	-	-	-	-	-

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Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
		0.25-0.35	8.94	S Alk	0.19	L	110	SS	-	-	-	-	-	-
		0.55-0.65	8.76	S Alk	0.44	M	380	MS	-	-	-	-	-	-
		0.8-0.9	8.42	M Alk	0.86	H	1200	HS	-	-	-	-	-	-
Greycliffe (VE AD)	173	0.0-0.1	7.18	Neut	0.12308	L	52.6515	NS	-	-	-	-	-	-
		0.2-0.3	8.82	M Alk	0.34732	M	297.242	SS	-	-	-	-	-	-
		0.55-0.65	8.81	M Alk	0.84417	H	355.85	MS	-	-	-	-	-	-
		0.8-0.9	8.7	M Alk	1.12509	VH	1032.57	HS	-	-	-	-	-	-
	175	0.0-0.1	9	S Alk	0.25	M	220	SS	-	-	-	-	-	-
		0.2-0.3	8.59	S Alk	1.38	ExH	1900	HS	-	-	-	-	-	-
		0.55-0.65	8.08	M Alk	2.94	ExH	2600	ExS	-	-	-	-	-	-
		0.8-0.9	8.12	M Alk	2.14	ExH	2800	ExS	-	-	-	-	-	-
	175B	0.0-0.1	8.76	S Alk	0.23435	L	173.2775	SS	-	-	-	-	-	-
		0.2-0.3	8.73	S Alk	0.81218	H	1059.41	HS	-	-	-	-	-	-
		0.55-0.65	8.44	S Alk	1.21906	VH	1540.605	HS	-	-	-	-	-	-
		0.8-0.9	6.07	M Ac	1.01612	VH	1437.81	HS	-	-	-	-	-	-
Isaac (VE AE)	126	0.0-0.1	7.82	M Alk	0.15	L	46	NS	801	L	16	L	1	L
		0.25-0.35	8.83	S Alk	0.22	L	94	NS	-	-	-	-	-	-
		0.55-0.65	8.68	S Alk	0.44	M	510	MS	-	-	-	-	-	-

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CONTAMINATION RESOLVED

Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
		0.8-0.9	8.65	S Alk	0.54	M	720	HS	-	-	-	-	-	-
	127	0.0-0.1	6.37	Neut	0.06	VL	42	NS	743	L	86	H	1.7	M
		0.1-0.2	7.15	Neut	0.05	VL	48	NS	-	-	-	-	-	-
		0.1-0.3	7.7	Neut	0.07	VL	51	NS	-	-	-	-	-	-
		0.3-0.4	8.09	M Alk	0.12	L	150	SS	-	-	-	-	-	-
		0.4-0.5	8.38	M Alk	0.16	L	250	SS	-	-	-	-	-	-
		0.5-0.6	8.26	M Alk	0.24	M	380	MS	-	-	-	-	-	-
		0.6-0.7	7.73	Neut	0.22	L	370	MS	-	-	-	-	-	-
		0.7-0.8	7.65	Neut	0.39	M	620	HS	-	-	-	-	-	-
		0.8-0.9	7.87	M Alk	0.5	M	880	HS	-	-	-	-	-	-
		0.9-1.0	8.19	M Alk	0.53	M	810	HS	-	-	-	-	-	-
		1.0-1.1	8.26	M Alk	0.52	M	850	HS	-	-	-	-	-	-
		1.1-1.2	8.49	M Alk	0.64	H	1000	HS	-	-	-	-	-	-
		1.4-1.5	8.44	M Alk	0.55	M	880	HS	-	-	-	-	-	-
	128	0.0-0.1	8.85	S Alk	0.16227	L	34.727	NS	-	-	-	-	-	-
		0.25-0.35	8.86	S Alk	0.34832	M	290.0975	SS	-	-	-	-	-	-
		0.55-0.65	8.82	S Alk	0.58625	M	632.39	HS	-	-	-	-	-	-
		0.8-0.9	8.94	S Alk	0.56825	M	589.215	MS	-	-	-	-	-	-

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Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
	142	0.0-0.1	7.78	S Alk	0.0566	VL	41.2335	NS	-	-	-	-	-	-
		0.25-0.35	7.52	S Alk	0.0508	VL	11.5005	NS	-	-	-	-	-	-
		0.55-0.65	8.67	S Alk	0.16247	L	49.61	NS	-	-	-	-	-	-
		0.8-0.9	8.34	S Alk	0.16637	L	130.2675	SS	-	-	-	-	-	-
	203	0.0-0.1	6.6	Neut	0.08689	VL	104.7805	SS	-	-	-	-	-	-
		0.25-0.35	7.05	Neut	0.0615	VL	112.7885	SS	-	-	-	-	-	-
		0.55-0.65	7.67	S Alk	0.0755	VL	95.667	NS	-	-	-	-	-	-
		0.8-0.9	8.13	M Alk	0.13598	L	191.092	SS	-	-	-	-	-	-
	203B	0.0-0.1	6.76	Neut	0.0816	VL	54.8845	NS	-	-	-	-	-	-
		0.25-0.35	7.47	S Alk	0.0581	VL	57.717	NS	-	-	-	-	-	-
		0.55-0.65	8.49	M Alk	0.35631	M	324.0325	SS	-	-	-	-	-	-
		0.8-0.9	8.4	M Alk	0.44229	M	536.415	MS	-	-	-	-	-	-
Langley (VE AE)	132	0.0-0.1	8.22	M Alk	0.15	L	24	NS	756	L	118	H	1.4	L
		0.1-0.2	8.54	S Alk	0.13	L	13	NS	-	-	-	-	-	-
		0.2-0.3	8.79	S Alk	0.14	L	11	NS	-	-	-	-	-	-
		0.3-0.4	8.79	S Alk	0.15	L	4	NS	-	-	-	-	-	-
		0.4-0.5	8.91	S Alk	0.18	L	3	NS	-	-	-	-	-	-
		0.5-0.6	8.99	S Alk	0.22	L	22	NS	-	-	-	-	-	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
		0.6-0.7	9.03	S Alk	0.21	L	17	NS	-	-	-	-	-	-
		0.7-0.8	9.07	S Alk	0.23	L	33	NS	-	-	-	-	-	-
		0.8-0.9	9.2	S Alk	0.26	M	45	NS	-	-	-	-	-	-
		0.9-1.0	9.11	S Alk	0.24	M	53	NS	-	-	-	-	-	-
		1.1-1.2	9.1	S Alk	0.29	M	120	SS	-	-	-	-	-	-
	139	0.0-0.1	8.22	M Alk	0.14	L	21	NS	770	L	175	H	2.5	M
		0.25-0.35	9	S Alk	0.21	L	57	NS	-	-	-	-	-	-
		0.55-0.65	8.8	S Alk	0.57	H	510	MS	-	-	-	-	-	-
		0.8-0.9	7.94	M Alk	3.1	ExH	1100	HS	-	-	-	-	-	-
	105	0.0-0.1	8.06	M Alk	0.14	L	49	NS	-	-	-	-	-	-
		0.25-0.35	8.53	S Alk	0.09	VL	31	NS	-	-	-	-	-	-
		0.55-0.65	8.4	M Alk	0.11	VL	75	NS	-	-	-	-	-	-
		0.8-0.9	8.82	S Alk	0.24	M	150	SS	-	-	-	-	-	-
		1.1-1.2	8.82	S Alk	0.22	L	190	SS	-	-	-	-	-	-
	114	0.0-0.1	8.39	M Alk	0.0753	VL	69.8115	NS	-	-	-	-	-	-
		0.25-0.35	8.36	M Alk	0.0664	VL	32.681	NS	-	-	-	-	-	-
		0.55-0.65	8.94	S Alk	0.17207	L	118.14	SS	-	-	-	-	-	-
		0.8-0.9	9.09	S Alk	0.42729	M	454.74	MS	-	-	-	-	-	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
	115	0.0-0.1	8.33	M Alk	0.11	VL	12	NS	-	-	-	-	-	-
		0.25-0.35	8.85	S Alk	0.31	M	170	SS	-	-	-	-	-	-
		0.55-0.65	7.84	M Alk	2.98	ExH	450	MS	-	-	-	-	-	-
		0.8-0.9	7.81	M Alk	3.31	ExH	1100	HS	-	-	-	-	-	-
		1.1-1.2	8	M Alk	1.61	ExH	1900	HS	-	-	-	-	-	-
	121	0.0-0.1	8.26	M Alk	0.11	VL	2	NS	-	-	-	-	-	-
		0.25-0.35	8.83	S Alk	0.15	L	20	NS	-	-	-	-	-	-
		0.55-0.65	8.95	S Alk	0.32	M	350	MS	-	-	-	-	-	-
	143	0.0-0.1	8.97	S Alk	0.32232	M	207.537	SS	-	-	-	-	-	-
		0.25-0.35	8.81	S Alk	0.18746	L	53.779	NS	-	-	-	-	-	-
		0.55-0.65	8.89	S Alk	0.59224	H	591.305	MS	-	-	-	-	-	-
		0.8-0.9	8.77	S Alk	0.84017	H	950.4	HS	-	-	-	-	-	-
	202	0.0-0.1	6.5	S Ac	0.93814	H	655.765	HS	-	-	-	-	-	-
		0.25-0.35	6.79	S Ac	0.47928	M	251.02	SS	-	-	-	-	-	-
		0.55-0.65	7.76	Neut	0.50127	M	349.184	MS	-	-	-	-	-	-
		0.8-0.9	8.41	M Alk	0.60024	H	736.725	HS	-	-	-	-	-	-
Langley (VE AE)	121	0.8-0.9	8.72	S Alk	0.68	H	720	HS	-	-	-	-	-	-
	134	0.0-0.1	7.71	Neut	0.07	VL	42	NS	-	-	-	-	-	-

Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
		0.25-0.35	8.44	M Alk	0.13	L	81	NS	-	-	-	-	-	-
	134	0.55-0.65	8.53	S Alk	0.11	VL	87	NS	-	-	-	-	-	-
		0.8-0.9	8.29	M Alk	0.24	M	390	MS	-	-	-	-	-	-
	140	0-0.1	8.75	S Alk	0.14	L	22	NS	-	-	-	-	-	-
		0.25-0.35	9.09	S Alk	0.29	M	240	SS	-	-	-	-	-	-
		0.55-0.65	8.71	S Alk	1.09	VH	1200	HS	-	-	-	-	-	-
		0.8-0.9	8.06	M Alk	3.05	ExH	2400	ExS	-	-	-	-	-	-
Stephens (DE AE)	125	0.0-0.1	7.53	Neut	0.06	VL	27	NS	518	L	27	M	1.1	L
		0.25-0.35	8.55	S Alk	0.27	M	320	MS	-	-	-	-	-	-
		0.55-0.65	8.82	S Alk	0.65	H	860	HS	-	-	-	-	-	-
		0.8-0.9	8.72	S Alk	0.63	H	890	HS	-	-	-	-	-	-
		1.1-1.2	8.46	M Alk	0.51	H	670	HS	-	-	-	-	-	-
		1.4-1.5	7.86	M Alk	0.39	M	590	MS	-	-	-	-	-	-
	129	0.0-0.1	6.86	Neut	0.06	VL	22	NS	-	-	-	-	-	-
		0.25-0.35	8.21	M Alk	0.18	L	230	SS	-	-	-	-	-	-
		0.55-0.65	8.56	S Alk	0.69	H	840	HS	-	-	-	-	-	-
		0.8-0.9	8.65	S Alk	0.73	H	930	HS	-	-	-	-	-	-
		1.1-1.2	8.66	S Alk	0.62	H	780	HS	-	-	-	-	-	-

Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
	129B	0.0-0.1	6.8	Neut	0.0581	VL	124.421	SS	-	-	-	-	-	-
		0.25-0.35	7.44	M Alk	0.18397	L	327.25	MS	-	-	-	-	-	-
		0.55-0.65	8.57	S Alk	0.45229	M	565.345	MS	-	-	-	-	-	-
		0.8-0.9	8.79	S Alk	0.48728	M	622.05	HS	-	-	-	-	-	-
Thalberg (CH AB)	146	0.0-0.1	7.29	Neut	0.04	VL	11	NS	818	L	4	L	0.7	VL
		0.2-0.3	7.2	Neut	0.01	VL	6	NS	-	-	-	-	-	-
		0.5-0.6	7.24	Neut	0.07	VL	37	NS	-	-	-	-	-	-
		0.8-0.9	8.55	S Alk	0.07	VL	43	NS	-	-	-	-	-	-
	147	0.0-0.1	7.81	M Alk	0.03	VL	8	NS	767	L	14	L	2	M
		0.2-0.3	8.5	S Alk	0.06	VL	13	NS	-	-	-	-	-	-
		0.5-0.6	9.05	S Alk	0.09	L	8	NS	-	-	-	-	-	-
		0.8-0.9	9.52	S Alk	0.17	L	13	NS	-	-	-	-	-	-
		1.1-1.2	9.66	S Alk	0.28	M	150	SS	-	-	-	-	-	-
	150	0.0-0.1	6.77	Neut	0.02	VL	9	NS	1080	L	50	H	0.9	VL
		0.35-0.45	7.41	Neut	0.01	VL	7	NS	-	-	-	-	-	-
		0.55-0.65	8.4	M Alk	0.01	VL	7	NS	-	-	-	-	-	-
		0.8-0.9	9.1	S Alk	0.02	VL	9	NS	-	-	-	-	-	-
	158	0.0-0.1	7.75	Neut	0.05	VL	6	NS	771	L	9	L	1.6	L

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
		0.25-0.35	8.71	S Alk	0.13	L	57	NS	-	-	-	-	-	-
		0.55-0.65	8.82	S Alk	0.25	M	280	SS	-	-	-	-	-	-
	170	0.0-0.1	6.94	Neut	0.04	VL	3	NS	509	L	6	L	0.7	VL
		0.2-0.3	6.21	Neut	0.02	VL	4	NS	-	-	-	-	-	-
		0.55-0.65	5.8	M Ac	0.01	VL	3	NS	-	-	-	-	-	-
		0.8-0.9	5.49	M Ac	0.01	VL	2	NS	-	-	-	-	-	-
		1.1-1.2	5.43	M Ac	0.01	VL	1	NS	-	-	-	-	-	-
		1.4-1.5	4.77	S Ac	0.03	VL	1	NS	-	-	-	-	-	-
	161	0.4-0.5	7.38	Neut	0.06	VL	72	NS	-	-	-	-	-	-
	167	0.7-0.8	8.7	S Alk	0.09	L	12	NS	-	-	-	-	-	-
	176	0.4-0.5	9.16	S Alk	0.09	L	14	NS	-	-	-	-	-	-
	177	0.4-0.5	6.94	Neut	0.05	VL	12	NS	-	-	-	-	-	-
Tralee (VE AD)	111	0-0.1	8.74	S Alk	0.14618	L	50.402	NS	-	-	-	-	-	-
		0.25-0.35	8.96	S Alk	0.17397	L	46.761	NS	-	-	-	-	-	-
		0.55-0.65	9.02	S Alk	0.30433	M	168.0855	SS	-	-	-	-	-	-
		0.8-0.9	8.89	S Alk	0.66122	H	614.295	HS	-	-	-	-	-	-
	148	0.0-0.1	7.89	M Alk	0.03	VL	8	NS	782	L	16	L	0.8	VL
		0.25-0.35	8.96	S Alk	0.53	M	740	HS	-	-	-	-	-	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
		0.55-0.65	9.02	S Alk	0.89	H	1200	HS	-	-	-	-	-	-
		0.7-0.8	8.97	S Alk	0.95	H	1400	HS	-	-	-	-	-	-
		0.8-0.9	9.04	S Alk	0.93	H	1300	HS	-	-	-	-	-	-
		1.1-1.2	9.08	S Alk	0.92	H	1300	HS	-	-	-	-	-	-
		1.4-1.5	8.88	S Alk	0.71	H	880	HS	-	-	-	-	-	-
	153	0-0.05	8.1	M Alk	0.07	VL	23	NS	835	L	48	M	0.9	VL
		0.25-0.35	8.85	S Alk	0.23	L	160	SS	-	-	-	-	-	-
		0.55-0.65	8.59	S Alk	0.62	H	930	HS	-	-	-	-	-	-
		0.8-0.9	8.49	M Alk	1.09	VH	1500	HS	-	-	-	-	-	-
	153B	0-0.1	7.82	S Alk	0.0788	VL	32.6315	NS	-	-	-	-	-	-
		0.25-0.35	8.88	S Alk	0.17927	L	59.191	NS	-	-	-	-	-	-
		0.55-0.65	8.85	S Alk	0.79218	H	786.06	HS	-	-	-	-	-	-
		0.8-0.9	8.7	S Alk	0.93214	H	1034.275	HS	-	-	-	-	-	-
	162	0-0.1	8.88	S Alk	0.14	L	45	NS	608	L	2	L	0.8	VL
		0.25-0.35	8.73	S Alk	0.45	M	630	HS	-	-	-	-	-	-
		0.55-0.65	8	M Alk	1.96	ExH	1100	HS	-	-	-	-	-	-
		0.8-0.9	7.77	Neut	3.07	ExH	1200	HS	-	-	-	-	-	-
	155	0-0.1	8.51	S Alk	0.11	VL	16	NS	-	-	-	-	-	-

Soil Name	Site	Depth	pH 1:5 (water)		EC 1:5 (water)		Chloride		Total Nitrogen		Available Phosphorus		Organic Carbon	
		m	Vaue		dS/m		mg/kg		mg/kg		mg/kg		%	
		0.25-0.35	9.2	S Alk	0.27	M	310	MS	-	-	-	-	-	-
		0.55-0.65	8.81	S Alk	0.92	H	1200	HS	-	-	-	-	-	-
		0.8-0.9	8.66	S Alk	1.11	VH	1400	HS	-	-	-	-	-	-

Notes:
1. Interpretation Criteria is provided in Tables 24 to 34

Table 35: Land Suitability Class Criteria

Limitations	Class 1	Class 2	Class 3	Class 4	Class 5
Water availability	PAWC>150mm/100cm (only cotton furrow irrigated crops)	PAWC 125-150mm/100cm	PAWC 100-125mm/100cm	PAWC 75-100mm/100cms	PAWC<50-75mm/100cm
Nutrient deficiency	NA	NA	NA	NA	NA
Surface Condition (Soil physical factors/ soil workability)	Soft/loose sandy to sandy loam surface horizons Very fine self mulching clays (Peds<2mm)	Soft, firm or weakly hard setting with sandy to loamy surface horizons Fine self mulching clays (Peds >2-5mm)	Coarse self mulching clays (Peds>5-10mm), poor seed soil contact (large peds drying) Clay soils with hard setting, firm pedal or weakly self mulching surface horizons	Very coarse self mulching clays (peds > 10mm) Loamy, fine sand, silty or clayey surface soils that are extremely hard setting, massive or crusting	
Rockiness	Gravels <20mm: Abundance <10%	Gravels <20mm: Abundance 10-20% Pebbles 20-60mm: Abundance <20%	Cobbles 60 to 200mm: abundance >10% Gravels <20mm: Abundance >50% Stones >200mm: Abundance <10%	Cobbles 60 to 100mm: Abundance >10% Pebbles 20-60mm: Abundance>20% Stones >200mm: Abundance 10-20%	Stones >200mm: abundance >20%
Microrelief	Microrelief <70% land surface	Weak microrelief VI<0.1m	Shallow melonhole gilgai: VI 300-600mm across 30-70% land surface	Shallow melonhole gilgai: VI 300-600mm across <30% land surface across >70% land surface- Strongly developed deep melonhole gilgai: VI 600-1500mm across <30% land surface	Strongly developed deep melonhole gilgai: VI0.6-1.5m across >30% land surface

Limitations	Class 1	Class 2	Class 3	Class 4	Class 5
pH (1:5)	NA	NA	NA	NA	NA
ESP (topsoil)	NA	NA	NA	NA	NA
Wetness	Well drained/rapidly drained	Moderately well drained and highly to slowly permeable	Imperfectly drained and highly -moderately permeable	Imperfectly drained and slowly permeable	Very poorly to poorly drained
Topography	NA	NA	NA	NA	NA
Water erosion	Top 200mm- Slopes 0-0.5%: Weak to strongly coherent Slopes 0.5-1%: Moderate to strongly coherent	Top 200mm- Slopes 0.5-1%: Weakly coherent Slopes 1-3%: Moderately to strongly coherent	Top 200mm- Slopes 0-0.5%: Dispersive soil Slopes 1-3%: weakly coherent Slopes 3-8%: moderate to strongly coherent	Top 200mm- Slopes 0.5-1%: Dispersive soil Slopes 3-8%: weakly coherent	Top 200mm- Slopes 1-8%: Dispersive soil Slopes >8%: Dispersive Weakly to Strongly coherent
Narrow Moisture Range	Wide moisture range for cultivation Moderate to rapidly well drained Not hard setting Not spewy/boggy when wet Deep sands and thick sandy surfaced texture contrast soils	Moderate moisture range for cultivation: Moderate to rapidly well drained Hard setting Not spewy/boggy when wet Well drained earths	Moderate moisture range for cultivation (>Pm3) Imperfectly – moderately well drained Not hard setting Spewy when wet Sandy surfaced (> 0.4m) Sodic texture Contrast Soils		

Table 36: Suitability subclass Assessment sites

UMA	Location	Soil ASC	E		Es		M		Pm		W			Ps		R			Tm		Da		Overall
			Slope	Aggregate. stability class (disp.)		Clay content (%)		PAWC/ Soil Water (mm)		Surface condition	Exchangeable sodium percentage (ESP %)		Drainage	Permeability		Peds (mm)		Rockiness	Gravel/ Fragments (%)		Gilgai		ASS		
1.01	105	Langley (VE AB)	<1%	3(4) to 4	1	62-66	1	120	3	Self Mulching	1.6 – 10.8 nSod - mSod	3	Imp	Slow	4	1-5	2	Nil	1-2.6	1	Nil	1	Nil	1	4
	124		<1%	3(4) to 4	1	52-76	1	120	3	Self-mulching	1.6 – 10.8 NSod - mSod	3	Imp	Mod	4	2-10	2	Nil	1-2.6	1	25% VI 0.3 m	2	Nil	1	4
	132		<1%	3(4) to 4	1	52-76	1	65	5	Self-mulching	4.0 -9.6 NSod - mSod	3	Mod Well	Slow	2	5-10	3	Nil	1-6	1	Nil	1	Nil	1	5
	133		<1%	3(4) to 4	1	52-76	1	120	3	Self-mulching – Coarse	4.0 -9.6 NSod - mSod	3	Mod Well	Mod	2	5-10	3	Nil		1	Nil	1	Nil	1	4
	134		<1%	3[4] to 4	1	52-76	2	118	3	Self-mulching – Coarse	4.1 – 10 nSod to mSod	3	Mod Well	Mod Rapid	2	2-10	3	Nil	0-0.4	1	25% VI 0.2 m	2	Nil	1	3
	135		<1%	3[4] to 4	1	52-76	2	120	3	Self-mulching – Coarse	4.1 – 10 nSod to mSod	3	Mod Well	Mod Rapid	2	5-10	3	Nil	0-0.4	1	25% VI 0.2 m	2	Nil	1	3
	201		<1%	3[4] to 4	1	46 – 54	2	120	3	Poached	4.1 – 10 nSod to mSod	3	-	slow	4	>2mm	2	Nil	0-0.4	1	Nil	1	Nil	1	4
1.02	126	Isaac (VE AE)	<1%	3[3]	2	58.5	2	120	3	Self-mulching – Coarse	1.9 nSod	2	Mod Well	Slow	2	2-5 10-30	2	Nil	0-5.4	1	25% VI 0.2 m	2	Nil	1	3
	127		<1%	3[3]	2	33-43	2	72	5	Self-mulching – Coarse	2.6 – 16.8 nSod to sSod	2	Mod Well	Slow	2	2-5 10-30	2	Nil	2-4	1	25% VI 0.2 m	2	Nil	1	5
	128		<1%	3[3]	2	46-62	2	114	3	Self-mulching – Coarse	2.6 – 16.8 nSod to sSod	2	Mod Well	Slow	2	2-10 10-30	2	Nil	0.4-3.1	1	10% VI 0.1 m	2	Nil	1	3
1.03	125	Stephens (DE AE)	<1%	2[2]	4	28	3	40	5	Firm – wet	4.6 – 17.2 nSod topsoil to sSod subsoil	3	Imp	Slow	4	5-10 10-20	3	Nil	4-13	1	Nil	1	Nil	1	5
	129		<1%	2[2]	4	29-50	3	54	5	Firm (mossy)	6.2 – 16 nSod topsoil to sSod subsoil	3	Mod well	Mod	2	1-2	1	Nil	0-1.5	1	10% VI 0.1 m	2	Nil	1	5
	129B		<1%	2[2]	4	40-53	3	109	3	Poached	6.2 – 16 nSod topsoil to sSod subsoil	3	Mod well	Mod	2	Blocky Lentic.	1	Nil	0-2.7	1	Nil	1	Nil	1	4
1.04	131	Bluchers (VE AD)	<1%	3(1) to 4	2	64-70	2	120	3	Poached	1.5 nSod	3	Imp	Slow	4	5-20 20-50	4	Nil	0.1-0.3	1	Nil	1	Nil	1	4
	113		<1%	3(1) to 4	2	64-70	2	-	-	Firm, poached	1.5 nSod	3	Poorly	slow	5	weak	3	Nil	0.1-0.3	1	Nil	1	Nil	1	5
	137		<1%	3(1) to 4	2	64-70	2	120	3	Poached	5.4 - 20 nSod to sSod	3	Imp	Slow	4	5-20 20-50	4	Nil	0.1-0.3	1	debil debil 0.3 m	2	Nil	1	4

UMA	Location	Soil ASC	E			Es		M		Pm			W			Ps		R			Tm		Da		Overall
			Slope	Aggregate. stability class (disp.)		Clay content (%)		PAWC/ Soil Water (mm)		Surface condition	Exchangeable sodium percentage (ESP %)		Drainage	Permeability		Peds (mm)		Rockiness	Gravel/ Fragments (%)		Gilgai		ASS		
	141		4%	3[3] to 4	5	62-74	2	-	-	Poached – Severe	5.4 - 20 nSod to sSod	3	Imp	Mod	3	1-5 2-5	2	Nil	0	1	Normal, 0.2m, 10m	3	Nil	1	5
	144		<1%	3[3] to 4	4	41- 49	2	-	-	Severely poached Self Mulching	5.4 - 20 nSod to sSod	2	Mod well	Mod	2	2-5 strong	2	Nil	0	1	Debil debil 0.3m	2	Nil	1	4
	149		1%	3[3] to 4	4	41- 49	2	-	-	Strongly Self Mulching	5.4 - 20 nSod to sSod	3	Imp	slow	4	Poly blocky	2	Nil	1-4	1	Nil	1	Nil	1	4
	165		<1%	3[3] to 4	4	41-74	2	-	-	Poached, cracking, coarse self mulching	5.4 - 20 nSod to sSod	3	Imp	Mod	3	2-10 10-20	3	Nil	1-4	1	Nil	1	Nil	1	4
	180		<1%	3[3] to 4	4	41-74	2	-	-	Poached - cracking	5.4 - 20 nSod to sSod	3	Imp	Mod	3	Blocky	2	Nil	1-4	1	Minor – swamp hummoch	1	Nil	1	4
1.05	107	Langley (VE AE)	<1%	3[4] to 4	1	57-64	1	120	3	Trampled	2.5 – 17.2 nSod topsoil to sSod subsoil	3	Mod Well	Slow	2	5-10 10-20	3	Nil	0.7-2.4	1	Nil	1	Nil	1	3
	108		<1%	3[4] to 4	1	57-64	1	120	3	Trampled	2.5 – 17.2 nSod topsoil to sSod subsoil	3	Mod Well	Slow	2	5-10 10-20	4	Nil	0.7-2.4	1	Nil	1	Nil	1	4
	117		<1%	3[4] to 4	1	57-64	1	120	3	Self-mulching	2.5 – 17.2 nSod topsoil to sSod subsoil	2	Mod Well	Mod	2	10-20 2-10	3	Nil	0.7-2.4	1	Nil	1	Nil	1	3
	121		<1%	3[4] to 4	1	57-64	1	120	3	Self-mulching	2.5 – 17.2 nSod topsoil to sSod subsoil	3	Imp	Slow	4	2-5 2-10	2	2% 2-10 mm	0.7-2.4	1	Nil	1	Nil	1	4
	138		<1%	3[4] to 4	1	57-64	1	96	4	Self-mulching	2.5 – 17.2 nSod topsoil to sSod subsoil	3	-	Mod	-	-	-	Nil	0.7-2.4	1	Nil	1	Nil	1	5
	139		<1%	3[4] to 4	1	57-61	1	120	3	Self-mulching	5.1 nSod	3	Mod well	Mod	2	2-10 5-15	3	Nil	0.1-0.9	1	25% VI 0.1 m	2	Nil	1	3
	140		<1%	3[4] to 4	1	56-61	1	54	5	Self-mulching – Coarse	5.4 – 21.6 nSod to sSod	3	Mod well	Slow	2	2-5 20-50	2	Nil	0-0.3	1	50% VI 0.2 m	2	Nil	1	5
	159		<1%	3[4] to 4	1	56-61	1	120	3	Cracking, hard setting	5.4 – 21.6 nSod to sSod	3	Mod well	Slow	2	-	-	Nil	0-0.3	1	Nil	1	Nil	1	3
1.06	119	Thalberg (CH AB)	<1%	3[2] - 4	4	8-13**	5	80	4	Firm	1.2 – 8.1 nSod topsoil to sSod subsoil	3	Imperfect	Mod	3	<2 5-20	1	Nil	4-13	2	Nil	1	Nil	1	5
	120		5.3%*	3[2] - 4	5	8-13**	5	75	4	Firm	1.2 – 8.1 nSod topsoil to sSod subsoil	3	Well	Rapid	1	Mod <2mm	1	Nil	4-13	2	Nil	1	Nil	1	5

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

UMA	Location	Soil ASC	E			Es		M		Pm			W			Ps		R			Tm		Da		Overall
			Slope	Aggregate. stability class (disp.)		Clay content (%)		PAWC/ Soil Water (mm)		Surface condition	Exchangeable sodium percentage (ESP %)		Drainage	Permeability		Peds (mm)		Rockiness	Gravel/ Fragments (%)		Gilgai		ASS		
	150		2%	3[2] - 4	5	8-13**	5	50	5	Firm – hard setting	1.2 – 8.1 nSod topsoil to sSod subsoil	3	Imp	Mod	3	<2 10	1	Nil	4-13	2	Nil	1	Nil	1	5
	151		3.5%*	3[2] - 4	5	8-13**	5	-	-	Firm – Hard setting	1.2 – 8.1 nSod topsoil to sSod subsoil	2	Mod	Mod	2	Nil	2	30% 5-100 mm	4-13	4	Nil	1	Nil	1	5
	152		6%	3[2] - 4	5	8-13**	5	107	3	Firm – Hardsetting	1.2 – 8.1 nSod topsoil to sSod subsoil	-	NA	Mod	-	Nil columnar	2	20% 5-50 mm	4-13	2	Nil	1	Nil	1	5
1.07	153	Tralee (VE AD)	1%	1 -2[3]	4	36	3	66	5	Cracking	1.2 – 21.4 mSod topsoil to sSod subsoil	3	Imp	Slow	4	1.2: 20-50	3	Nil	2-20	1	25% VI 0.1 m	2	Nil	1	5
	153B		1%	1 to 2[3]	4	40-48	3	66	5	Cracking	1.7 – 23.8 nSod topsoil, sSod subsoil	3	Imp	Slow	4	2-15 5-10	3	25-30% 15-150mm	0.4-1.2	4	Lumpy	1	Nil	1	5
	155		1%	1 to 2[3]	4	40-44	3	58	5	Cracking – Hard setting	4.7 nSod	4	Imp	Slow	4	Mod Sub Blocky 2-15	3	1% 2-5 mm	0.3-0.6	1	Nil	1	Nil	1	5
1.08	118	Thalberg (CHAB)	2%	3[3] top - 4 at depth	5	16-29	3	70	5	Crusty	1-5.6 nSod	3	Imp	Slow	4	NA	-	Nil	10-11	2	nil	1	Nil	1	5
	154		3.73%*	3[3]- 4	5	16-29	3	70	5	Firm – Hard setting	1-5.6 nSod	4	Imp	Slow	4	Blocky	2	10% 5-50 mm	10-11	2	Nil	1	Nil	1	5
	156		3.32%*	3[3] - 4	5	16-29	3	40	5	Firm – Hard setting	1-5.6 nSod	4	Imp	Mod	3	Mod blocky	2	Nil	10-11	2	Nil	1	Nil	1	5
	158		4%*	3[3] - 4	5	16-29	3	65	5	Hard setting	1-5.6 nSod	4	Imp	Mod	3	Sub blocky	2	10% 5-20 mm	10-11	2	Nil	1	Nil	1	5
1.09	157	Thalberg	2%	3[4]	5	22	3	-	-	Loose, sandy	3.2 nSod	-	-	Mod rapid	-	Mod	2	Nil	1	1	Nil	1	Nil	1	5
	122		5%	3[4]	5	22	3	-	-	Firm	3.2 nSod	3	Imp	Slow	4	10-20	3	Nil	1	1	Nil	1	Nil	1	5
	106		2%	3[4]	5	22	3	-	-	Trampled	3.2 nSod	3	imp	NA	-	NA		Nil	1	1	nil	1	Nil	1	5
	161		2%	3[4]	5	22	3	-	-	Hard setting, sandy	3.2 nSod	3	imperfect	Slow	4	Mod	2	Nil	1		Nil		Nil	1	5
	109		7%	3[4]	5	22	4	-	-	Trampled	3.2 nSod	3	Imperfect	Slow	4	Mod	2	30%, 2-30mm	1	1	Nil	1	nil	1	5
	110		8%	3[4]	5	22	4	-	-	Trampled – soft	3.2 nSod	3	Imperfect	Slow		NA	-	Nil	1	1	Nil	1	Nil	1	5
	101		6%	3[4]	5	22	4	-	-	Trampled	3.2 nSod	3	imperfect	Slow	4	Mod	2	Nil	1	1	nil	1	Nil	1	5

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

UMA	Location	Soil ASC	E			Es		M		Pm			W			Ps		R			Tm		Da		Overall
			Slope	Aggregate. stability class (disp.)		Clay content (%)		PAWC/ Soil Water (mm)		Surface condition	Exchangeable sodium percentage (ESP %)		Drainage	Permeability		Peds (mm)		Rockiness	Gravel/ Fragments (%)		Gilgai		ASS		
	103		3%	3[4]	5	22	3	-	-	Trampled	3.2 nSod	2	well	Mod	2	Mod	2	Nil	1	1	Nil	1	Nil	1	5
	177		1%	3[4]	4	43	2	-	-	Sandy – Hard setting	5 nSod	3	imperfect	Mod	3	NA	-	Nil	1	1	Nil	1	nil	1	4
	179		1%	3[4]	4	43	2	-	-	trampled	5 nSod	3	imperfect	Mod	3	Mod	2	Nil	1	1	nil	1	Nil	1	4
	176		3%	3[4]	5	18	3	-	-	Firm	3.5 nSod	3	imperfect	Mod	3	NA		Nil	1	1	nil	1	Nil	1	5
	116		7%	3[4]	5	19	4	-	-	Soft – Ant nests	3.5 nSod	2	Well	Rapid	1	10-20	3	Nil	1	1	Nil	1	nil	1	5
	167		<1%	[4]	1	19	2	-	-	Sandy – loose	4.2 nSod	3	imperfect	Slow	3	Mod	3	Nil	1	1	nil	1	nil	1	3
1.10	102	Thalberg (CHAB)	1%	2(1) - 4	5	-	-	80	4	Trampled	nSod topsoil to mSod subsoil	2	Mod well	Mod rapid	1	Mod	2	Nil	NA	1	Nil	1	Nil	1	5
	123		6%	2(1) - 4	5	-	-	80	4	Firm (NA)	nSod topsoil to mSod subsoil	-	-	Mod	-	Mod	2	Nil	NA	1	Nil	1	Nil	1	5
	160		6%	2(1) to 4	5	-	-	89	4	Hard setting, sandy	nSod topsoil to mSod subsoil	3	Imp	Slow	4	Mod	2	Nil	NA	1	Nil	1	Nil	1	5
1.12	142	Isaac	<1%	3[4] to 4	1	32-45	1	61	5	Cracked, slight self mulch	2.9-4 nSod	2	Mod well	Mod	2	5-20 10-30	4	Nil	Nil	1	Nil	1	Nil	1	5
	203		<1%	3[4] to 4	1	52-58	1	120	3	Self mulching/ cracked	1.7 – 6 nSod topsoil to mSod subsoil	3	Imperfect	Slow	4	Mod Sub Blocky	3	Nil	0-0.4	1	Lumpy	1	Nil	1	4
	203B		<1%	3[4] to 4	1	55-63	1	120	3	Self mulching	1.2 – 7.5 nSod topsoil to mSod subsoil	3	Imperfect	Slow	4	Strong Blocky	3	Nil	0-0.4	1	Nil	1	Nil	1	4
1.13	111	Tralee (VE AD)	<1%	4(top) 2[1], to 3[1] (sub)	2	20-31	2	112	3	Self-mulching, cracking	1.8 – 14 nSod topsoil to mSod subsoil	3	Imp	Slow	4	Blocky	1	Nil	NA	1	Nil	1	Nil	1	4
	148		<1%	4(top) 2[1], to 3[1] (sub)	2	20-31	2	38	5	Hardsetting – pedal	3.6 – 26.2 nSod to sSod	2	Mod well	Slow	2	2-5	2	Nil	1-3	1	Nil	1	Nil	1	5
	162		<1%	4	1	29-33	1	52	4	Coarse self mulch	6.2 – 17.2 mSod to sSod	2	Mod well	Mod	2	10-20 20-50	4	Nil	19-21	2	25% VI 0.1 m	1	Nil	1	4
	164		<1%	2(1) to 4	1	29-33	1	120	3	Coarse self mulch	6.2 – 17.2 mSod to sSod	3	Imp	Mod	3	5-10 10-20	3	Nil	19-21	2	Nil	1	Nil	1	4
1.14	102	Thalberg (CH AB)	1%	2(1) to 4	4	NA	-	40	5	Trampled	mSod topsoil to sSod subsoil	3	Mod well	Mod Rapid	1	Nil	1	Nil	NA	1	Nil	1	Nil	1	5

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

UMA	Location	Soil ASC	E			Es		M		Pm			W			Ps		R			Tm		Da		Overall
			Slope	Aggregate. stability class (disp.)		Clay content (%)		PAWC/ Soil Water (mm)		Surface condition	Exchangeable sodium percentage (ESP %)		Drainage	Permeability		Peds (mm)		Rockiness	Gravel/ Fragments (%)		Gilgai		ASS		
	163		3.5%*	2(1) to 4	5	NA	-	40	5	Sandy, hard setting	mSod topsoil to sSod subsoil	3	Imp	Mod	3	NA	-	Nil	NA	1	Nil	1	Nil	1	5
	166		8%	2(1) to 4	5	NA		40	5	Sandy	mSod topsoil to sSod subsoil	3	Mod well	Rapid	1	NA	-	Nil	NA	1	Nil	1	Nil	1	5
1.16	114	Bluchers (VE AD)	<1%	3(1) to 4	4	38-40	2	80	4	Poached and crusty	4.7 – 13.2 nSod topsoil mSod subsoil	3	Imp	slow	4	Mod Sub Blocky	3	nil	0-0.4	1	nil	1	Nil	1	4
	115		1%	3(1) to 4	4	50-59	2	80	4	Crusty, self mulching	3.5 – 18.4 nSod to sSod	-	-	Slow	-	Strong Sub Blocky	3	nil	0.1-0.6	1	nil	1	Nil	1	4
	143		<1%	3(1) to 4	4	52-62	2	83	4	Poached, coarse self mulching	4.5 – 19.7 nSod to sSod	3	Mod well	Mod	2	5-10 5-20	4	nil	0.1-2.3	1	blade ploughed	1	Nil	1	4
1.17	168		<1%	4	1	7-29	1	>120	3	Cracked, hard setting	0.04-0.06 nSod	3	imp	mod	3	10-20	4	20% 5m 0.3m	1-2	4	Nil	1	Nil	1	4
1.19	169	Greycliffe	<1%	4	1	7-29	1	>120	3	Hard Setting	0.04-0.06 nSod	3	imp	slow	4	10-20	4	5% subangular 2-5mm	1-2	1	Nil	1	Nil	1	4
	170		1%	4	1	7-29	1	>120	3	Sandy- hard setting	1.8 – 5.1 nSod	3	imp	Rapid	1	Mod coher	2	-	1-2	1	Nil	1	Nil	1	3
	171		2%	4	2	7-29	1	>120	3	Sandy- hard setting	1.8 – 5.1 nSod	2	Mod well	mod	2	10-20 20-30	4	Nil	1-2	1	Nil	1	Nil	1	4
	172		2%	4	2	7-29	1	>120	3	Cracking/ poached	1.8 – 5.1 nSod	3	Poor	slow	5	10-20 10-50	4	2% 2-5mm	1-2	1	Nil	1	Nil	1	4
	173		3.1%	4	3	33-43	3	65	4	Cracked/ poached	0.8-22.4 nSod to sSod	3	Poor	slow	5	5-10 20-50	4	10% 2-30mm Sub Angular	0.3-1.5	1	50% Melonhole 0.5-1.0m on 20-50m. lumpy	4	Nil	1	5
	174		1%	4	1	33-55	1	-	5	Poached, cracking, trampled	0.8-22.4 nSod to sSod	3	imp	slow	4	5-10 20-50	4	Nil	0.3-1.5	1	2m wide 0.3m deep	2	Nil	1	5
	175		1%	4	1	42-53	1	24	5	Cracking self mulching	5.8-18.2 nSod to sSod	3	imp	Slow	4	5-10 20-50	4	Nil	0-0.5	1	<50% melonhole 0.5-1.5m/ 20-50m	4	Nil	1	5
	175B		3.92%	4	3	43-55	3	12	5	Cracking/ self mulching	4.6-32.7 nSod to sSod	3	Mod well	Mod	2	2-10 5-10	3	25-30%AV-15mm-150mm/rounded Sub angular	0.3-0.9	1	20%, 3m/5-10m	1	Nil	1	5

Notes:

1. *measured using dumpy level
2. Ped size (Ps) for top 30cm of soil used in classification
3. Shaded cells represent land suitability class (refer to Section 8.2 of the main report for a description): 1, 2, 3, 4, 5

E Water erosion; Es Subsoil erosion; M Soil water availability; Pm Narrow moisture range; W Wetness; Ps Surface condition; R Rockiness; Tm Microrelief; Da Acid drainage water hazard actual (from *Regional Land Suitability Frameworks for Queensland,* (DNRM & DSITIA 2013).

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

APPENDIX A: QUALITY ASSURANCE AND QUALITY CONTROL

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

Table 3: Field intra and inter duplicate results Soil Analysis

Analyte	LOR	B141 (0.55-0.65)	BD1	SD1	RPD1	RPD2	Criteria	B141 (0.8-0.9)	BD2	SD2	RPD1	RPD2	Criteria
pH	0.1	8.6	8.3	8.5	3%	1%	<50%	8.94	8.9	8.7	1%	2%	<50%
COND.	0.1	0.1	0.083	0.17	19%	52%	No Limit	0.198	0.144	0.22	32%	42%	No Limit
Cl	5	40.9	117	15	96%	93%	<80%	101	134	50	28%	91%	<50%
CEC	0.1	53.2	52.82	22	1%	83%	<50%	56.71	55.18	22.7	3%	83%	<50%
Ex Na	0.01	3.15	2.61	1.45	19%	74%	<50%	5.29	4.48	2.7	17%	65%	<50%
Ex K	0.01	1	0.96	0.22	4%	128%	<50%	0.87	0.87	0.26	0%	108%	<50%
Ex Ca	0.01	37.55	37.95	17.1	1%	75%	<50%	37.79	37.72	16.2	0%	80%	<50%
Ex Mg	0.01	11.54	11.3	5.1	2%	77%	<50%	12.77	12.12	5.6	5%	78%	<50%

Note(s):

1. LOR - level of reporting; RPD - relative percentage difference; Red values exceed the RPD criterion;
2. Screening values for RPDs – 50% for inorganic analytes, 80% where values between 5x and 10x LOR, no limit where values <5xLOR.

Table 4: Field intra duplicate results Grain Size Analysis

Analyte	LOR	B141 (0.55-0.65)	BD1	RPD1	Criteria	B141 (0.8-0.9)	BD2	RPD1	Criteria	BH131 (0.8-0.9)	BD3	RPD1	Criteria
Gravel	NA	0	0.0	0%	100%	0	0.2	200%	100%	0.2	0.2	0%	100%
Sand	NA	10.4	15	36%	100%	9.1	10.4	13%	100%	15.7	15.5	1%	100%
Silt	NA	13.1	11.4	14%	100%	17.2	13.5	24%	100%	20.7	19.7	5%	100%
Clay	NA	76.5	73.6	4%	100%	73.6	76.1	3%	100%	63.7	64.8	2%	100%

Analyte	LOR	B129 (0.55-0.65)	BD4	RPD1	Criteria	B173 (0.55-0.65)	BD5	RPD1	Criteria
Gravel	NA	1.8	2	11%	100%	0.2	0.2	0%	100%
Sand	NA	22.5	32.7	37%	100%	15.7	15.5	1%	100%
Silt	NA	24.9	18.9	27%	100%	20.7	19.7	5%	100%
Clay	NA	52.6	48.5	8%	100%	63.7	64.8	2%	100%

Note(s):

3. LOR - level of reporting; RPD - relative percentage difference; Red values exceed the RPD criterion;
4. Screening values for RPDs – 50% for inorganic analytes, 80% where values between 5x and 10x LOR, no limit where values <5xLOR.

APPENDIX B: LABORATORY TRANSCRIPTS AND CHAIN OF CUSTODY DOCUMENTATION

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 718107 Laboratory: EAL Kismore

Project Manager: MCK Sampler: MCK Site Location: Boralaba Sheet: 1 of 6

No. of samples	Sample ID/ Depth	Anticipated Result (PID/EC reading)	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: Hydrometer PSA	pH, Cl, CEC	CEC											Sample-specific instructions/ notes
																					MISC1 - Extra Sieving - See notes
1	BH139/0.0-0.1		25/03		X			X													SS-SING-038
2	" /0.25-0.35		"		X			X													SS-SING-012
3	" /0.55-0.65		"		X			X													SS-PACK-010
4	" /0.8-0.9		"		X			X													SS-PACK-041
5	BH137/0.0-0.1		26/03		X			X													
6	" /0.1-0.2		"		X			X			1										
7	" /0.55-0.65		"		X			X													
8	" /0.8-0.9		"		X			X													
9	BH05/0.0-0.1		"		X			X													
10	" /0.25-0.35		"		X			X													
11	" /0.55-0.65		"		X			X													
12	" /0.8-0.9		"		X			X													
13	BH128/0.0-0.1		"		X			X	X												
14	" /0.25-0.35		"		X			X	X												
15	" /0.55-0.65		"		X			X	X												
16	" /0.8-0.9		"		X			X	X												
17	BH129/0.0-0.1		"		X			X													
18	" /0.25-0.35		"		X			X													
19	" /0.55-0.65		"		X			X	X												
20	" /0.8-0.9		"		X			X													
	TOTAL				20			20	6												

Turn Around *(circle)*: NORMAL / 3 DAYS / 48 HRS / 24 HRS *(confirm with lab in advance if quick turn-around is required)*

Lab Quotation No. *(if applicable)*:

Comments/ Instructions:
- PSA <0.002mm (clay), <0.02mm (silt), <2mm (sand), >2mm (fine gravel + coarse gravel)
- CEC = SS-Pack-041
- Cl + (pH + EC (1:5 water))

Send report to *(email address)*: mhowalczyk@eesigroup.com

Cc: report to *(email address)*:

Cc: invoice to *(email address)*: accounts@eesigroup.com

	Name	Signature	Date	Time
Sent off Site/Office by:	Michael H		24/03/19	
Receiving Lab:			03/04/19	
Receiving Lab:				

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED
Phone: (07) 3852 6666
Fax: (07) 3852 5666
PO Box: 3297, Newstead QLD 4006
Email: [redacted]

ID 368 x 101 soil

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Project Manager: MeK   Sampler: MeK   Job No: 718107   Laboratory: EAL

Site Location: Boradaba   Sheet: 2 of 6

No. of samples	Sample ID/ Depth	Anticipated Result (PID/EC reading)	Date sampled	Time sampled	Soil	Water	Sediment	Hydrometer PSA	pH+Cl+CEC+	EC
21	BH203B/0.0-0.1	-	25/03		X			X	X	
22	" /0.25-0.35	-	"		X			X	X	
23	" /0.55-0.65	-	"		X			X	X	
24	" /0.8-0.9	-	"		X			X	X	
25	BH203/0.0-0.1	-	"		X			X	X	
26	" /0.25-0.35	-	"		X			X	X	
27	" /0.55-0.65	-	"		X			X	X	
28	" /0.8-0.9	-	"		X			X	X	
29	BH201/0.0-0.1	-	"		X			X	X	
30	" /0.25-0.35	-	"		X			X	X	
31	" /0.55-0.65	-	"		X			X	X	
32	" /0.8-0.9	-	"		X			X	X	
33	BH141/0.0-0.1	-	"		X			X	X	
34	" /0.25-0.35	-	"		X			X	X	
35	" /0.55-0.65	-	"		X			X	X	
36	" /0.8-0.9	-	"		X			X	X	
37	BH140/0.0-0.1	-	"		X			X		
38	" /0.25-0.35	-	"		X			X		
39	" /0.55-0.65	-	"		X			X		
40	" /0.8-0.9	-	"		X			X		
	TOTAL				20			20	16	

Turn Around (circle): (NORMAL) / 3 DAYS / 48 HRS / 24 HRS (confirm with lab in advance if quick turn-around is required)

Comments/ Instructions: see page 1

Lab Quotation No. (if applicable):

Send report to (email address): mkowalczyk@eesigroup.com

Cc: report to (email address):

Cc: invoice to (email address): accounts@eesigroup.com

	Name	Signature	Date	Time
Sent off Site/Office by:	Michael K	[signature]	29/03/19	
Receiving Lab:				
Receiving Lab:				

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED
Phone: (07) 3852 6666
Fax: (07) 3852 5666
PO Box: 3207, Newstead QLD 4006
Email: eesQLD@eesigroup.com

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 718107

Laboratory: EAL

Project Manager: MCK

Sampler: MCK

Site Location: Baralaba

Sheet: 3 of 6

No. of samples	Sample ID/ Depth	Anticipated Result (PID)/EC reading	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: Hydrometer PSA	pH+CL+CEC+	EC
41	BH29B/0.0-0.1	-	26/03		X			X	X	✓
42	" /0.25-0.65	-	"		X			X	X	✓
43	" /0.55-0.65	-	"		X			X	X	✓
44	" /0.8-0.9	-	"		X			X	X	✓
45	BH26/0.0-0.1	-	"		X			X		✓
46	" /0.25-0.35	-	"		X			X		✓
47	" /0.55-0.65	-	"		X			X		✓
48	" /0.8-0.9	-	"		X			X		✓
49	BH34/0.0-0.1	-	26/03		X			X		✓
50	" /0.25-0.35	-	"		X			X		✓
51	" /0.55-0.65	-	"		X			X		✓
52	" /0.8-0.9	-	"		X			X		✓
53	BH53B/0.0-0.1	-	"		X			X	X	✓
54	" /0.25-0.35	-	"		X			X	X	✓
55	" /0.55-0.65	-	"		X			X	X	✓
56	" /0.8-0.9	-	"		X			X	X	✓
57	BH55/0.0-0.1	-	27/03		X			X		✓
58	" /0.25-0.35	-	"		X			X		✓
59	" /0.55-0.65	-	"		X			X		✓
60	" /0.8-0.9	-	"		X			X		✓
	TOTAL				20			20	8	✓

Sample-specific instructions/ notes:

Turn Around (circle): ~~NORMAL / 5~~ DAYS / 48 HRS / 24 HRS (confirm with lab in advance if quick turn-around is required)

Comments/ Instructions: See page 1

Lab Quotation No. (if applicable):

Send report to (email address):

Cc: report to (email address): mkowalczyk@eesigroup.com

Cc: invoice to (email address): accounts@eesigroup.com

	Name	Signature	Date	Time
Sent off Site/Office by:	Michael K	[signature]	29/03/19	
Receiving Lab:				
Receiving Lab:				

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Email: eesi@eesigroup.com

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 718107 Laboratory: EAL

Project Manager: MCK Sampler: MCK Site Location: Barabba Sheet: 4 of 6

No. of samples	Sample ID/ Depth	Anticipated Result (PID)/EC reading	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: Hydrometer PSA	pH+Cl+CEC+EC												Sample-specific instructions/ notes
61	BH143/0.0-0.1		25/03		X			X	X												
62	" /0.25-0.35		"		X			X	X												
63	" /0.55-0.65		"		X			X	X												
64	" /0.8-0.9		"		X			X	X												
65	BH115/0.0-0.1		"		X			X													
66	" /0.25-0.35		"		X			X													
67	" /0.55-0.65		"		X			X													
68	" /0.8-0.9		"		X			X													
69	BH114/0.0-0.1		"		X			X	X												
70	" /0.25-0.35		"		X			X	X												
71	" /0.55-0.65		"		X			X	X												
72	" /0.8-0.9		"		X			X	X												
73	BH111/0.0-0.1		"		X			X	X												
74	" /0.25-0.35		"		X			X	X												
75	" /0.55-0.65		"		X			X	X												
76	" /0.8-0.9		"		X			X	X												
77	BH142/0.0-0.1		"		X			X	X												
78	" /0.25-0.35		"		X			X	X												
79	" /0.55-0.65		"		X			X	X												
	TOTAL				19			19	15												

Turn Around (circle): NORMAL / 3 DAYS / 48 HRS / 24 HRS (confirm with lab in advance if quick turn-around is required)

Comments/ Instructions: see page 1

	Name	Signature	Date	Time
Sent off Site/Office by:	Michael K	[signature]	29/03/19	
Receiving Lab:				
Receiving Lab:				

Lab Quotation No. (if applicable):

Send report to (email address): mkowalczyk@eesigroup.com

Cc: report to (email address):

Cc: invoice to (email address): accounts@eesigroup.com

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Email: eesQLD@eesigroup.com

CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 718107 Laboratory: EAL

Project Manager: MCL Sampler: MCL Site Location: Barcaldine Sheet: 5 of 6

No. of samples	Sample ID/ Depth	Anticipated flowsplit (PID)/EC reading	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: Hydrocarbons PSA	pH, Cl, CSC	± EC	Sample-specific instructions/ notes
80	BH121/0.0-0.1		27/03		X			X		✓	
81	" 0.25-0.35		"		X			X		✓	
82	" 0.55-0.65		"		X			X		✓	
83	" 0.8-0.9		"		X			X		✓	
84	BH175/0.0-0.1		"		X			X	X	✓	
85	" 0.25-0.35		"		X			X	X	✓	
86	" 0.55-0.65		"		X			X	X	✓	
87	" 0.8-0.9		"		X			X	X	✓	
88	BH175B/0.0-0.1		"		X			X	X	✓	
89	" 0.25-0.35		"		X			X	X	✓	
90	" 0.55-0.65		"		X			X	X	✓	
91	" 0.8-0.9		"		X			X	X	✓	
92	BH173/0.0-0.1		"		X			X	X	✓	
93	" 0.25-0.35		"		X			X	X	✓	
94	" 0.55-0.65		"		X			X	X	✓	
95	" 0.8-0.9		"		X			X	X	✓	
	[illegible]										
	TOTAL				16			16	12		

Turn Around *(circle)*: (NORMAL) / 3 DAYS / 48 HRS / 24 HRS *(confirm with lab in advance if quick turn-around is required)*

Lab Quotation No. *(if applicable)*:

Comments/ Instructions: See page 1

Send report to *(email address)*: mkowalczyk@eesgroup.com

Cc: report to *(email address)*:

Cc: invoice to *(email address)*: accounts@eesgroup.com

	Name	Signature	Date	Time
Sent off Site/Office by:	Michael K		29/05/19	
Receiving Lab:				
Receiving Lab:				

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CHAIN OF CUSTODY - ANALYSIS REQUEST FORM

Job No: 718107 Laboratory: EAL

Project Manager: MCK Sampler: MCK Site Location: Bundaberg Sheet 6 of 6

No. of samples	Sample ID/ Depth	Anticipated Result (PID)/EC reading	Date sampled	Time sampled	Sample Matrix: Soil	Water	Sediment	Analysis Required: Hydrocarbons PSA	pH+Cl+EC	EC	Put on Hold										Sample-specific instructions/ notes
96	BD1	-	-		X			X	X												
97	BD2	-	-		X			X	X												
98	BD3	-	-		X			X	X												
99	BD4	-	-		X			X													
100	BD5	-	-		X			X													
101	BD6	-	-		X						X										
	TOTAL				6			5	3	1											

Turn Around *(circle)*: **NORMAL / 3 DAYS / 48 HRS / 24 HRS** *(confirm with lab in advance if quick turn-around is required)*

Lab Quotation No. *(if applicable)*:

Comments/ Instructions: see page 1

Send report to *(email address)*: bhawkeye@eesigroup.com

Cc: report to *(email address)*:

Cc: invoice to *(email address)*: accounts@eesigroup.com

	Name	Signature	Date	Time
Sent off Site/Office by:	Mdavid K		14/08/19	
Receiving Lab:				
Receiving Lab:				

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Environmental Analysis Laboratory

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E: eal@scu.edu.au
www.scu.edu.au/eal
ABN: 41 995 651 524

Sample Receipt Notification (SRN)

Project: **EAL/I0368**
Customer: Environmental Earth Sciences (QLD)
Contact: Michael Kowalczyk
Client Job ID: 718107
No. of Samples 101 x Soil
Date Received: 04 APR 2019
Comments: Standard Request

Biller: **Environmental Earth Sciences (QLD) -** Accounts Payable

		Test Request				
Sample Text ID	**Client Sample ID**	Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
I0368/001	BH139/0.0-0.1	0	0	0	1	0
I0368/002	BH139/0.25-0.35	0	0	0	1	0
I0368/003	BH139/0.55-0.65	0	0	0	1	0

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ABN: 41 995 651 524

Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/004	BH139/0.8-0.9	0	0	0	1	0
I0368/005	BH131/0.0-0.1	0	0	0	1	0
I0368/006	BH131/0.1-0.2	0	0	0	1	0
I0368/007	BH131/0.55-0.65	0	0	0	1	0
I0368/008	BH131/0.8-0.9	0	0	0	1	0
I0368/009	BH105/0.0-0.1	0	0	0	1	0
I0368/010	BH105/0.25-0.35	0	0	0	1	0
I0368/011	BH105/0.55-0.65	0	0	0	1	0
I0368/012	BH105/0.8-0.9	0	0	0	1	0
I0368/013	BH128/0.0-0.1	0	1	1	1	1

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Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/014	BH128/0.25-0.35	0	1	1	1	1
I0368/015	BH128/0.55-0.65	0	1	1	1	1
I0368/016	BH128/0.8-0.9	0	1	1	1	1
I0368/017	BH129/0.0-0.1	0	0	0	1	0
I0368/018	BH129/0.25-0.35	0	0	0	1	0
I0368/019	BH129/0.55-0.65	0	1	1	1	1
I0368/020	BH129/0.8-0.9	0	0	0	1	0
I0368/021	BH203B/0.0-0.1	0	1	1	1	1
I0368/022	BH203B/0.25-0.35	0	1	1	1	1
I0368/023	BH203B/0.55-0.65	0	1	1	1	1

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Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/024	BH201B/0.8-0.9	0	1	1	1	1
I0368/025	BH203/0.0-0.1	0	1	1	1	1
I0368/026	BH203/0.25-0.35	0	1	1	1	1
I0368/027	BH203/0.55-0.65	0	1	1	1	1
I0368/028	BH203/0.8-0.9	0	1	1	1	1
I0368/029	BH201/0.0-0.1	0	1	1	1	1
I0368/030	BH201/0.25-0.35	0	1	1	1	1
I0368/031	BH201/0.55-0.65	0	1	1	1	1
I0368/032	BH201/0.8-0.9	0	1	1	1	1
I0368/033	BH141/0.0-0.1	0	1	1	1	1

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Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/034	BH141/0.25-0.35	0	1	1	1	1
I0368/035	BH141/0.55-0.65	0	1	1	1	1
I0368/036	BH141/0.8-0.9	0	1	1	1	1
I0368/037	BH140/0.0-0.1	0	0	0	1	0
I0368/038	BH140/0.25-0.35	0	0	0	1	0
I0368/039	BH140/0.55-0.65	0	0	0	1	0
I0368/040	BH140/0.8-0.9	0	0	0	1	0
I0368/041	BH129B/0.0-0.1	0	1	1	1	1
I0368/042	BH129B/0.25-0.65	0	1	1	1	1
I0368/043	BH129B/0.55-0.65	0	1	1	1	1

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ABN: 41 995 651 524

Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/044	BH129B/0.8-0.9	0	1	1	1	1
I0368/045	BH126/0.0-0.1	0	0	0	1	0
I0368/046	BH126/0.25-0.35	0	0	0	1	0
I0368/047	BH126/0.55-0.65	0	0	0	1	0
I0368/048	BH126/0.8-0.9	0	0	0	1	0
I0368/049	BH134/0.0-0.1	0	0	0	1	0
I0368/050	BH134/0.25-0.35	0	0	0	1	0
I0368/051	BH134/0.55-0.65	0	0	0	1	0
I0368/052	BH134/0.8-0.9	0	0	0	1	0
I0368/053	BH153B/0.0-0.1	0	1	1	1	1

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Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/054	BH153B/0.25-0.35	0	1	1	1	1
I0368/055	BH153B/0.55-0.65	0	1	1	1	1
I0368/056	BH153B/0.8-0.9	0	1	1	1	1
I0368/057	BH155/0.0-0.1	0	0	0	1	0
I0368/058	BH155/0.25-0.35	0	0	0	1	0
I0368/059	BH155/0.55-0.65	0	0	0	1	0
I0368/060	BH155/0.8-0.9	0	0	0	1	0
I0368/061	BH143/0.0-0.1	0	1	1	1	1
I0368/062	BH143/0.25-0.35	0	1	1	1	1
I0368/063	BH143/0.55-0.65	0	1	1	1	1

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ABN: 41 995 651 524

Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/064	BH143/0.8-0.9	0	1	1	1	1
I0368/065	BH115/0.0-0.1	0	0	0	1	0
I0368/066	BH115/0.25-0.35	0	0	0	1	0
I0368/067	BH115/0.55-0.65	0	0	0	1	0
I0368/068	BH115/0.8-0.9	0	0	0	1	0
I0368/069	BH114/0.0-0.1	0	1	1	1	1
I0368/070	BH114/0.25-0.35	0	1	1	1	1
I0368/071	BH114/0.55-0.65	0	1	1	1	1
I0368/072	BH114/0.8-0.9	0	1	1	1	1
I0368/073	BH111/0.0-0.1	0	1	1	1	1

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ABN: 41 995 651 524

Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/074	BH111/0.25-0.35	0	1	1	1	1
I0368/075	BH111/0.55-0.65	0	1	1	1	1
I0368/076	BH111/0.8-0.9	0	1	1	1	1
I0368/077	BH142/0.0-0.1	0	1	1	1	1
I0368/078	BH142/0.25-0.35	0	1	1	1	1
I0368/079	BH142/0.55-0.65	0	1	1	1	1
I0368/080	BH121/0.0-0.1	0	0	0	1	0
I0368/081	BH121/0.25-0.35	0	0	0	1	0
I0368/082	BH121/0.55-0.65	0	0	0	1	0
I0368/083	BH121/0.8-0.9	0	0	0	1	0

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Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/084	BH175/0.0-0.1	0	1	1	1	1
I0368/085	BH175/0.25-0.35	0	1	1	1	1
I0368/086	BH175/0.55-0.65	0	1	1	1	1
I0368/087	BH175/0.8-0.9	0	1	1	1	1
I0368/088	BH175B/0.0-0.1	0	1	1	1	1
I0368/089	BH175B0.25-0.35	0	1	1	1	1
I0368/090	BH175B/0.55-0.65	0	1	1	1	1
I0368/091	BH175B/0.8-0.9	0	1	1	1	1
I0368/092	BH173/0.0-0.1	0	1	1	1	1
I0368/093	BH173/0.25-0.35	0	1	1	1	1

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Sample Receipt Notification (SRN) for EAL/I0368

		_STORED	SS-PACK-010	SS-PACK-041	SS-SING-012	SS-SING-038
		Sample Stored	pH and EC	Exchangeable Cations - 15D3 - 1M NH4OAc	Particle Size Analysis - Hydrometer	Available Chloride
I0368/094	BH173/0.55-0.65	0	1	1	1	1
I0368/095	BH173/0.8-0.9	0	1	1	1	1
I0368/096	BD1	0	1	1	1	1
I0368/097	BD2	0	1	1	1	1
I0368/098	BD3	0	1	1	1	1
I0368/099	BD4	0	0	0	1	0
I0368/100	BD5	0	0	0	1	0
I0368/101	BD6	1	0	0	0	0
Total		1	59	59	100	59

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Sample Receipt Notification (SRN) for EAL/I0368

Test Descriptions

Test List Item	Item Description
SS-SING-038	**Available Chloride** Includes water extract
_STORED	**Sample Stored**
SS-PACK-010	**pH and EC** Dry and Grind pH (water), EC
SS-PACK-041	**Exchangeable Cations - 15D3 - 1M NH4OAc** Dry and Grind 1M NH4OAc at pH 7.0 (Na, K, Ca, Mg, CEC, ESP) No pre-treatment for soluble salts
SS-SING-012	**Particle Size Analysis - Hydrometer** Particle size of sediments and soils by hydrometer for fractions > 2 mm, > 50 µm, > 20 µm, 2 - 20 µm, < 2 µm. Includes moisture, may include drying.

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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368

Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

		Sample ID:	Sample 13 BH128/0.0-0.1	Sample 14 BH128/0.25-0.35	Sample 15 BH128/0.55-0.65	Sample 16 BH128/0.8-0.9	Sample 19 BH129/0.55-0.65	Sample 21 BH203B/0.0-0.1
		Crop:	N/G	N/G	N/G	N/G	N/G	N/G
		Client:	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba
	Parameter	Method reference	I0368/13	I0368/14	I0368/15	I0368/16	I0368/19	I0368/21
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.85	8.86	8.82	8.94	8.55	6.76
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.162	0.348	0.586	0.568	0.607	0.082
	Exchangeable Calcium (cmol$_+$/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	36.46	31.55	25.64	24.49	17.44	24.02
	Exchangeable Calcium (kg/ha)		16369	14162	11508	10993	7830	10784
	Exchangeable Calcium (mg/kg)		7307	6322	5137	4907	3495	4814
	Exchangeable Magnesium (cmol$_+$/kg)		10.65	12.07	12.64	11.13	11.34	9.06
	Exchangeable Magnesium (kg/ha)		2900	3285	3442	3029	3088	2467
	Exchangeable Magnesium (mg/kg)		1294	1466	1536	1352	1378	1101
	Exchangeable Potassium (cmol$_+$/kg)		0.69	0.62	0.61	0.54	0.45	1.59
	Exchangeable Potassium (kg/ha)		602	544	532	470	392	1396
	Exchangeable Potassium (mg/kg)		269	243	238	210	175	623
	Exchangeable Sodium (cmol$_+$/kg)		2.21	4.44	6.80	6.43	5.56	0.44
	Exchangeable Sodium (kg/ha)		1141	2285	3503	3313	2863	225
	Exchangeable Sodium (mg/kg)		509	1020	1564	1479	1278	100
	Effective Cation Exchange Capacity (ECEC) (cmol$_+$/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol$_+$/kg)	50.02	48.67	45.69	42.59	34.79	35.12
	Calcium (%)	**Base Saturation Calculations - Cation cmol$_+$/kg / ECEC x 100	72.9	64.8	56.1	57.5	50.1	68.4
	Magnesium (%)		21.3	24.8	27.7	26.1	32.6	25.8
	Potassium (%)		1.4	1.3	1.3	1.3	1.3	4.5
	Sodium - ESP (%)		4.4	9.1	14.9	15.1	16.0	1.2
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol$_+$/kg)	3.4	2.6	2.0	2.2	1.5	2.7
	Chloride (mg/kg)	**Rayment & Lyons 2011 - 5A3a	35	290	632	589	769	55

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil results'.
10. Conversions for 1 cmol$_+$/kg = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimate
13. ** NATA accreditation does not cover the performance of this service.
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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368
Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

	Parameter		Method reference	Sample 22 BH203B/0.25-0.35	Sample 23 BH203B/0.55-0.65	Sample 24 BH201B/0.8-0.9	Sample 25 BH203/0.0-0.1	Sample 26 BH203/0.25-0.35	Sample 27 BH203/0.55-0.65
	Sample ID:								
	Crop:			N/G	N/G	N/G	N/G	N/G	N/G
	Client:			Boralaba	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba
				I0368/22	I0368/23	I0368/24	I0368/25	I0368/26	I0368/27
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.47	8.49	8.40	6.60	7.05	7.67
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.058	0.356	0.442	0.087	0.062	0.076
	Exchangeable Calcium	($cmol_+/kg$)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	25.72	29.48	28.13	23.25	24.23	25.52
		(kg/ha)		11544	13233	12628	10437	10876	11456
		(mg/kg)		5153	5907	5637	4659	4855	5114
	Exchangeable Magnesium	($cmol_+/kg$)		9.66	10.95	11.07	9.66	10.42	10.67
		(kg/ha)		2629	2980	3014	2629	2837	2904
		(mg/kg)		1173	1330	1345	1173	1266	1296
	Exchangeable Potassium	($cmol_+/kg$)		1.27	0.92	0.86	1.49	1.14	0.84
		(kg/ha)		1115	807	752	1301	997	739
		(mg/kg)		498	360	336	581	445	330
	Exchangeable Sodium	($cmol_+/kg$)		0.79	2.80	3.28	0.62	0.89	1.53
		(kg/ha)		409	1441	1691	319	459	787
		(mg/kg)		183	644	755	142	205	351
	Effective Cation Exchange Capacity (ECEC) ($cmol_+/kg$)		**Calculation: Sum of Ca,Mg,K,Na,Al,H ($cmol_+/kg$)	37.44	44.15	43.34	35.01	36.68	38.56
	Calcium (%)		**Base Saturation Calculations - Cation $cmol_+/kg$ / ECEC x 100	68.7	66.8	64.9	66.4	66.1	66.2
	Magnesium (%)			25.8	24.8	25.5	27.6	28.4	27.7
	Potassium (%)			3.4	2.1	2.0	4.2	3.1	2.2
	Sodium - ESP (%)			2.1	6.3	7.6	1.8	2.4	4.0
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium ($cmol_+/kg$)	2.7	2.7	2.5	2.4	2.3	2.4
	Chloride (mg/kg)		**Rayment & Lyons 2011 - 5A3a	58	324	536	105	113	96

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil results
10. Conversions for 1 $cmol_+/kg$ = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368
Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

			Sample 28	Sample 29	Sample 30	Sample 31	Sample 32	Sample 33
		Sample ID:	BH203/0.8-0.9	BH201/0.0-0.1	BH201/0.25-0.35	BH201/0.55-0.65	BH201/0.8-0.9	BH141/0.0-0.1
		Crop:	N/G	N/G	N/G	N/G	N/G	N/G
		Client:	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba
	Parameter	Method reference	I0368/28	I0368/29	I0368/30	I0368/31	I0368/32	I0368/33
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.13	6.50	6.79	7.76	8.41	7.53
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.136	0.938	0.479	0.501	0.600	0.116
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	25.89	21.81	24.63	32.04	35.91	40.80
	Exchangeable Calcium (kg/ha)		11622	9790	11058	14384	16120	18315
	Exchangeable Calcium (mg/kg)		5188	4370	4936	6421	7196	8176
	Exchangeable Magnesium (cmol+/kg)		10.92	8.94	9.06	9.92	10.51	11.14
	Exchangeable Magnesium (kg/ha)		2973	2434	2467	2700	2861	3034
	Exchangeable Magnesium (mg/kg)		1327	1086	1101	1205	1277	1354
	Exchangeable Potassium (cmol+/kg)		0.69	8.49	4.45	2.26	0.74	1.49
	Exchangeable Potassium (kg/ha)		605	7437	3897	1983	649	1305
	Exchangeable Potassium (mg/kg)		270	3320	1740	885	290	583
	Exchangeable Sodium (cmol+/kg)		2.40	1.72	1.20	1.99	3.91	1.32
	Exchangeable Sodium (kg/ha)		1238	885	617	1024	2012	678
	Exchangeable Sodium (mg/kg)		553	395	275	457	898	303
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	39.91	40.96	39.34	46.21	51.07	54.75
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	64.9	53.2	62.6	69.3	70.3	74.5
	Magnesium (%)		27.4	21.8	23.0	21.5	20.6	20.4
	Potassium (%)		1.7	20.7	11.3	4.9	1.5	2.7
	Sodium - ESP (%)		6.0	4.2	3.0	4.3	7.6	2.4
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	2.4	2.4	2.7	3.2	3.4	3.7
	Chloride (mg/kg)	**Rayment & Lyons 2011 - 5A3a	191	656	251	349	737	86

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368
Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

	Parameter		Method reference	Sample 34 BH141/0.25-0.35	Sample 35 BH141/0.55-0.65	Sample 36 BH141/0.8-0.9	Sample 41 BH129B/0.0-0.1	Sample 42 BH129B/0.25-0.65	Sample 43 BH129B/0.55-0.65
	Sample ID:			BH141/0.25-0.35	BH141/0.55-0.65	BH141/0.8-0.9	BH129B/0.0-0.1	BH129B/0.25-0.65	BH129B/0.55-0.65
	Crop:			N/G	N/G	N/G	N/G	N/G	N/G
	Client:			Boralaba	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba
	Lab No.			I0368/34	I0368/35	I0368/36	I0368/41	I0368/42	I0368/43
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.12	8.57	8.94	6.80	7.44	8.57
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.074	0.102	0.198	0.058	0.184	0.452
	Exchangeable Calcium	($cmol_+/kg$)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	41.46	37.55	37.79	15.87	23.41	30.54
		(kg/ha)		18611	16855	16962	7124	10506	13707
		(mg/kg)		8308	7524	7572	3180	4690	6119
	Exchangeable Magnesium	($cmol_+/kg$)		11.21	11.54	12.77	8.13	12.97	14.04
		(kg/ha)		3052	3141	3475	2213	3531	3822
		(mg/kg)		1362	1402	1551	988	1576	1706
	Exchangeable Potassium	($cmol_+/kg$)		1.12	1.00	0.87	0.73	0.59	0.54
		(kg/ha)		983	874	758	640	518	470
		(mg/kg)		439	390	338	286	231	210
	Exchangeable Sodium	($cmol_+/kg$)		1.99	3.15	5.29	1.64	4.07	5.64
		(kg/ha)		1025	1624	2726	845	2098	2903
		(mg/kg)		458	725	1217	377	937	1296
	Effective Cation Exchange Capacity (ECEC) ($cmol_+/kg$)		**Calculation: Sum of Ca,Mg,K,Na,Al,H ($cmol_+/kg$)	55.78	53.24	56.71	26.37	41.04	50.75
	Calcium (%)		**Base Saturation Calculations - Cation $cmol_+/kg$ / ECEC x 100	74.3	70.5	66.6	60.2	57.0	60.2
	Magnesium (%)			20.1	21.7	22.5	30.8	31.6	27.7
	Potassium (%)			2.0	1.9	1.5	2.8	1.4	1.1
	Sodium - ESP (%)			3.6	5.9	9.3	6.2	9.9	11.1
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium ($cmol_+/kg$)	3.7	3.3	3.0	2.0	1.8	2.2
	Chloride (mg/kg)		**Rayment & Lyons 2011 - 5A3a	32	41	101	124	327	565

Notes:

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2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368
Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

	Parameter		Method reference	Sample 44 BH129B/0.8-0.9 N/G Boralaba I0368/44	Sample 53 BH153B/0.0-0.1 N/G Boralaba I0368/53	Sample 54 BH153B/0.25-0.35 N/G Boralaba I0368/54	Sample 55 BH153B/0.55-0.65 N/G Boralaba I0368/55	Sample 56 BH153B/0.8-0.9 N/G Boralaba I0368/56	Sample 61 BH143/0.0-0.1 N/G Boralaba I0368/61
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.79	7.82	8.88	8.85	8.70	8.97
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.487	0.079	0.179	0.792	0.932	0.322
	Exchangeable Calcium	($cmol_+/kg$)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	31.53	20.73	30.57	21.58	21.04	31.81
		(kg/ha)		14155	9304	13721	9687	9447	14281
		(mg/kg)		6319	4153	6125	4324	4217	6375
	Exchangeable Magnesium	($cmol_+/kg$)		12.21	6.61	7.16	8.16	8.91	12.40
		(kg/ha)		3323	1799	1948	2222	2425	3374
		(mg/kg)		1483	803	870	992	1082	1506
	Exchangeable Potassium	($cmol_+/kg$)		0.52	0.91	0.47	0.41	0.44	0.58
		(kg/ha)		453	800	411	360	384	511
		(mg/kg)		202	357	184	161	172	228
	Exchangeable Sodium	($cmol_+/kg$)		5.35	0.51	2.25	8.47	9.51	5.12
		(kg/ha)		2755	262	1159	4364	4897	2634
		(mg/kg)		1230	117	517	1948	2186	1176
	Effective Cation Exchange Capacity (ECEC) ($cmol_+/kg$)		**Calculation: Sum of Ca,Mg,K,Na,Al,H ($cmol_+/kg$)	49.61	28.76	40.44	38.62	39.90	49.91
	Calcium (%)		**Base Saturation Calculations - Cation $cmol_+/kg$ / ECEC x 100	63.6	72.1	75.6	55.9	52.7	63.7
	Magnesium (%)			24.6	23.0	17.7	21.1	22.3	24.8
	Potassium (%)			1.0	3.2	1.2	1.1	1.1	1.2
	Sodium - ESP (%)			10.8	1.8	5.6	21.9	23.8	10.2
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium ($cmol_+/kg$)	2.6	3.1	4.3	2.6	2.4	2.6
	Chloride (mg/kg)		**Rayment & Lyons 2011 - 5A3a	622	33	59	786	1034	208

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil results
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11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimate
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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368
Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

	Parameter		Method reference	Sample 62 BH143/0.25-0.35	Sample 63 BH143/0.55-0.65	Sample 64 BH143/0.8-0.9	Sample 69 BH114/0.0-0.1	Sample 70 BH114/0.25-0.35	Sample 71 BH114/0.55-0.65
	Sample ID:			BH143/0.25-0.35	BH143/0.55-0.65	BH143/0.8-0.9	BH114/0.0-0.1	BH114/0.25-0.35	BH114/0.55-0.65
	Crop:			N/G	N/G	N/G	N/G	N/G	N/G
	Client:			Boralaba	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba
	Parameter		Method reference	I0368/62	I0368/63	I0368/64	I0368/69	I0368/70	I0368/71
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.81	8.89	8.77	8.39	8.36	8.94
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.187	0.592	0.840	0.075	0.066	0.172
	Exchangeable Calcium	($cmol_+/kg$)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	35.07	28.29	25.26	22.31	22.06	22.03
		(kg/ha)		15741	12699	11338	10014	9902	9890
		(mg/kg)		7027	5669	5061	4470	4420	4415
	Exchangeable Magnesium	($cmol_+/kg$)		10.39	13.00	13.28	5.78	5.89	6.91
		(kg/ha)		2828	3538	3614	1575	1603	1882
		(mg/kg)		1262	1579	1613	703	715	840
	Exchangeable Potassium	($cmol_+/kg$)		0.77	0.59	0.63	0.62	0.67	0.54
		(kg/ha)		672	521	553	545	585	469
		(mg/kg)		300	232	247	243	261	209
	Exchangeable Sodium	($cmol_+/kg$)		2.23	7.55	9.66	1.44	1.41	3.05
		(kg/ha)		1146	3889	4975	741	724	1571
		(mg/kg)		512	1736	2221	331	323	701
	Effective Cation Exchange Capacity (ECEC) ($cmol_+/kg$)		**Calculation: Sum of Ca,Mg,K,Na,Al,H ($cmol_+/kg$)	48.45	49.43	48.83	30.15	30.02	32.53
	Calcium (%)		**Base Saturation Calculations - Cation $cmol_+/kg$ / ECEC x 100	72.4	57.2	51.7	74.0	73.5	67.7
	Magnesium (%)			21.4	26.3	27.2	19.2	19.6	21.2
	Potassium (%)			1.6	1.2	1.3	2.1	2.2	1.6
	Sodium - ESP (%)			4.6	15.3	19.8	4.8	4.7	9.4
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium ($cmol_+/kg$)	3.4	2.2	1.9	3.9	3.7	3.2
	Chloride (mg/kg)		**Rayment & Lyons 2011 - 5A3a	54	591	950	70	33	118

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368
Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

	Parameter		Method reference	Sample 72	Sample 73	Sample 74	Sample 75	Sample 76	Sample 77
	Sample ID:			BH114/0.8-0.9	BH111/0.0-0.1	BH111/0.25-0.35	BH111/0.55-0.65	BH111/0.8-0.9	BH142/0.0-0.1
	Crop:			N/G	N/G	N/G	N/G	N/G	N/G
	Client:			Boralaba	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba
				I0368/72	I0368/73	I0368/74	I0368/75	I0368/76	I0368/77
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	9.09	8.74	8.96	9.02	8.89	7.78
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.427	0.146	0.174	0.304	0.661	0.057
	Exchangeable Calcium	($cmol_+/kg$)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	29.91	41.46	39.15	36.17	35.08	24.23
		(kg/ha)		13427	18611	17576	16236	15748	10876
		(mg/kg)		5994	8308	7846	7248	7030	4855
	Exchangeable Magnesium	($cmol_+/kg$)		8.50	8.92	10.06	11.82	13.35	7.22
		(kg/ha)		2315	2427	2738	3218	3634	1965
		(mg/kg)		1033	1083	1222	1436	1622	877
	Exchangeable Potassium	($cmol_+/kg$)		0.50	0.79	0.75	0.64	0.65	0.81
		(kg/ha)		436	692	653	561	569	712
		(mg/kg)		195	309	291	251	254	318
	Exchangeable Sodium	($cmol_+/kg$)		5.93	0.96	2.14	4.63	8.28	0.99
		(kg/ha)		3053	492	1101	2386	4265	508
		(mg/kg)		1363	220	492	1065	1904	227
	Effective Cation Exchange Capacity (ECEC) ($cmol_+/kg$)		**Calculation: Sum of Ca,Mg,K,Na,Al,H ($cmol_+/kg$)	44.84	52.12	52.10	53.26	57.36	33.25
	Calcium (%)		**Base Saturation Calculations - Cation $cmol_+/kg$ / ECEC x 100	66.7	79.5	75.2	67.9	61.2	72.9
	Magnesium (%)			19.0	17.1	19.3	22.2	23.3	21.7
	Potassium (%)			1.1	1.5	1.4	1.2	1.1	2.4
	Sodium - ESP (%)			13.2	1.8	4.1	8.7	14.4	3.0
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium ($cmol_+/kg$)	3.5	4.7	3.9	3.1	2.6	3.4
	Chloride (mg/kg)		**Rayment & Lyons 2011 - 5A3a	455	50	47	168	614	41

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
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8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368
Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

	Parameter		Method reference	Sample 78 BH142/0.25-0.35	Sample 79 BH142/0.55-0.65	Sample 84 BH175/0.0-0.1	Sample 85 BH175/0.25-0.35	Sample 86 BH175/0.55-0.65	Sample 87 BH175/0.8-0.9
	Sample ID:								
	Crop:			N/G	N/G	N/G	N/G	N/G	N/G
	Client:			Boralaba	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba
				I0368/78	I0368/79	I0368/84	I0368/85	I0368/86	I0368/87
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	7.52	8.67	8.34	8.74	7.37	5.85
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.051	0.162	0.166	0.271	0.973	1.253
	Exchangeable Calcium	($cmol_+/kg$)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	24.39	33.04	17.69	17.12	11.53	9.57
		(kg/ha)		10950	14832	7942	7686	5175	4295
		(mg/kg)		4888	6621	3545	3431	2310	1917
	Exchangeable Magnesium	($cmol_+/kg$)		7.23	8.23	9.80	10.01	9.25	9.19
		(kg/ha)		1967	2241	2669	2725	2519	2503
		(mg/kg)		878	1000	1191	1216	1124	1117
	Exchangeable Potassium	($cmol_+/kg$)		0.96	0.62	0.91	0.66	0.54	0.59
		(kg/ha)		841	541	800	578	470	513
		(mg/kg)		375	241	357	258	210	229
	Exchangeable Sodium	($cmol_+/kg$)		0.71	1.79	3.45	5.18	11.10	12.02
		(kg/ha)		365	920	1779	2668	5714	6191
		(mg/kg)		163	411	794	1191	2551	2764
	Effective Cation Exchange Capacity (ECEC) ($cmol_+/kg$)		**Calculation: Sum of Ca,Mg,K,Na,Al,H ($cmol_+/kg$)	33.29	43.68	31.86	32.97	32.41	31.37
	Calcium (%)		**Base Saturation Calculations - Cation $cmol_+/kg$ / ECEC x 100	73.3	75.6	55.5	51.9	35.6	30.5
	Magnesium (%)			21.7	18.8	30.8	30.4	28.5	29.3
	Potassium (%)			2.9	1.4	2.9	2.0	1.7	1.9
	Sodium - ESP (%)			2.1	4.1	10.8	15.7	34.2	38.3
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium ($cmol_+/kg$)	3.4	4.0	1.8	1.7	1.2	1.0
	Chloride (mg/kg)		**Rayment & Lyons 2011 - 5A3a	12	50	130	227	1755	2039

Notes:

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5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368
Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

	Parameter		Method reference	Sample 88 BH175B/0.0-0.1 N/G Boralaba I0368/88	Sample 89 BH175B0.25-0.35 N/G Boralaba I0368/89	Sample 90 BH175B/0.55-0.65 N/G Boralaba I0368/90	Sample 91 BH175B/0.8-0.9 N/G Boralaba I0368/91	Sample 92 BH173/0.0-0.1 N/G Boralaba I0368/92	Sample 93 BH173/0.25-0.35 N/G Boralaba I0368/93
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.76	8.73	8.44	6.07	7.18	8.82
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.234	0.812	1.219	1.016	0.123	0.347
	Exchangeable Calcium	($cmol_+/kg$)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	37.80	31.73	17.26	10.94	22.77	31.32
		(kg/ha)		16967	14243	7749	4909	10222	14061
		(mg/kg)		7574	6358	3459	2191	4563	6277
	Exchangeable Magnesium	($cmol_+/kg$)		8.78	12.17	14.21	11.49	4.10	7.50
		(kg/ha)		2391	3312	3869	3128	1115	2041
		(mg/kg)		1067	1478	1727	1396	498	911
	Exchangeable Potassium	($cmol_+/kg$)		0.82	0.52	0.42	0.34	1.18	0.52
		(kg/ha)		719	459	364	298	1033	460
		(mg/kg)		321	205	163	133	461	205
	Exchangeable Sodium	($cmol_+/kg$)		2.27	7.53	11.99	11.04	0.23	3.38
		(kg/ha)		1167	3880	6176	5687	118	1739
		(mg/kg)		521	1732	2757	2539	53	776
	Effective Cation Exchange Capacity (ECEC) ($cmol_+/kg$)		**Calculation: Sum of Ca,Mg,K,Na,Al,H ($cmol_+/kg$)	49.67	51.95	43.88	33.81	28.28	42.72
	Calcium (%)		**Base Saturation Calculations - Cation $cmol_+/kg$ / ECEC x 100	76.1	61.1	39.3	32.3	80.5	73.3
	Magnesium (%)			17.7	23.4	32.4	34.0	14.5	17.5
	Potassium (%)			1.7	1.0	0.9	1.0	4.2	1.2
	Sodium - ESP (%)			4.6	14.5	27.3	32.7	0.8	7.9
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium ($cmol_+/kg$)	4.3	2.6	1.2	1.0	5.6	4.2
	Chloride (mg/kg)		**Rayment & Lyons 2011 - 5A3a	173	1059	1541	1438	53	297

Notes:

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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368

Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

			Sample 94	Sample 95	Sample 96	Sample 97	Sample 98
		Sample ID:	BH173/0.55-0.65	BH173/0.8-0.9	BD1	BD2	BD3
		Crop:	N/G	N/G	N/G	N/G	N/G
		Client:	Boralaba	Boralaba	Boralaba	Boralaba	Boralaba
	Parameter	Method reference	I0368/94	I0368/95	I0368/96	I0368/97	I0368/98
	pH	Rayment & Lyons 2011 - 4A1 (1:5 Water)	8.81	8.70	8.33	8.89	9.03
	Electrical Conductivity (dS/m)	Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.844	1.125	0.083	0.144	0.204
	Exchangeable Calcium (cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	25.92	20.01	37.95	37.72	35.55
	Exchangeable Calcium (kg/ha)		11633	8981	17034	16931	15959
	Exchangeable Calcium (mg/kg)		5193	4009	7604	7558	7124
	Exchangeable Magnesium (cmol+/kg)		9.24	10.31	11.30	12.12	13.47
	Exchangeable Magnesium (kg/ha)		2517	2808	3077	3298	3666
	Exchangeable Magnesium (mg/kg)		1123	1253	1373	1472	1636
	Exchangeable Potassium (cmol+/kg)		0.50	0.48	0.96	0.87	0.59
	Exchangeable Potassium (kg/ha)		435	417	840	761	519
	Exchangeable Potassium (mg/kg)		194	186	375	340	232
	Exchangeable Sodium (cmol+/kg)		7.19	8.94	2.61	4.48	5.18
	Exchangeable Sodium (kg/ha)		3700	4603	1346	2305	2666
	Exchangeable Sodium (mg/kg)		1652	2055	601	1029	1190
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)	**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	42.84	39.74	52.82	55.18	54.78
	Calcium (%)	**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	60.5	50.4	71.8	68.4	64.9
	Magnesium (%)		21.6	26.0	21.4	22.0	24.6
	Potassium (%)		1.2	1.2	1.8	1.6	1.1
	Sodium - ESP (%)		16.8	22.5	4.9	8.1	9.4
	Calcium/Magnesium Ratio	**Calculation: Calcium / Magnesium (cmol+/kg)	2.8	1.9	3.4	3.1	2.6
	Chloride (mg/kg)	**Rayment & Lyons 2011 - 5A3a	356	1033	117	134	190

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil results
10. Conversions for 1 cmol+/kg = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimate
13. ** NATA accreditation does not cover the performance of this service.
14. Analysis conducted between sample arrival date and reporting date.
15. This report is not to be reproduced except in full. Results only relate to the item tested.
16. All services undertaken by EAL are covered by the EAL Laboratory Services Terms and Conditions. These Terms and Conditions are available on the EAL website: scu.edu.au/eal, or on request.

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AGRICULTURAL SOIL ANALYSIS REPORT

101 samples supplied by Environmental Earth Sciences on 4th April, 2019. Lab Job No.I0368
Analysis requested by Michael Kowalczyk. Your Job: 718107

PO Box 3207 NEWSTEAD QLD 4006

	Parameter		Method reference	Heavy Soil	Medium Soil	Light Soil	Sandy Soil
	Sample ID:						
	Crop:						
	Client:			Clay	Clay Loam	Loam	Loamy Sand
	Parameter		**Method reference**	**Indicative guidelines - refer to Notes 6 and 8**			
	pH		Rayment & Lyons 2011 - 4A1 (1:5 Water)	6.5	6.5	6.3	6.3
	Electrical Conductivity (dS/m)		Rayment & Lyons 2011 - 3A1 (1:5 Water)	0.200	0.150	0.120	0.100
	Exchangeable Calcium	(cmol+/kg)	Rayment & Lyons 2011 - 15D3 (Ammonium Acetate)	15.6	10.8	5.0	1.9
		(kg/ha)		7000	4816	2240	840
		(mg/kg)		3125	2150	1000	375
	Exchangeable Magnesium	(cmol+/kg)		2.4	1.7	1.2	0.60
		(kg/ha)		650	448	325	168
		(mg/kg)		290	200	145	75
	Exchangeable Potassium	(cmol+/kg)		0.60	0.50	0.40	0.30
		(kg/ha)		526	426	336	224
		(mg/kg)		235	190	150	100
	Exchangeable Sodium	(cmol+/kg)		0.3	0.26	0.22	0.11
		(kg/ha)		155	134	113	57
		(mg/kg)		69	60	51	25
	Effective Cation Exchange Capacity (ECEC) (cmol+/kg)		**Calculation: Sum of Ca,Mg,K,Na,Al,H (cmol+/kg)	20.1	14.3	7.8	3.3
	Calcium (%)		**Base Saturation Calculations - Cation cmol+/kg / ECEC x 100	77.6	75.7	65.6	57.4
	Magnesium (%)			11.9	11.9	15.7	18.1
	Potassium (%)			3.0	3.5	5.2	9.1
	Sodium - ESP (%)			1.5	1.8	2.9	3.3
	Calcium/Magnesium Ratio		**Calculation: Calcium / Magnesium (cmol+/kg)	6.5	6.4	4.2	3.2
	Chloride (mg/kg)		**Rayment & Lyons 2011 - 5A3a	..			

Notes:

1. All results presented as a 40°C oven dried weight. Soil sieved and lightly crushed to < 2 mm.
2. Methods from Rayment and Lyons, 2011. *Soil Chemical Methods - Australasia.* CSIRO Publishing: Collingwood.
3. Soluble Salts included in Exchangeable Cations - NO PRE-WASH (unless requested).
4. 'Morgan 1 Extract' adapted from 'Science in Agriculture', 'Non-Toxic Farming' and LaMotte Soil Handbook.
5. Guidelines for phosphorus have been reduced for Australian soils.
6. Indicative guidelines are based on 'Albrecht' and 'Reams' concepts.
7. Total Acid Extractable Nutrients indicate a store of nutrients.
8. National Environmental Protection (Assessment of Site Contamination) Measure 2013, Schedule B(1) - Guideline on Investigation Levels for Soil and Groundwater. Table 5-A Background Ranges.
9. Information relating to testing colour codes is available on sheet 2 - 'Understanding your agricultural soil results
10. Conversions for 1 cmol+/kg = 230 mg/kg Sodium, 390 mg/kg Potassium, 122 mg/kg Magnesium, 200 mg/kg Calcium
11. Conversions to kg/ha = mg/kg x 2.24
12. The chloride calculation of Cl mg/L = EC x 640 is considered an estimate, and most likely an over-estimate
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Report of Analysis

TW12-07201

Client:

ENVIRONMENTAL EARTH SCIENCES QLD
PO BOX 3207
NEWSTEAD QLD 4006

Order Number: 612024
Report Date: 05-October-2012
Received Date: 31-August-2012

Analysis	Unit	TW12-07201.001 Site 302 0-0.1 Soil	TW12-07201.002 Site 302 0.25-0.35 Soil	TW12-07201.003 Site 302 0.55-0.65 Soil	TW12-07201.004 Site 302 0.8-0.9 Soil
ACIDITY					
pH - Water	pH units	8.39	9.08	7.88	6.74
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	118	144
Potassium	mg/kg	291	161	-	-
Phosphorus - Colwell extr	mg/kg	3	-	-	-
Total Kjeldahl Nitrogen	mg/kg	568	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	3
Calcium	mg/kg	-	-	4790	4070
Magnesium	mg/kg	-	-	1580	1560
Calcium	mg/kg	5810	3950	-	-
Magnesium	mg/kg	889	1640	-	-
ORGANIC MATTER					
Organic Carbon	%	1.1	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.08	0.33	1.62	1.75
Chloride	mg/kg	5	280	1500	2000
Sodium	mg/kg	-	-	1320	1250
Sodium	mg/kg	236	930	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	43.2	39.1
Exchangeable Sodium	meq/100g	-	-	5.74	5.45
Exchangeable Potassium	meq/100g	-	-	0.30	0.37
Exchangeable Calcium	meq/100g	-	-	23.9	20.4
Exchangeable Magnesium	meq/100g	-	-	13.2	12.9
Exchangeable Aluminium	meq/100g	-	-	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	-	1.82	1.58
Cation Exchange	meq/100g	26.3	23.2	-	-
Exchangeable Sodium	meq/100g	1.03	4.04	-	-
Exchangeable Potassium	meq/100g	0.75	0.39	-	-
Exchangeable Calcium	meq/100g	29.0	19.8	-	-
Exchangeable Magnesium	meq/100g	7.41	13.6	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	-	-
Calcium/Magnesium Ratio		3.92	1.45	-	-
Subcontracted Analysis					
Emerson Aggregate Test		3(2)	-	2(1)	-

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TW12-07201

Analysis	Unit	TW12-07201.001 Site 302 0-0.1 Soil	TW12-07201.002 Site 302 0.25-0.35 Soil	TW12-07201.003 Site 302 0.55-0.65 Soil	TW12-07201.004 Site 302 0.8-0.9 Soil
Gravel	%	2	-	12	-
Coarse Sand	%	21	-	11	-
Fine Sand	%	23	-	19	-
Silt	%	31	-	29	-
Clay	%	23	-	28	-

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TW12-07201

Analysis	Unit	TW12-07201.005 Site 301 0-0.1 Soil	TW12-07201.006 Site 301 0.25-0.35 Soil	TW12-07201.007 Site 301 0.55-0.65 Soil	TW12-07201.008 Site 301 0.8-0.9 Soil
ACIDITY					
pH - Water	pH units	7.06	8.90	8.53	8.37
MAJOR ELEMENTS					
Potassium	mg/kg	165	-	-	-
Potassium	mg/kg	-	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	-	-	-
Calcium	mg/kg	4840	-	-	-
Magnesium	mg/kg	974	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.07	0.36	0.87	0.98
Chloride	mg/kg	47	470	1600	1900
Sodium	mg/kg	158	-	-	-
Sodium	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	33.4	-	-	-
Exchangeable Sodium	meq/100g	0.68	-	-	-
Exchangeable Potassium	meq/100g	0.42	-	-	-
Exchangeable Calcium	meq/100g	24.2	-	-	-
Exchangeable Magnesium	meq/100g	8.11	-	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	-
Calcium/Magnesium Ratio		2.98	-	-	-
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.009 Site 305 0-0.1 Soil	TW12-07201.010 Site 305 0.25-0.35 Soil	TW12-07201.011 Site 305 0.55-0.65 Soil	TW12-07201.012 Site 305 0.8-0.9 Soil
ACIDITY					
pH - Water	pH units	6.81	8.40	8.24	8.43
MAJOR ELEMENTS					
Potassium	mg/kg	920	-	-	-
Potassium	mg/kg	-	581	153	126
Phosphorus - Colwell extr	mg/kg	72	-	-	-
Total Kjeldahl Nitrogen	mg/kg	1150	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	4350	-	-	-
Magnesium	mg/kg	705	-	-	-
Calcium	mg/kg	-	3600	3260	3100
Magnesium	mg/kg	-	952	1300	1360
ORGANIC MATTER					
Organic Carbon	%	3.0	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.10	0.29	1.66	1.46
Chloride	mg/kg	34	270	1700	1800
Sodium	mg/kg	105	-	-	-
Sodium	mg/kg	-	428	756	782
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	30.5	-	-	-
Exchangeable Sodium	meq/100g	0.46	-	-	-
Exchangeable Potassium	meq/100g	2.36	-	-	-
Exchangeable Calcium	meq/100g	21.8	-	-	-
Exchangeable Magnesium	meq/100g	5.88	-	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	-
Calcium/Magnesium Ratio		3.70	-	-	-
Cation Exchange	meq/100g	-	24.6	21.6	20.1
Exchangeable Sodium	meq/100g	-	1.86	3.29	3.40
Exchangeable Potassium	meq/100g	-	1.49	0.39	0.32
Exchangeable Calcium	meq/100g	-	18.0	16.3	15.5
Exchangeable Magnesium	meq/100g	-	7.94	10.9	11.3
Exchangeable Aluminium	meq/100g	-	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	2.27	1.50	1.37
Subcontracted Analysis					
Emerson Aggregate Test		3(4)	-	3(1)	-
Gravel	%	9	-	12	-
Coarse Sand	%	26	-	13	-
Fine Sand	%	22	-	18	-
Silt	%	28	-	31	-
Clay	%	15	-	26	-

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.013 Site 158 0-0.1 Soil	TW12-07201.014 Site 158 0.25-0.35 Soil	TW12-07201.015 Site 158 0.55-0.65 Soil	TW12-07201.016 Site 170 0-0.1 Soil
ACIDITY					
pH - Water	pH units	7.75	8.71	8.82	5.94
MAJOR ELEMENTS					
Potassium	mg/kg	309	-	-	127
Potassium	mg/kg	-	204	139	-
Phosphorus - Colwell extr	mg/kg	9	-	-	6
Total Kjeldahl Nitrogen	mg/kg	771	-	-	509
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	4390	-	-	464
Magnesium	mg/kg	362	-	-	78
Calcium	mg/kg	-	3970	3210	-
Magnesium	mg/kg	-	577	829	-
ORGANIC MATTER					
Organic Carbon	%	1.6	-	-	0.7
SALINITY					
Electrical Conductivity	dS/m	0.06	0.13	0.25	0.04
Chloride	mg/kg	6	57	280	3
Sodium	mg/kg	57	-	-	15
Sodium	mg/kg	-	218	205	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	26.0	-	-	3.36
Exchangeable Sodium	meq/100g	0.25	-	-	0.06
Exchangeable Potassium	meq/100g	0.79	-	-	0.33
Exchangeable Calcium	meq/100g	22.0	-	-	2.32
Exchangeable Magnesium	meq/100g	3.01	-	-	0.65
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	Not Applicable
Calcium/Magnesium Ratio		7.28	-	-	3.55
Cation Exchange	meq/100g	-	19.0	15.9	-
Exchangeable Sodium	meq/100g	-	0.96	0.89	-
Exchangeable Potassium	meq/100g	-	0.52	0.36	-
Exchangeable Calcium	meq/100g	-	19.8	16.0	-
Exchangeable Magnesium	meq/100g	-	4.80	6.91	-
Exchangeable Aluminium	meq/100g	-	Not Applicable	Not Applicable	-
Calcium/Magnesium Ratio		-	4.13	2.32	-
Subcontracted Analysis					
Emerson Aggregate Test		3(3)	-	4	-
Gravel	%	10	-	11	2
Coarse Sand	%	28	-	19	59
Fine Sand	%	17	-	9	20
Silt	%	29	-	33	12
Clay	%	16	-	29	7

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.017 Site 170 0.2-0.3 Soil	TW12-07201.018 Site 170 0.55-0.65 Soil	TW12-07201.019 Site 170 0.8-0.9 Soil	TW12-07201.020 Site 170 1.1-1.2 Soil
ACIDITY					
pH - Water	pH units	6.21	5.89	5.49	5.43
MAJOR ELEMENTS					
Potassium	mg/kg	82	38	20	25
Potassium	mg/kg	-	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	14	22	40	63
Calcium	mg/kg	292	150	93	152
Magnesium	mg/kg	22	9	6	11
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.02	0.01	0.01	0.01
Chloride	mg/kg	4	3	2	1
Sodium	mg/kg	14	12	11	13
Sodium	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	1.91	0.98	1.06	1.67
Exchangeable Sodium	meq/100g	0.06	0.05	0.05	0.06
Exchangeable Potassium	meq/100g	0.21	0.10	0.05	0.06
Exchangeable Calcium	meq/100g	1.46	0.75	0.46	0.76
Exchangeable Magnesium	meq/100g	0.19	0.08	0.05	0.09
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	0.45	0.70
Calcium/Magnesium Ratio		7.88	9.69	8.94	8.65
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	<1	-	-
Coarse Sand	%	-	58	-	-
Fine Sand	%	-	15	-	-
Silt	%	-	13	-	-
Clay	%	-	13	-	-

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.021 Site 170 1.4-1.5 Soil	TW12-07201.022 Site 176 0.4-0.5 Soil	TW12-07201.023 Site 177 0.4-0.5 Soil	TW12-07201.024 Site 161 0.4-0.5 Soil
ACIDITY					
pH - Water	pH units	4.77	9.16	5.94	7.38
MAJOR ELEMENTS					
Potassium	mg/kg	44	30	-	44
Potassium	mg/kg	-	-	61	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	389	<1	<1	<1
Calcium	mg/kg	293	2140	-	2420
Magnesium	mg/kg	117	730	-	714
Calcium	mg/kg	-	-	1240	-
Magnesium	mg/kg	-	-	494	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.03	0.09	0.05	0.06
Chloride	mg/kg	1	14	12	72
Sodium	mg/kg	14	140	-	140
Sodium	mg/kg	-	-	121	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	6.94	17.5	-	18.8
Exchangeable Sodium	meq/100g	0.06	0.61	-	0.61
Exchangeable Potassium	meq/100g	0.11	0.08	-	0.11
Exchangeable Calcium	meq/100g	1.47	10.7	-	12.1
Exchangeable Magnesium	meq/100g	0.98	6.08	-	5.96
Exchangeable Aluminium	meq/100g	4.32	Not Applicable	-	Not Applicable
Calcium/Magnesium Ratio		1.50	1.76	-	2.04
Cation Exchange	meq/100g	-	-	10.6	-
Exchangeable Sodium	meq/100g	-	-	0.53	-
Exchangeable Potassium	meq/100g	-	-	0.16	-
Exchangeable Calcium	meq/100g	-	-	6.22	-
Exchangeable Magnesium	meq/100g	-	-	4.12	-
Exchangeable Aluminium	meq/100g	-	-	Not Applicable	-
Calcium/Magnesium Ratio		-	-	1.51	-
Subcontracted Analysis					
Emerson Aggregate Test		4	3(3)	3(4)	3(4)
Gravel	%	<1	<1	<1	<1
Coarse Sand	%	34	45	37	31
Fine Sand	%	15	18	<1	23
Silt	%	22	18	41	24
Clay	%	29	18	43	22

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.025 Site 167 0.7-0.8 Soil	TW12-07201.026 Site 150 0-0.1 Soil	TW12-07201.027 Site 150 0.35-0.45 Soil	TW12-07201.028 Site 150 0.55-0.65 Soil
ACIDITY					
pH - Water	pH units	8.70	6.77	7.41	8.40
MAJOR ELEMENTS					
Potassium	mg/kg	-	62	7	-
Potassium	mg/kg	255	-	-	60
Phosphorus - Colwell extr	mg/kg	-	50	-	-
Total Kjeldahl Nitrogen	mg/kg	-	1080	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	1340	354	-
Magnesium	mg/kg	-	172	19	-
Calcium	mg/kg	2830	-	-	836
Magnesium	mg/kg	494	-	-	311
ORGANIC MATTER					
Organic Carbon	%	-	0.9	-	-
SALINITY					
Electrical Conductivity	dS/m	0.09	0.02	0.01	0.01
Chloride	mg/kg	12	9	7	7
Sodium	mg/kg	-	22	10	-
Sodium	mg/kg	187	-	-	120
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	8.37	1.99	-
Exchangeable Sodium	meq/100g	-	0.10	0.04	-
Exchangeable Potassium	meq/100g	-	0.16	0.02	-
Exchangeable Calcium	meq/100g	-	6.68	1.77	-
Exchangeable Magnesium	meq/100g	-	1.44	0.16	-
Exchangeable Aluminium	meq/100g	-	Not Applicable	Not Applicable	-
Calcium/Magnesium Ratio		-	4.65	10.93	-
Cation Exchange	meq/100g	19.4	-	-	8.24
Exchangeable Sodium	meq/100g	0.81	-	-	0.52
Exchangeable Potassium	meq/100g	0.65	-	-	0.15
Exchangeable Calcium	meq/100g	14.2	-	-	4.17
Exchangeable Magnesium	meq/100g	4.11	-	-	2.69
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	Not Applicable
Calcium/Magnesium Ratio		3.44	-	-	1.61
Subcontracted Analysis					
Emerson Aggregate Test		4	3(1)	-	3(3)
Gravel	%	<1	4	-	13
Coarse Sand	%	52	63	-	53
Fine Sand	%	10	9	-	8
Silt	%	18	16	-	12
Clay	%	19	8	-	13

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.029 Site 150 0.8-0.9 Soil	TW12-07201.030 Site 153 0-0.05 Soil	TW12-07201.031 Site 153 0.25-0.35 Soil	TW12-07201.032 Site 153 0.55-0.65 Soil
ACIDITY					
pH - Water	pH units	9.10	8.10	8.85	8.59
MAJOR ELEMENTS					
Potassium	mg/kg	-	273	-	-
Potassium	mg/kg	84	-	132	138
Phosphorus - Colwell extr	mg/kg	-	46	-	-
Total Kjeldahl Nitrogen	mg/kg	-	876	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	4590	-	-
Magnesium	mg/kg	-	752	-	-
Calcium	mg/kg	1240	-	4520	3870
Magnesium	mg/kg	989	-	1230	1480
ORGANIC MATTER					
Organic Carbon	%	-	0.9	-	-
SALINITY					
Electrical Conductivity	dS/m	0.02	0.07	0.23	0.62
Chloride	mg/kg	9	23	160	930
Sodium	mg/kg	-	84	-	-
Sodium	mg/kg	252	-	619	1350
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	30.3	-	-
Exchangeable Sodium	meq/100g	-	0.36	-	-
Exchangeable Potassium	meq/100g	-	0.70	-	-
Exchangeable Calcium	meq/100g	-	22.9	-	-
Exchangeable Magnesium	meq/100g	-	6.27	-	-
Exchangeable Aluminium	meq/100g	-	Not Applicable	-	-
Calcium/Magnesium Ratio		-	3.66	-	-
Cation Exchange	meq/100g	13.5	-	26.5	27.1
Exchangeable Sodium	meq/100g	1.10	-	2.69	5.86
Exchangeable Potassium	meq/100g	0.22	-	0.34	0.35
Exchangeable Calcium	meq/100g	6.20	-	22.6	19.4
Exchangeable Magnesium	meq/100g	8.24	-	10.2	12.4
Exchangeable Aluminium	meq/100g	Not Applicable	-	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		0.76	-	2.21	1.57
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	2(3)
Gravel	%	-	-	-	20
Coarse Sand	%	-	-	-	3
Fine Sand	%	-	-	-	10
Silt	%	-	-	-	31
Clay	%	-	-	-	36

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TW12-07201

Analysis	Unit	TW12-07201.033 Site 153 0.8-0.9 Soil	TW12-07201.034 Site 162 0-0.1 Soil	TW12-07201.035 Site 162 0.25-0.35 Soil	TW12-07201.036 Site 162 0.55-0.65 Soil
ACIDITY					
pH - Water	pH units	8.49	8.88	8.73	8.00
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	149	843	364	382
Phosphorus - Colwell extr	mg/kg	-	2	-	-
Total Kjeldahl Nitrogen	mg/kg	-	608	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	3160	4570	3920	4410
Magnesium	mg/kg	1400	919	1220	1640
ORGANIC MATTER					
Organic Carbon	%	-	0.8	-	-
SALINITY					
Electrical Conductivity	dS/m	1.09	0.14	0.45	1.96
Chloride	mg/kg	1500	45	630	1100
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	1330	443	823	1040
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	26.9	31.3	29.2	26.3
Exchangeable Sodium	meq/100g	5.76	1.93	3.68	4.52
Exchangeable Potassium	meq/100g	0.38	2.16	0.93	0.98
Exchangeable Calcium	meq/100g	15.8	22.9	19.6	22.1
Exchangeable Magnesium	meq/100g	11.7	7.66	10.2	13.7
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		1.35	2.98	1.93	1.61
Subcontracted Analysis					
Emerson Aggregate Test		-	4	-	4
Gravel	%	-	21	-	19
Coarse Sand	%	-	3	-	2
Fine Sand	%	-	16	-	13
Silt	%	-	31	-	34
Clay	%	-	29	-	33

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TW12-07201

Analysis	Unit	TW12-07201.037 Site 162 0.8-0.9 Soil	TW12-07201.038 Site 126 0-0.1 Soil	TW12-07201.039 Site 131 0-0.1 Soil	TW12-07201.040 Site 139 0-0.1 Soil
ACIDITY					
pH - Water	pH units	7.77	7.82	8.21	8.22
MAJOR ELEMENTS					
Potassium	mg/kg	-	311	318	-
Potassium	mg/kg	307	-	-	936
Phosphorus - Colwell extr	mg/kg	-	16	64	175
Total Kjeldahl Nitrogen	mg/kg	-	801	718	770
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	6270	8120	-
Magnesium	mg/kg	-	1300	974	-
Calcium	mg/kg	3670	-	-	4720
Magnesium	mg/kg	1530	-	-	744
ORGANIC MATTER					
Organic Carbon	%	-	1.0	1.0	2.6
SALINITY					
Electrical Conductivity	dS/m	3.07	0.15	0.12	0.14
Chloride	mg/kg	1200	46	23	21
Sodium	mg/kg	-	188	171	-
Sodium	mg/kg	848	-	-	397
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	43.8	50.3	-
Exchangeable Sodium	meq/100g	-	0.82	0.74	-
Exchangeable Potassium	meq/100g	-	0.80	0.82	-
Exchangeable Calcium	meq/100g	-	31.4	40.6	-
Exchangeable Magnesium	meq/100g	-	10.9	8.12	-
Exchangeable Aluminium	meq/100g	-	Not Applicable	Not Applicable	-
Calcium/Magnesium Ratio		-	2.89	5.00	-
Cation Exchange	meq/100g	27.3	-	-	33.6
Exchangeable Sodium	meq/100g	3.69	-	-	1.73
Exchangeable Potassium	meq/100g	0.79	-	-	2.40
Exchangeable Calcium	meq/100g	18.3	-	-	23.6
Exchangeable Magnesium	meq/100g	12.8	-	-	6.20
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	Not Applicable
Calcium/Magnesium Ratio		1.44	-	-	3.81
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.041 Site 303 0-0.1 Soil	TW12-07201.042 Site 303 0.25-0.35 Soil	TW12-07201.043 Site 303 0.55-0.65 Soil	TW12-07201.044 Site 303 0.8-0.9 Soil
ACIDITY					
pH - Water	pH units	8.63	9.01	8.39	7.43
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	400	-	-	-
Phosphorus Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	4120	-	-	-
Magnesium	mg/kg	668	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.10	0.25	0.69	0.79
Chloride	mg/kg	13	220	1100	1600
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	278	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	30.3	-	-	-
Exchangeable Sodium	meq/100g	1.21	-	-	-
Exchangeable Potassium	meq/100g	1.03	-	-	-
Exchangeable Calcium	meq/100g	20.6	-	-	-
Exchangeable Magnesium	meq/100g	5.49	-	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	-
Calcium/Magnesium Ratio		3.76	-	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.045 Site 127 0.1-0.2 Soil	TW12-07201.046 Site 127 0.3-0.4 Soil	TW12-07201.047 Site 127 0.4-0.5 Soil	TW12-07201.048 Site 127 0.6-0.7 Soil
ACIDITY					
pH - Water	pH units	7.15	8.09	8.38	7.73
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	-	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.05	0.12	0.16	0.22
Chloride	mg/kg	48	150	250	370
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.049 Site 127 0.7-0.8 Soil	TW12-07201.050 Site 127 0.9-1.0 Soil	TW12-07201.051 Site 127 1.0-1.1 Soil	TW12-07201.052 Site 132 0.1-0.2 Soil
ACIDITY					
pH - Water	pH units	7.66	8.19	8.35	8.54
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	-	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.39	0.53	0.62	0.13
Chloride	mg/kg	620	810	850	13
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.053 Site 132 0.3-0.4 Soil	TW12-07201.054 Site 132 0.4-0.6 Soil	TW12-07201.055 Site 132 0.6-0.7 Soil	TW12-07201.056 Site 132 0.7-0.8 Soil
ACIDITY					
pH - Water	pH units	8.79	8.91	9.03	9.07
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	-	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.15	0.18	0.21	0.23
Chloride	mg/kg	4	3	17	33
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.057 Site 132 0.9-1.0 Soil	TW12-07201.058 Site 121 0-0.1 Soil	TW12-07201.059 Site 121 0.25-0.35 Soil	TW12-07201.060 Site 121 0.55-0.65 Soil
ACIDITY					
pH - Water	pH units	9.11	8.26	8.63	8.95
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	-	1070	336	283
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	-	8400	6430	5850
Magnesium	mg/kg	-	858	1020	1330
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.24	0.11	0.15	0.32
Chloride	mg/kg	53	2	20	350
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	-	265	473	1090
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	-	46.1	36.2	41.6
Exchangeable Sodium	meq/100g	-	1.15	2.06	4.75
Exchangeable Potassium	meq/100g	-	2.74	0.86	0.73
Exchangeable Calcium	meq/100g	-	42.0	32.2	28.3
Exchangeable Magnesium	meq/100g	-	7.16	8.48	11.1
Exchangeable Aluminium	meq/100g	-	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	5.88	3.79	2.55
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.061 Site 121 0.8-0.9 Soil	TW12-07201.062 Site 134 0-0.1 Soil	TW12-07201.063 Site 134 0.25-0.35 Soil	TW12-07201.064 Site 134 0.55-0.65 Soil
ACIDITY					
pH - Water	pH units	8.72	7.71	8.44	8.53
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	297	565	303	297
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	5350	7510	9130	7560
Magnesium	mg/kg	1900	1230	1480	1680
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.68	0.07	0.13	0.11
Chloride	mg/kg	720	42	81	87
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	1280	302	454	576
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	32.4	31.7	35.6	36.0
Exchangeable Sodium	meq/100g	6.57	1.31	1.97	2.94
Exchangeable Potassium	meq/100g	0.76	1.45	0.78	0.76
Exchangeable Calcium	meq/100g	26.8	37.6	45.6	38.3
Exchangeable Magnesium	meq/100g	12.5	10.3	12.3	14.0
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		2.14	3.65	3.70	2.73
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.065 Site 134 0.8-0.9 Soil	TW12-07201.066 Site 155 0-0.1 Soil	TW12-07201.067 Site 155 0.25-0.35 Soil	TW12-07201.068 Site 155 0.55-0.65 Soil
ACIDITY					
pH - Water	pH units	8.29	8.51	9.20	8.81
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	251	263	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	6410	6190	-	-
Magnesium	mg/kg	1720	648	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.24	0.11	0.27	0.92
Chloride	mg/kg	390	16	310	1200
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	783	282	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	34.1	26.1	-	-
Exchangeable Sodium	meq/100g	3.40	1.23	-	-
Exchangeable Potassium	meq/100g	0.64	0.67	-	-
Exchangeable Calcium	meq/100g	32.1	31.0	-	-
Exchangeable Magnesium	meq/100g	14.3	5.40	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	-	-
Calcium/Magnesium Ratio		2.24	5.73	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.069 Site 155 0.8-0.9 Soil	TW12-07201.070 Site 105 0-0.1 Soil	TW12-07201.071 Site 105 0.25-0.35 Soil	TW12-07201.072 Site 105 0.55-0.65 Soil
ACIDITY					
pH - Water	pH units	8.66	8.06	8.53	8.40
MAJOR ELEMENTS					
Potassium	mg/kg	-	519	-	-
Potassium	mg/kg	-	-	372	297
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	<1	<1	1
Calcium	mg/kg	-	8300	-	-
Magnesium	mg/kg	-	1220	-	-
Calcium	mg/kg	-	-	7270	5920
Magnesium	mg/kg	-	-	1210	1200
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	1.11	0.14	0.09	0.11
Chloride	mg/kg	1400	49	31	75
Sodium	mg/kg	-	200	-	-
Sodium	mg/kg	-	-	564	748
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	53.8	-	-
Exchangeable Sodium	meq/100g	-	0.87	-	-
Exchangeable Potassium	meq/100g	-	1.33	-	-
Exchangeable Calcium	meq/100g	-	41.5	-	-
Exchangeable Magnesium	meq/100g	-	10.1	-	-
Exchangeable Aluminium	meq/100g	-	Not Applicable	-	-
Calcium/Magnesium Ratio		-	4.09	-	-
Cation Exchange	meq/100g	-	-	31.7	30.9
Exchangeable Sodium	meq/100g	-	-	2.45	3.25
Exchangeable Potassium	meq/100g	-	-	0.95	0.76
Exchangeable Calcium	meq/100g	-	-	36.4	29.6
Exchangeable Magnesium	meq/100g	-	-	10.1	9.98
Exchangeable Aluminium	meq/100g	-	-	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	-	3.61	2.97
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.073 Site 105 0.8-0.9 Soil	TW12-07201.074 Site 105 1.1-1.2 Soil	TW12-07201.075 Site 175 0-0.1 Soil	TW12-07201.076 Site 175 0.25-0.35 Soil
ACIDITY					
pH - Water	pH units	8.82	8.82	9.00	8.59
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	316	221	269	328
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	5310	4240	3850	3360
Magnesium	mg/kg	1740	1440	1330	1620
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.24	0.22	0.25	1.38
Chloride	mg/kg	150	190	220	1900
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	884	818	630	1260
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	38.2	32.9	28.2	30.0
Exchangeable Sodium	meq/100g	3.84	3.56	2.74	5.45
Exchangeable Potassium	meq/100g	0.81	0.57	0.69	0.84
Exchangeable Calcium	meq/100g	26.5	21.2	19.4	16.8
Exchangeable Magnesium	meq/100g	14.5	12.0	11.1	13.5
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		1.83	1.77	1.76	1.26
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.077 Site 175 0.55-0.65 Soil	TW12-07201.078 Site 175 0.8-0.9 Soil	TW12-07201.079 Site 175 1.4-1.5 Soil	TW12-07201.080 Site 141 0-0.1 Soil
ACIDITY					
pH - Water	pH units	8.08	8.12	8.35	7.60
MAJOR ELEMENTS					
Potassium	mg/kg	211	344	281	525
Potassium	mg/kg	-	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	13	<1
Calcium	mg/kg	6890	4600	2470	9250
Magnesium	mg/kg	1430	1670	1490	1260
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	2.94	2.14	1.71	0.11
Chloride	mg/kg	2600	2800	2900	62
Sodium	mg/kg	665	937	991	272
Sodium	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	49.8	41.9	29.9	59.4
Exchangeable Sodium	meq/100g	2.89	4.07	4.31	1.18
Exchangeable Potassium	meq/100g	0.54	0.88	0.72	1.35
Exchangeable Calcium	meq/100g	34.5	23.0	12.3	46.3
Exchangeable Magnesium	meq/100g	11.9	13.9	12.4	10.6
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	0.15	Not Applicable
Calcium/Magnesium Ratio		2.90	1.66	0.99	4.36
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.081 Site 141 0.25-0.35 Soil	TW12-07201.082 Site 141 0.55-0.65 Soil	TW12-07201.083 Site 141 0.8-0.9 Soil	TW12-07201.084 Site 141 1.1-1.2 Soil
ACIDITY					
pH - Water	pH units	8.79	8.93	8.75	8.60
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	340	257	313	302
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	6080	4320	4560	4020
Magnesium	mg/kg	1540	1470	1750	1670
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.15	0.20	0.25	0.26
Chloride	mg/kg	13	86	230	360
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	754	1060	1390	1400
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	40.8	33.8	24.1	24.3
Exchangeable Sodium	meq/100g	3.28	4.57	6.04	6.08
Exchangeable Potassium	meq/100g	0.87	0.68	0.80	0.78
Exchangeable Calcium	meq/100g	30.4	21.6	22.8	20.1
Exchangeable Magnesium	meq/100g	12.8	12.2	14.6	13.9
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		2.37	1.77	1.55	1.44
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.085 Site 165 0-0.1 Soil	TW12-07201.086 Site 165 0.25-0.35 Soil	TW12-07201.087 Site 165 0.55-0.65 Soil	TW12-07201.088 Site 165 0.8-0.9 Soil
ACIDITY					
pH - Water	pH units	8.66	8.94	8.76	8.42
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	-	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.13	0.19	0.44	0.86
Chloride	mg/kg	11	110	380	1200
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.089 Site 115 0-0.1 Soil	TW12-07201.090 Site 115 0.25-0.35 Soil	TW12-07201.091 Site 115 0.55-0.65 Soil	TW12-07201.092 Site 115 0.8-0.9 Soil
ACIDITY					
pH - Water	pH units	8.33	8.85	7.84	7.81
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	654	332	364	297
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	5710	4510	5230	3620
Magnesium	mg/kg	1110	1530	1650	1770
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.11	0.31	2.98	3.31
Chloride	mg/kg	12	170	460	1100
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	282	630	677	774
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	35.5	33.0	33.5	27.6
Exchangeable Sodium	meq/100g	1.23	2.74	2.94	3.36
Exchangeable Potassium	meq/100g	1.68	0.85	0.91	0.76
Exchangeable Calcium	meq/100g	28.8	22.5	26.2	18.1
Exchangeable Magnesium	meq/100g	9.22	12.8	13.7	14.8
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		3.10	1.77	1.91	1.23
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.093 Site 116 1.1-1.2 Soil	TW12-07201.094 Site 129 0-0.1 Soil	TW12-07201.095 Site 129 0.25-0.35 Soil	TW12-07201.096 Site 129 0.55-0.65 Soil
ACIDITY					
pH - Water	pH units	8.00	6.86	8.21	8.56
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	289	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	2360	-	-	-
Magnesium	mg/kg	1830	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	1.61	0.06	0.18	0.69
Chloride	mg/kg	1900	22	230	840
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	1080	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	25.5	-	-	-
Exchangeable Sodium	meq/100g	4.70	-	-	-
Exchangeable Potassium	meq/100g	0.74	-	-	-
Exchangeable Calcium	meq/100g	11.8	-	-	-
Exchangeable Magnesium	meq/100g	15.3	-	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	-
Calcium/Magnesium Ratio		0.77	-	-	-
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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TW12-07201

Analysis	Unit	TW12-07201.097 Site 129 0.8-0.9 Soil	TW12-07201.098 Site 129 1.1-1.2 Soil	TW12-07201.099 Site 140 0-0.1 Soil	TW12-07201.100 Site 140 0.25-0.35 Soil
ACIDITY					
pH - Water	pH units	8.65	8.66	8.75	9.09
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	-	-	451	263
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	-	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	8440	6160
Magnesium	mg/kg	-	-	1140	1400
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.73	0.62	0.14	0.29
Chloride	mg/kg	930	780	22	240
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	-	-	443	1010
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	-	-	35.7	32.0
Exchangeable Sodium	meq/100g	-	-	1.92	4.41
Exchangeable Potassium	meq/100g	-	-	1.16	0.67
Exchangeable Calcium	meq/100g	-	-	42.2	30.8
Exchangeable Magnesium	meq/100g	-	-	9.48	11.7
Exchangeable Aluminium	meq/100g	-	-	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	-	4.45	2.63
Subcontracted Analysis					
Emerson Aggregate Test		-	-	-	-
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-

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Report of Analysis

TW12-07201

Analysis	Unit	TW12-07201.101 Site 140 0.55-0.65 Soil	TW12-07201.102 Site 140 0.8-0.9 Soil		
ACIDITY					
pH - Water	pH units	8.71	8.06		
MAJOR ELEMENTS					
Potassium	mg/kg	-	-		
Potassium	mg/kg	305	302		
Phosphorus - Colwell extr	mg/kg	-	-		
Total Kjeldahl Nitrogen	mg/kg	-	-		
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1		
Calcium	mg/kg	-	-		
Magnesium	mg/kg	-	-		
Calcium	mg/kg	5620	5710		
Magnesium	mg/kg	1700	1800		
ORGANIC MATTER					
Organic Carbon	%	-	-		
SALINITY					
Electrical Conductivity	dS/m	1.09	3.05		
Chloride	mg/kg	1200	2400		
Sodium	mg/kg	-	-		
Sodium	mg/kg	1500	1180		
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-		
Exchangeable Sodium	meq/100g	-	-		
Exchangeable Potassium	meq/100g	-	-		
Exchangeable Calcium	meq/100g	-	-		
Exchangeable Magnesium	meq/100g	-	-		
Exchangeable Aluminium	meq/100g	-	-		
Calcium/Magnesium Ratio		-	-		
Cation Exchange	meq/100g	30.2	31.2		
Exchangeable Sodium	meq/100g	6.53	5.13		
Exchangeable Potassium	meq/100g	0.78	0.77		
Exchangeable Calcium	meq/100g	28.1	28.5		
Exchangeable Magnesium	meq/100g	14.2	15.0		
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable		
Calcium/Magnesium Ratio		1.98	1.90		
Subcontracted Analysis					
Emerson Aggregate Test		-	-		
Gravel	%	-	-		
Coarse Sand	%	-	-		
Fine Sand	%	-	-		
Silt	%	-	-		
Clay	%	-	-		

Results are on an 'air dried' basis.

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Report of Analysis

TW12-07201

Analysed Between 31/08/2012 - 05/10/2012

Method of Analysis Analysis	Unit	Det.Lim.	Method
pH - Water	pH units	0.01	SOL003/SOL007-2
Electrical Conductivity	dS/m	0.01	SOL003/SOL007-2
Chloride	mg/kg	1	SOL030
Aluminium	mg/kg	1	SOL002/1-2
Sodium	mg/kg	1	15A2/15D1
Potassium	mg/kg	1	15A2/15D1
Calcium	mg/kg	1	15A2/15D1
Magnesium	mg/kg	1	15A2/15D1
Cation Exchange	meq/100g	0.01	15A2/15D1
Exchangeable Sodium	meq/100g	0.01	15A2/15D1
Exchangeable Potassium	meq/100g	0.01	15A2/15D1
Exchangeable Calcium	meq/100g	0.01	15A2/15D1
Exchangeable Magnesium	meq/100g	0.01	15A2/15D1
Exchangeable Aluminium	meq/100g	0.01	15A2/15D1
Calcium/Magnesium Ratio		0.01	15A2/15D1
Sodium	mg/kg	1	15C1
Potassium	mg/kg	1	15C1
Calcium	mg/kg	1	15C1
Magnesium	mg/kg	1	15C1
Cation Exchange	meq/100g	0.01	15C1
Exchangeable Sodium	meq/100g	0.01	15C1
Exchangeable Potassium	meq/100g	0.01	15C1
Exchangeable Calcium	meq/100g	0.01	15C1
Exchangeable Magnesium	meq/100g	0.01	15C1
Exchangeable Aluminium	meq/100g	0.01	15C1
Calcium/Magnesium Ratio		0.01	15C1
Emerson Aggregate Test			SOL012
Gravel	%	1	SOL028
Coarse Sand	%	1	SOL028
Fine Sand	%	1	SOL028
Silt	%	1	SOL028
Clay	%	1	SOL028
Phosphorus - Colwell extr	mg/kg	1	SOL005/001/4
Organic Carbon	%	0.3	CAR002/SOL002/1
Total Kjeldahl Nitrogen	mg/kg	1	

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TW12-07201

The analyses presented in the report refer exclusively to the samples analysed.

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Keegan Roache - Laboratory Operations Manager

For and on behalf of SGS Australia Pty Ltd

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Report of Analysis

TW12-07019

Client:

ENVIRONMENTAL EARTH SCIENCES QLD
PO BOX 3207
NEWSTEAD QLD 4006

Order Number: 612024
Report Date: 04-October-2012
Received Date: 27-August-2012

Analysis	Unit	TW12-07019.001 Site 245 Depth 0.0-0.1m Soil	TW12-07019.002 Site 245 Depth 0.2-0.3m Soil	TW12-07019.003 Site 245 Depth 0.5-0.6m Soil	TW12-07019.004 Site 245 Depth 0.8-0.9m Soil
ACIDITY					
pH - Water	pH units	8.66	9.30	9.57	9.50
MAJOR ELEMENTS					
Potassium	mg/kg	63	-	-	-
Potassium	mg/kg	-	156	61	56
Phosphorus - Colwell extr	mg/kg	2	-	-	-
Total Kjeldahl Nitrogen	mg/kg	494	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	1410	-	-	-
Magnesium	mg/kg	463	-	-	-
Calcium	mg/kg	-	5140	1480	1120
Magnesium	mg/kg	-	1350	719	641
ORGANIC MATTER					
Organic Carbon	%	0.4	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.05	0.12	0.27	0.28
Chloride	mg/kg	15	63	120	200
Sodium	mg/kg	53	-	-	-
Sodium	mg/kg	-	934	487	525
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	11.4	-	-	-
Exchangeable Sodium	meq/100g	0.27	-	-	-
Exchangeable Potassium	meq/100g	0.16	-	-	-
Exchangeable Calcium	meq/100g	7.06	-	-	-
Exchangeable Magnesium	meq/100g	3.86	-	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	-
Calcium/Magnesium Ratio		1.83	-	-	-
Cation Exchange	meq/100g	-	11.2	10.2	10.4
Exchangeable Sodium	meq/100g	-	4.06	2.12	2.28
Exchangeable Potassium	meq/100g	-	0.40	0.16	0.14
Exchangeable Calcium	meq/100g	-	25.7	7.38	5.62
Exchangeable Magnesium	meq/100g	-	11.2	5.99	5.34
Exchangeable Aluminium	meq/100g	-	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	2.29	1.23	1.05

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.001 Site 245 Depth 0.0-0.1m Soil	TW12-07019.002 Site 245 Depth 0.2-0.3m Soil	TW12-07019.003 Site 245 Depth 0.5-0.6m Soil	TW12-07019.004 Site 245 Depth 0.8-0.9m Soil
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	3	2	-	2
Coarse Sand	%	53	39	-	32
Fine Sand	%	5	12	-	16
Silt	%	24	24	-	25
Clay	%	16	23	-	26
Emerson Aggregate Test		-	1	-	1

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.005 Site 245 Depth 1.1-1.2m Soil	TW12-07019.006 Site 245 Depth 1.4-1.5m Soil	TW12-07019.007 Site 224 Depth 0.0-0.1m Soil	TW12-07019.008 Site 224 Depth 0.4-0.6m Soil
ACIDITY					
pH - Water	pH units	9.49	9.49	6.66	8.43
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	410	-
Potassium	mg/kg	60	48	-	252
Phosphorus - Colwell extr	mg/kg	-	-	38	-
Total Kjeldahl Nitrogen	mg/kg	-	-	611	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	1450	-
Magnesium	mg/kg	-	-	245	-
Calcium	mg/kg	1260	1000	-	2770
Magnesium	mg/kg	720	609	-	642
ORGANIC MATTER					
Organic Carbon	%	-	-	0.9	-
SALINITY					
Electrical Conductivity	dS/m	0.27	0.31	0.02	0.05
Chloride	mg/kg	220	300	6	5
Sodium	mg/kg	-	-	19	-
Sodium	mg/kg	625	594	-	135
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	10.4	-
Exchangeable Sodium	meq/100g	-	-	0.08	-
Exchangeable Potassium	meq/100g	-	-	1.05	-
Exchangeable Calcium	meq/100g	-	-	7.27	-
Exchangeable Magnesium	meq/100g	-	-	2.04	-
Exchangeable Aluminium	meq/100g	-	-	Not Applicable	-
Calcium/Magnesium Ratio		-	-	3.56	-
Cation Exchange	meq/100g	10.1	8.05	-	16.7
Exchangeable Sodium	meq/100g	2.72	2.58	-	0.59
Exchangeable Potassium	meq/100g	0.16	0.12	-	0.65
Exchangeable Calcium	meq/100g	6.28	5.02	-	13.9
Exchangeable Magnesium	meq/100g	6.00	5.07	-	5.35
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	-	Not Applicable
Calcium/Magnesium Ratio		1.05	0.99	-	2.59
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.005 Site 245 Depth 1.1-1.2m Soil	TW12-07019.006 Site 245 Depth 1.4-1.5m Soil	TW12-07019.007 Site 224 Depth 0.0-0.1m Soil	TW12-07019.008 Site 224 Depth 0.4-0.5m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	-	<1	<1
Coarse Sand	%	-	-	44	25
Fine Sand	%	-	-	18	10
Silt	%	-	-	23	35
Clay	%	-	-	15	30
Emerson Aggregate Test		-	-	-	3(4)

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.009 Site 230 Depth 0.0-0.1m Soil	TW12-07019.010 Site 230 Depth 0.25-0.35m Soil	TW12-07019.011 Site 230 Depth 0.55-0.65m Soil	TW12-07019.012 Site 230 Depth 0.8-0.9m Soil
ACIDITY					
pH - Water	pH units	6.66	8.57	9.18	9.27
MAJOR ELEMENTS					
Potassium	mg/kg	351	-	-	-
Potassium	mg/kg	-	171	195	183
Phosphorus - Colwell extr	mg/kg	16	-	-	-
Total Kjeldahl Nitrogen	mg/kg	546	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	1910	-	-	-
Magnesium	mg/kg	275	-	-	-
Calcium	mg/kg	-	3350	3610	3520
Magnesium	mg/kg	-	665	717	748
ORGANIC MATTER					
Organic Carbon	%	1.1	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.03	0.08	0.24	0.28
Chloride	mg/kg	10	23	130	210
Sodium	mg/kg	63	-	-	-
Sodium	mg/kg	-	372	304	369
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	13.1	-	-	-
Exchangeable Sodium	meq/100g	0.27	-	-	-
Exchangeable Potassium	meq/100g	1.00	-	-	-
Exchangeable Calcium	meq/100g	9.55	-	-	-
Exchangeable Magnesium	meq/100g	2.29	-	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	-
Calcium/Magnesium Ratio		4.17	-	-	-
Cation Exchange	meq/100g	-	14.5	15.7	15.5
Exchangeable Sodium	meq/100g	-	1.62	1.32	1.60
Exchangeable Potassium	meq/100g	-	0.44	0.50	0.47
Exchangeable Calcium	meq/100g	-	16.8	18.1	17.6
Exchangeable Magnesium	meq/100g	-	5.54	5.98	6.24
Exchangeable Aluminium	meq/100g	-	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	3.03	3.02	2.82
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.009 Site 230 Depth 0.0-0.1m Soil	TW12-07019.010 Site 230 Depth 0.25-0.35m Soil	TW12-07019.011 Site 230 Depth 0.55-0.65m Soil	TW12-07019.012 Site 230 Depth 0.8-0.9m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	13	<1	-	2
Coarse Sand	%	24	3	-	1
Fine Sand	%	26	33	-	45
Silt	%	23	37	-	34
Clay	%	14	26	-	17
Emerson Aggregate Test		-	1	-	2(1)

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.013 Site 230 Depth 1.1-1.2m Soil	TW12-07019.014 Site 231 Depth 0.0-0.1m Soil	TW12-07019.015 Site 231 Depth 0.2-0.3m Soil	TW12-07019.016 Site 231 Depth 0.5-0.6m Soil
ACIDITY					
pH - Water	pH units	9.42	7.19	8.43	8.89
MAJOR ELEMENTS					
Potassium	mg/kg	-	596	-	-
Potassium	mg/kg	165	-	104	68
Phosphorus - Colwell extr	mg/kg	-	23	-	-
Total Kjeldahl Nitrogen	mg/kg	-	665	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	2760	-	-
Magnesium	mg/kg	-	364	-	-
Calcium	mg/kg	2910	-	2600	3050
Magnesium	mg/kg	707	-	460	704
ORGANIC MATTER					
Organic Carbon	%	-	2.0	-	-
SALINITY					
Electrical Conductivity	dS/m	0.29	0.04	0.08	0.20
Chloride	mg/kg	150	7	10	110
Sodium	mg/kg	-	67	-	-
Sodium	mg/kg	400	-	96	130
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	18.7	-	-
Exchangeable Sodium	meq/100g	-	0.29	-	-
Exchangeable Potassium	meq/100g	-	1.53	-	-
Exchangeable Calcium	meq/100g	-	13.8	-	-
Exchangeable Magnesium	meq/100g	-	3.04	-	-
Exchangeable Aluminium	meq/100g	-	Not Applicable	-	-
Calcium/Magnesium Ratio		-	4.55	-	-
Cation Exchange	meq/100g	13.9	-	17.2	15.3
Exchangeable Sodium	meq/100g	1.74	-	0.42	0.57
Exchangeable Potassium	meq/100g	0.42	-	0.27	0.18
Exchangeable Calcium	meq/100g	14.5	-	13.0	16.3
Exchangeable Magnesium	meq/100g	5.89	-	3.83	5.87
Exchangeable Aluminium	meq/100g	Not Applicable	-	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		2.47	-	3.40	2.60
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.013 Site 230 Depth 1.1-1.2m Soil	TW12-07019.014 Site 231 Depth 0.0-0.1m Soil	TW12-07019.015 Site 231 Depth 0.2-0.3m Soil	TW12-07019.016 Site 231 Depth 0.5-0.6m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	4	3	11
Coarse Sand	%	-	42	28	25
Fine Sand	%	-	15	9	17
Silt	%	-	25	32	24
Clay	%	-	14	28	22
Emerson Aggregate Test		-	-	4	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.017 Site 231 Depth 0.8-0.9m Soil	TW12-07019.018 Site 231 Depth 1.1-1.2m Soil	TW12-07019.019 Site 125 Depth 0.0-0.1m Soil	TW12-07019.020 Site 125 Depth 0.25-0.35m Soil
ACIDITY					
pH - Water	pH units	8.89	8.95	7.53	8.55
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	759	-
Potassium	mg/kg	107	94	-	141
Phosphorus - Colwell extr	mg/kg	-	-	27	-
Total Kjeldahl Nitrogen	mg/kg	-	-	518	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	3
Calcium	mg/kg	-	-	3940	-
Magnesium	mg/kg	-	-	1060	-
Calcium	mg/kg	3110	2710	-	5180
Magnesium	mg/kg	834	962	-	1170
ORGANIC MATTER					
Organic Carbon	%	-	-	1.1	-
SALINITY					
Electrical Conductivity	dS/m	0.33	0.36	0.06	0.27
Chloride	mg/kg	320	350	27	320
Sodium	mg/kg	-	-	338	-
Sodium	mg/kg	293	334	-	979
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	31.9	-
Exchangeable Sodium	meq/100g	-	-	1.47	-
Exchangeable Potassium	meq/100g	-	-	1.95	-
Exchangeable Calcium	meq/100g	-	-	19.7	-
Exchangeable Magnesium	meq/100g	-	-	8.79	-
Exchangeable Aluminium	meq/100g	-	-	Not Applicable	-
Calcium/Magnesium Ratio		-	-	2.24	-
Cation Exchange	meq/100g	12.7	13.1	-	25.2
Exchangeable Sodium	meq/100g	1.28	1.45	-	4.25
Exchangeable Potassium	meq/100g	0.27	0.24	-	0.36
Exchangeable Calcium	meq/100g	15.5	13.6	-	25.9
Exchangeable Magnesium	meq/100g	6.95	8.01	-	9.78
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	-	Not Applicable
Calcium/Magnesium Ratio		2.24	1.69	-	2.65
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.017 Site 231 Depth 0.8-0.9m Soil	TW12-07019.018 Site 231 Depth 1.1-1.2m Soil	TW12-07019.019 Site 125 Depth 0.0-0.1m Soil	TW12-07019.020 Site 125 Depth 0.25-0.35m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	11	3	9	13
Coarse Sand	%	27	34	3	3
Fine Sand	%	13	14	22	21
Silt	%	25	24	38	36
Clay	%	23	25	28	27
Emerson Aggregate Test		4	-	2(1)	2(2)

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.021 Site 125 Depth 0.55-0.65m Soil	TW12-07019.022 Site 125 Depth 0.8-0.9m Soil	TW12-07019.023 Site 125 Depth 1.1-1.2m Soil	TW12-07019.024 Site 125 Depth 1.4-1.5m Soil
ACIDITY					
pH - Water	pH units	8.82	8.72	8.46	7.86
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	151	169	199	184
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	5200	4850	4570	3740
Magnesium	mg/kg	1260	1250	1200	1030
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.65	0.63	0.51	0.39
Chloride	mg/kg	860	890	670	530
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	973	989	986	826
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	24.9	25.5	25.0	23.8
Exchangeable Sodium	meq/100g	4.23	4.30	4.29	3.59
Exchangeable Potassium	meq/100g	0.39	0.41	0.51	0.47
Exchangeable Calcium	meq/100g	26.0	24.3	22.9	18.7
Exchangeable Magnesium	meq/100g	10.5	10.4	9.96	8.54
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		2.48	2.33	2.30	2.19
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.021 Site 125 Depth 0.55-0.65m Soil	TW12-07019.022 Site 125 Depth 0.8-0.9m Soil	TW12-07019.023 Site 125 Depth 1.1-1.2m Soil	TW12-07019.024 Site 125 Depth 1.4-1.5m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	4	-	-
Coarse Sand	%	-	3	-	-
Fine Sand	%	-	19	-	-
Silt	%	-	45	-	-
Clay	%	-	29	-	-
Emerson Aggregate Test		-	2(2)	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.025 Site 127 Depth 0.0-0.1m Soil	TW12-07019.026 Site 127 Depth 0.2-0.3m Soil	TW12-07019.027 Site 127 Depth 0.6-0.8m Soil	TW12-07019.028 Site 127 Depth 0.8-0.9m Soil
ACIDITY					
pH - Water	pH units	6.37	7.70	8.26	7.87
MAJOR ELEMENTS					
Potassium	mg/kg	1030	-	-	-
Potassium	mg/kg	-	504	436	297
Phosphorus - Colwell extr	mg/kg	86	-	-	-
Total Kjeldahl Nitrogen	mg/kg	743	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	5330	-	-	-
Magnesium	mg/kg	1370	-	-	-
Calcium	mg/kg	-	7340	7460	7060
Magnesium	mg/kg	-	1440	1530	1580
ORGANIC MATTER					
Organic Carbon	%	1.7	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.06	0.07	0.24	0.50
Chloride	mg/kg	42	51	380	880
Sodium	mg/kg	263	-	-	-
Sodium	mg/kg	-	552	891	1030
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	41.8	-	-	-
Exchangeable Sodium	meq/100g	1.10	-	-	-
Exchangeable Potassium	meq/100g	2.63	-	-	-
Exchangeable Calcium	meq/100g	26.6	-	-	-
Exchangeable Magnesium	meq/100g	11.4	-	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	-
Calcium/Magnesium Ratio		2.33	-	-	-
Cation Exchange	meq/100g	-	26.4	29.3	27.0
Exchangeable Sodium	meq/100g	-	2.40	3.87	4.49
Exchangeable Potassium	meq/100g	-	1.29	1.12	0.76
Exchangeable Calcium	meq/100g	-	36.7	37.3	35.3
Exchangeable Magnesium	meq/100g	-	12.0	12.8	13.1
Exchangeable Aluminium	meq/100g	-	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	3.06	2.92	2.69
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.026 Site 127 Depth 0.0-0.1m Soil	TW12-07019.026 Site 127 Depth 0.2-0.3m Soil	TW12-07019.027 Site 127 Depth 0.5-0.6m Soil	TW12-07019.028 Site 127 Depth 0.8-0.9m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	4	4	-	2
Coarse Sand	%	3	2	-	1
Fine Sand	%	21	17	-	11
Silt	%	38	39	-	44
Clay	%	33	38	-	43
Emerson Aggregate Test		3(3)	3(4)	-	3(3)

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.029 Site 127 Depth 1.1-1.2m Soil	TW12-07019.030 Site 127 Depth 1.4-1.5m Soil	TW12-07019.031 Site 146 Depth 0.0-0.1m Soil	TW12-07019.032 Site 146 Depth 0.2-0.3m Soil
ACIDITY					
pH - Water	pH units	8.49	8.44	7.29	7.20
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	323	43
Potassium	mg/kg	266	209	-	-
Phosphorus - Colwell extr	mg/kg	-	-	4	-
Total Kjeldahl Nitrogen	mg/kg	-	-	818	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	1650	575
Magnesium	mg/kg	-	-	121	28
Calcium	mg/kg	6870	5400	-	-
Magnesium	mg/kg	1520	1350	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	0.7	-
SALINITY					
Electrical Conductivity	dS/m	0.64	0.55	0.04	0.01
Chloride	mg/kg	1000	880	11	6
Sodium	mg/kg	-	-	22	4
Sodium	mg/kg	858	791	-	-
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	10.2	3.23
Exchangeable Sodium	meq/100g	-	-	0.10	0.02
Exchangeable Potassium	meq/100g	-	-	0.83	0.11
Exchangeable Calcium	meq/100g	-	-	8.23	2.87
Exchangeable Magnesium	meq/100g	-	-	1.01	0.23
Exchangeable Aluminium	meq/100g	-	-	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	-	8.18	12.34
Cation Exchange	meq/100g	21.1	20.5	-	-
Exchangeable Sodium	meq/100g	3.72	3.44	-	-
Exchangeable Potassium	meq/100g	0.68	0.54	-	-
Exchangeable Calcium	meq/100g	34.3	27.0	-	-
Exchangeable Magnesium	meq/100g	12.7	11.3	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	-	-
Calcium/Magnesium Ratio		2.71	2.39	-	-
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.029 Site 127 Depth 1.1-1.2m Soil	TW12-07019.030 Site 127 Depth 1.4-1.6m Soil	TW12-07019.031 Site 146 Depth 0.0-0.1m Soil	TW12-07019.032 Site 146 Depth 0.2-0.3m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	-	1	2
Coarse Sand	%	-	-	61	59
Fine Sand	%	-	-	18	20
Silt	%	-	-	15	9
Clay	%	-	-	5	9
Emerson Aggregate Test		-	-	-	3(3)

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TW12-07019

Analysis	Unit	TW12-07019.033 Site 146 Depth 0.5-0.6m Soil	TW12-07019.034 Site 146 Depth 0.8-0.9m Soil	TW12-07019.035 Site 147 Depth 0.0-0.1m Soil	TW12-07019.036 Site 147 Depth 0.2-0.3m Soil
ACIDITY					
pH - Water	pH units	7.24	8.55	7.81	8.50
MAJOR ELEMENTS					
Potassium	mg/kg	146	-	-	-
Potassium	mg/kg	-	139	384	177
Phosphorus - Colwell extr	mg/kg	-	-	14	-
Total Kjeldahl Nitrogen	mg/kg	-	-	767	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	1390	-	-	-
Magnesium	mg/kg	694	-	-	-
Calcium	mg/kg	-	1900	4400	4060
Magnesium	mg/kg	-	588	269	500
ORGANIC MATTER					
Organic Carbon	%	-	-	2.0	-
SALINITY					
Electrical Conductivity	dS/m	0.07	0.07	0.03	0.06
Chloride	mg/kg	37	43	8	13
Sodium	mg/kg	257	-	-	-
Sodium	mg/kg	-	349	120	124
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	14.2	-	-	-
Exchangeable Sodium	meq/100g	1.12	-	-	-
Exchangeable Potassium	meq/100g	0.37	-	-	-
Exchangeable Calcium	meq/100g	6.97	-	-	-
Exchangeable Magnesium	meq/100g	5.78	-	-	-
Exchangeable Aluminium	meq/100g	Not Applicable	-	-	-
Calcium/Magnesium Ratio		1.21	-	-	-
Cation Exchange	meq/100g	-	11.6	15.2	12.9
Exchangeable Sodium	meq/100g	-	1.52	0.52	0.54
Exchangeable Potassium	meq/100g	-	0.36	0.98	0.45
Exchangeable Calcium	meq/100g	-	9.49	22.0	20.3
Exchangeable Magnesium	meq/100g	-	8.23	2.16	4.17
Exchangeable Aluminium	meq/100g	-	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		-	1.15	10.20	4.86
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.033 Site 146 Depth 0.5-0.6m Soil	TW12-07019.034 Site 146 Depth 0.8-0.9m Soil	TW12-07019.035 Site 147 Depth 0.0-0.1m Soil	TW12-07019.036 Site 147 Depth 0.2-0.3m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	<1	2	6
Coarse Sand	%	-	36	48	45
Fine Sand	%	-	19	17	12
Silt	%	-	20	20	21
Clay	%	-	25	13	17
Emerson Aggregate Test		-	2(3)	3(1)	3(4)

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.037 Site 147 Depth 0.5-0.6m Soil	TW12-07019.038 Site 147 Depth 0.8-0.9m Soil	TW12-07019.039 Site 147 Depth 1.1-1.2m Soil	TW12-07019.040 Site 148 Depth 0.0-0.1m Soil
ACIDITY					
pH - Water	pH units	9.06	9.52	9.66	7.89
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	193	187	129	407
Phosphorus - Colwell extr	mg/kg	-	-	-	16
Total Kjeldahl Nitrogen	mg/kg	-	-	-	782
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	2860	2850	2420	2990
Magnesium	mg/kg	752	974	1160	540
ORGANIC MATTER					
Organic Carbon	%	-	-	-	0.8
SALINITY					
Electrical Conductivity	dS/m	0.09	0.17	0.28	0.03
Chloride	mg/kg	8	13	150	8
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	169	315	647	110
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	12.4	14.4	15.7	13.3
Exchangeable Sodium	meq/100g	0.74	1.37	2.81	0.48
Exchangeable Potassium	meq/100g	0.50	0.48	0.33	1.04
Exchangeable Calcium	meq/100g	14.3	14.2	12.1	15.0
Exchangeable Magnesium	meq/100g	6.26	8.11	9.63	4.50
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		2.29	1.75	1.26	3.32
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.037 Site 147 Depth 0.5-0.6m Soil	TW12-07019.038 Site 147 Depth 0.8-0.9m Soil	TW12-07019.039 Site 147 Depth 1.1-1.2m Soil	TW12-07019.040 Site 148 Depth 0.0-0.1m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	3	-	4
Coarse Sand	%	-	43	-	24
Fine Sand	%	-	7	-	26
Silt	%	-	22	-	27
Clay	%	-	26	-	20
Emerson Aggregate Test		-	2(1)	-	4

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.041 Site 148 Depth 0.25-0.35m Soil	TW12-07019.042 Site 148 Depth 0.55-0.65m Soil	TW12-07019.043 Site 148 Depth 0.7-0.8m Soil	TW12-07019.044 Site 148 Depth 0.8-0.9m Soil
ACIDITY					
pH - Water	pH units	8.96	9.02	8.97	9.04
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	124	120	-	324
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	1	-	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	4930	3810	-	3790
Magnesium	mg/kg	1410	1360	-	1270
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.53	0.69	0.95	0.93
Chloride	mg/kg	740	1200	1400	1300
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	1020	883	-	852
Chloride	mg/kg	-	-	1300	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	19.3	15.0	-	17.3
Exchangeable Sodium	meq/100g	4.43	3.84	-	3.70
Exchangeable Potassium	meq/100g	0.32	0.31	-	0.83
Exchangeable Calcium	meq/100g	24.6	19.1	-	18.9
Exchangeable Magnesium	meq/100g	11.8	11.4	-	10.6
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	-	Not Applicable
Calcium/Magnesium Ratio		2.09	1.68	-	1.78
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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TW12-07019

Analysis	Unit	TW12-07019.041 Site 148 Depth 0.25-0.35m Soil	TW12-07019.042 Site 148 Depth 0.55-0.65m Soil	TW12-07019.043 Site 148 Depth 0.7-0.8m Soil	TW12-07019.044 Site 148 Depth 0.8-0.9m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	<1	-	-	3
Coarse Sand	%	10	-	-	9
Fine Sand	%	25	-	-	24
Silt	%	35	-	-	32
Clay	%	29	-	-	31
Emerson Aggregate Test		2(1)	-	-	3(1)

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TW12-07019

Analysis	Unit	TW12-07019.045 Site 148 Depth 1.1-1.2m Soil	TW12-07019.046 Site 148 Depth 1.4-1.5m Soil	TW12-07019.047 Site 149 Depth 0.0-0.1m Soil	TW12-07019.048 Site 149 Depth 0.25-0.35m Soil
ACIDITY					
pH - Water	pH units	9.08	8.88	8.38	9.00
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	239	160	711	323
Phosphorus - Colwell extr	mg/kg	-	-	48	-
Total Kjeldahl Nitrogen	mg/kg	-	-	835	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	3980	3500	7620	6190
Magnesium	mg/kg	1440	1250	1110	1380
ORGANIC MATTER					
Organic Carbon	%	-	-	1.0	-
SALINITY					
Electrical Conductivity	dS/m	0.92	0.71	0.10	0.21
Chloride	mg/kg	1300	880	26	74
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	1190	855	324	733
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	19.8	20.6	26.3	24.7
Exchangeable Sodium	meq/100g	5.19	3.72	1.41	3.19
Exchangeable Potassium	meq/100g	0.61	0.41	1.82	0.83
Exchangeable Calcium	meq/100g	19.9	17.5	38.1	30.9
Exchangeable Magnesium	meq/100g	12.0	10.4	9.26	11.5
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		1.66	1.68	4.12	2.69
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.045 Site 148 Depth 1.1-1.2m Soil	TW12-07019.046 Site 148 Depth 1.4-1.5m Soil	TW12-07019.047 Site 149 Depth 0.0-0.1m Soil	TW12-07019.048 Site 149 Depth 0.25-0.35m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	-	4	2
Coarse Sand	%	-	-	3	2
Fine Sand	%	-	-	14	5
Silt	%	-	-	37	42
Clay	%	-	-	41	49
Emerson Aggregate Test		-	-	3(1)	3(3)

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.049 Site 149 Depth 0.55-0.65m Soil	TW12-07019.050 Site 149 Depth 0.8-0.9m Soil	TW12-07019.051 Site 149 Depth 1.1-1.2m Soil	TW12-07019.052 Site 149 Depth 1.4-1.5m Soil
ACIDITY					
pH - Water	pH units	8.76	7.83	7.66	7.62
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	298	260	269	299
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	3260	3220	3360	3270
Magnesium	mg/kg	1730	1840	2090	2320
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.52	2.90	3.20	2.71
Chloride	mg/kg	470	960	1700	1900
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	1260	1100	1090	1130
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	25.0	23.9	27.6	27.8
Exchangeable Sodium	meq/100g	5.49	4.78	4.72	4.91
Exchangeable Potassium	meq/100g	0.76	0.64	0.69	0.77
Exchangeable Calcium	meq/100g	16.3	16.1	16.8	16.4
Exchangeable Magnesium	meq/100g	14.4	15.4	17.4	19.3
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		1.13	1.05	0.96	0.85
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.049 Site 149 Depth 0.55-0.65m Soil	TW12-07019.050 Site 149 Depth 0.8-0.9m Soil	TW12-07019.051 Site 149 Depth 1.1-1.2m Soil	TW12-07019.052 Site 149 Depth 1.4-1.5m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	1	-	-
Coarse Sand	%	-	2	-	-
Fine Sand	%	-	8	-	-
Silt	%	-	42	-	-
Clay	%	-	46	-	-
Emerson Aggregate Test		-	4	-	-

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TW12-07019

Analysis	Unit	TW12-07019.053 Site 132 Depth 0.0-0.1m Soil	TW12-07019.054 Site 132 Depth 0.2-0.3m Soil	TW12-07019.055 Site 132 Depth 0.5-0.6m Soil	TW12-07019.056 Site 132 Depth 0.8-0.9m Soil
ACIDITY					
pH - Water	pH units	8.22	8.79	8.99	9.20
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	780	295	320	338
Phosphorus - Colwell extr	mg/kg	118	-	-	-
Total Kjeldahl Nitrogen	mg/kg	756	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	6370	5340	4820	4510
Magnesium	mg/kg	1110	1390	1800	2020
ORGANIC MATTER					
Organic Carbon	%	1.4	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.15	0.14	0.22	0.26
Chloride	mg/kg	24	11	22	45
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	357	697	837	1330
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	38.7	31.4	33.5	32.7
Exchangeable Sodium	meq/100g	1.55	3.03	3.64	5.77
Exchangeable Potassium	meq/100g	2.00	0.76	0.82	0.87
Exchangeable Calcium	meq/100g	31.9	26.7	24.1	22.5
Exchangeable Magnesium	meq/100g	9.24	11.6	16.0	16.9
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		3.45	2.31	1.61	1.34
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.053 Site 132 Depth 0.0-0.1m Soil	TW12-07019.054 Site 132 Depth 0.2-0.3m Soil	TW12-07019.055 Site 132 Depth 0.5-0.6m Soil	TW12-07019.056 Site 132 Depth 0.8-0.9m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	5	<1	-	6
Coarse Sand	%	5	2	-	2
Fine Sand	%	12	3	-	64
Silt	%	40	49	-	14
Clay	%	38	45	-	13
Emerson Aggregate Test		4	4	-	3(4)

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TW12-07019

Analysis	Unit	TW12-07019.057 Site 132 Depth 1.1-1.2m Soil	TW12-07019.058 Site 240 Depth 0.4-0.6m Soil	TW12-07019.059 Site 243 Depth 0.25-0.35m Soil	TW12-07019.060 Site 233 Depth 0.55-0.65m Soil
ACIDITY					
pH - Water	pH units	9.10	8.85	7.96	8.78
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	340	123	86	236
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	<1	<1	<1	<1
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	3630	1250	1850	1930
Magnesium	mg/kg	1810	1260	782	725
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.29	0.25	0.06	0.07
Chloride	mg/kg	120	310	26	24
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	1230	563	228	196
Chloride	mg/kg	-	-	-	-
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	34.0	14.7	17.8	16.5
Exchangeable Sodium	meq/100g	5.36	2.45	0.99	0.85
Exchangeable Potassium	meq/100g	0.87	0.32	0.22	0.61
Exchangeable Calcium	meq/100g	18.1	6.25	9.29	9.66
Exchangeable Magnesium	meq/100g	15.1	10.5	6.51	6.06
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Calcium/Magnesium Ratio		1.20	0.60	1.43	1.60
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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TW12-07019

Analysis	Unit	TW12-07019.057 Site 132 Depth 1.1-1.2m Soil	TW12-07019.058 Site 240 Depth 0.4-0.6m Soil	TW12-07019.059 Site 243 Depth 0.25-0.35m Soil	TW12-07019.060 Site 233 Depth 0.55-0.65m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-
Emerson Aggregate Test		-	-	-	-

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TW12-07019

Analysis	Unit	TW12-07019.061 Site 222 Depth 0.25-0.35m Soil	TW12-07019.062 Site 222 Depth 0.55-0.65m Soil	TW12-07019.063 Site 222 Depth 0.8-0.9m Soil	TW12-07019.064 Site 126 Depth 0.25-0.35m Soil
ACIDITY					
pH - Water	pH units	6.66	8.36	8.52	8.83
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	215	205	192	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	1	<1	<1	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	2620	2690	2050	-
Magnesium	mg/kg	856	1040	870	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.13	0.20	0.18	0.22
Chloride	mg/kg	120	280	240	94
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	337	347	513	-
Chloride	mg/kg	-	-	-	91
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	20.4	18.3	16.9	-
Exchangeable Sodium	meq/100g	1.47	1.51	2.23	-
Exchangeable Potassium	meq/100g	0.55	0.53	0.49	-
Exchangeable Calcium	meq/100g	13.1	12.9	10.3	-
Exchangeable Magnesium	meq/100g	7.47	8.68	7.25	-
Exchangeable Aluminium	meq/100g	Not Applicable	Not Applicable	Not Applicable	-
Calcium/Magnesium Ratio		1.75	1.49	1.42	-
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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TW12-07019

Analysis	Unit	TW12-07019.061 Site 222 Depth 0.25-0.35m Soil	TW12-07019.062 Site 222 Depth 0.55-0.65m Soil	TW12-07019.063 Site 222 Depth 0.8-0.9m Soil	TW12-07019.064 Site 125 Depth 0.25-0.35m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-
Emerson Aggregate Test		-	-	-	-

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TW12-07019

Analysis	Unit	TW12-07019.065 Site 126 Depth 0.55-0.65m Soil	TW12-07019.066 Site 126 Depth 0.8-0.9m Soil	TW12-07019.067 Site 131 Depth 0.25-0.35m Soil	TW12-07019.068 Site 131 Depth 0.55-0.65m Soil
ACIDITY					
pH - Water	pH units	8.68	8.65	8.77	9.03
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	-	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.44	0.64	0.15	0.22
Chloride	mg/kg	510	720	15	16
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	-	-	-	-
Chloride	mg/kg	480	700	11	3
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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TW12-07019

Analysis	Unit	TW12-07019.065 Site 126 Depth 0.55-0.65m Soil	TW12-07019.066 Site 126 Depth 0.8-0.9m Soil	TW12-07019.067 Site 131 Depth 0.25-0.35m Soil	TW12-07019.068 Site 131 Depth 0.55-0.65m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-
Emerson Aggregate Test		-	-	-	-

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TW12-07019

Analysis	Unit	TW12-07019.069 Site 131 Depth 0.8-0.9m Soil	TW12-07019.070 Site 139 Depth 0.25-0.35m Soil	TW12-07019.071 Site 139 Depth 0.55-0.65m Soil	TW12-07019.072 Site 139 Depth 0.8-0.9m Soil
ACIDITY					
pH - Water	pH units	9.11	9.00	8.80	7.94
MAJOR ELEMENTS					
Potassium	mg/kg	-	-	-	-
Potassium	mg/kg	-	-	-	-
Phosphorus - Colwell extr	mg/kg	-	-	-	-
Total Kjeldahl Nitrogen	mg/kg	-	-	-	-
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
Calcium	mg/kg	-	-	-	-
Magnesium	mg/kg	-	-	-	-
ORGANIC MATTER					
Organic Carbon	%	-	-	-	-
SALINITY					
Electrical Conductivity	dS/m	0.24	0.21	0.67	3.10
Chloride	mg/kg	28	57	510	1100
Sodium	mg/kg	-	-	-	-
Sodium	mg/kg	-	-	-	-
Chloride	mg/kg	20	49	470	1100
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
Cation Exchange	meq/100g	-	-	-	-
Exchangeable Sodium	meq/100g	-	-	-	-
Exchangeable Potassium	meq/100g	-	-	-	-
Exchangeable Calcium	meq/100g	-	-	-	-
Exchangeable Magnesium	meq/100g	-	-	-	-
Exchangeable Aluminium	meq/100g	-	-	-	-
Calcium/Magnesium Ratio		-	-	-	-
ELEMENTAL ANALYSIS					
Iron	%	-	-	-	-
Arsenic	mg/kg	-	-	-	-
Chromium	mg/kg	-	-	-	-
Cadmium	mg/kg	-	-	-	-
Zinc	mg/kg	-	-	-	-
Lead	mg/kg	-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.069 Site 131 Depth 0.8-0.9m Soil	TW12-07019.070 Site 139 Depth 0.25-0.35m Soil	TW12-07019.071 Site 139 Depth 0.55-0.65m Soil	TW12-07019.072 Site 139 Depth 0.8-0.9m Soil
Copper	mg/kg	-	-	-	-
Manganese	mg/kg	-	-	-	-
Mercury	mg/kg	-	-	-	-
Particle Size Analysis					
Gravel	%	-	-	-	-
Coarse Sand	%	-	-	-	-
Fine Sand	%	-	-	-	-
Silt	%	-	-	-	-
Clay	%	-	-	-	-
Emerson Aggregate Test		-	-	-	-

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.073 Site QC1 Soil	TW12-07019.074 Site QC2 Soil		
ACIDITY					
pH - Water	pH units	-	-		
MAJOR ELEMENTS					
Potassium	mg/kg	-	-		
Potassium	mg/kg	-	-		
Phosphorus - Colwell extr	mg/kg	-	-		
Total Kjeldahl Nitrogen	mg/kg	-	-		
SECONDARY ELEMENTS					
Aluminium	mg/kg	-	-		
Calcium	mg/kg	-	-		
Magnesium	mg/kg	-	-		
Calcium	mg/kg	-	-		
Magnesium	mg/kg	-	-		
ORGANIC MATTER					
Organic Carbon	%	-	-		
SALINITY					
Electrical Conductivity	dS/m	-	-		
Chloride	mg/kg	-	-		
Sodium	mg/kg	-	-		
Sodium	mg/kg	-	-		
Chloride	mg/kg	-	-		
EXCHANGEABLE CATIONS					
Cation Exchange	meq/100g	-	-		
Exchangeable Sodium	meq/100g	-	-		
Exchangeable Potassium	meq/100g	-	-		
Exchangeable Calcium	meq/100g	-	-		
Exchangeable Magnesium	meq/100g	-	-		
Exchangeable Aluminium	meq/100g	-	-		
Calcium/Magnesium Ratio		-	-		
Cation Exchange	meq/100g	-	-		
Exchangeable Sodium	meq/100g	-	-		
Exchangeable Potassium	meq/100g	-	-		
Exchangeable Calcium	meq/100g	-	-		
Exchangeable Magnesium	meq/100g	-	-		
Exchangeable Aluminium	meq/100g	-	-		
Calcium/Magnesium Ratio		-	-		
ELEMENTAL ANALYSIS					
Iron	%	3.27	2.03		
Arsenic	mg/kg	14.4	24.3		
Chromium	mg/kg	248	152		
Cadmium	mg/kg	6.45	3.36		
Zinc	mg/kg	81	46		
Lead	mg/kg	9	8		
Copper	mg/kg	38	22		

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Report of Analysis

TW12-07019

Analysis	Unit	TW12-07019.073 Site QC1 Soil	TW12-07019.074 Site QC2 Soil		
Manganese	mg/kg	550	204		
Mercury	mg/kg	0.01	<0.01		
Particle Size Analysis					
Gravel	%	-	-		
Coarse Sand	%	-	-		
Fine Sand	%	-	-		
Silt	%	-	-		
Clay	%	-	-		
Emerson Aggregate Test		-	-		

Results are on an 'air dried' basis.

Analysed Between 24/08/2012 - 04/10/2012

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Report of Analysis

TW12-07019

Method of Analysis Analysis	Unit	Det.Lim.	Method
pH - Water	pH units	0.01	SOL003/SOL007-2
Electrical Conductivity	dS/m	0.01	SOL003/SOL007-2
Chloride	mg/kg	1	SOL030
Aluminium	mg/kg	1	SOL002/1-2
Sodium	mg/kg	1	15A2/15D1
Potassium	mg/kg	1	15A2/15D1
Calcium	mg/kg	1	15A2/15D1
Magnesium	mg/kg	1	15A2/15D1
Cation Exchange	meq/100g	0.01	15A2/15D1
Exchangeable Sodium	meq/100g	0.01	15A2/15D1
Exchangeable Potassium	meq/100g	0.01	15A2/15D1
Exchangeable Calcium	meq/100g	0.01	15A2/15D1
Exchangeable Magnesium	meq/100g	0.01	15A2/15D1
Exchangeable Aluminium	meq/100g	0.01	15A2/15D1
Calcium/Magnesium Ratio		0.01	15A2/15D1
Sodium	mg/kg	1	15C1
Potassium	mg/kg	1	15C1
Calcium	mg/kg	1	15C1
Magnesium	mg/kg	1	15C1
Cation Exchange	meq/100g	0.01	15C1
Exchangeable Sodium	meq/100g	0.01	15C1
Exchangeable Potassium	meq/100g	0.01	15C1
Exchangeable Calcium	meq/100g	0.01	15C1
Exchangeable Magnesium	meq/100g	0.01	15C1
Exchangeable Aluminium	meq/100g	0.01	15C1
Calcium/Magnesium Ratio		0.01	15C1
Gravel	%	1	SOL028
Coarse Sand	%	1	SOL028
Fine Sand	%	1	SOL028
Silt	%	1	SOL028
Clay	%	1	SOL028
Emerson Aggregate Test			SOL012
Phosphorus - Colwell extr	mg/kg	1	SOL005/001/4
Organic Carbon	%	0.3	CAR002/SOL002/1
Total Kjeldahl Nitrogen	mg/kg	1	
Chloride	mg/kg	1	SOL030
Iron	%	0.01	MIN012

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Report of Analysis

TW12-07019

Arsenic	mg/kg	0.1	MIN012
Chromium	mg/kg	1	MIN012
Cadmium	mg/kg	0.01	MIN012
Zinc	mg/kg	1	MIN012
Lead	mg/kg	1	MIN012
Copper	mg/kg	1	MIN012
Manganese	mg/kg	0.1	MIN012
Mercury	mg/kg	0.01	MIN012

The analyses presented in the report refer exclusively to the samples analysed.

The presented report can only be reproduced in its entirety.

Keegan Roache - Laboratory Operations Manager

For and on behalf of SGS Australia Pty Ltd

APPENDIX C: BORELOGS AND SITE PHOTOGRAPHS

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH101

Date	21/7/2012
Time	7:30AM
Describer	A.Sheldon
Elevation (m)	105
Easting	55 / 790559
Northing	7312369
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Buffel Grass
Lithology	Relict Alluvium	**Surface Soil Condition**	trampled
Substrate:	Relict Alluvium	**Crack width:**	none
ASC:	Brown Chromosol	**Runoff:**	Rapid
Soil Type:	Thalberg	**Permeability**	Slow
SCL Status:	-	**Drainage:**	Imperfectly drained
Slope:	6%	**Coarse Fragments (Abundance, Size, Shape):**	Nil
Assessment Method:	Clinometer	**Coarse Fragments (lithology):**	Nil
Morphological Type:	Simple Slope	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	Rill and Sheet
Landform Element:	Hillslope	**Erosion Severity/State:**	Minor/Partially Stabilised
Landform Pattern:	Hills	**Inundation:**	None
Land Use	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance	Cleared	**SCL 2 (Rockiness)**	Pass
Ground cover:	50%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5	**Additional Notes**	
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH101

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark Brown 10YR 3/3, Loamy sand (medium)	-	Moderate	10%, <1mm	6.5 / None	-	Moist	Clear
B21	0.5	Dark yellowish brown 10YR 4/4, Light clay		Moderate	5 %, <1mm	5.5 / None	Normal	Moist	Diffuse
B22	0.8	Strong Brown, 7.5YR 4/6, Light clay	Carbonate Fragments, 2%, <5mm	Weak SB		8 / Medium		Slightly Moist	Diffuse
B3	1.3	Strong Brown, 7.5YR 5/6, Light Clay	Carbonate Fragments, 20%, <10mm	Weak SB		9.5 / Strong		Slightly Moist	Refusal

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH102

Date	21/7/2012
Time	9:20AM
Describer	A.Sheldon
Elevation (m):	90
Easting	55 / 790815
Northing	7311660
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Buffel Grass, Poplar Box, Tea Tree
Lithology	Colluvium	**Surface Soil Condition**	Trampled
Substrate:	Colluvium	**Crack Width**	Nil
ASC:	Brown Chromosol	**Runoff:**	Slow
Soil Type:	Thalberg	**Permeability**	Moderately Rapid
SCL Status	Fail	**Drainage:**	Moderately well drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Gently Undulating hills	**Erosion Type:**	-
Landform Element:	Toeslope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Regular
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (Rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	
Preclear RE:	11.4.8/9a/		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH102

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Loamy sand (F)	-	Moderate	5%, <1	6.5 / -	-	Slightly Moist	Diffuse
A2	0.6	Greyish Brown, 10YR 4/2, Sand (C)	-	Moderate	2%, <1	7 / -	-	Slightly Moist	Diffuse
B1	1.0	Greyish Brown, 10YR 4/2 (moist) (DRY: Greyish brown 10YR 5/2), Sand (C)	-	Moderate	-	8 / -	-	Slightly Moist	Diffuse
B21	1.2	Light Brownish Grey, 10YR 6/2, Mottle 20% Brownish Yellow, Clayey sand (C)	-	Moderate	-	9 / None	-	Slightly Moist	Refusal

PROJECT NO: 718107 SITE: BH104

Date	21/7/2012
Time	10:50AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 788549
Northing	7313133
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	QA	**Vegetation Species:**	Buffel Grass, Brigalow
Lithology	Alluvium	**Surface Soil Condition**	Poached
Substrate:	Alluvium	**Crack Width**	Nil
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Moderately Well Drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood Prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (Rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH104

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Black, 10YR 2/1 Light medium clay	-	Strong Sub Blocky	5%, <1mm	7 / -	N	Moist	Diffuse
B21	0.4	Very Dark Greyish Brown, 2.5Y 3/2, Medium Clay	-	Strong Sub Blocky	2%, <1mm	9 / Nil	N	Moist	Diffuse
B22	0.8	Brown: 10YR 4/3 Brown, Medium Clay	Carbonate Nodules	Strong Sub Blocky	2%, <1mm	9 / Mod	N	Slightly Moist	Diffuse
B23	1.1	Brown: 10YR 4/3 Sub Dominant: 10YR 2/1, medium Clay	Carbonate Nodules	Moderate Sub Blocky		9 / Mod	N	Slightly Moist	Diffuse
2Db	1.5	D Yellowish Brown: 10YR 4/4, Sandy Clay, Fine sand	-	Weak Granular		9 / Nil	N	Slightly Moist	-

PROJECT NO: 718107 SITE: BH105

Date	26/3/2019 & 26/03/2019
Time	9:23 AM
Described by:	AS/ MCK
Elevation (m):	90
Easting	55 / 788399
Northing	7314318
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	QA	**Vegetation Species:**	Buffel Grass, Purple Pidgeon Grass, Brigalow Regrowth
Lithology	Alluvium	**Surface Soil Condition**	Self Mulching
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Moderate
SCL Status	Pass	**Drainage:**	Moderately Well Drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood Prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared (5)	**SCL 2 (rockiness)**	Pass
Groundcover:	70%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1.5m	**Additional Notes**	Centre pivot irrigator installed 30 yrs ago, not used, abandoned
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH105

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1°/2° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark grey 10YR 3/1, Medium heavy clay	-	Strong Sub Blocky 1-5mm	10% 1-2mm	7.5	-	Moist	Diffuse
B21	0.35	Very dark grey 10YR 3/1, Heavy clay	Carbonate nodules 3% 1-5mm	Strong Sub Blocky 1-5mm/ lenticular 20-30mm	5% 1-2mm	9/ Strong	-	Slightly moist	Diffuse
B22	0.8	Very dark grey 10YR 3/1, Heavy clay	Carbonate nodules 3% 1-4mm	Strong Sub Blocky 5-10mm	5% 1-2mm	9	-	Slightly Moist	Diffuse
B23	1.1	Very dark grey 10YR 3/1,Sub dominant yellowish brown 10YR5/4 10% Heavy clay	Carbonate Nodules 5% 2-5mm	Strong Sub Blocky	-	9.5	-	Slightly Moist	Diffuse
B24	1.25	Dark grey 10YR 4/1, Medium clay, Mottled yellowish brown 10YR 5/4 10%	Shell/ Carbonate inclusions <2% 4mm	Strong Sub Blocky	-	8.5	-	Moist	Diffuse

PROJECT NO: 718107 SITE: BH106

Date	21/7/2012
Time	13:15PM
Described by:	A. Sheldon
Elevation (m):	100
Easting	55 / 790587
Northing	7313751
Observation Type	Check
Sample Method	Test Pit

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Buffel Grass
Lithology	-	**Surface Soil Condition**	Trampled
Substrate:	Calcareous Sandstone	**Crack Width**	-
ASC:	Brown Sodosol	**Runoff:**	Rapid
Soil Type:	Thalberg	**Permeability**	
SCL Status		**Drainage:**	Imperfectly Drained
Slope	2%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple Slope	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hills	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	None
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH106

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Brown, Fine sandy clay	-	Moderate	30%, 1-2mm	-	-	Moist	-
A2	0.3	Grey Brown, Bleached, Clayey sand	-	Moderate	20% 1-2mm	-	-	Moist	-
B2	0.5	Orangey Brown, 1° Mottle: 20%, Brown, Medium clay	-	Weak Sub Blocky		-	-	Saturated	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH107

Date	21/7/2012
Time	13:36PM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 789575
Northing	7314540
Observation Type	Detailed
Sample Method	Test Pit

SITE DESCRIPTION

Geology Unit:	QA	**Vegetation Species:**	Purple Pidgeon Grass, (Brigalow)
Lithology	Alluvium	**Surface Soil Condition**	Trampled
Substrate:	Alluvium	**Crack Width**	Nil
ASC:	Slightly Moist Black Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Moderately Well Drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood Prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	Langley
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH107

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Black, 7.5YR 2.5/1, Medium Heavy Clay, Cracks: 20%, 1-2mm	-	Moderate Sub Blocky 5-10mm	30%, <1-3mm	-	N	Wet	Diffuse/ Even
B21	0.4	Very Dark Greyish Brown, 10YR 3/2. Black along crack lines. Heavy Clay, Cracks: 20%, 1-2mm	-	Strong lenticular 10-20mm	10%, <1mm	-	-	Wet	Diffuse/ Even
B22	0.8	Very Dark Greyish Brown, 10YR 3/2. Sub dominant Grey 7.5YR2.5/1. Grade: Heavy Clay, Cracks: 10%, 1mm	Carbonate Nodules, 5%, 2-5mm, (trace gypsum)	Strong Lenticular 10-20mm	5% 1mm	-	-	Slightly Moist	Diffuse / Even
B23	1.2	Very Dark Greyish Brown, 10YR 3/2, Heavy Clay, Cracks: 10%, 1mm	Carbonate Nodules, 2%, 2-5mm	Strong Angular Blocky 10-30mm	2%, <1mm	-	-	Slightly Moist	-

PROJECT NO: 718107 SITE: BH110

Date	21/7/2012
Time	13:00PM
Described by:	A. Sheldon
Elevation (m):	105
Easting	55 / 790129
Northing	7313147
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Dawson Gum, Buffel Grass
Lithology	Weathered Sediments	**Surface Soil Condition**	Trampled – soft
Substrate:	Calcareous Sandstone	**Crack Width**	Nil
ASC:	Brown Sodosol	**Runoff:**	Slow
Soil Type:	Thalberg	**Permeability**	Moderate
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	8%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple Slope	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Undulating Low hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	20m	**Additional Notes**	-
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH110

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark brown 10YR 2/2, Loamy Sand (Coarse)	-	Moderate	5%, 1-2mm	7	-	Dry	Diffuse
A2	0.45	Brown 10YR 5/3, Clayey Sand (Coarse)	-	Moderate	2%, 1-2mm	7	-	Dry	Diffuse
B21	0.7	Brown 10YR 5/3, Sandy Clay, Coarse Sand, mottled Red/orange 40%	Silcrete nodules 10% 30mm, Sub angular Coarse Fragments 2% 2-5mm	Weak Sub Blocky	-	5	-	Slightly Moist	Clear
B22	1.0	Brown 10YR 5/3, Clayey Sand (Coarse)	Sub angular Coarse Fragments 2% 2-5mm	Weak Sub Blocky	-	5	-	Dry	Refusal

PROJECT NO: 718107 SITE: BH111

Date	25/07/2012 & 25/03/2019
Time	11:14AM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 790562
Northing	7311425
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel Grass, silk sorghum, brigalow, galvanised burr
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching, cracking
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Brown Vertosol	**Runoff:**	Slow
Soil Type:	Tralee	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Imperfectly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Lumpy
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	2m	**Additional Notes**	-
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH111

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.15	Very dark greyish brown 10YR 3/2, Medium Clay	-	Blocky	20%, 1-3mm	8.5	-	Dry	Diffuse
B21	0.55	Brown 10YR 4/3, Medium Heavy clay	Carbonate nodules 1% 1-3mm	Blocky	10% 1mm	9 Strong	-	Dry	Diffuse
B22	1.0	Dark greyish brown 10YR 4/2 Fine sand	Carbonate nodules/ fragments 2%, 3-5mm	Blocky	-	9 Strong	-	Dry	Diffuse

MCK update (2019)

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Medium Clay	-	Strong Sub Blocky	20%, 1-2mm	8	N	Moist	Diffuse
B21	1.2	Dark Brown 10YR 3/3, Medium heavy clay	-	Strong Sub Blocky	5%, <1mm	9	N	Moist	Diffuse
B22	1.5	Dark Brown 10YR 3/3, Medium Clay	Carbonate nodules 1%, <1mm	Strong Sub Blocky	-	9/mild	N	Slightly Moist	-

PROJECT NO: 718107 SITE: BH112

Date	23/7/2012
Time	11:30AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 790196
Northing	7310978
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Coolibah, swamp grass, Nardoo
Lithology	Alluvium	**Surface Soil Condition**	Poached
Substrate:	Alluvium	**Crack Width**	-
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Bluchers	**Permeability**	Slow
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	15m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH112

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.15	Very dark grey 10YR 3/1, Light clay	-	Moderate Sub Blocky 2-5mm	30% 1-2mm	7	-	Slightly moist	Diffuse
B21	0.5	Very dark grey 10YR 3/1, Heavy clay	-	Strong Lenticular 5-20mm	5%, <1mm	8	-	Moist	Diffuse
B22	0.8	Very dark grey 10YR 3/1, Heavy clay	Carbonate nodules 5%, 1-2mm	Strong Lenticular 5-20mm	2%, <1mm	9	-	Moist	Diffuse
B23	1.0	Brown 10YR 5/3, Medium clay, sub dominant black	Carbonate nodules 1% 2-5mm	Strong Sub Blocky 5-10mm	-	9	-	-	-

PROJECT NO: 718107 SITE: BH113

Date	23/7/2012
Time	12:15PM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 790435
Northing	7310772
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Bottle tree, brigalow, Bauhinia (hookeri), Buffel grass, silk sorghum
Lithology	Alluvium	**Surface Soil Condition**	Poached minor, firm
Substrate:	Alluvium	**Crack Width**	-
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Bluchers	**Permeability**	Slow
SCL Status	-	**Drainage:**	Poorly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	10m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH113

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark grey 10YR 3/1, Medium clay	-	Weak Sub Blocky	30% 1-2mm	7	N	Moist	Diffuse
B21	0.45	Very dark grey 10YR 3/1, Heavy clay	-	Strong Sub Blocky	-	8	-	Moist	Diffuse
B22	0.8	Dark brown 10YR 3//, Heavy clay	Carbonate nodules 1% 1-2mm	Strong Sub Blocky	-	9	-	Moist	Diffuse
B23	1.0	Dark greyish brown 10YR 4/2, Medium clay	Carbonate nodules 1% 1-2mm	Moderate Sub Blocky	-	9	-	Slightly Moist	-

PROJECT NO: 718107 SITE: BH114

Date	23/7/2012 & 25/03/2019
Time	13:15PM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 790523
Northing	7310561
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Poached and crusty
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Black Vertisol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood plain	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	70-80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH114

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark grey 10YR 3/1, Medium clay	-	Moderate Sub Blocky	20% 1-3mm	7.5-8	-	Dry (fluctuates)	Diffuse
B21	0.35	Dark grey 10YR4/1, Medium Clay	-	Strong Sub Blocky	10% <1mm	8	-	Moist	-
B22	0.5	Dark greyish brown 10YR 4/2, Medium clay	Carbonate nodules 2% 2-5mm	Strong Sub Blocky	<5% <1mm	9 / Strong	-	Slightly Moist	-
B23	1.0	Brown 10YR 5/3, Medium Clay, Mottled red/brown 10%	Carbonate nodules 2% 2-5mm	Strong Sub Blocky	<1% <1mm	9 / Strong	-	Slightly Moist	-

PROJECT NO: 718107 SITE: BH115

Date	23/7/2012 & 25/03/2019
Time	15:00PM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 790924
Northing	7310317
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, brigalow, silk sorghum
Lithology	Alluvium	**Surface Soil Condition**	Crusty, self mulching
Substrate:	Alluvium	**Crack Width**	3mm
ASC:	Black Vertisol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	-	**Drainage:**	-
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Minor, lumpy
Relief Modal Slope:	-	**Erosion Type:**	Sheet
Landform Element:	Flood plain	**Erosion Severity/State:**	Minor, stabilised
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1.5m	**Additional Notes**	-
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH115

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark grey 10YR 4/1, Medium heavy Clay	-	Strong Sub Blocky	30% 1-2mm	9	-	Moist	Diffuse
B21	0.4	Dark greyish brown 10YR 4/2, Medium Clay	Carbonate fragments 5% 2mm	Strong Sub Blocky	10% 1-2mm	9 / Strong	-	Moist	Diffuse
B22	0.8	Dark greyish brown 10YR 4/2, Medium clay	Carbonate fragments 5% 2.5mm, gypsum crystals 5% <1mm	Strong Sub Blocky	2% <1mm	9 / Strong	-	Dry	Diffuse
B23	1.0-1.2	Brown 10YR 4/3, Medium clay, mottled red/brown	Carbonate fragments 1% <1mm	Strong Sub Blocky	1% 10mm (tree roots)	9 / Strong	-	Dry	-

PROJECT NO: 718107 SITE: BH116

Date	23/7/2012
Time	16:10PM
Described by:	A. Sheldon
Elevation (m):	100
Easting	55 / 791232
Northing	7311658
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Buffel grass, Sally wattle, moreton bay ash, Red Nattal, fire weed
Lithology	Weathered Sandstone	**Surface Soil Condition**	Soft – Ant nests
Substrate:	-	**Crack Width**	-
ASC:	-	**Runoff:**	Slow
Soil Type:	Thalberg	**Permeability**	Rapid
SCL Status	-	**Drainage:**	Well Drained
Slope	7%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple Slope	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hill slope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	3m	**Additional Notes**	-
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH116

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark brown 10YR 3/3, Loamy Sand	-	Moderate	20% 1-2mm	6	-	Moist	-
B21	0.4	Brown 10YR 4/3, Clayey sand	-	Moderate	5% 1-2mm	7	-	Moist	-
B22	1.0	Brown 10YR 5/3, Clayey sand (coarse)	-	Moderate	-	7	-	Moist	-
B23	1.6	Dark yellowish brown 10YR 4/6	-	Moderate	-	8	-	Moist	-

PROJECT NO: 718107 SITE: BH117

Date	24/7/2012
Time	7:30AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 790152
Northing	7316668
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, brigalow, purple pidgeon grass
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching, poached
Substrate:	Alluvium	**Crack Width**	2mm
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Mod
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH117

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Medium clay	-	Strong Sub Blocky 10-20mm	20% 1-2mm	6	N	Moist	Diffuse
B21	0.5	Very dark greyish brown 10YR 3/2, Heavy clay	Carbonate fragments 2% 2-5mm	Strong lenticular 5-10mm	10% 1-2mm	9	N	Moist	Diffuse
B22	1.0	Dark greyish brown 10YR 4/2, Heavy clay	Carbonate fragments 5% 2-5mm, gypsum crystals 2%, Mn nodules 1%	Strong lenticular 2-10mm	10% 1-2mm	9	N	Moist	Diffuse
B23	1.2	Dark brown 10YR 3/3, Heavy clay	-	Strong Sub Blocky	2% 10mm (brigalow)	7	N	Moist	-

PROJECT NO: 718107 SITE: BH119

Date	24/7/2012
Time	9:20AM
Described by:	A. Sheldon
Elevation (m):	105
Easting	55 / 790991
Northing	7315749
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Buffel grass, Eucalypt
Lithology	Weathered Sandstone	**Surface Soil Condition**	Firm
Substrate:	Calcareous Sandstone	**Crack Width**	-
ASC:	Brown Sodosol	**Runoff:**	Rapid
Soil Type:	Thalberg	**Permeability**	Mod
SCL Status	Fail	**Drainage:**	Imperfectly Drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Gently undulating hills	**Erosion Type:**	-
Landform Element:	-	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	-
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH119

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Sandy clay loam	-	Moderate	10% 1-2mm	7	-	-	Diffuse
B21	0.45	Brown 10YR 5/3, Clay Loam, Sandy (C)	-	Moderate	2% <1mm	8	-	-	Diffuse
B22	0.8	Brown 10YR 5/3, Clayey Sand (C)	-	Moderate	-	8.5	-	-	Diffuse
B23	1.1	Pale brown 10YR 6/3, Clay loam, Sandy (C)	Carbonate layers 10% 2-5mm	Weak Sub Blocky 5-20mm	-	9	-	-	Diffuse
BC	1.5	Light yellowish brown 2.5Y 6/4, Clay loam, Sandy (C)	Carbonate Layers 30% 2-5mm	Weak Sub Blocky 5-20mm	-	10	-	-	Refusal

PROJECT NO: 718107 SITE: BH120

Date	24/7/2012
Time	10:30AM
Described by:	A. Sheldon
Elevation (m):	95
Easting	55 / 790642
Northing	7315809
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Buffel grass, lime bush, Eucalypt
Lithology	Weathered Sandstone	**Surface Soil Condition**	Firm
Substrate:	Calcareous Sandstone	**Crack Width**	-
ASC:	Brown Sodosol	**Runoff:**	Slow
Soil Type:	Thalberg	**Permeability**	Rapid
SCL Status	Fail	**Drainage:**	Well drained
Slope	5.3%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Dumpy level	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Gently undulating hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	3m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH120

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.4	Very dark greyish brown 10YR 3/2, Sandy clay loam	-	Moderate	20% 1-2mm	7	-	Moist	Diffuse
A2	0.55	Dark greyish brown 10YR 4/2 (dominant moist), Light yellowish brown 10YR 6/3 (dominant dry), Clayey sand	-	Moderate	1% <1mm	8	-	Moist	Diffuse
B2	1.0	Light yellowish brown 10YR 6/4, Sandy Clay (C)	Coarse fragments 2% sub angular 2-5mm	Moderate	-	10	-	Slightly Moist	Refusal

PROJECT NO: 718107 SITE: BH121

Date	24/7/2012 & 27/03/2019
Time	11:50AM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 790306
Northing	7315868
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, brigalow, clover, brigalow grass
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching
Substrate:	Alluvium	**Crack Width**	3-15 mm
ASC:	Black Vertisol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Imperfectly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	2% 2-10mm sub angular
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	Quartz-red, sandstone fragment
Morphological Type	Flat	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Floodplain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	0%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	3m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH121

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Medium clay, fine sand	-	Strong Sub Angular 2-5mm	20% 1-2mm	6.5	-	Dry/Slightly Moist to moist (fluctuates)	Diffuse
B2(1)	1.0	Very dark greyish brown 10YR 3/2, Heavy clay	Carbonate Nodules 2% 2-3mm, 5% sub angular coarse fragments 2-4mm	Strong Sub Angular 2-10mm	5-10% 50mm (updated MCK) 1mm	8-8.5	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH122

Date	24/7/2012
Time	12:50AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 790359
Northing	7315965
Observation Type	Check
Sample Method	N/A

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Buffel, lime bush
Lithology	-	**Surface Soil Condition**	Firm
Substrate:	Calcareous sandstone	**Crack Width**	-
ASC:	-	**Runoff:**	Rapid
Soil Type:	Thalberg	**Permeability**	Slow
SCL Status	Fail	**Drainage:**	Imperfectly drained
Slope	5%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	None
Relief Modal Slope:	-	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1m	**Additional Notes**	-
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH122

PROFILE MORPHOLOGY

No bore log information available

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary

PROJECT NO: 718107 SITE: BH123

Date	25/7/2012
Time	8:35AM
Described by:	A. Sheldon
Elevation (m):	93
Easting	55 / 790131
Northing	7312692
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Buffel, Bauhinia, bottle tree
Lithology	Weathered sediments	**Surface Soil Condition**	Firm
Substrate:	Calcareous sandstone	**Crack Width**	-
ASC:	Brown sodosol	**Runoff:**	Mod
Soil Type:	Thalberg	**Permeability**	Mod rapid
SCL Status	Fail	**Drainage:**	-
Slope	6%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	10m	**Additional Notes**	-
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH123

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark yellowish brown 10YR 3/4, Clay Loam	-	Moderate	20% 1-2mm	7	-	Moist	Diffuse
A2	0.65	Strong brown 7.5YR 4/6, Clay Loam, Fine sand	-	Moderate	15% 1-2mm	7	-	Slightly moist	Clear
B2t	1.5	Olive yellow 2.5Y 6/6, Heavy Clay, Coarse sand	Coarse fragments 30% on boundary, rounded 10-50mm with coarse qtz sand	Strong Blocky	5% 1-2mm	9	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH124

Date	25/7/2012
Time	10:00AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 788728
Northing	7316128
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Brigalow (80%), dawson gum (20%), silk sorghum, buffel, purple pidgeon grass, clover
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching
Substrate:	Alluvium	**Crack Width**	1-3mm
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Imperfectly Drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Normal, even 30cm/15m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	10m	**Additional Notes**	-
Preclear RE:	11.3.2		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH124

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Black 10YR 2/1, Medium heavy clay	-	Strong Sub Blocky 2-10mm	20% 1-3mm	6.5	N	Moist	Diffuse
B21	0.35	Black 10YR 2/1, Medium Heavy clay	Carbonate nodules 1% 1-2	Strong Sub Blocky 5-20mm	10% 1-2mm	9	N	Slightly moist	Diffuse
B22	1.1	Very dark grey 10YR 3./1, Medium heavy clay	Carbonate nodules 1% 1-3mm	Stong lenticular 20-60mm, slickensides	10% 1-5mm	8	N	Slightly moist	Diffuse
B23	1.35	Brown 10YR 4/3, Medium Heavy clay	-	Strong lenticular 20-60mm	5% 1-3mm	7.5	N	Slightly Moist	Diffuse
B24	1.7	Brown 10YR 4/3, Medium clay, greasy	-	Weak Sub Blocky 5-10mm	-	7	N	Dry	-

PROJECT NO: 718107 SITE: BH125

Date	25/7/2012
Time	11:15AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 788086
Northing	7315733
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	dawson gum (20%), silk sorghum, buffel
Lithology	Alluvium	**Surface Soil Condition**	Firm – wet
Substrate:	Alluvium	**Crack Width**	-
ASC:	Black Dermosol	**Runoff:**	Slow
Soil Type:	Stephens	**Permeability**	Slow
SCL Status	Fail	**Drainage:**	Imperfectly Drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Normal, even 30cm/15m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	11.3.2		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH125

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Light clay	-	Weak Sub Blocky 5-10mm	30% 1-2	7	-	Moist	Diffuse
B21	0.5	Very dark grey 10YR 3/1, Medium clay	-	Mod Sub Blocky 10-20mm	1% 1-2mm	8.5	-	Moist	Diffuse
B22	1.1	Dark grey 10YR 4/1, Medium clay	Carbonate nodules 2% 2-5mm	Strong Sub Blocky 10-20mm	2% <1mm	8	-	Slightly moist	Diffuse
B23	1.5	Brown 10YR 4/3, Medium clay, greasy	-	Strong poly h 5-10mm	-	7.5	-	Slightly Moist	Diffuse
B24	1.7	Yellowish brown 10YR 5/4, Light medium clay, sodic	-	Mod Sub Blocky 2-5mm	-	7	-	Dry	-

PROJECT NO: 718107 SITE: BH126

Date	25/7/2012 & 26/03/2019
Time	12:15AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 788407
Northing	7315684
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	dawson gum (20%), buffel grass, purple pidgeon grass, Nardoo
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching – Coarse S3GR
Substrate:	Alluvium	**Crack Width**	2-10mm
ASC:	Black Vertisol	**Runoff:**	Slow
Soil Type:	Isaac	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Normal (<50%), even gilgai 20cm 10m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	11.3.2		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH126

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark grey 10YR 3/1, Heavy clay, greasy	-	Moderate Sub Blocky 2-5mm	20% 1-2mm	7	N	Moist	Diffuse
B21	0.9	Very dark grey 10YR 3/1, Heavy clay, sodic	Carbonate nodules 2% 2-3mm	Strong lenticular 10-30mm	10% 1-2mm	8.5	N	Moist	Diffuse
B22	1.4	Dark greyish brown 10YR 4/2 Medium clay	Carbonate nodules 1% 3-5mm	Strong Sub Blocky 2-5mm	2% 1-2mm	8	N	Dry	Diffuse
D2	1.8	Dark greyish brown 2.5Y 4/2, Light clay	-	Strong blocky	-	6.5	N	Dry	Diffuse

PROJECT NO: 718107 SITE: BH127

Date	25/7/2012
Time	13:45PM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 788419
Northing	7315387
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	dawson gum, sally wattle, buffel grass
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching – Coarse
Substrate:	Alluvium	**Crack Width**	5mm
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Isaac	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Normal, even 20cm 15m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	-	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	15m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH127

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark grey 10YR 3/1, Medium heavy clay	-	Mod Sub Blocky 5-10mm	20% 1-2mm	6	N	Moist	Diffuse
B21	1.0	Very dark grey 10YR 3/1, Medium heavy clay	-	Strong lenticular 10-20mm	5% 1-2mm	8	N	Slightly moist	Diffuse
B22	1.4	Dark grey 10YR 4/1, Medium heavy clay	Carbonate nodules 5% 2-5mm	Strong lenticular 10-20mm	2% <1mm	8.5	N	Slightly moist	Diffuse
D2b	1.8	Dark greyish brown 10YR 4/2, Medium clay, old cracks Dark grey 10YR 4/1	-	Moderate Sub Blocky 2-5mm	-	8	N	Slightly Moist	-

PROJECT NO: 718107 SITE: BH128

Date	25/7/2012 & 26/03/2019
Time	14:50PM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 787956
Northing	7315030
Observation Type	Check
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, silk sorghum, eucalypt seedlings
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching – Coarse
Substrate:	Alluvium	**Crack Width**	5mm
ASC:	Black Vertisol	**Runoff:**	Slow
Soil Type:	Isaac	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Very slight normal 10cm/20m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH128

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2 Medium heavy clay	-	Sub Blocky 2-10mm	20% 1-2mm	7	-	-	diffuse
B21	0.5	Very dark greyish brown, 10YR 3/1 Medium heavy clay	Carbonate nodules <2%, 1-2mm	Sub Blocky 1-5mm	10% 1-2mm	8.5 / strong	-	-	diffuse
B22	0.8	Dark Grey, 10YR 3/1, Medium heavy clay	Carbonate nodules 5% 3-5mm	Lenticular 10-30mm	5% 1mm	8.5 / strong	-	-	diffuse
B23	1.0	Brown, 10YR 4/3, Medium clay	Carbonate nodules 5% 3-5mm	Sub Blocky 2-10mm		8.5 / strong	-	-	diffuse

PROJECT NO: 718107 SITE: BH129

Date	25/7/2012 & 26/03/2019
Time	15:45PM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 787850
Northing	7315357
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, sally wattle regrowth
Lithology	Alluvium	**Surface Soil Condition**	Firm (mossy)
Substrate:	Alluvium	**Crack Width**	-
ASC:	Black Dermosol	**Runoff:**	Slow
Soil Type:	Stephens	**Permeability**	Mod
SCL Status	Fail	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	2m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH129

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark greyish brown 10YR 4/2,10YR 4/3, Light clay with silt	-	Weak Sub Blocky	20% 1-2mm	6	-	Moist	Diffuse
B21	0.5	Brown 7.5YR 4/3,7.5YR 3/2, Light clay with silt	-	Mod prismatic 10-20mm	5-10% 1-2mm	7-8	-	Moist	Diffuse
B22	1.2	Brown 7.5YR 4/3, 10YR 4/3, Light clay with silt	Carbonate nodules 1-2% 2-5mm (updated 1-2mm)	Strong Sub Blocky 20-50mm	2% 1-2mm	7-8 / strong	-	Slightly moist	Diffuse
B23	1.4	Dark yellowish brown 10YR 4/4, Light medium clay with silt	-	Strong Sub Blocky 2-5mm	-	7.8	Sub	Slightly moist	-

PROJECT NO: 718107 SITE: BH129B

Date	26/03/2019
Time	11:54 PM
Describer	MCK
Elevation	90
Easting	55 / 790827
Northing	7315077
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, Sally Wattle regrowth, eucalypt regrowth
Lithology	Alluvium	**Surface Soil Condition**	poached
Substrate:	Alluvium	**Crack Width**	1-3mm
ASC:	Dermasol	**Runoff:**	slow
Soil Type:	Stephens	**Permeability**	Moderate
SCL Status	-	**Drainage:**	Well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Level plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Clearing	**SCL 2 (rockiness)**	Pass
Groundcover:	70%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	2m	**Additional Notes**	North East of NCPL marker
Preclear RE:			

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH129B

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.1	Dark grey 10YR 4/1,1° mottle 7.5YR 5/8, Medium clay, fine sand massive, Grade: moderate	Magames nodules1%, 1-2mm	Blocky	10% 1-2mm	6.5	S	Dry	Diffuse
B21	0.55	Very Dark Grey 10YR 3/1, heavy clay, Grade: Strong	Carbonate Fragments, 5% 1-3mm, 2% angular coarse fragments, 2mm	Lenticular	0	7.5, strong	S	-	Diffuse
B22	0.8	Dark Grey, 10YR 4/1, medium heavy clay, Grade: Strong	Carbonate fragments, 2%	Lenticular	0	8, strong	S	-	Diffuse
B23	1.4	Brown 10YR 5/3, medium heavy clay	Carbonate Fragments, 3%, 1-5 mm	Lenticular	0	8, strong	-	-	Diffuse

PROJECT NO: 718107 SITE: BH130

Date	26/7/2012
Time	7:22AM
Described by:	A. Sheldon
Elevation (m):	-
Easting	55 / 789321
Northing	7314745
Observation Type	Cont Land
Sample Method	Push tube

SITE DESCRIPTION

No site description available

Geology Unit:	-	**Vegetation Species:**	-
Lithology	-	**Surface Soil Condition**	-
Substrate:	-	**Crack Width**	-
ASC:	-	**Runoff:**	-
Soil Type:	-	**Permeability**	-
SCL Status	-	**Drainage:**	-
Slope	-	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	-	**Coarse Fragments (lithology):**	-
Morphological Type	-	**Gilgai and Microrelief:**	-
Relief Modal Slope:	-	**Erosion Type:**	-
Landform Element:	-	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	-	**SCL 1 (Slope >/=3%)**	-
Site Disturbance:	-	**1.4**	-
Groundcover:	-	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	-
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	-		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH130

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
Fill	0.3	Pale brown, Clayey gravel	-	-	-	-	-	-	-
Natural	0.5	Brown, Medium clay	-	-	-	-	-	-	-

PROJECT NO: 718107 SITE: BH131

Date	26/7/2012 & 26/03/2019
Time	7:45AM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 789276
Northing	7314857
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel, Sedge grass, nardoo bush, sally wattle, bauhinia
Lithology	Alluvium	**Surface Soil Condition**	Poached
Substrate:	Alluvium	**Crack Width**	3-5mm
ASC:	Grey Vertisol	**Runoff:**	Slow
Soil Type:	Bluchers	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Imperfectly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Seasonally inundated
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	Swampy area
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH131

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark grey 2.5Y 4/1, 10YR 4/1 Medium heavy clay	-	Strong Sub Blocky 5-20mm	30% 12mm Updated: 20% 1-2mm	7	-	Wet Updated: moist	Diffuse
B21	0.2	Dark grey 5Y 4/1, 10YR 3/1, Medium heavy clay	-	Strong Sub Blocky 5-20mm	20% 1-2mm Updated: 10% 1mm	8	-	Wet Updated: moist	Diffuse
B22	1.2	Dark Grey 5Y 4/1,10YR 3/1, Medium heavy clay	-	Strong lenticular 20-50mm	10% 1-2mm	9 / strong	-	Wet Updated: slightly moist	Diffuse
B23	1.6	Dark grey 5Y 4/1, Medium heavy clay	Carbonate nodules 2% 1-2mm	Strong lenticular 20-50mm	2% 1-2mm	9	-	Wet	Diffuse
B24	1.8	Dark greyish brown 2.5Y 4/2, Medium clay	-	Strong lenticular 20-50mm	-	9	-	Wet	-

PROJECT NO: 718107 SITE: BH132

Date	26/7/2012
Time	8:30AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 789183
Northing	7315430
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel, purple pidgeon grass, silk sorghum, brigalow, few dawson gum
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Grey Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Very minor
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	2m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH132

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A11	0.005	Dark grey 10YR 4/1, Medium heavy clay	-	Strong granular 2-5mm	-	9	-	Slightly moist	Clear
A12	0.1	Dark grey 10YR 4/1 Medium heavy clay	-	Strong Sub Blocky 5-10mm	30% 1-2mm	9	-	Slightly moist	Diffuse
B21	0.3	Dark grey 10YR 4/1, Medium heavy clay	Carbonate nodules 1% 2-5mm	Strong lenticular 20-50mm	10% 1-2mm	9	-	Slightly moist	Diffuse
B22	1.2	Dark grey 10YR 4/1, Medium heavy clay	Carbonate nodules 1% 2-5mm	Strong lenticular 5-20mm	5% 1-2mm	9	-	Slightly moist	Diffuse
2D6	1.8	Brown 10YR 4/3, Cracks/root channels Dark grey 10YR 4/1, Light medium clay with silt	-	Mod Sub Blocky 2-5mm	2% 1-2mm	9	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH133

Date	26/7/2012
Time	9:50AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 790125
Northing	7316381
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel, purple pidgeon grass, galvanised burr, brigalow, dawson gum
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching – Coarse
Substrate:	Alluvium	**Crack Width**	2mm
ASC:	Brown Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH133

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark greyish brown 10YR 4/2, Medium heavy clay	-	Strong Sub Blocky	20% 1-2mm	8-9	-	Slightly moist	Diffuse
B21	1.6	Brown 10YR 5/3, Medium heavy clay	Carbonate nodules 1% 1-2mm	Strong lenticular 20-50mm	10% 1-2mm	9 / Strong	-	Slightly moist	Diffuse
B22	1.8	Brown 10YR 5/3, Medium clay	Mn soft 2% 1-3mm	Strong lenticular 20-50mm	-	9	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH134

Date	26/7/2012
Time	11:00AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 789588
Northing	7316534
Observation Type	Detailed
Sample Method	Push tube

No photo available

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel, purple pidgeon grass, silk sorghum, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching – Coarse
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Black Vertisol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Mod Rapid
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Normal gilgai <50% 20cm 10m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	50%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1.5m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH134

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A11	0.005	Very dark grey 10YR 3/1, Heavy clay	-	Strong granular 2-5mm	<2%, <1mm	7-7.5	-	Dry/ Slightly Moist	Clear (updated diffuse)
A12	0.1	Very dark grey 10YR 3/1, Heavy clay, fine sand	-	Strong Sub Blocky 5-10mm	30% 1-3mm (updated <5%)	7-8	-	Moist	Diffuse
B21	0.4	Very dark grey 10YR 3/1, Heavy clay	-	Strong Sub Blocky 5-10mm (updated: lenticular)	<2% <1mm	8 / Strong	-	Slightly moist	Diffuse
B22	1.3	Very dark grey 10YR 3/1, Heavy clay	Carbonate Nodule <2%, 1-2mm	Strong lenticular 20-50mm	-	8, 6 at base	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH135

Date	26/7/2012
Time	11:45AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 789378
Northing	7316097
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Purple pidgeon grass, silk sorghum, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching – Coarse
Substrate:	Alluvium	**Crack Width**	2mm
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Mod Rapid
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Normal 0.2m/ 10m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1.5m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH135

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A11	0.005	Very dark grey 10YR 3/1, Heavy clay	-	Strong granular 5-10mm	-	7	-	Dry	Clear
A12	0.1	Very dark grey 10YR 3/1, Heavy clay	-	Strong Sub Blocky 2-5mm	30% 1-2mm	7	-	Moist	Diffuse
B21	1.0	Very dark grey 10YR 3/1, Heavy clay	-	Strong lenticular 20-50mm	10% 1-2mm	9	-	Moist – 0.5	-
B22	1.4	Very dark greyish brown 10YR 3/2, Heavy clay	-	Strong lenticular 20-50mm	2% 1-2mm	6	-	Dry	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH136

Date	26/7/2012
Time	12:20PM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 789123
Northing	7316290
Observation Type	Cont Land
Sample Method	N/A

No photo available

SITE DESCRIPTION

Geology Unit:	-	**Vegetation Species:**	-
Lithology	-	**Surface Soil Condition**	-
Substrate:	-	**Crack Width**	-
ASC:	-	**Runoff:**	-
Soil Type:	-	**Permeability**	-
SCL Status	-	**Drainage:**	-
Slope	-	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	-	**Coarse Fragments (lithology):**	-
Morphological Type	-	**Gilgai and Microrelief:**	-
Relief Modal Slope:	-	**Erosion Type:**	-
Landform Element:	-	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	-	**SCL 1 (Slope >/=3%)**	-
Site Disturbance:	-	**SCL 2 (rockiness)**	-
Groundcover:	-	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	-
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	-		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH136

PROFILE MORPHOLOGY

no bore log information available

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary

PROJECT NO: 718107 SITE: BH137

Date	26/7/2012
Time	13:30PM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 789823
Northing	7315731
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Nardoo, buffel, swamp grass, cane grass, silk sorghum
Lithology	Alluvium	**Surface Soil Condition**	Poached
Substrate:	Alluvium	**Crack Width**	-
ASC:	Aquic Vertosol	**Runoff:**	Slow
Soil Type:	Bluchers	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Imperfectly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Debil debil 0.3m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Seasonally inundated
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH137

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
O	0.05	Brown 7.5YR 4/4, Fibric	-	-	100% 1-2mm	-	-	Dry	Clear
A1	0.15	Very dark grey 10YR 3/1, Medium clay	-	Strong Lenticular	20% 1-2mm	8	N	Wet	Diffuse
B21	1.8	Very dark grey 10YR 3/1, medium clay	Carbonate nodules 1% 1-2mm	Strong lenticular	5% 1-2mm	9	N	Wet	Diffuse
B22	1.9	Dark Grey 10YR 4/1, Medium clay	-	Strong lenticular	-	9	N	Wet	-

PROJECT NO: 718107 SITE: BH138

Date	26/7/2012
Time	14:25PM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 789261
Northing	7313589
Observation Type	Cont Land and Check
Sample Method	N/A

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel, brigalow, dawson gum
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching (on nat)
Substrate:	Alluvium	**Crack Width**	2mm
ASC:	-	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Mod
SCL Status	-	**Drainage:**	-
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing/Rail reserve	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH138

PROFILE MORPHOLOGY

No bore log information available

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary

PROJECT NO: 718107 SITE: BH139

Date	26/7/2012 & 25/03/2019
Time	15:00PM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 789487
Northing	7313441
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Purple pidgeon grass, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Black Vertisol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	<50% Normal 0.1m/15m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH139

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A11	0.005	Very dark greyish brown 10YR 3/2, Medium heavy clay	-	Strong granular 2-5mm	-	9	N	Dry	Clear
A12	0.1	Very dark greyish brown 10YR 3/2, Medium heavy clay	-	Strong Sub Blocky 5-10mm	20% 1-2mm	9	N	Moist	Diffuse
B21	0.4	Dark brown 10YR 3/3 Medium heavy clay	Carbonate nodules 2% 2-5mm	Strong Sub Blocky 5-10mm	10% 1-2mm	9	N	Slightly moist	Diffuse
B22	1.2	Dark brown 10YR 3/3, Medium heavy clay	Carbonate nodules 2% 1-5mm, gypsum crystals 2% 1-2mm	Strong lenticular 20-60mm	5% 1-2mm	9	N	Slightly moist	Diffuse

MCK update (2019)

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, heavy clay	-	Strong granular 2-10mm	10% 1-2mm	9 / Strong	-	Dry	Diffuse
B21	0.45	Dark brown 10YR 3/2 heavy clay	Carbonate nodules 2%	Strong Sub Blocky 5-15mm	10% 1-2mm	9 / Strong	-	Dry	Diffuse
B22	1.2	Dark brown 10YR 4/2, heavy clay	Carbonate nodules<2%	Strong lenticular 20-40mm	5% 1mm	9 / Strong	-	Dry	Diffuse

PROJECT NO: 718107 SITE: BH140

Date	26/7/2012 & 25/03/2019
Time	16:15PM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 789898
Northing	7312619
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Purple pidgeon grass, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Self-mulching – Coarse
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Black Vertisol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	Fail	**Drainage:**	Mod well drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	<50% Moderate Normal 0.2m/30m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	-	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1m	**Additional Notes**	-
Preclear RE:	11.3.1		

PROJECT NO: 718107 SITE: BH140

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Medium heavy clay	-	Strong Sub Blocky 2-5mm	20% 1-2mm	8	-	Slightly moist	Diffuse
B21	0.2	Very dark greyish brown 10YR 3/2, Medium heavy clay	-	Strong SB 5-10mm	5% 1-2mm	9	-	Moist	Diffuse
B22	0.65	Brown 10YR 4/3, Medium heavy clay, Sodic	Carbonate nodules 2% 2-5mm	Strong lenticular 20-50mm	5% 1-2mm	9	-	Slightly moist	Diffuse
B23	1.4	Brown 10YR 4/3, Medium heavy clay, Sodic	Carbonate nodules 2% 2-5mm, gypsum crystals 2% 2-5mm	Strong lenticular 20-60mm	1% <1mm	9	-	Slightly moist	Diffuse
B24	1.5	Brown 10YR 4/3, Medium heavy clay, Sodic	-	Strong lenticular 5-20mm	1% <1mm	9	-	Slightly moist	Diffuse

MCK update (2019)

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	10YR 4/2, Medium heavy clay	-	Sub Blocky 2-5mm	20% 1-3mm	9	-	Dry	Diffuse
B21	0.2	10YR 4/1, Medium heavy clay	Carbonate nodules <2% 2-3mm	Sub Blocky 5-10mm	<2% 1mm	9	-	Dry	Diffuse
B22	0.65	10YR 3/2, Medium heavy clay, Sodic	Carbonate nodules 2% 2-4mm	lenticular 20-30mm	<2% 1mm	9	-	Dry	Diffuse
B23	1.0	10YR 4/3, Medium heavy clay Sub Dominant 10YR 3/6	Carbonate nodules and gypsum crystals 2% 1-5mm	lenticular 20-50mm	<2% <1mm	9	-	Slightly moist	Diffuse

PROJECT NO: 718107 SITE: BH141

Date	28/7/2012 & 25/03/2019
Time	7:40AM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 790108
Northing	7311964
Observation Type	Detailed
Sample Method	Hand auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Brigalow grass, Nardoo, galvanised burr, Sedge grass, Buffel, Brigalow, Dawson Gum, Silk Sorghum, Cane grass, swamp doc.
Lithology	Alluvium	**Surface Soil Condition**	Poached – Severe
Substrate:	Alluvium	**Crack Width**	5-15mm
ASC:	Grey Vertisol	**Runoff:**	Slow
Soil Type:	Bluchers	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Imperfectly drained
Slope	4%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Normal, 0.2m, 10m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Seasonally inundated
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	Frost normally swampy
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH141

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark grey 10YR 3/1, Medium / medium heavy clay	-	Moderately Sub Blocky 1-5mm	30-40% 1-2mm	7.5	Sub	Wet Update: Slightly Moist	Diffuse
B21	0.25	Very dark grey 10YR 3/1, Medium / medium heavy clay	-	Strong Sub Blocky 2-5mm	2-5% <1mm	8	Sub	Wet Update: Dry	Diffuse
B22	1.9	Dark grey-Black 10YR 4/1, 10YR 2/1 Heavy clay	Carbonate nodules 2-5% 1-3mm	Strong lenticular 5mm	<2% <1mm	8	Sub	Wet Update: Dry	-

PROJECT NO: 718107 SITE: BH142

Date	28/7/2012 & 25/03/2019
Time	8:45AM
Described by:	A. Sh / MCK
Elevation (m):	90
Easting	55 / 789789
Northing	7311721
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel, galvanised burr, herbaceous weeds, silk sorghum
Lithology	Alluvium	**Surface Soil Condition**	Cracked, slight self mulch
Substrate:	Alluvium	**Crack Width**	1-2mm
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Isaac	**Permeability**	Mod
SCL Status	-	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH142

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Medium heavy/ heavy clay	-	Mod Sub Blocky 5-20mm	20% 1-2mm	7	-	Moist	Diffuse
B21	0.5	Very dark greyish brown 10YR 3/2, 10YR 3/1, Medium heavy/ heavy clay	Carbonate nodules 1% 1mm	Mod lenticular 10-30mm	10% 1mm	7.5 / Moderate	-	Moist (updated: dry)	Diffuse
B22	0.8	Brown 10YR 4/3, 10YR 3/2, Sub dominant 10YR 3/6, Medium clay, fine sand	Carbonate nodules/ fragments 2% 2-3mm	Strong Sub Blocky 1-20mm	2% 1-2mm	9 / Strong	-	Dry	Diffuse
2D6	1.3	Brown 10YR 5/3, Light medium clay with fine sand	Carbonate nodules 2% 2-5mm	Strong SB 5-10mm	1% 1-2mm	9	-	Dry	-

PROJECT NO: 718107 SITE: BH143

Date	28/7/2012 & 25/03/2019
Time	10:25AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 791317
Northing	7309957
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, limebush, dawson gum, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Poached, coarse self mulching
Substrate:	Alluvium	**Crack Width**	2mm
ASC:	Grey Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Lumpy / uneven
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	2m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH143

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.15	Dark greyish brown 10YR 4/2, Medium heavy clay	-	Strong Sub Blocky 5-10mm	10-20% 1-3mm	8-8.5	-	Moist	Diffuse
B21	0.5	Dark greyish brown 10YR 4/2, Medium heavy clay	Carbonate nodules 5% 2-5mm	Strong lenticular 5-20mm	<10% 1-3mm	8.5-9 / Strong	-	Moist (update: dry)	Diffuse
B22	1.4	Brown 10YR 4/3, Medium heavy clay	Carbonate nodules 2% 2-5mm	Strong lenticular 10-20mm	<5% 1-2mm	8-9 / Strong	-	Slightly moist (update: dry)	Diffuse
B23	1.7	Brown 10YR 4/3, Medium heavy clay, Mottled Orange brown 10%	Mn Segments 5% 5-10mm, gypsum crystals bands 5% 2-10mm	Strong lenticular 10-20mm	<5% 1-2mm, 10mm	7	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH144

Date	28/7/2012
Time	11:25AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 791990
Northing	7310351
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel fire weed, galvanised burr, river she-oak, swamp sedge, nut grass
Lithology	Alluvium	**Surface Soil Condition**	Severely poached, debil debil and self mulch
Substrate:	Alluvium	**Crack Width**	2mm
ASC:	Grey Vertosol	**Runoff:**	Slow
Soil Type:	Bluchers	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Debil debil 0.3m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Seasonally inundated
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	Gleyed lower profile
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH144

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark grey 10YR 3/1, Medium heavy clay	-	Strong Sub Blocky	10% 1-2mm	8	-	Moist	Diffuse
B21	0.8	Dark grey 10YR 4/1, Medium heavy clay	Carbonate concretions 5% 2-5mm	Strong lenticular	5% <1mm	8.5/ Strong	-	Moist	Diffuse
B22	1.2	Dark greyish brown 10YR 4/2, Medium heavy clay	Carbonate concretions 2% 2-5mm	Strong Polyhedral 5-10mm	-	8	-	Moist	Diffuse
B23	1.7	Pale brown 10YR 6/3 (gleyed), sub dominant Brownish yellow 10YR 6/6, Medium heavy clay	Mn cutans 5%	Strong polyhedral 2-5mm	-	6.5	-	Moist	-

PROJECT NO: 718107 SITE: BH144

Date	28/7/2012
Time	11:25AM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 791990
Northing	7310351
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel fire weed, galvanised burr, river she-oak, swamp sedge, nut grass
Lithology	Alluvium	**Surface Soil Condition**	Severely poached, debil debil and self mulch
Substrate:	Alluvium	**Crack Width**	2mm
ASC:	Grey Vertosol	**Runoff:**	Slow
Soil Type:	Bluchers	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Debil debil 0.3m
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Seasonally inundated
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (Slope >/=20%/60mm)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	Gleyed lower profile
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH144

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark grey 10YR 3/1, Medium heavy clay	-	Strong Sub Blocky	10% 1-2mm	8	-	Moist	Diffuse
B21	0.8	Dark grey 10YR 4/1, Medium heavy clay	Carbonate concretions 5% 2-5mm	Strong lenticular	5% <1mm	8.5/ Strong	-	Moist	Diffuse
B22	1.2	Dark greyish brown 10YR 4/2, Medium heavy clay	Carbonate concretions 2% 2-5mm	Strong Polyhedral 5-10mm	-	8	-	Moist	Diffuse
B23	1.7	Pale brown 10YR 6/3 (gleyed), sub dominant Brownish yellow 10YR 6/6, Medium heavy clay	Mn cutans 5%	Strong polyhedral 2-5mm	-	6.5	-	Moist	-

PROJECT NO: 718107 SITE: BH145

Date	1/8/2012
Time	7:45AM
Described by:	S Ba
Elevation (m):	116
Easting	55 / 792492
Northing	7311802
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Cz/Qa	**Vegetation Species:**	Brigalow regrowth and Buffel
Lithology	Alluvium	**Surface Soil Condition**	Firm – hard setting
Substrate:	Alluvium	**Crack Width**	<5mm
ASC:	Vertosol/AE	**Runoff:**	Mod rapid
Soil Type:	Tralee	**Permeability**	Slow
SCL Status	N/A	**Drainage:**	Mod well drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	70%, 0.6m deep, melonhole
Relief Modal Slope:	Gentle rolling rises	**Erosion Type:**	Sheet
Landform Element:	-	**Erosion Severity/State:**	Low, Partially active
Landform Pattern:	-	**Inundation:**	Frequent
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	95%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	4m	**Additional Notes**	Little evidence of self mulch, but peddled from grazing
Preclear RE:	11.4.9a (Brigalow on Cz)		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH145

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark greyish brown 10YR 3/2, Light medium clay	-	Mod Polyhedral 2-5mm	<2mm M	6.5	-	Moderately moist	-
B21	0.3	Dark greyish brown 10YR 3/2, Medium heavy clay	Carbonate nodules 2% 2-5mm	Mod Angular Blocky 5-10mm	<1mm C	8.5	-	Moderately moist	-
B22	0.9	Dark greyish brown 10YR 4/2, Medium heavy clay	Carbonate nodules 2% 2-5mm, Mn coarse fragments 2% 2mm	Mod lenticular 10-20mm	<1mm C	8.5	-	Moderately moist	-
B23	1.4	Greyish brown 10YR 5/2, Medium heavy clay, mottled orange <2%	Carbonate nodules 2% 2-5mm, Mn coarse fragments 2% 2mm	Mod Angular Blocky/ lenticular 20-30mm	<1mm F	8.5	-	Moderately moist	-
B24	1.8	Greyish brown 10YR 5/2, Medium heavy clay, mottled orange 2-10%	-	Mod Angular Blocky/ lenticular 20-30mm	<1mm F	8.5	-	Moderately moist	-

PROJECT NO: 718107 SITE: BH145

Date	1/8/2012
Time	7:45AM
Described by:	S Ba
Elevation (m):	109
Easting	55 / 792492
Northing	7311802
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Cz/Qa	**Vegetation Species:**	Brigalow regrowth and Buffel
Lithology	Alluvium	**Surface Soil Condition**	Firm – hard setting
Substrate:	Alluvium	**Crack Width**	<5mm
ASC:	Vertosol/AE	**Runoff:**	Mod rapid
Soil Type:	Tralee	**Permeability**	Slow
SCL Status	N/A	**Drainage:**	Mod well drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	70%, 0.6m deep, melonhole
Relief Modal Slope:	Gentle rolling rises	**Erosion Type:**	Sheet
Landform Element:	-	**Erosion Severity/State:**	Low, Partially active
Landform Pattern:	-	**Inundation:**	Frequent
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	95%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	4m	**Additional Notes**	Little evidence of self mulch, but peddled from grazing
Preclear RE:	11.4.9a (Brigalow on Cz)		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH145

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark greyish brown 10YR 3/2, Light medium clay	-	Mod Polyhedral 2-5mm	<2mm Many	6.5	-	Moderately moist	-
B21	0.3	Dark greyish brown 10YR 3/2, Medium heavy clay	Carbonate nodules 2% 2-5mm	Mod Angular Blocky 5-10mm	<1mm C	8.5	-	Moderately moist	-
B22	0.9	Dark greyish brown 10YR 4/2, Medium heavy clay	Carbonate nodules 2% 2-5mm, Mn coarse fragments 2% 2mm	Mod lenticular 10-20mm	<1mm C	8.5	-	Moderately moist	-
B23	1.4	Greyish brown 10YR 5/2, Medium heavy clay, mottled orange <2%	Carbonate nodules 2% 2-5mm, Mn coarse fragments 2% 2mm	Mod Angular Blocky/ lenticular 20-30mm	<1mm Few	8.5	-	Moderately moist	-
B24	1.8	Greyish brown 10YR 5/2, Medium heavy clay, mottled orange 2-10%	-	Mod Angular Blocky/ lenticular 20-30mm	<1% F	8.5	-	Moderately moist	-

PROJECT NO: 612024 SITE: BH146

Date	1/8/2012
Time	9:20AM
Described by:	S Ba
Elevation (m):	116
Easting	55 / 792376
Northing	7311968
Observation Type	Detailed
Sample Method	

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Dawson Gum, Bottle tree Buffel, current bush
Lithology	Tertiary Sediments	**Surface Soil Condition**	Soft – firm
Substrate:		**Crack Width**	Nil
ASC:	CH/SO-AC	**Runoff:**	Mod rapid
Soil Type:	Thalberg	**Permeability**	Moderate
SCL Status	N/A	**Drainage:**	Imperfectly
Slope	5%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Undulating rises	**Erosion Type:**	Sheet + rill
Landform Element:	Rise Slope	**Erosion Severity/State:**	Moderate/Active
Landform Pattern:	Rise	**Inundation:**	rare
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	95%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	6m	**Additional Notes**	
Preclear RE:	11.4.8 (Dawson deplex soils)		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH145

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.2	Dark brown 10YR 3/3 Sandy Clay, Sand: F	-	-	<2mm Many	6.5	-	-	Clear
A2e	0.32	Dry -10YR 7/3 1° Mottle 20-50% Orange Sandy clay, fine sand	-	-	<2mm Many	8.5	-	-	Abrupt
B21	0.6	Light yellow brown 10YR 6/4 Medium clay. Fine sand	-	-	<1mm	8.5	-	-	Clear
B22	1.15	yellowish brown 10YR 6/4, Medium clay	Carbonate nodules <2% 2-5mm Mn inclusions <2% 2-5mm (massive)	-	<1mm Few	8.5	-	-	Clear
B23a	1.25	-	-	-	Nil	8.5	-		-

PROJECT NO: 612024 SITE: BH147

Date	1/8/2012
Time	10:45AM
Described by:	S Ba
Elevation (m):	107
Easting	55 / 792490
Northing	7312484
Observation Type	Detailed
Sample Method	

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Bigalow – all cleared, Bufffel
Lithology	Tertiary Sediments	**Surface Soil Condition**	Hard Setting
Substrate:	Calcareous Sandstone	**Crack Width**	Nil
ASC:	DE-AE	**Runoff:**	Moderate rapid
Soil Type:	Thalberg	**Permeability**	Moderate slow
SCL Status	N/A	**Drainage:**	Imperfect – Moderate
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Gently Undulating plains	**Erosion Type:**	Sheet
Landform Element:	Pediment	**Erosion Severity/State:**	Low/Active
Landform Pattern:	Pediment	**Inundation:**	Rare
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	3m	**Additional Notes**	Appears to be black ploughed – clumps of earth and no bigalow except for on the edges
Preclear RE:	11.4.9 (Bigalow on Vertisols)		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH147

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments /Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.3	Very dark greyish brown 10YR 3/2 Weak Medium Clay	-	Poly	<2mm Many	7.5	-	-	-
A2e	0.6	dark greyish brown -10YR 4/2 Loam Weak medium clay	-	Poly	<1mm Many	9.0	-	-	-
B21	0.85	Medium clay. Fine sand	Carbonate nodules <2% 2-5mm	Poly	<1mm Few	9.0	-	-	-
B22	1.4	Brown 10YR 5/3, Medium clay	Soft carbonate 20-50%	Poly	Nil	9.0	-	-	-

PROJECT NO: 612024 SITE: BH148

Date	4/8/2012
Time	8:20AM
Described by:	S Ba
Elevation (m):	98
Easting	55 / 792376
Northing	7311968
Observation Type	Core
Sample Method	

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel
Lithology	Alluvium	**Surface Soil Condition**	Hardsetting - pedal
Substrate:	-	**Crack Width**	5mm
ASC:	UE-AE	**Runoff:**	Mod rapid
Soil Type:	Tvalee	**Permeability**	Slow
SCL Status	Fail	**Drainage:**	Moderately well
Slope	4%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Level Plain	**Erosion Type:**	Sheet
Landform Element:	Savoll	**Erosion Severity/State:**	Moderate/Active
Landform Pattern:	Flood Plain	**Inundation:**	rare
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	75%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	Grass <1m	**Additional Notes**	
Preclear RE:	114.4.9a (Brigalow and Vertosols)		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH148

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A	0.05	Black Greyish Brown 10YR 3/2 Moderate Clay, fine sand	-	Moderate, Polyhedral, 2-5 mm, sodic	<2mm	7.0	-	-	Sharp
B21	0.3	Moderate clay	-	Strong Angular Blocky, 10-20 mm, sodic	<2mm	9.9	-	-	Clear
B22	0.5	Grey 10YR 4/3 Medium clay	-	Strong Lenticular, 10-20mm, sodic	<1mm, Few	9.9	-	-	Clear
B23	1.55	Brown 7.5YR 5/4, Medium heavy clay	Soft Carbonate <2% 2-5mm Mn inclusions 2% <2mm	Strong Lenticular, 10-20mm, sodic		9.9	-	-	-

Additional Notes

SCL4 Soil Depth>600mm	SCL5 Drainage	SCL 6 pH	SCL 7 Soil Cl>800mg/kg @600mm	SCL 8 Water storage >100mm
P	P	P	1200mg/kg	72mm

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH149

Date	1/8/2012
Time	10:45AM
Described by:	S Ba
Elevation (m):	95
Easting	55 / 791440
Northing	
Observation Type	Core
Sample Method	

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Bigalow grass, Bufffel
Lithology	Alluvium	**Surface Soil Condition**	Strongly Self Mulching
Substrate:		**Crack Width**	Expanded 5-10mm
ASC:	VE-AD	**Runoff:**	Slow
Soil Type:	Bluches	**Permeability**	slow
SCL Status	Fail	**Drainage:**	Imperfectly
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Land plains	**Erosion Type:**	Sheet
Landform Element:	Plain	**Erosion Severity/State:**	Minor/Active
Landform Pattern:	Flood plain	**Inundation:**	Rare
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	<1m grass	**Additional Notes**	
Preclear RE:	11.4.9a (Bigalow on Vertisols)		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH149

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plas ticity Type	Moisture	Boundary
A1	0.02	dark grey 10YR 4/1 Medium heavy Clay Grade: W	-	Poly	<2mm Many	9.9 horizon 0.1	S	-	Angular
A12	0.12	dark grey 10YR 4/1	-	Angular Blocky	<2mm	9.9 horizon 0.3	S	-	Clear
B21	0.25	Grey 2.5Y 5/1 Medium heavy Clay	soft Mn <2mm	Lenticular	<1mm Common	9.9 horizon 0.6	S	-	Diffuse
B22	0.65	Greyish brown 2.5Y 5/2 1° Mottle 7.5YR 7/6 10% Medium heavy clay	Mn nodules <2mm	-	<1mm Few	9.0 horizon 1.2	S	-	Clear
B23	1.5	Light Yellowish Brown, 2.5Y 6/2, 1° Mottle 7.5YR 7/6 10-20% Medium heavy Clay	Mn nodules <2mm	-	<1mm Few	8.0 horizon 1.6	S	-	Clear
B24	1.8	2.5Y 6/3, 1° Mottle 7.5YR 7/6 10-20% Medium heavy Clay	-	-	<1mm Few		S	-	-

SCL4 Soil Depth>600mm	SCL5 Drainage	SCL 6 pH	SCL 7 Soil Cl>800mg/kg @600mm	SCL 8 Water storage >100mm
P	waterlogged	P	-	120mm

PROJECT NO: 612024 SITE: BH150

Date	20/8/2012
Time	9:45AM
Described by:	A Sheldon
Elevation (m):	100
Easting	55 / 790798
Northing	7315462
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Cz	**Vegetation Species:**	Buffel Grass,Dawson gum
Lithology	Weathered Sediments	**Surface Soil Condition**	Firm - Hardsetting
Substrate:	Calcareous Sandstone	**Crack Width**	-
ASC:	Brown Sodsol	**Runoff:**	Slow
Soil Type:	Thalberg	**Permeability**	Moderate
SCL Status	Fail	**Drainage:**	Imperfectly drained
Slope	2%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Upper slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	G. undulating low hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH150

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.35	Very Dark Brown 10YR 2/2 Sandy Loam Grade: W, massive	-	-	1-2mm 30%	6.5	-	Slightly Moist	Diffuse
A2e	0.55	10YR 5/3, 1° Mottle 10YR 7/2, sandy Loam, massive	-	-	1-2mm 10%	6.5	-	Slightly Moist	Clear
B21	1.25	10YR 5/3 Medium clay, grade: moderate	-	Prismatic , 10mm	-	8.0	-	Moist	Diffuse
B22	1.75	10YR 5/3 Sub dominant 10YR 6/4 30% Light Medium clay, Grade: W, moderate Sand	soft Mn 2-5mm 10%	Blocky, 20mm	-	9.5	-	Moist	clear
B3	1.8	10YR 6/2, 1° Mottle 10YR 6/4 Medium Clay, Grade: W, moderate sand	Soft Carbonate 10-20mm, 30%	Blocky, 20mm	-	9.5	-	Moist	-

Additional Notes

SCL4 Soil Depth>600mm	SCL5 Drainage	SCL 6 pH	SCL 7 Soil Cl>800mg/kg @600mm	SCL 8 Water storage >100mm
P	Bleach - Fail	P	-	Fail – 81.5mm

PROJECT NO: 612024 SITE: BH152

Date	20/8/2012
Time	10:20AM
Described by:	A Sheldon
Elevation (m):	95
Easting	55 / 790677
Northing	7315353
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, Lime Bush, Sally Wattle, Red Nattal grass
Lithology	Calcareous Sediments	**Surface Soil Condition**	Firm - Hardsetting
Substrate:	Weathered Mudstone	**Crack Width**	-
ASC:	Brown Dermosol	**Runoff:**	Moderate
Soil Type:	Thalberg	**Permeability**	Moderate
SCL Status	Fail	**Drainage:**	
Slope	6%	**Coarse Fragments (Abundance, Size, Shape):**	20% 5-50 Subangular
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	Weathered Sandstone, Quartz
Morphological Type	Simple slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	70%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH152

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.25	10YR 3/3, Light Clay, Fine sand, massive	Sub Angular, 10%, 10-30mm	-	1-2mm 20%	6.5	-	Slightly moist	-
A2	0.65	10YR 3/2, Light Clay, massive, Fine Sand	-	-	1-2mm 2%	7.5	-	Slightly moist	-
B3	0.9	7.5YR 4/4 Medium clay, grade: moderate, Sodic	-	Columnar	-	6.0	-	Dry	-
C	1.2	10YR 5/4 Sub dominant 7.5YR 4/2	-	-	-	-	-	Dry	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH153

Date	20/8/2012
Time	11:00AM
Described by:	A Sheldon
Elevation (m):	90
Easting	55 / 790676
Northing	7315105
Observation Type	Check
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel Grass, Brigalow
Lithology	Alluvium	**Surface Soil Condition**	Cracking/poached
Substrate:	Alluvium	**Crack Width**	2.5mm
ASC:	Grey vertosol	**Runoff:**	Slow
Soil Type:	Tralee	**Permeability**	Slow
SCL Status	Fail	**Drainage:**	Imperfectly drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Irregular mound 10% 5m 0.1m
Relief Modal Slope:	Level Plain	**Erosion Type:**	Nil
Landform Element:	Flood Plain	**Erosion Severity/State:**	Nil
Landform Pattern:		**Inundation:**	Flood Prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	Near drainage line Salt/Carbonate at surface
Preclear RE:	11.4.9a		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH153

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plas ticity Type	Moisture	Boundary
A1	0.05	10YR 4/2 Medium heavy Clay Grade: S	-	Sub Blocky,	1-2mm 20%			Slightly Moist	Diffuse
A21	1.2	10YR 3/1, Medium heavy Clay, Grade: S	-	Lenticular 20-50 mm	2%	7 (0.5m depth)	Sub	Slightly Moist	Diffuse
B22	1.8	10YR 3/2,1° Mottle 10YR 4/4 Medium heavy Clay, Grade: S	Carbonate Nodules 1-2mm, 5%. Sub angular; 1-2mm, 2%	Lenticular 20-50 mm	-	8.5 (0.9m depth)	Sub	Slightly Moist	-
-	-	-	Carbonate Nodules 1-2mm, 5%. Sub angular; 1-2mm, 2%	-	-	8.5 (1.3m depth)	-	-	-

Additional Notes

SCL4 Soil Depth>600mm	SCL5 Drainage	SCL 6 pH	SCL 7 Soil Cl>800mg/kg @600mm	SCL 8 Water storage >100mm
P	P	P	930 kg/kg	Fail – 72mm

No.	EC 1:5	dS/m	pH 1:5
1	0.4m	0.52	8.1
2	0.7m	1.16	7.9
3	0.9m	1.43	7.9
4	Surface (drain)	1.17	7.6

PROJECT NO: 718107 SITE: BH153B

Date	26/03/2019
Time	15:54 PM
Describer	MCK
Elevation	97
Easting	55 / 790827
Northing	7315077
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass (brigalow)
Lithology	Alluvium	**Surface Soil Condition**	Cracking/ poached
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Grey Vertisol	**Runoff:**	slow
Soil Type:	Tralee	**Permeability**	slow
SCL Status	-	**Drainage:**	impermeable
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	25-30%AV-15mm-150mm/rounded Sub angular
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	Diorite
Morphological Type	-	**Gilgai and Microrelief:**	lumpy
Relief Modal Slope:	-	**Erosion Type:**	-
Landform Element:	-	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	-	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	-	**SCL 2 (rockiness)**	Fail
Groundcover:	-	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Fail
Upper Height stratum (m):	-	**Additional Notes**	Carbonate nodules on surface
Preclear RE:			

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH153B

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A11	0.15	Brown10YR 4/3, Medium clay, massive	Carbonate nodules 2% 1-2mm	Sub Blocky 2-15mm	10% 1-2mm	6.5	-	Slightly moist	-
B21	0.6	Dark Greyish brown 10YR 4/2, Medium clay, Grade: S	Carbonate nodule 5% 1-5mm <2% sub angular coarse Fragments, 2-5mm	Sub Blocky 5-10mm	<2% <1mm	8.5, strong HCl	-	Slightly moist	-
B22	1.0	Brown 10YR 4/3, 1° mottle 5YR 3/4 3% Medium clay, Grade: S	sub angular coarse Fragments, 1-2mm. Black nodules 3%, 1-3mm	Lenticular 10-30mm		7-8	-	Slightly moist	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH154

Date	20/8/2012 & 26/03/2019
Time	11:55AM
Described by:	A. Sh / MCK
Elevation (m):	95
Easting	55 / 790712
Northing	7314729
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, Lime Bush, Sally Wattle
Lithology	Calcareous Sediments	**Surface Soil Condition**	Firm - Hardsetting
Substrate:	Weathered Mudstone	**Crack Width**	
ASC:	Brown Dermosol	**Runoff:**	Moderate
Soil Type:	Thalberg	**Permeability**	Slow
SCL Status	Fail	**Drainage:**	Imperfectly drained
Slope	3.73%	**Coarse Fragments (Abundance, Size, Shape):**	10-15% 5-100mm Rounded Sub Angular
Assessment Method	Dumpy Level	**Coarse Fragments (lithology):**	Weathered Sandstone, Quartz, opalized
Morphological Type	Simple slope	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	Nil
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):		**Additional Notes**	Same as Northern Hill (BH152)
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH154

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plas ticity Type	Moisture	Boundary
A1	0.15	10YR 2/2, Light Clay, Sand: Fine, massive	-	Blocky	2mm, 20%	6.5	-	Dry	Diffuse
B21	0.35	10YR 3/2, Light medium Clay, Grade: W, Sand: Fine	Coarse subangular, 2%, 2-5mm	Blocky	1-2mm, 5%	7.5	-	Slightly Moist	Diffuse
B22	0.7	10YR 4/4 light Medium clay, grade: W, Sand: Fine	soft Carbonate, 10%, 5-10mm. Coarse subangular, 2%, 2-5mm	Prismatic	1-2mm, 2%	8.5	-	Dry	Diffuse
B3	0.7	10YR 5/4,1° Mottle: dark brown, Grade: W	soft Carbonate, 30%, 10-20mm.	Sub Blocky		8.5	-	-	Refusal – weathered mudstone

MCK Update (2019)

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plas ticity Type	Moisture	Boundary
A1	0.1	Brown 7.5YR 4/4, Light Medium Clay, Sand: Fine, massive	-	Weak Sub Angular, 2-5mm	1-2mm, 10%	6.5	-	Dry	Diffuse
B21	0.2	Dark Yellowish Brown 10YR 4/4, Light medium Clay, Grade: W, Sand: Fine	Coarse angular, 5%, 2-15mm	Weak Sub Angular, 2-10mm	<1mm, 5%	6.5	-	Dry	Diffuse
-	-	-	-	-	-	-	-	-	Refusal at weathered rock

PROJECT NO: 612024 SITE: BH155

Date	20/8/2012
Time	14:00
Described by:	A Sheldon
Elevation (m):	93
Easting	55 / 791144
Northing	7314967
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel Grass, Brigalow
Lithology	Alluvium	**Surface Soil Condition**	Cracking - Hardsetting
Substrate:	Alluvium	**Crack Width**	2.5mm
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Tralee	**Permeability**	Moderate
SCL Status	Fail	**Drainage:**	Imperfectly drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	1% 2-5mm Sub Angular
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	Sandstone, Quartz
Morphological Type	Flat	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Level plain	**Erosion Type:**	Nil
Landform Element:	Flood Plain	**Erosion Severity/State:**	Nil
Landform Pattern:		**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	
Preclear RE:	11.4.9a		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH155

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.15	10YR 2/2, Medium Heavy Clay	Soft Carbonate, 1% sub angular 2.5mm	Moderate Sub Blocky	1-2mm, 30%	7.5	-	Slightly Moist	-
B21	0.7	10YR 3/2, Light medium heavy Clay,	Carbonate nodules, sand lenses 200-500mm	Strong Lenticular	1-2mm, 5%	8.5	-	Slightly Moist	-
B22	1.8	10YR 4/2 light Medium heavy clay,	1% Gypsum (at 0.9m)	Strong Lenticular		7.5	-	Slightly Moist	-

Additional notes

SCL4 Soil Depth>600mm	SCL5 Drainage	SCL 6 pH	SCL 7 Soil Cl>800mg/kg @600mm	SCL 8 Water storage >100mm
P	P	P	Fail - 1200 mg/kg	Fail – 72mm

PROJECT NO: 612024 SITE: BH156

Date	20/8/2012
Time	15:00
Described by:	A Sheldon
Elevation (m):	95
Easting	55 / 790816
Northing	7314489
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, Dawson gum, Lime Bush
Lithology	Calcareous Sediments	**Surface Soil Condition**	Firm- Hardsetting
Substrate:	Weathered Sandstone	**Crack Width**	
ASC:	Brown Sodosol	**Runoff:**	Moderate
Soil Type:	Thalberg	**Permeability**	Moderate
SCL Status	Fail	**Drainage:**	Imperfectly drained
Slope	3.23%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple Slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating Low Hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	10m	**Additional Notes**	DL= 1.58 30m 0.61/0.97
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH156

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plas ticity Type	Moisture	Boundary
A1	0.1	10YR 2/2, Fine Sandy loam,	-	Moderate	1-2mm, 5%	7	-	Dry	Diffuse
A2	0.2	10YR 3/2, 10YR 7/2 Fine Sandy loam	-	Moderate	-	7	-	Dry	Clear
B21	0.6	10YR 4/2, 1° Mottle: pale brown, light Medium clay, fine sand	Soft Carbonate, 2.5mm 5%, sub angular 2.5mm	Blocky	-	9.5	-	Dry	Refusal (below) weathered rock

Additional Notes

SCL4 Soil Depth>600mm	SCL5 Drainage	SCL 6 pH	SCL 7 Soil Cl>800mg/kg @600mm	SCL 8 Water storage >100mm
-	Fail	-	-	Fail – 40mm

PROJECT NO: 612024 SITE: BH157

Date	20/8/2012
Time	15:40
Described by:	A Sheldon
Elevation (m):	105
Easting	55 / 790811
Northing	7314167
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, Sally Wattle
Lithology	Calcareous Sediments	**Surface Soil Condition**	Loose, sandy
Substrate:	Weathered fine Sandstone	**Crack Width**	-
ASC:	Brown Sodosol	**Runoff:**	slow
Soil Type:	Thalberg	**Permeability**	Moderately rapid
SCL Status		**Drainage:**	
Slope	2%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple Slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating Low Hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:		**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):		**Additional Notes**	
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH157

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments / Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.2	10YR 3/4, Fine Sandy loam, massive	-	Moderate	1-2mm, 20%	7	-	Slightly Moist	-
A2e	0.5	10YR 6/4, 10YR 7/4, Fine Sandy loam,	-	Moderate	1-2mm, 5%	7	-	Slightly Moist	-
B21	0.6	10YR 5/3, light Medium clay, Sand: Fine,	Soft Carbonate, 2.5mm 5%, sub angular 2.5mm	Moderate Prismatic 10-20mm	1-2mm, 2%	7	-	Slightly Moist	-
C	0.9	10YR 6/3 1° Mottle: 40% 5YR 5/6,2° Mottle, fine sand	-	Moderate Blocky 5-10mm	-	-	-	Dry	-

PROJECT NO: 718107 SITE: BH158

Date	20/8/2012
Time	4:20 PM
Describer	A Sheldon
Elevation (m)	95
Easting	55 / 790204
Northing	7314055
Sample Method	Push Tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, linear brush, bottle tree
Lithology	Calcareous Sedimentaries	**Surface Soil Condition**	Hard setting
Substrate:	Weathered Sandstone	**Crack Width**	1-2mm
ASC:	Brown Dermosol	**Runoff:**	Mod
Soil Type:	Thalberg	**Permeability**	Slow
SCL Status	Fail	**Drainage:**	Imperfectly drained
Slope	4%	**Coarse Fragments (Abundance, Size, Shape):**	10%, 5-20mm, subangular
Assessment Method	Dumpy Level	**Coarse Fragments (lithology):**	Weathered Sandstone/quartzite/opalized wood
Morphological Type	Simple Slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:		**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):		**Additional Notes**	
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH158

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Brown 7.5YR 4/6, Light Medium Clay	-	Sub Blocky-	10%/ 1-2mm	7	-	Dry	-
B21	0.45	Dark Brown, 7.5YR 3/4, Light Medium Clay	2% Sub Angular, 2-5mm	Sub Blocky	10%/ 1-2mm	8.5	-	Slightly Moist	-
B3	0.65	Pale Brown, 7.5YR 6/4, Light Medium Clay, fine sand	Soft Carbonate concretions, 10%, 2-5mm	Blocky	2% / 1-2mm	9.0	-	Dry	-
C	0.75	Light Brown, 7.5YR 6/6, Light Medium Clay, fine Sand	Soft Carbonate concretions, 25%, 5-10mm	-	-	-	-	Dry	Refusal

PROJECT NO: 718107 SITE: BH159

Date	21/8/2012
Time	7:30 AM
Describer	A Sheldon
Elevation	90
Easting	55 / 789983
Northing	7313906
Observation Type	Detailed
Sample Method	Push Tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel Grass, Brigalow, Lime bush
Lithology	Alluvium	**Surface Soil Condition**	Cracking, hard setting
Substrate:	Alluvium	**Crack Width**	1-2mm
ASC:	Grey Vertosol	**Runoff:**	Slow
Soil Type:	Tralee/Langley?	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Mod well drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood plain	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:		**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	Shallow Tralee over RW sediments
Preclear RE:	11.4.9a		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH159

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	10YR 3/2, Medium Clay	-	Blocky	20%, 1-2	6.5	-	-	-
B2	0.4	10YR 4/2, Medium Clay	-	Lenticular	5%, 1-2	6.5	-	-	-
B3	0.6	10YR 6/4, Light Clay	-	Blocky	Root layer	6.5	-	-	-
2Cb	0.8	10YR 8/3, Clayey Sand, Weathered sandstone	-	Moderate	-	-	-	-	Refusal

PROJECT NO: 718107 SITE: BH160

Date	21/8/2012
Time	8:15 AM
Describer	A Sheldon
Elevation	95
Easting	55 / 789894
Northing	7313381
Observation Type	Detailed
Sample Method	Push Tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, Bottle tree, current bush
Lithology	Calcareous Sediments	**Surface Soil Condition**	Hard setting, sandy
Substrate:	Weathered Sandstone	**Crack Width**	-
ASC:	Brown Sodosol	**Runoff:**	Rapid
Soil Type:	Thalburg	**Permeability**	Slow
SCL Status	Fail	**Drainage:**	Imperfectly drained
Slope	6%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple Slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating Low Hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1m	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH160

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.3	10YR 3/2, Fine Sandy Loam	-	Moderate	10%, 1-2mm	7.5	-	Moist	Diffuse
A2e	0.45	7.5YR 5/3 (moist), 7.5YR 7/2 (dry), Fine Sandy Loam	-	Moderate	5%, 1-2mm	6.5	-	Slightly Moist	Clear
B21	0.65	10YR 6/3 (dominant), 10YR 6/4 (sub dominant), 7.5YR 5/6 (mottles 10%) Medium Clay, with fine sand.	-	Columnar	-	7.5	-	-	-
B22	0.9	10YR 6/2 (dominant), 10YR 4/2 (sub dominant), 7.5YR 5/6 (mottles 5%), Medium Clay, with fine sand.	Soft Carbonate concretions (2%, 5-10mm)	Moderate	-	8.5	-	Slightly Moist	Diffuse
C	1.4	10YR 6/3 (dominant), 10YR 8/3 (sub dominant), 7.5YR 5/6 (mottles 2%), medium clay, with fine sand.	Soft carbonate concretions (20%, 10-20) Coarse fragments (2%, 2-5mm, sub angular)	Moderate	-	8.5/ Strong	-	Slightly Moist	-

PROJECT NO: 718107 SITE: BH161

Date	21/8/2012
Time	9:05 AM
Describer	A Sheldon
Elevation	110
Easting	55 / 790923
Northing	7313314
Observation Type	Detailed
Sample Method	Push Tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, current bush, Dawson gum, prickly pear, lime bush
Lithology	Calcareous Sediments	**Surface Soil Condition**	Hard setting, sandy
Substrate:	Weathered Sandstone	**Crack Width**	-
ASC:	Brown Chromosol	**Runoff:**	Rapid
Soil Type:	Thalburg	**Permeability**	Slow
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	2%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Upper Slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating Low Hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH161

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.2	10YR 4/3, Fine Sandy loam	-	Moderate	20%, 1-2mm	6.0	-	Slightly Moist	-
A2	0.35	7.5YR 5/4 (moist), 10YR 7/3 (dry), fine sandy loam	-	Moderate	5%, 1-2mm	6.5	-	Slightly Moist	-
B21	0.55	7.5YR 5/6 (dominant), 10YR 6/2 (mottles 20%), medium heavy clay	Cutans (clay skins, 30%)	Moderate Columnar	2%, 1-2mm	6.5	-	Slightly Moist	-
B22	0.75	5YR 5/6 (dominant), 7.5YR 6/1 (mottles, 30%)	-	Moderate	-	7.5	-	Diffuse	-
B23	0.9	7.5YR 5/6, medium clay, with find sand.	-	Moderate	-	9	-	Diffuse	-
B3	1.1	7.5YR 5/4	Weathered sandstone (white)	-	-	9	-	Diffuse	Refusal

PROJECT NO: 718107 SITE: BH161

Date	21/8/2012
Time	9:05 AM
Describer	A Sheldon
Elevation	110
Easting	55 / 790923
Northing	7313314
Observation Type	Detailed
Sample Method	Push Tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, current bush, Dawson gum, prickly pear, lime bush
Lithology	Calcareous Sediments	**Surface Soil Condition**	Hard setting, sandy
Substrate:	Weathered Sandstone	**Crack Width**	-
ASC:	Brown Chromosol	**Runoff:**	Rapid
Soil Type:	Thalburg	**Permeability**	Slow
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	2%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Upper Slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating Low Hills	**Erosion Type:**	-
Landform Element:	Hillslope	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH161

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.2	10YR 4/3, Fine Sandy loam		Moderate	20%, 1-2mm	6.0	-	Slightly Moist	-
A2	0.35	7.5YR 5/4 (moist), 10YR 7/3 (dry), fine sandy loam	-	Moderate	5%, 1-2mm	6.5	-	Slightly Moist	-
B21	0.55	7.5YR 5/6 (dominant), 10YR 6/2 (mottles 20%), medium heavy clay	Cutans (clay skins, 30%)	Moderate Columnar	2%, 1-2mm	6.5	-	Slightly Moist	-
B22	0.75	5YR 5/6 (dominant), 7.5YR 6/1 (mottles, 30%)	-	Moderate	-	7.5	-	Diffuse	-
B23	0.9	7.5YR 5/6, medium clay, with find sand.	-	Moderate	-	9	-	Diffuse	-
B3	1.1	7.5YR 5/4	Weathered sandstone (white)	-	-	9	-	Diffuse	Refusal

PROJECT NO: 718107 SITE: BH162

Date	21/8/2012
Time	10:00 AM
Describer	A Sheldon
Elevation	90
Easting	55 / 791130
Northing	7311039
Observation Type	Detailed
Sample Method	Push Tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, sally wattle, lime bush
Lithology	Alluvium	**Surface Soil Condition**	Coarse self mulch
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Grey Vertosol	**Runoff:**	Slow
Soil Type:	Tralee	**Permeability**	Mod
SCL Status	Fail	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Irregular 0.1m/30m depressions
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	50%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	3m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH162

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A11	0.005	Dark grey 10YR 4/1, Medium heavy clay		Mod Granular 5-10mm	-	8.5	-	Dry	Clear
A12	0.1	Dark grey 10YR 4/1, Medium heavy clay, Sodic,	-	Mod Sub Blocky 10-20mm	20% 1-2mm	8.5	-	Slightly moist	Diffuse
B21	0.65	Dark grey 10YR 4/1 Medium heavy clay	Carbonate nodules 2% 1-2mm	Strong lenticular 20-50mm	2%, 1-2mm	8.5	-	Slightly moist	Diffuse
B22	1.3	Grey 10YR 5/1, Medium heavy clay	Gypsum crystals 2% 1-2mm	Strong lenticular 20-50mm	1% 1-2mm	8.5	-	Slightly moist	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH163

Date	21/8/2012
Time	10:46 AM
Describer	A Sheldon
Elevation	93
Easting	55 / 791204
Northing	7311421
Observation Type	Surface
Sample Method	N/A

No photo available

SITE DESCRIPTION

Geology Unit:	Rw	**Vegetation Species:**	Buffel grass, sally wattle, bauhinia, fire weed
Lithology	Calcareous sediments	**Surface Soil Condition**	Sandy, hard setting
Substrate:	-	**Crack Width**	-
ASC:	Brown Chromosol	**Runoff:**	Mod
Soil Type:	Thalberg	**Permeability**	Mod
SCL Status	Fail	**Drainage:**	Imperfectly drained
Slope	3.5%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Dumpy Level	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hill slope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH163

PROFILE MORPHOLOGY

No bore log information available

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary

PROJECT NO: 718107 SITE: BH164

Date	21/8/2012
Time	11:30 AM
Describer	A Sheldon
Elevation	90
Easting	55 / 791718
Northing	7310525
Observation Type	Detailed
Sample Method	Push Tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, fire weed, limebush, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Poached – coarse self mulching
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Grey Vertosol	**Runoff:**	Slow
Soil Type:	Tralee	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Imperfectly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Slightly undulating surface
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	-	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH164

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A11	0.005	Dark grey 10YR 4/1, Medium heavy clay		Weak granular 5-10mm	-	7.5	-	Dry	Clear
A12	0.15	Dark grey 10YR 4/1, Medium heavy clay	-	Mod Sub Blocky 10-20mm	30% 1-2mm	7.5	Sub	Slightly moist	Gradual
B21	0.9	Dark greyish brown 10YR 4/2, Medium heavy clay	Carbonate nodules 5% 2-5mm	Strong lenticular 20-50mm	5% 1-2mm	7.5	-	Slightly moist	Gradual
B22	1.5	Dark greyish brown 10Yr 4/2, Medium heavy clay	-	Strong lenticular 20-50mm	-	7.5	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH165

Date	21/8/2012
Time	12:55 PM
Describer	A Sheldon
Elevation	90
Easting	55 / 791694
Northing	7310933
Observation Type	Detailed
Sample Method	Push Tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, fire weed, galvanised burr, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Poached, cracking, coarse self mulching
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Grey Vertosol	**Runoff:**	Slow
Soil Type:	Tralee	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Imperfectly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Lumpy, like debil debil
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH165

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A11	0.005	Dark grey 10YR 4/1, Medium heavy clay	-	Weak granular 2-10mm	-	8.0	-	Dry	Clear
A12	0.15	Dark grey 10YR 4/1, Medium heavy clay	Carbonate nodules 1% 1-2mm, Cracks 5% 2-10mm	Mod Sub Blocky 10-20mm	10% 1-2mm	8.0	-	Dry	Diffuse
B21	1.3	Dark grey 10Yr 4/1, medium heavy clay	Carbonate nodules 1% 1mm	Mod lenticular 20-50mm	1% 1-2mm	7.5	-	Slightly moist	Diffuse
B22	1.7	Dark greyish brown 10Yr 4/2, Medium heavy clay	Mn veins 10% 1mm	Mod lenticular 20-50mm	-	6.0	-	Slightly moist	Diffuse
B23	1.8	Dark grey 10YR 4/1, Medium heavy clay	-	Mod lenticular 20-50mm	-	6.0	-	Slightly moist	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH166

Date	21/8/2012
Time	13:30 PM
Describer	A Sheldon
Elevation	95
Easting	55 / 791802
Northing	7311001
Observation Type	Surface
Sample Method	N/A

Photo Unavailable

SITE DESCRIPTION

Geology Unit:	Rw	**Vegetation Species:**	Buffel grass, bauhinia
Lithology	Weathered calcareous	**Surface Soil Condition**	Sandy
Substrate:	Sandstone	**Crack Width**	-
ASC:	Brown Chromosol	**Runoff:**	Mod
Soil Type:	Thalberg	**Permeability**	Rapid
SCL Status	Fail	**Drainage:**	Mod well drained
Slope	8%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hill slope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	10m	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH166

PROFILE MORPHOLOGY

No bore log information available

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH167

Date	21/8/2012
Time	13:45 PM
Describer	A Sheldon
Elevation	105
Easting	55 / 791874
Northing	7311241
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Rw	**Vegetation Species:**	Buffel grass, bauhinia, Fire weed, bottle tree, dawson gum, thistle, red natal grass, flannel weed
Lithology	Calcareous sediments	**Surface Soil Condition**	Sandy – loose
Substrate:	Weathered sandstone	**Crack Width**	-
ASC:	Brown Chromosol	**Runoff:**	Slow
Soil Type:	Thalberg	**Permeability**	Rapid
SCL Status	-	**Drainage:**	Mod well drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hill top	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	-	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH167

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.3	Dark brown 10YR 3/3 Clayey sand	-	Moderate	5% 1-3mm	7	-	Slightly moist	-
A2	0.65	Pale brown 10YR 6/3 (dominant moist), White 10YR 8/1 (dominant dry), Clayey sand		Moderate	2% 1-2mm	7	-	Slightly moist	-
B2	1.1	Pale brown 10YR 6/3, Medium clay, with medium sand, mottled red 2.5YR 4/8		Strong columnar	-	8	-	Slightly moist	-
B3	1.3	Light brownish grey 10YR 6/2, Medium clay, with medium sand, mottled brownish yellow 10YR 6/6	Carbonate inclusions, soft, white 30% 5-10mm	Moderate	-	9	-	Slightly moist	-
-	-	Weathered sandstone	-	-	-	-	-	-	Refusal

PROJECT NO: 718107 SITE: BH168

Date	21/8/2012
Time	14:31 PM
Describer	A Sheldon
Elevation	95
Easting	55 / 792368
Northing	7311365
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Buffel grass, Fire weed, galvanised burr, lime bush, cane grass in depressions
Lithology	Alluvium	**Surface Soil Condition**	Cracked, hard setting
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Brown Vertosol	**Runoff:**	Slow
Soil Type:	Tralee	**Permeability**	Mod
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	20% Irregular depressions 5m 0.3m
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Valley Flat	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	1m	**Additional Notes**	-
Preclear RE:	11.4.9a		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH168

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Medium heavy clay	-	Strong blocky 10-20mm	20% 1-2mm	7.5	-	Dry	Diffuse
B21	0.2	Very dark greyish brown 10YR 3/2, Medium heavy clay	-	Mod Sub Blocky 10-20mm	10% 1-2mm	8.5	-	Slightly moist	Diffuse
B22	1.3	Very dark greyish brown 10YR 3/2, Medium heavy clay	Carbonate nodules 5% 1-5mm	Mod lenticular 20-50mm	5% 1-2mm	8.5	-	Slightly moist	Diffuse
B23	1.8	Yellowish brown 10YR 5/4, Mottled Dark greyish brown 10YR 4/2, Medium heavy clay	-	Mod Sub Blocky 10-20mm	-	7.5	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH169

Date	21/8/2012
Time	15:35 PM
Describer	A Sheldon
Elevation	100
Easting	55 / 792536
Northing	7311230
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Rw	**Vegetation Species:**	Buffel grass, bauhinia, prickly pear
Lithology	Calcareous sediments	**Surface Soil Condition**	Hard setting
Substrate:	Weathered sandstone	**Crack Width**	1-2mm
ASC:	Brown chromosol	**Runoff:**	Rapid
Soil Type:	Thalberg	**Permeability**	Slow
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	3%	**Coarse Fragments (Abundance, Size, Shape):**	5% subangular 2-5mm
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	Weathered sandstone/ quartz
Morphological Type	Simple slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hill slope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH169

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.15	Dark yellowish brown 10YR 4/4, Light clay with fine sand	-	Weak Sub Blocky 10-20mm	20% 1-2mm	6.5	-	Slightly moist	Diffuse
B21	0.35	Brown 7.5YR 4/4, Light clay with fine sand	-	Moderate Sub Blocky 10-20mm	10% 1-2mm	7.5	-	Slightly moist	Diffuse
B22	0.6	Brown 7.5YR 5/4, Medium clay	Carbonate nodules 5% 1-5mm	Moderate prism 20-30mm	5% 1-2mm	9	-	Slightly moist	Diffuse
B3	0.8	Light yellowish brown 10YR 6/4, Medium clay	Mn nodules 5% 1-5mm	Moderate Sub Blocky 20-30mm	5% 1-2mm	9	-	Slightly moist	Diffuse
C	1.0	Very pale brown 10YR 7/4, Weathered sandstone, Carbonate white 10YR 8/1	-	Moderate Sub Blocky 10-20mm	-	-	-	Slightly moist	Refusal

PROJECT NO: 718107 SITE: BH170

Date	22/8/2012
Time	7:45 AM
Describer	A Sheldon
Elevation	110
Easting	55 / 793028
Northing	7311119
Observation Type	Check
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	Pw	**Vegetation Species:**	Buffel grass, bauhinia, dawson gum, bottle tree, current bush
Lithology	Permian sediments	**Surface Soil Condition**	Sandy – Hard setting
Substrate:	Weathered sandstone	**Crack Width**	1mm
ASC:	Brown Kurosol	**Runoff:**	Slow
Soil Type:	Thalberg	**Permeability**	Rapid
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Hill top	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hill crest	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	Not calcareous sediments
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH170

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.3	Brown 7.5YR 4/4, Fine sandy loam	-	Moderately coherent	5% 1-2mm	6	-	Slightly moist	Diffuse
A2	1.3	Light yellowish brown 10YR 6/4, Fine sandy loam	-	Moderately loose	1% 1-2mm	4.5	-	Slightly moist	Clear
B2	1.5	Light grey 10YR 7/1, Light clay with fine sand	-	Moderately	-	4	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH171

Date	22/8/2012
Time	8:45 AM
Describer	A Sheldon
Elevation	105
Easting	55 / 792901
Northing	7311647
Observation Type	Check
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel grass, dawson gum, lime bush
Lithology	Calcareous sediments	**Surface Soil Condition**	Fine sandy – Hard setting
Substrate:	Weathered sandstone	**Crack Width**	-
ASC:	Brown Chromosol	**Runoff:**	Mod
Soil Type:	Thalberg	**Permeability**	Mod
SCL Status	-	**Drainage:**	Mod well drained
Slope	2%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hill slope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	70%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH171

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Dark brown 10YR 3/3, Fine sandy loam	-	Weak Sub Blocky 10-20mm	20% 1-2mm	6	-	Slightly moist	-
B1	0.3	Brown 7.5YR 4/4, Light clay with fine sand	-	Weak Sub Blocky 20-30mm	5% 1-2mm	7.5	-	Slightly moist	-
B2	0.65	Brown 7.5YR 4/32, Light medium clay with fine sand	-	Mod prismatic 20-30mm	2% 1-2mm	9	-	Slightly moist	-
C	0.8	Very pale brown 10YR 7/4, Weathered marly sandstone, Marl 40% White 10YR 8/1	-	-	-	9	-	Dry	-

PROJECT NO: 718107 SITE: BH172

Date	22/8/2012
Time	9:40 AM
Describer	A Sheldon
Elevation	105
Easting	55 / 793021
Northing	7312048
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel grass, current bush, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Cracking/ poached
Substrate:	Alluvium	**Crack Width**	1-2mm
ASC:	Brown Vertosol	**Runoff:**	Slow
Soil Type:	Greycliffe	**Permeability**	Slow
SCL Status	-	**Drainage:**	Poorly drained
Slope	2%	**Coarse Fragments (Abundance, Size, Shape):**	2% 2-5mm subangular
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	Quartz
Morphological Type	Simple slope	**Gilgai and Microrelief:**	Lumpy, blade ploughed
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	Gully
Landform Element:	Hill slope	**Erosion Severity/State:**	Minor, stabilised – in cattle pads
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	3m	**Additional Notes**	-
Preclear RE:	11.4.9a		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH172

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Very dark greyish brown 10YR 3/2, Medium heavy clay	-	Mod blocky 10-20mm	30% 1-2mm	7.5	-	Dry	Diffuse
B21	0.5	Brown 10YR 4/3, Medium heavy clay	Mn nodules 2% 1mm, Carbonate nodules 2% 1-2mm	Mod lenticular 20-50mm	20% 1-2mm	8.5	-	Slightly moist	Diffuse
B22	1.9	Brown 10YR 5/3, Medium heavy clay	Mn nodules 10% 1-2mm, Carbonate nodules 2% 2-5mm	Mod lenticular 20-50mm	2% 1-2mm	8.5	-	Slightly moist	-

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH173

Date	22/8/2012 & 27/03/2019
Time	10:45 AM
Describer	A Sh / MCK
Elevation	110
Easting	55 / 792796
Northing	7312402
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel grass, current bush, brigalow, Fireweed, cane grass, clover, flannel weed
Lithology	Alluvium	**Surface Soil Condition**	Cracked/ poached
Substrate:	Alluvium	**Crack Width**	2-5mm
ASC:	Brown Vertosol	**Runoff:**	Slow
Soil Type:	Greycliffe Melonhole	**Permeability**	Slow
SCL Status	-	**Drainage:**	Poorly drained
Slope	3.1%	**Coarse Fragments (Abundance, Size, Shape):**	10% 2-30mm Sub Angular
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	Quartz, weathered sandstone
Morphological Type	Simple slope	**Gilgai and Microrelief:**	50% Melonhole 0.5-1.0m on 20-50m. lumpy
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	Gully
Landform Element:	Hill slope	**Erosion Severity/State:**	Minor/Stable
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	-
Preclear RE:	11.4.9a		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH173

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Brown 10YR 4/3, Medium heavy clay	Coarse fragments 2% sub-angular 2-5mm	Strong Granular 5-10mm	20% 1-2mm	-	-	Slightly moist	Diffuse
B21	0.7	Brown 10YR 5/3, Medium clay	Carbonate nodules 2% 2-5mm, gypsum crystals 2% 1-2mm	Weak lenticular 20-50mm	2% 1-2mm	-	-	Slightly moist	Diffuse
B22	1.8	Brown 10YR 5/3, Medium clay, fine sand	Carbonate nodules 2% 1mm, sand lenses 1mm, Mn nodules 1% 1mm	Weak lenticular 20-50mm	-	-	-	Slightly moist	Diffuse

MCK update (2019)

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Brown 10YR 4/3, Medium heavy clay	Carbonate fragments 10% sub-angular <1mm	Weak sub blocky 1-5mm	20% 1-2mm	7-8 / strong	-	Slightly moist	Diffuse
B21	0.5	Dark Yellowish Brown 10YR 4/4, Medium clay	Carbonate fragments 10% 1-5mm	Strong Sub Blocky 2-5mm	-	8.5/ strong	-	Slightly moist	Diffuse
B22	1.0	Yellowish Brown 10YR 5/4, Sub Dominant light brownish Grey 10YR 6/2 Medium clay, fine sand	Sand lenses	Strong Sub Blocky 5-10mm	-	7	-	Slightly moist	Diffuse

PROJECT NO: 718107 SITE: BH174

Date	22/8/2012
Time	13:00 PM
Describer	A Sheldon
Elevation	110
Easting	55 / 792150
Northing	7312763
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel grass, lime bush, dawson gum, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Poached, cracking, trampled
Substrate:	Alluvium	**Crack Width**	1-2mm
ASC:	Brown Vertosol	**Runoff:**	Slow
Soil Type:	Greycliffe	**Permeability**	Slow
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	Occasional depressions 2m wide 0.3m deep
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	Gully – cattle pads
Landform Element:	Hill slope	**Erosion Severity/State:**	Minor/stabilised
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	10m	**Additional Notes**	-
Preclear RE:	11.4.9a		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH174

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.1	Dark grey 10YR 4/1, Light clay with fine sand	-	Mod Sub Blocky 5-10mm	30% 1-2mm	6.5	-	Moist	Diffuse
B21	0.65	Grayish brown 10YR 5/2, Medium clay with fine sand	Gypsum crystals 2% 1-2mm	Mod lenticular, 20-50mm	5% 1-2mm	8.5	-	Slightly moist	Diffuse
B22	1.1	Brown 10YR 5/3, Medium clay with fine sand	Carbonate nodules 1% 1mm, sand lenses 1mm, Gypsum crystals 2% 1-2mm	Mod lenticular 20-50mm	-	4.5	-	Slightly moist	Diffuse
B23	1.6	Pale brown 10YR 6/3, Medium clay with fine sand, Sodic	Sand lenses 1mm	Weak lenticular 20-50mm	-	4 (pH 1:5 – 5) /EC 1.29	-	Slightly moist	Diffuse
B24	1.85	Very pale brown 10YR 7/4, Medium clay with fine sand, Slakes	-	Weak lenticular 20-50mm	-	4	-	Slightly moist	Diffuse

PROJECT NO: 718107 SITE: BH175

Date	22/8/2012 & 27/03/2019
Time	14:00 PM
Describer	A. Sh / MCK
Elevation	110
Easting	55 / 792044
Northing	7312474
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel grass, lime bush, dawson gum, brigalow, reeds, cane grass
Lithology	Alluvium	**Surface Soil Condition**	Cracking/ self mulching
Substrate:	Alluvium	**Crack Width**	1-3mm
ASC:	Grey Vertisol	**Runoff:**	Mod
Soil Type:	Greycliffe melonhole	**Permeability**	Slow
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	<50% melonhole 0.5-1.5m/ 20-50m
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	100%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	5m	**Additional Notes**	-
Preclear RE:	11.4.9a		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH175

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A11	0.005	Light brownish grey 10YR 6/2, Heavy clay	-	Strong Granular 2-5mm	-	8.5	-	Dry	-
A12	0.2	Light brownish grey 10YR 6/2, Heavy clay	-	Strong SB 10-20mm	20% 1-2mm	8.5	-	Slightly moist	-
B21	0.55	Light brownish grey 10YR 6/2, Heavy clay	Carbonate nodules 2% 1mm	Strong lenticular	2% 1-2mm	9	-	Slightly moist	-
B22	1.0	Light brownish grey 10YR 6/2, Heavy clay	Gypsum? fine crystals 2% 2-5mm	Strong lenticular	-	6	-	Slightly moist	-
B23	1.9	Light grey 10YR 7/2, Heavy clay	MgSO4?	Strong lenticular	-	4	-	Slightly moist	-

MCK update (2019)

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.1	10YR 5/2, Heavy clay	-	Strong Sub Blocky 1-10mm	<2%, <1mm	8.5	-	Dry	-
B21	0.55	10YR 5/1, Heavy clay	-	Strong lenticular	10% 1-3mm	9	-	Dry	-
B22	1.0	10YR 5/1, Heavy clay, fine sand	5% sand lenses	Strong lenticular 10-20mm	-	6	-	Dry	-

PROJECT NO: 718107 SITE: BH175B

Date	27/03/2019
Time	12:39 PM
Describer	MCK
Elevation	115
Easting	55 / 792620
Northing	7313498
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Pwy	**Vegetation Species:**	Buffel grass, lime bush, brigalow
Lithology	Alluvium	**Surface Soil Condition**	Cracking/ self mulching
Substrate:	Alluvium	**Crack Width**	3-5mm
ASC:	Brown Vertosol	**Runoff:**	Moderate
Soil Type:	Greycliffe	**Permeability**	Moderate
SCL Status	-	**Drainage:**	Moderate – well drained
Slope	3.92%	**Coarse Fragments (Abundance, Size, Shape):**	25-30%AV-15mm-150mm/rounded Sub angular
Assessment Method	Dumpy Level	**Coarse Fragments (lithology):**	Diorite
Morphological Type	Midslope	**Gilgai and Microrelief:**	20%, 3m/5-10m
Relief Modal Slope:	Undulating hills	**Erosion Type:**	Sheet
Landform Element:	hillslope	**Erosion Severity/State:**	Partially stabilised, moderate
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Fail
Groundcover:		**SCL 3 (Slope >/=50% land>500mm Microrelief)**	pass
Upper Height stratum (m):		**Additional Notes**	-
Preclear RE:			

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH175B

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A11	0.1	10YR 4/4, Medium clay	fragments 10% <1mm	Moderate Sub Angular 2-10mm	10% 1-3mm	8.5, strong HCl	-	Dry	diffuse
B21	0.4	10YR 4/6, Heavy clay, fine Sand	Carbonate fragments 10% <1mm 5% angular coarse Fragments, 1-3mm	Strong Sub Angular 5-10mm		8.5, strong HCl	-	Dry	Diffuse
B22	0.7	10YR 4/4, Heavy clay		Strong Lenticular 10-30mm		8-9	-	Slightly moist	Diffuse
B23	1.0	10YR 5/4, Heavy clay		Strong Lenticular 10-15mm		5-6	-	Dry	Diffuse

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH176

Date	22/8/2012
Time	15:06 PM
Describer	A Sheldon
Elevation	105
Easting	55 / 791548
Northing	7313875
Observation Type	Detailed
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Qld blue grass, buffel, lime bush, dawson gum, current bush
Lithology	Calcareous sediments	**Surface Soil Condition**	Firm
Substrate:	Weathered sandstone	**Crack Width**	-
ASC:	Brown Chromosol	**Runoff:**	Mod
Soil Type:	Thalberg	**Permeability**	Mod
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	3%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hill slope	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	2m	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH176

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.3	Very dark greyish brown 10YR 3/2, Fine sandy clay loam	-	Weak Sub Blocky 10-20mm	20% 1-2mm	6.5	-	Slightly moist	Diffuse
B2	0.6	Brown 10YR 5/3, Light medium clay with fine sand	-	Mod prismatic 20mm	5% 1-2mm	8.5	-	Slightly moist	Diffuse
B3	1.2	Pale brown 10YR 6/3, White N/9.5, Medium clay with fine sand	Carbonate nodules – soft 30% 5-10mm	Mod blocky 10-20mm	-	9.5/Strong HCL	-	Slightly moist	Diffuse
C	1.3	Pale brown 10YR 6/3, White N/9.5	Carbonate nodules – marl 20% 10-20mm	Moderate	-	9.5/Strong HCL	-	Dry	Refusal

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH177

Date	22/8/2012
Time	16:00 PM
Describer	A Sheldon
Elevation	112
Easting	55 / 791441
Northing	7313009
Observation Type	Check
Sample Method	Push tube

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Qld blue grass, buffel, lime bush, dawson gum, sally wattle
Lithology	Calcareous sediments	**Surface Soil Condition**	Sandy – Hard setting
Substrate:	Weathered sandstone	**Crack Width**	1-2mm
ASC:	Brown Chromosol	**Runoff:**	Mod
Soil Type:	Thalberg	**Permeability**	Mod
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Upper slope	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	Gully, cattle pads
Landform Element:	Hill Crest	**Erosion Severity/State:**	Minor
Landform Pattern:	-	**Inundation:**	Nil
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	70%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	15m	**Additional Notes**	-
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH177

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.1	Fine sandy loam	-	Moderate	20% 1-2mm	6.0	-	Slightly moist	Diffuse
A2e	0.35	Dry 10YR 7/3, Fine sandy loam	-	Moderate	5% 1-2mm	6.5	-	Slightly moist	-
B2	0.9	Brown 10YR 5/3, Medium clay with coarse sand, massive	Carbonate nodules – soft 30% 5-10mm	prismatic 20-30mm	2% 1-2mm	6.5	-	Slightly moist	-
					-		-		Refusal weathered sandstone

PROJECT NO: 612024 SITE: BH180

Date	23/8/2012
Time	15:30 PM
Describer	AS/JM
Elevation	90
Easting	55 / 790752
Northing	7311627
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Black tea tree, dawson gum, poplar box, Brigalow, Rhodes Grass, Red Natal, Auxelis Nardoo
Lithology	Alluvium	**Surface Soil Condition**	Poached - cracking
Substrate:	Alluvium	**Crack Width**	-
ASC:	Grey Vertosol	**Runoff:**	Mod
Soil Type:	Bluchers	**Permeability**	Mod
SCL Status	Pass	**Drainage:**	Imperfectly drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Minor – swamp hummoch
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Seasonally inundated
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	-	**Additional Notes**	
Preclear RE:	11.4.9a		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: BH180

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.15	10YR 3/2, Medium Clay, fine sand	-	Blocky	-	5.5	-	Slightly moist	Diffuse
B21	0.4	10YR 3/1, Medium Clay, fine sand	-	Blocky	-	9	-	Slightly moist	Diffuse
B22	0.9	10YR 4/1, Medium clay, fine sand	Carbonate nodules, 2% 1-3mm, Mn nodules, 2-3mm	Lenticular	-	9	-	Slightly moist	Diffuse

PROJECT NO: 718107 SITE: BH201

Date	19/7/2012
Time	10:05 PM
Describer	A Sheldon
Elevation	90
Easting	55 / 789066
Northing	7312762
Observation Type	Cont Land
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Coolibah, Buffel grass, brigalow, dawson gum
Lithology	Alluvium	**Surface Soil Condition**	Poached – cattle footprints
Substrate:	Alluvium	**Crack Width**	<2mm
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	-	**Drainage:**	-
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	nil
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	nil
Relief Modal Slope:	Level Plain	**Erosion Type:**	nil
Landform Element:	Flood plain	**Erosion Severity/State:**	nil
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	30%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	~10m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH201

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.1	Black 7.5YR 2.5/1, medium clay	Coarse fragments 5% angular 2-10mm	Moderate Sub Blocky	<2% <1mm	5.5	N	moist	diffuse
B21	0.4	Black 10YR 2/1 Medium Clay	Coarse fragments 10% angular 2-10mm	Strong Sub Blocky	<2% <1mm	6	N	Slightly moist	Diffuse
B22	0.9	Very dark Grey 10YR 3/1, Medium clay	-	Strong Sub Blocky		8	N	Slightly moist	Diffuse
D1	1.1	Brown 10YR 4/3 Clay Loam with fine sand		Massive		8		Dry	Diffuse
D2	1.2	Dark yellow brown 10YR 4/4 Sandy Loam with fine sand		Massive		8		dry	diffuse

SCL 4 Soil Depth>600mm	SCL5 drainage	SCL 6 pH	SCL7 soil Cl>800mg/kg at 600mm	SCL8 water storage>100mm
Pass	Pass	Pass	Pass	Pass

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH202

Date	19/7/2012
Time	12:13 PM
Describer	A Sheldon
Elevation	90
Easting	55 / 789066
Northing	7312762
Observation Type	Cont Land
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Coolibah, Buffel grass
Lithology	Alluvium	**Surface Soil Condition**	Firm
Substrate:	Alluvium	**Crack Width**	-
ASC:	Black Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	-	**Drainage:**	Poor
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	10% 2-10mm subangular/ Angular
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	Mixed gravel fill
Morphological Type	Flat	**Gilgai and Microrelief:**	-
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	~10m	**Additional Notes**	-
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH202

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
FILL 1	0.1	Brown, Sandy clay loam	Coarse fragments 5% angular 2-10mm	Moderate	10% <2mm	-	-	Slightly moist	Clear
FILL 2	0.2	Pale pink, Clayey sand with gravel	Coarse fragments 10% angular 2-10mm	Moderate	-	-	-	Slightly moist	Clear
A1	0.5	Black, Medium clay	-	Strong Sub Blocky	1% 10mm	-	-	Slightly moist	-

PROJECT NO: 718107 SITE: BH203

Date	23/07/2012 & 25/03/2019
Time	9:00 AM
Describer	A Sh / MCK
Elevation	90
Easting	55 / 789079
Northing	789079
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Dawson Gum (Brigalow), pigeon grass
Lithology	Alluvium	**Surface Soil Condition**	Self mulching/ cracked
Substrate:	Alluvium	**Crack Width**	0-3mm
ASC:	Black vertisol	**Runoff:**	slow
Soil Type:	Isaac	**Permeability**	slow
SCL Status	-	**Drainage:**	imperfectly
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	lumpy
Relief Modal Slope:	Level plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	Flood prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	30%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):		**Additional Notes**	
Preclear RE:			

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH203

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.1	Very Dark grey 10YR 3/1, Medium clay, fine sand	-	moderate Sub Blocky	20% <1mm	7	-	Moist	Diffuse
B21	0.7	Dark Grey 10YR 4/1, heavy clay	Coarse Fragments 1% Sub Angular 2-5mm	Strong Lenticular	10% <1mm	9	-	Moist	Diffuse
B22	1.1	Dark Grey, 10YR 4/1, heavy clay	Carbonate nodules, 1%, 1mm	Strong Lenticular	2% <1mm	9	-	Moist	Diffuse
B23	1.2	Dark Grey, 10YR 4/1, heavy clay	Carbonate Nodules, 2%, 2-5 mm	Strong Lenticular	0	9	-	Moist	-

MCK update (2019)

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.1	Very Dark grey 10YR 3/1, heavy clay	-	Strong Blocky	20% 1-2mm	6.5	-	Dry	Diffuse
B21	0.7	Dark Grey 10YR 4/1, medium heavy clay, fine sand	-	Strong Lenticular	5% 1mm	8.5	-	Dry	Diffuse
B22	1.0	Dark Grey, 10YR 4/1, heavy clay	-	Strong Lenticular	<2% 1mm	8.5	-	Slightly Moist	Diffuse

PROJECT NO: 718107 SITE: BH203B

Date	25/03/2019
Time	13:01 PM
Describer	MCK
Elevation	90
Easting	55 / 789079
Northing	789079
Observation Type	Detailed
Sample Method	Hand Auger

SITE DESCRIPTION

Geology Unit:	Qa	**Vegetation Species:**	Dawson (Brigalow), pigeon grass
Lithology	Alluvium	**Surface Soil Condition**	Self mulching
Substrate:	Alluvium	**Crack Width**	1mm
ASC:	Black vertisol	**Runoff:**	slow
Soil Type:	Isaac	**Permeability**	slow
SCL Status	-	**Drainage:**	imperfectly
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Level plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:		**Inundation:**	
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Partially Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	80%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):		**Additional Notes**	
Preclear RE:			

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: BH203B

PROFILE MORPHOLOGY

Horizon	Depth	Description	Fragments/ Inclusions	1 Ped Shape	Roots/ Size	pH / HCl/ EC (dS/m)	Plasticity Type	Moisture	Boundary
A1	0.1	Dark grey 10YR 4/1,1° mottle 7.5YR 5/8, Medium clay, fine sand	Magames nodules1%, 1-2mm	Strong Blocky	10% 1-2mm	6.5	S	Dry	Diffuse
B21	0.55	Very Dark Grey 10YR 3/1, heavy clay,	Carbonate Fragments, 5% 1-3mm, 2% angular coarse fragments, 2mm	Strong Lenticular	0	7.5, strong	S	-	Diffuse
B22	0.8	Dark Grey, 10YR 4/1, medium heavy clay,	Carbonate fragments, 2%	Strong Lenticular	0	8, strong	S	-	Diffuse
B23		Brown 10YR 5/3, medium heavy clay	Carbonate Fragments, 3%, 1-5 mm	Strong Lenticular	0	8, strong	-	-	Diffuse

PROJECT NO: 718107 SITE: SO103

Date	21/7/2012
Time	10:15AM
Described by:	A. Sheldon
Elevation (m):	100
Easting	55 / 790495
Northing	7311943
Observation Type	Surface
Sample Method	N/A

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, Poplar Box, Moreton Bay Ash, Bloodwood, Lemon Scented Gum, Current Bush
Lithology	Relict Alluvium	**Surface Soil Condition**	Trampled
Substrate:	Relict Alluvium	**Crack Width**	-
ASC:	Chromosol	**Runoff:**	Moderately Rapid
Soil Type:	Thalberg	**Permeability**	Moderate
SCL Status		**Drainage:**	Well drained
Slope	3%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple Slope	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	Sheet
Landform Element:	Hillslope	**Erosion Severity/State:**	Minor / Stabilized
Landform Pattern:		**Inundation:**	Nil
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Uncleared	**SCL 2 (rockiness)**	Pass
Groundcover:	50%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	15m	**Additional Notes**	
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: SO103

PROFILE MORPHOLOGY

No Bore log information available

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1									
A2									
B1									
B21									

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: SO108

Date	21/7/2012
Time	15:00PM
Described by:	A. Sheldon
Elevation (m):	90
Easting	55 / 789539
Northing	7314884
Observation Method	Surface
Sample Method	N/A

SITE DESCRIPTION

Geology Unit:	QA	**Vegetation Species:**	Purple Pidgeon Grass,
Lithology	Alluvium	**Surface Soil Condition**	Trampled
Substrate:	Alluvium	**Crack Width**	2mm
ASC:	Slightly Moist Black Vertosol	**Runoff:**	Slow
Soil Type:	Langley	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Moderately Well Drained
Slope	<1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Flat	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Level Plain	**Erosion Type:**	-
Landform Element:	Flood Plain	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Flood Prone
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	90%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	Same as BH107
Preclear RE:	11.3.1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: SO108

PROFILE MORPHOLOGY

Same as BH107

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary
A1	0.1	Black, 10YR 2.5/1, Grade: Moderate Heavy Clay, Moderate Strength. Cracks: 20%, 1-2mm	-	Sub Blocky 5-10mm	20%, <1-3mm	7 / -	N	Wet	Diffuse/ Even
B21	0.4	Very Dark Greyish Brown, 10YR 3/2. Black along crack lines. Grade: Heavy Clay, Strong. Cracks: 20%, 1-2mm	-	Lenticular 10-20mm	10%, <1mm	9 / Nil	-	Wet	Diffuse/ Even
B22	0.8	Very Dark Greyish Brown, 10YR 3/2. Sub dominant 7.5YR2.5/1. Grade: Medium Clay, Strong. Cracks: 10%, 1mm	Carbonate Nodules, 5%, 2-5mm, (trace gypsum)	Lenticular 10-20mm	10%, <1mm	9 / Mod	-	Slightly Moist	Diffuse / Even
B23	1.2	Very Dark Greyish Brown, 10YR 3/2, Grade: Medium Clay, strong. Cracks: 10%, 1mm	Carbonate Nodules, 2%, 2-5mm	Angular Blocky 10-30mm	2%, <1mm	9 / Mod	-	Slightly Moist	-

PROJECT NO: 718107 SITE: SO109

Date	21/7/2012
Time	15:20PM
Described by:	A. Sheldon
Elevation (m):	103
Easting	55 / 790514
Northing	7313198
Observation Type	Surface
Sample Method	N/A

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass, spiky bush
Lithology	-	**Surface Soil Condition**	Trampled
Substrate:	Calcareous Sandstone	**Crack Width**	1mm
ASC:	-	**Runoff:**	Rapid
Soil Type:	Thalberg	**Permeability**	Slow
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	7%	**Coarse Fragments (Abundance, Size, Shape):**	30%, 2-30mm, rounded – sub-angular
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	Quartz
Morphological Type	Simple Slope	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	Gully 0.5m
Landform Element:	Hillslope	**Erosion Severity/State:**	Moderate / Active
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Fail
Groundcover:	-	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	-
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: SO109

PROFILE MORPHOLOGY

No Bore log information available

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: SO118

Date	24/7/2012
Time	9:00AM
Described by:	A. Sheldon
Elevation (m):	100
Easting	55 / 790246
Northing	7314297
Observation Type	Surface
Sample Method	N/A

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel grass, brigalow
Lithology	Relief Alluvium	**Surface Soil Condition**	Crusty
Substrate:	-	**Crack Width**	2mm
ASC:	-	**Runoff:**	Rapid
Soil Type:	Thalberg	**Permeability**	Slow
SCL Status	Pass	**Drainage:**	Imperfectly Drained
Slope	2%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	None
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	Sheet
Landform Element:	Hillslope	**Erosion Severity/State:**	Minor, partially stabilised
Landform Pattern:	-	**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	0.5m	**Additional Notes**	-
Preclear RE:	11.4.8/9a/1		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 718107 SITE: SO118

PROFILE MORPHOLOGY

No bore log information available

Horizon	Depth	Description	Fragments/ Inclusions	1° Ped Shape	Roots/ Size	pH / HCl	Plasticity Type	Moisture	Boundary

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: SO151

Date	20/8/2012
Time	8:30AM
Described by:	A Sheldon
Elevation (m):	95
Easting	55 / 790780
Northing	7316250
Observation Type	Check
Sample Method	

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	Buffel Grass,Dawson gum, Lime bush, QLD blue grass
Lithology	Weathered Sediments	**Surface Soil Condition**	Firm - Hardsetting
Substrate:	Calcareous Sandstone	**Crack Width**	-
ASC:	Brown Sodsol	**Runoff:**	Fast
Soil Type:	Thalberg	**Permeability**	Moderate
SCL Status	Fail	**Drainage:**	Moderate
Slope	35%	**Coarse Fragments (Abundance, Size, Shape):**	30% 5-100mm rounded angular
Assessment Method	Dumpy Level	**Coarse Fragments (lithology):**	Sandstone/conglomerate (laterised) opalized wood
Morphological Type	Simple slope	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	Sheet
Landform Element:	Hillslope	**Erosion Severity/State:**	Minor/stabilised
Landform Pattern:		**Inundation:**	-
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Fail
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Fail
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	.5m	**Additional Notes**	Fine Sandy loam Surface, no access to dig.
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: SO178

Date	23/8/2012
Time	7:30 AM
Describer	A Sheldon
Elevation	110
Easting	55 / 791656
Northing	7312170
Observation Type	Surface
Sample Method	

SITE DESCRIPTION

Geology Unit:	Pw	**Vegetation Species:**	Buffel grass, lime bush
Lithology	Calcareous Sediments	**Surface Soil Condition**	Sandy Hardsetting
Substrate:	Weathered Sandstone	**Crack Width**	1-2mm
ASC:	Brown Chromosol	**Runoff:**	Slow
Soil Type:	Thalberg	**Permeability**	Moderate
SCL Status		**Drainage:**	imperfectly drained
Slope	2%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	Simple slope	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	hillslope	**Erosion Severity/State:**	
Landform Pattern:	-	**Inundation:**	Nil
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (rockiness)**	Pass
Groundcover:	70%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	2m	**Additional Notes**	Surface soil – fine sandy loam
Preclear RE:	11.4.8		

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

PROJECT NO: 612024 SITE: SO179

Date	23/8/2012
Time	8:05 PM
Describer	A Sheldon
Elevation	110
Easting	55 / 791725
Northing	7312757
Observation Type	
Sample Method	

SITE DESCRIPTION

Geology Unit:	CZ	**Vegetation Species:**	buffel, dawson gum
Lithology	Calcareous sediments	**Surface Soil Condition**	Sandy – hard setting
Substrate:	Weathered sandstone	**Crack Width**	1-2mm
ASC:	Brown Chromosol	**Runoff:**	Moderate
Soil Type:	Thalberg	**Permeability**	Moderate
SCL Status	-	**Drainage:**	Imperfectly drained
Slope	1%	**Coarse Fragments (Abundance, Size, Shape):**	-
Assessment Method	Clinometer	**Coarse Fragments (lithology):**	-
Morphological Type	crest	**Gilgai and Microrelief:**	Nil
Relief Modal Slope:	Undulating low hills	**Erosion Type:**	-
Landform Element:	Hillcrest	**Erosion Severity/State:**	-
Landform Pattern:	-	**Inundation:**	Nil
Land Use:	Grazing	**SCL 1 (Slope >/=3%)**	Pass
Site Disturbance:	Cleared	**SCL 2 (Slope >/=20%/60mm)**	Pass
Groundcover:	60%	**SCL 3 (Slope >/=50% land>500mm Microrelief)**	Pass
Upper Height stratum (m):	10m	**Additional Notes**	Surface Soil- fine sandy Loam
Preclear RE:	11.4.8		

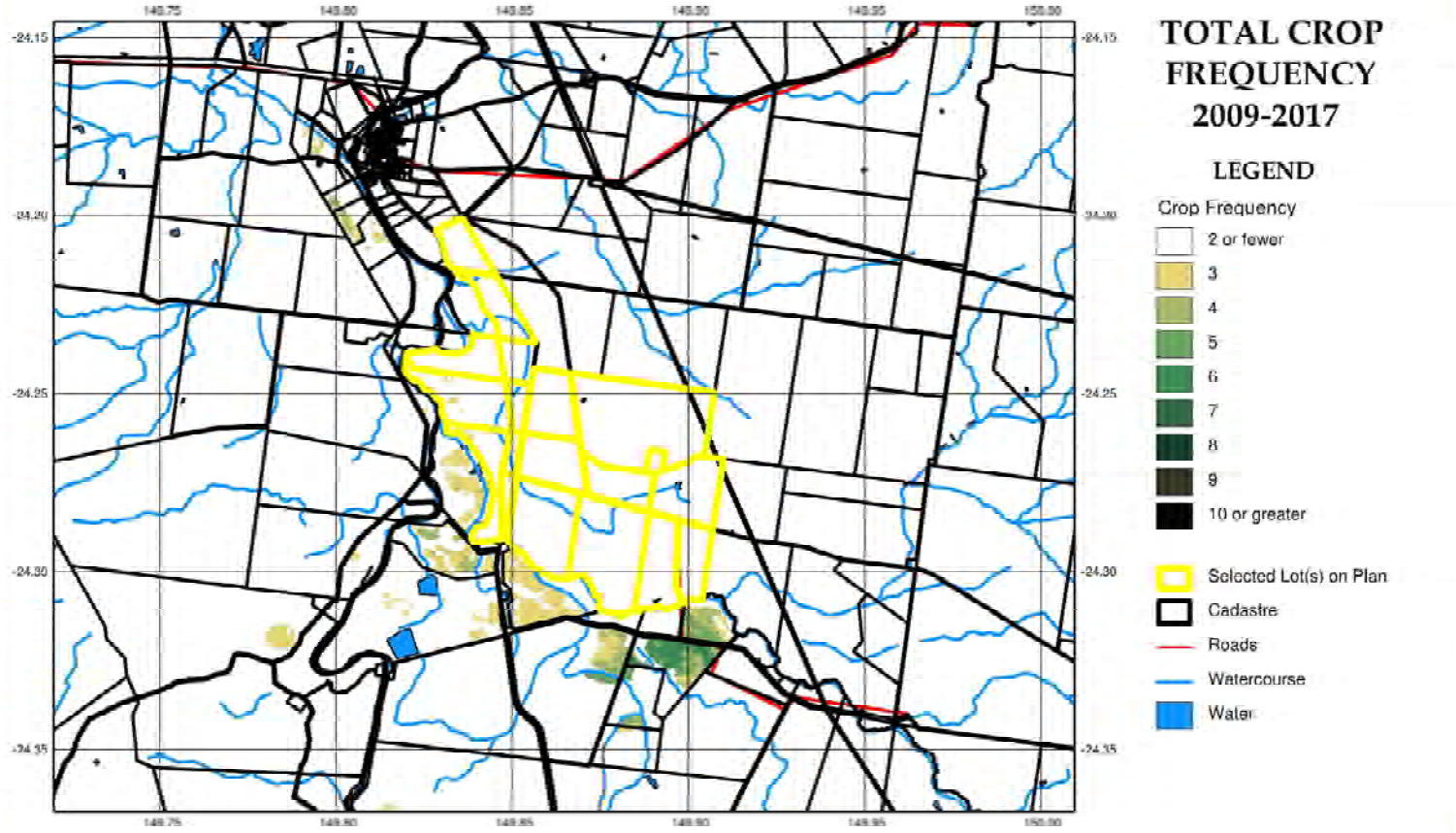
APPENDIX D: LAND SUITABILITY – FORAGE REPORTS

FORAGE REPORT: CROP FREQUENCY AND TYPE

Introduction

This report presents crop frequency and broad crop type information for your chosen area, for the time period selected (ten year period between 1988 and current). The report includes crop frequency mapping which is based on time series analysis of satellite imagery (30m spatial resolution) over the summer and winter growing seasons. The approach is based on detection of seasonal cycles of vegetation greenness, therefore some perennial crops may not be represented. Seasonal images displaying the maximum greenness within a summer and winter growing season for each year are also provided. For further information, refer to the FORAGE User Guide (https://data.longpaddock.qld.gov.au/static/forage_user_guide.pdf) .

Estimated total crop frequency map (2009 - 2018)



How to interpret the information

Crop frequency mapping: Coloured areas on the maps indicate locations where active crops have been detected three or more times in the summer and winter growing seasons, for a ten year period. The map on this page shows 'Total Frequency' which is a count of number of years that an active crop was detected. The two maps on the following page show the summer and winter crop frequency, respectively. These maps show a count of the number of times an active crop was detected in each of those distinct growing seasons. The detection of active crops is based on time-series analysis of satellite imagery. Due to the limitations of the automated method used to detect active cropping, you should also view the temporally adaptive seasonal image composite on page 6, compiled to represent the maximum greenness (per pixel) within a growing season.

Mapping of broad crop groups: Crop frequency information is also separated into estimates of dominant broad crop groups within the region. This estimation is based on an automated classification approach for each season (see Pringle *et al.* 2018 for more details).

In the winter season the classification differentiates between classes:

- Cereal crop (e.g. wheat, barley, oats);
- Pulse crop (e.g. chickpea).

In the summer season the classification differentiates between the classes:

- Coarse-grain and pulse (e.g. sorghum, maize, mungbean);
- Cotton crop.

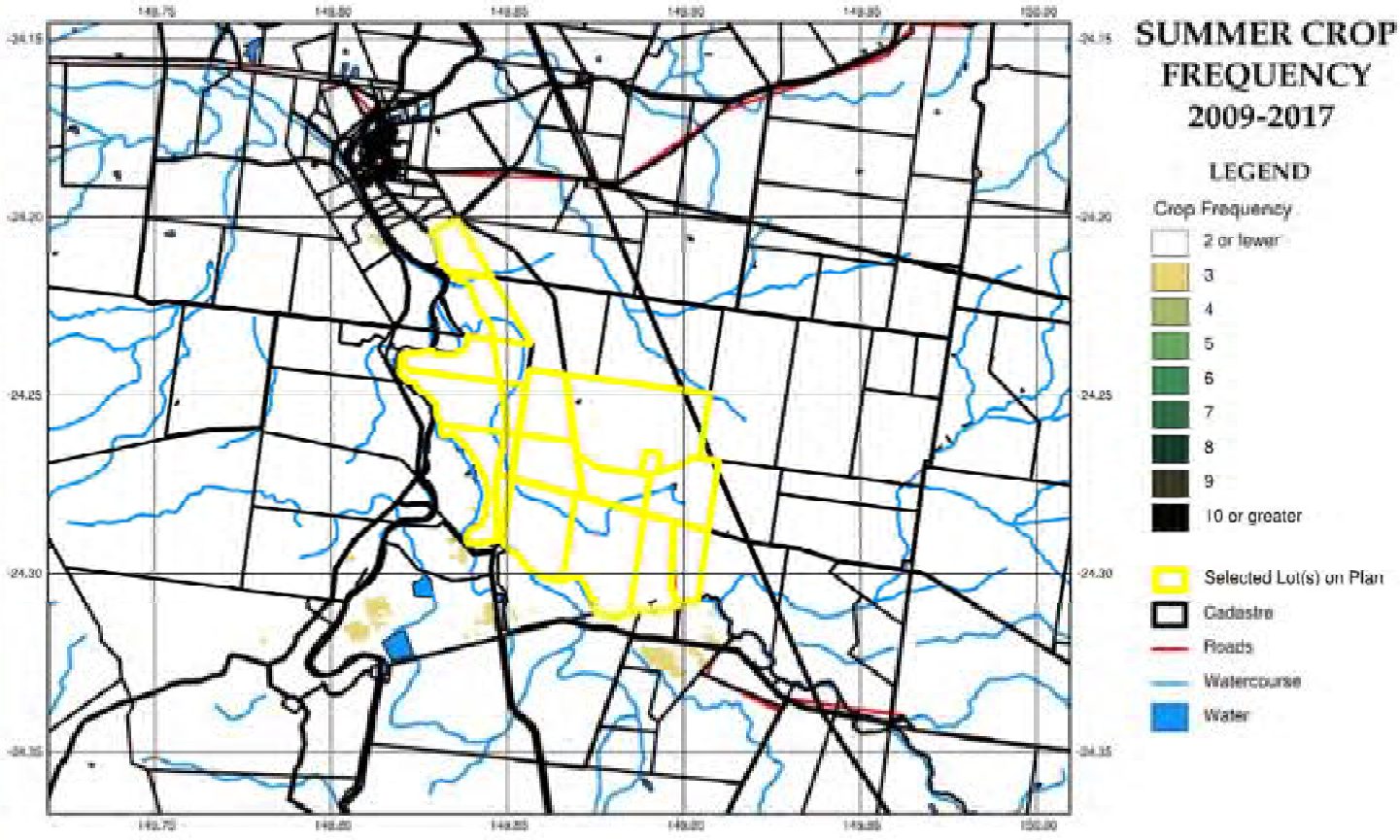
Landsat satellite imagery: Landsat imagery at 30m spatial resolution are predominately used. Since 2015 Sentinel-2 imagery are included and re-sampled to a 30m spatial resolution to match the Landsat imagery. Since 2000 imagery from MODIS serve as backup data in case of large (> 4 weeks) data gap (e.g. cloud issues). The seasonal maximum vegetation imagery for summer (around February) and winter (around September) on the following pages help confirm the presence of an active crop. Each maximum vegetation image is designed to optimise the identification of winter and summer cropping and is generated from a number of images acquired within the growing season. The cropped areas will generally appear bright green in the imagery compared with the surrounding landscape. Even if the crop frequency mapping does not indicate cropping in an area, it is important to check each Landsat image to confirm that cropping has not been undertaken. Sometimes it will not be possible to clearly identify cropped areas in the imagery. For example, in some wetter seasons, much of the imagery can appear very green and cropping may be difficult to identify. Where this is the case, it is recommended to undertake further investigation using other information sources. Note: It is not possible to visually differentiate between crop groups in the seasonal maximum vegetation image. This image is only used to confirm the presence or absence of cropping activities.

FORAGE REPORT: CROP FREQUENCY AND TYPE

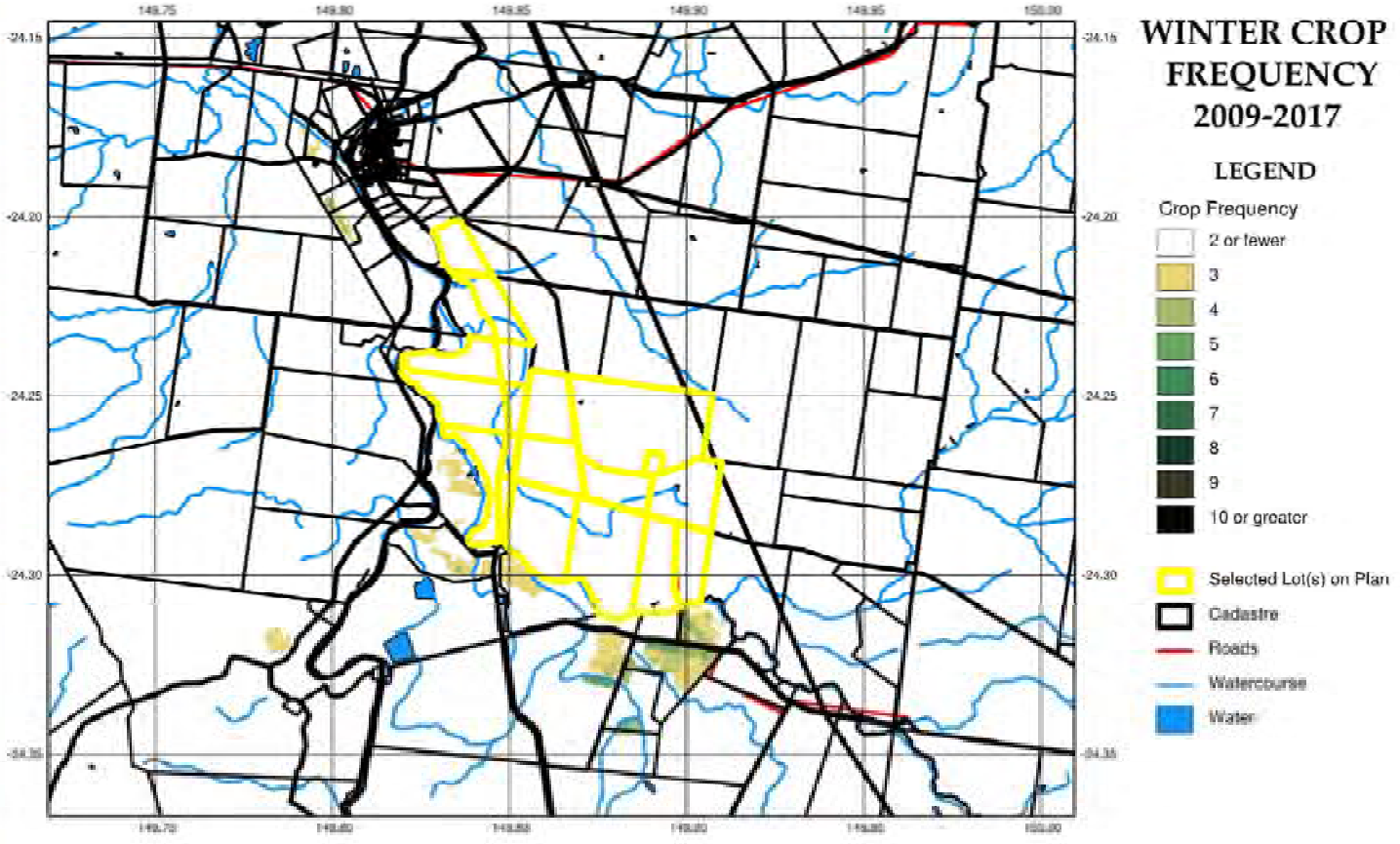
http://www.longpaddock.qld.gov.au/forage *March 6, 2019* *Lot on Plan: 145FN502,141FN137,79FN106,78FN15 etc.* *Label: 718107*

Queensland Government

Estimated frequency map for summer (February) crop (2009 - 2018)



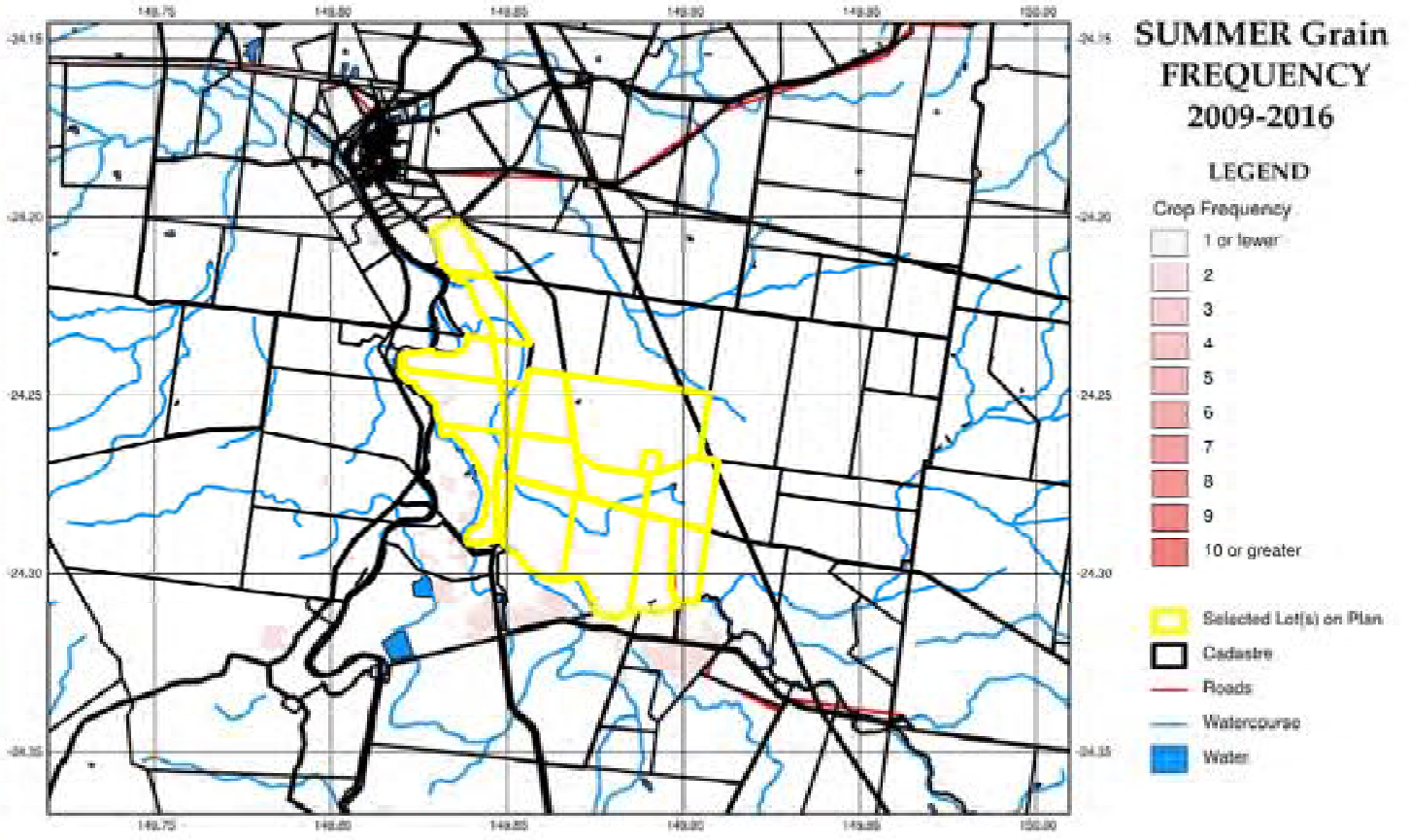
Estimated frequency map for winter (September) crop (2009 - 2018)



FORAGE REPORT: CROP FREQUENCY AND TYPE

Queensland Government

Estimated frequency map for summer (February) coarse grain and pulse crop (2009 - 2018)



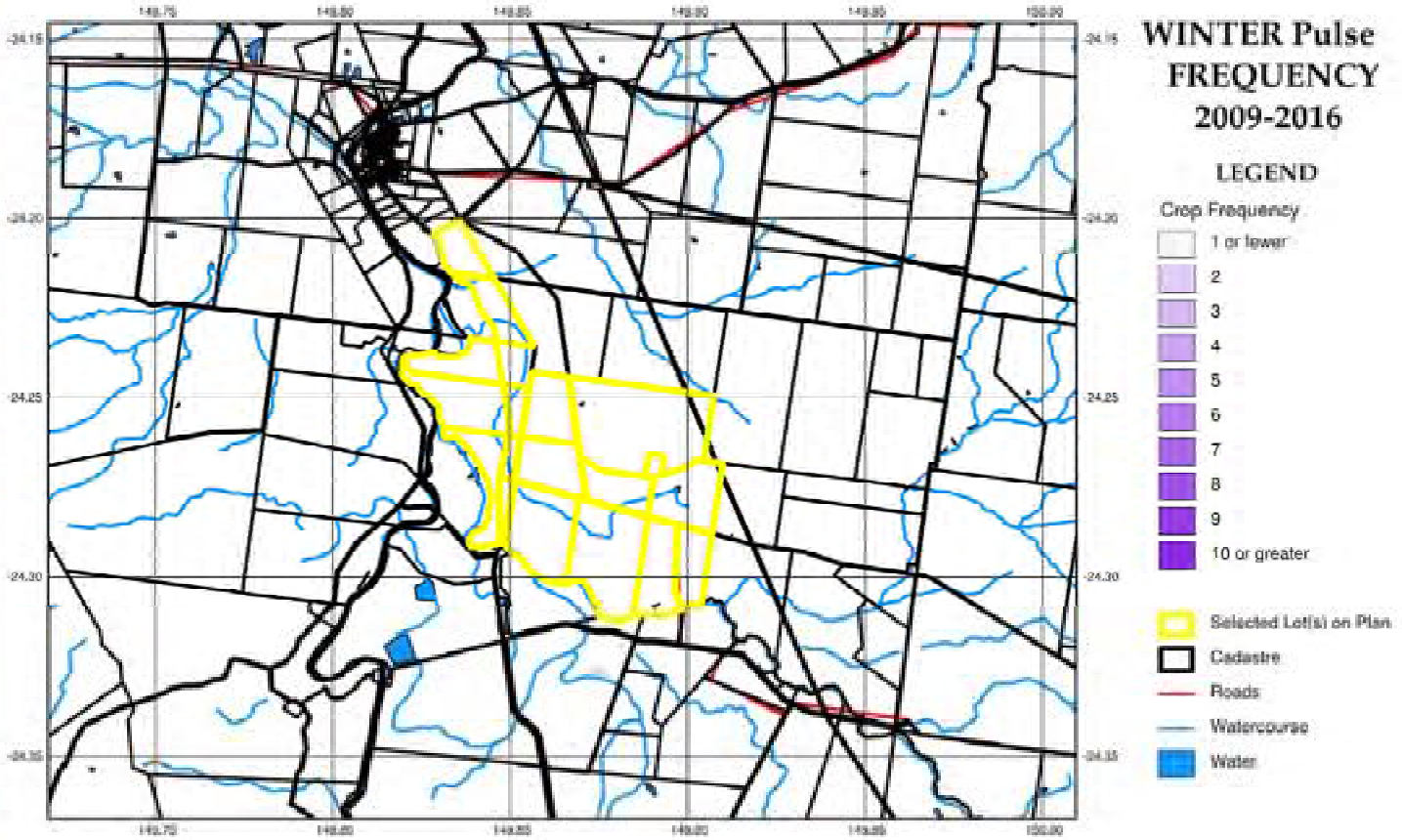
Estimated frequency map for summer (February) cotton crop (2009 - 2018)

FORAGE REPORT: CROP FREQUENCY

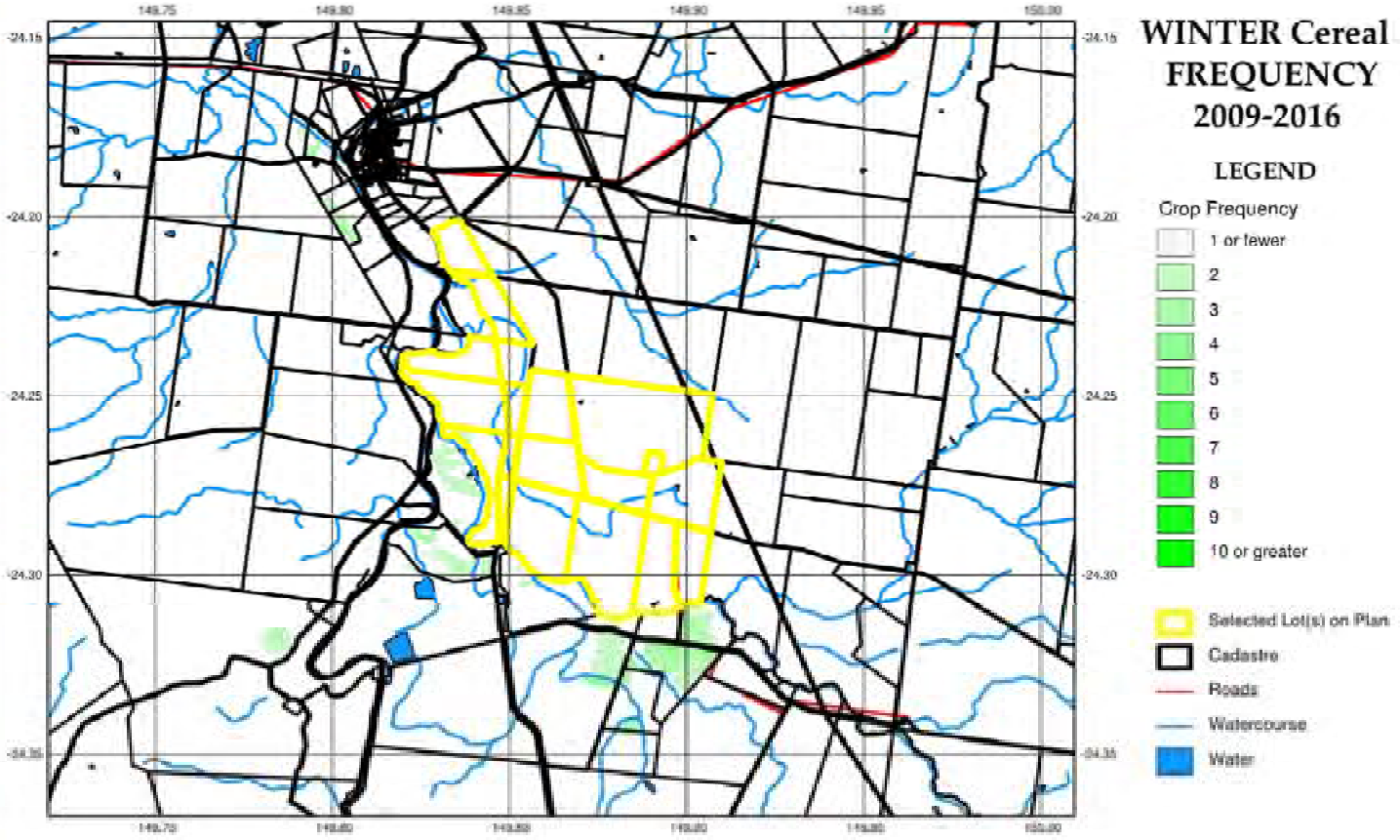
http://www.longpaddock.qld.gov.au/forage *March 6, 2019* *Lot on Plan: 145FN502,141FN137,79FN106,78FN15 etc.* *Label: 718107*

Queensland Government

Estimated frequency map for winter (September) pulse crop (2009 - 2018)



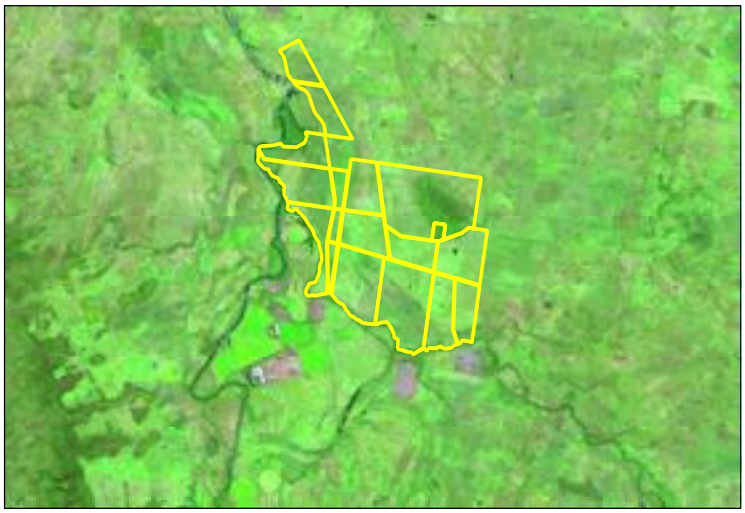
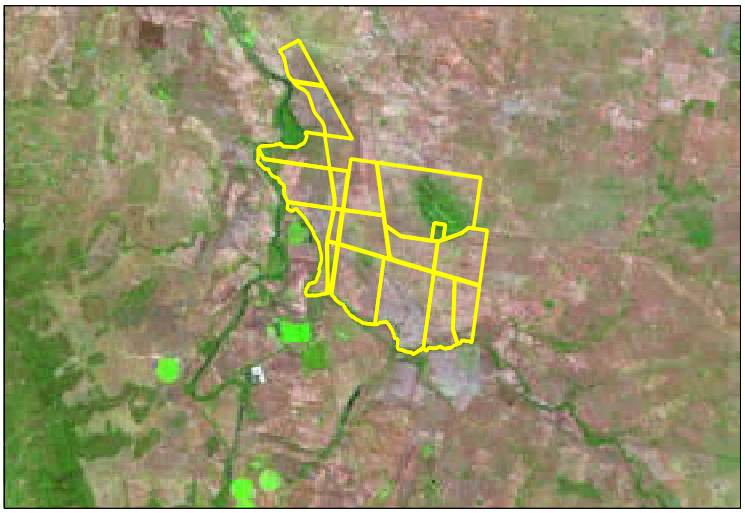
Estimated frequency map for winter (September) cereal crop (2009 - 2018)



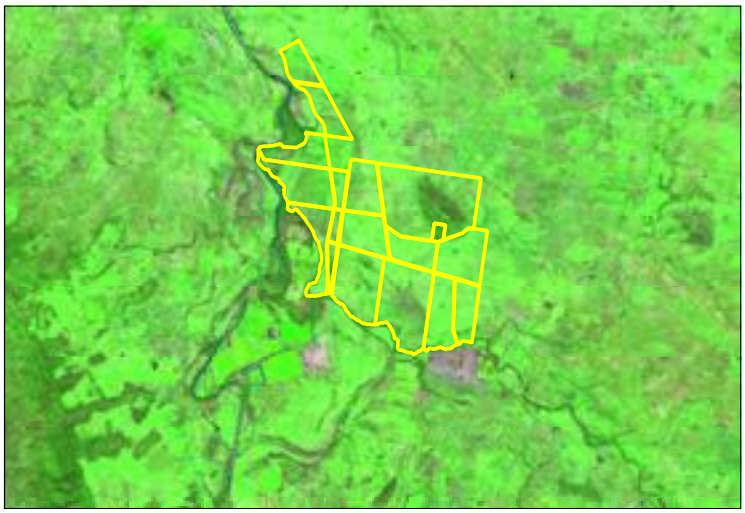
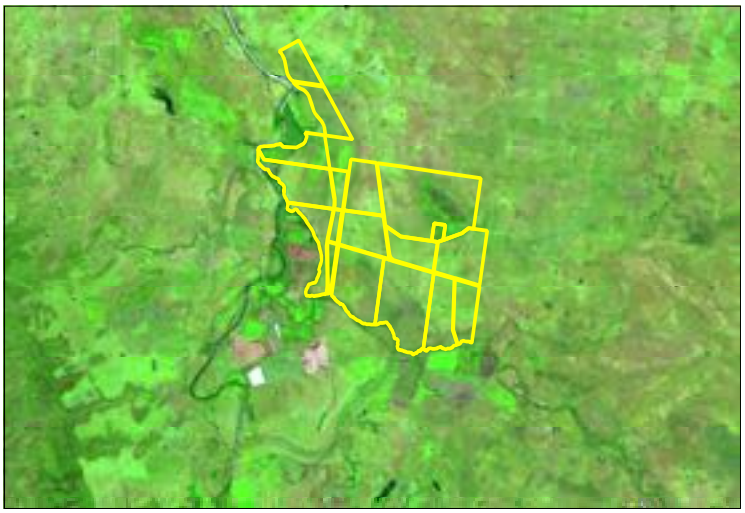
FORAGE REPORT: CROP FREQUENCY

Queensland Government

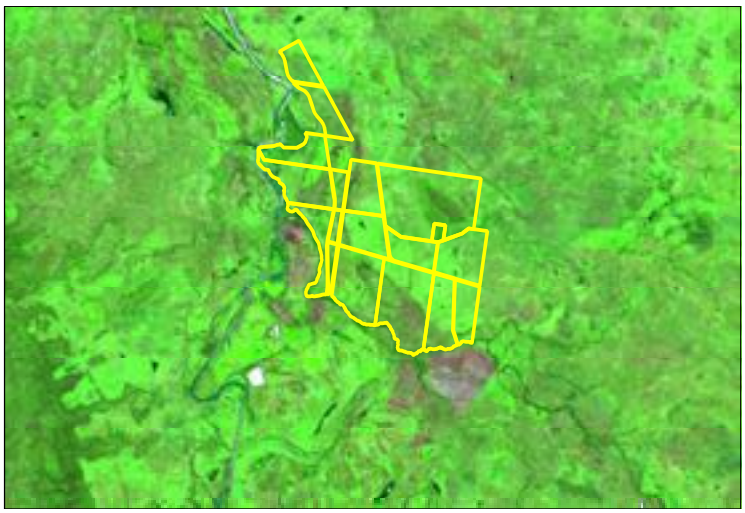
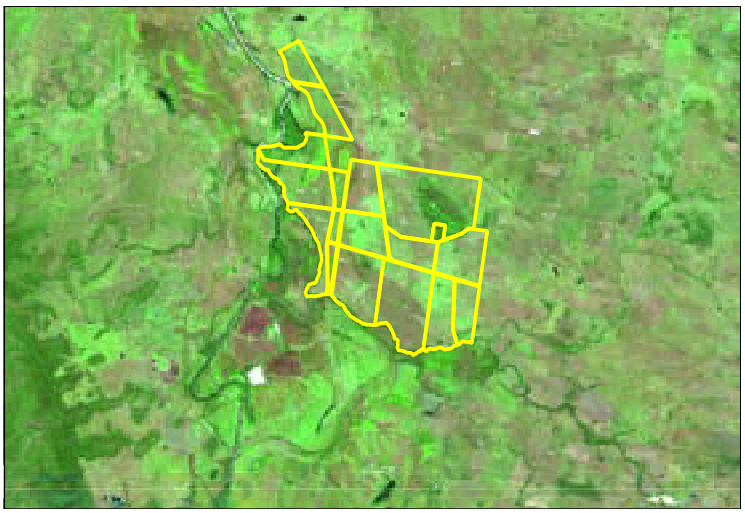
February (left) and September (right) images for 2009

February (left) and September (right) images for 2010

February (left) and September (right) images for 2011

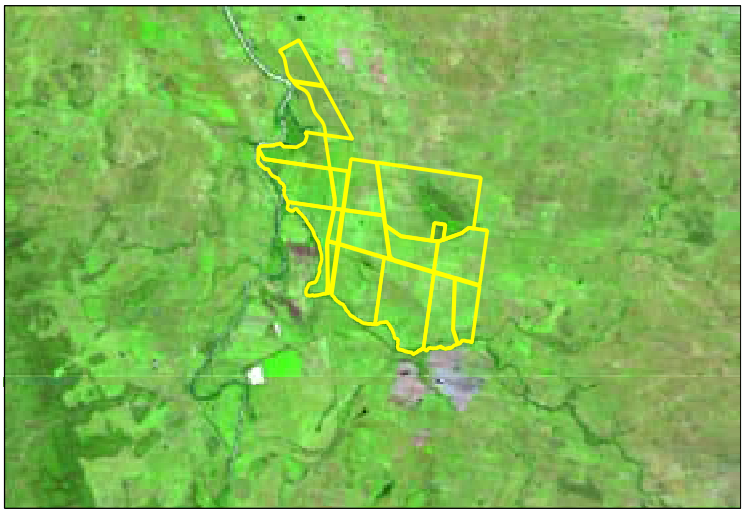



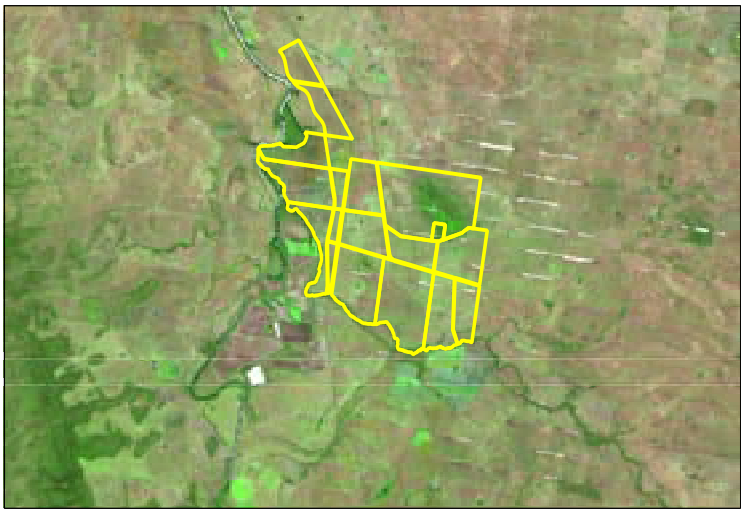
FORAGE REPORT: CROP FREQUENCY

http://www.longpaddock.qld.gov.au/forage *March 6, 2019* *Lot on Plan: 145FN502,141FN137,79FN106,78FN15 etc.* *Label: 718107*

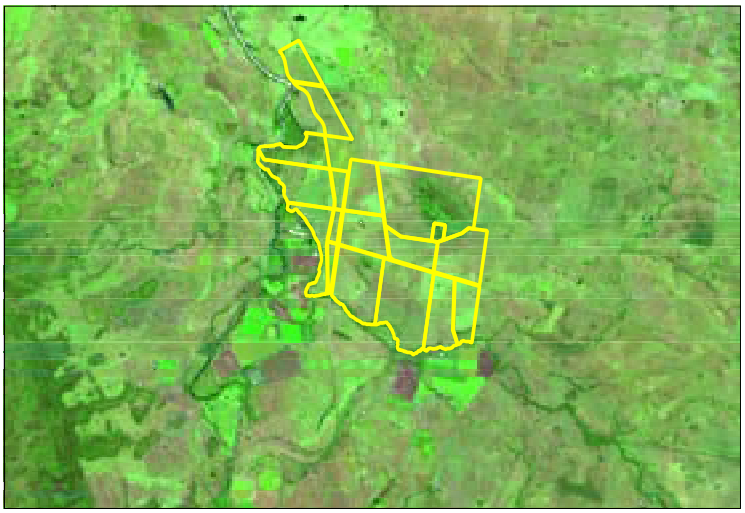
Queensland Government

February (left) and September (right) images for 2012

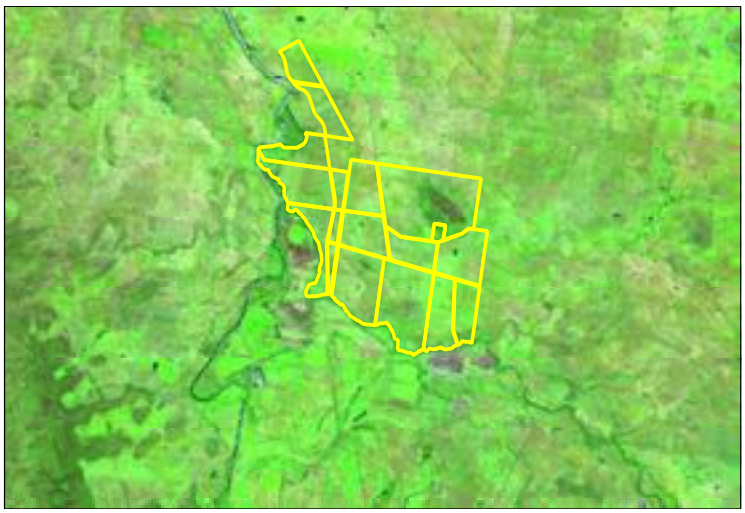


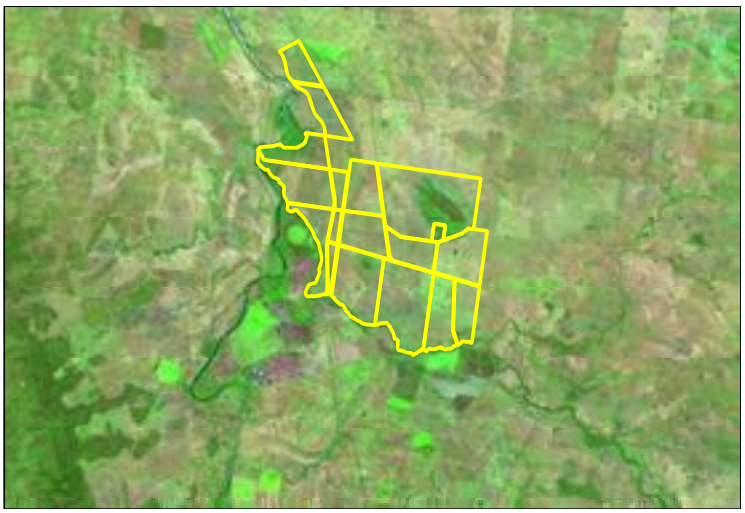


February (left) and September (right) images for 2013



February (left) and September (right) images for 2014



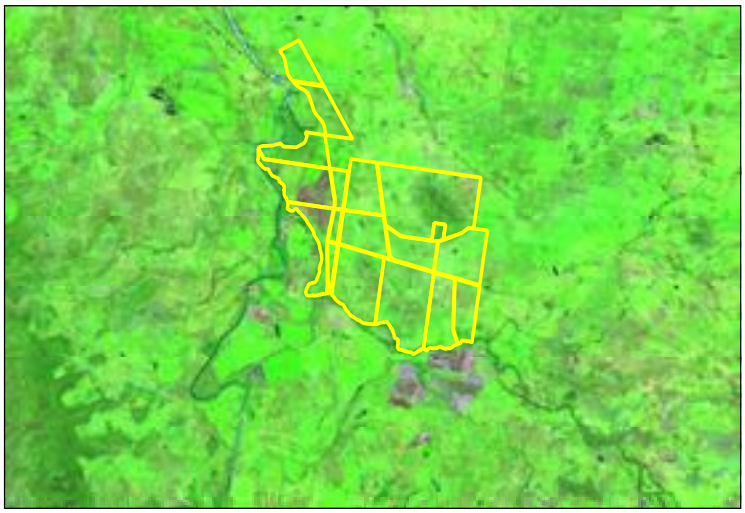


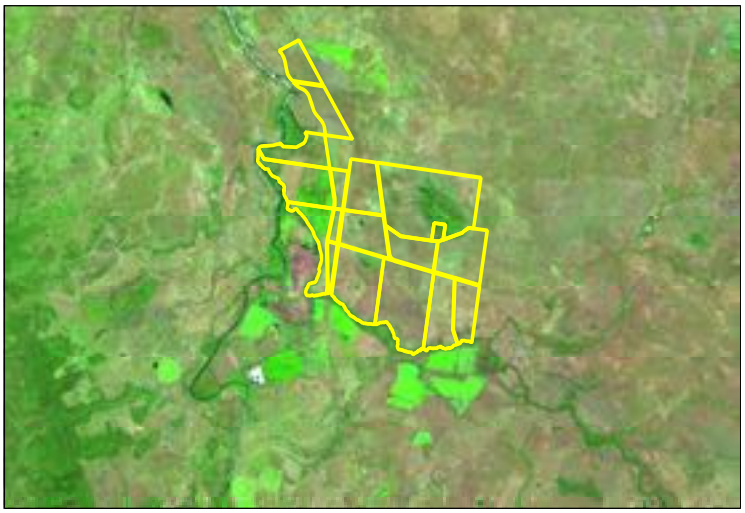
FORAGE REPORT: CROP FREQUENCY

http://www.longpaddock.qld.gov.au/forage *March 6, 2019* *Lot on Plan: 145FN502,141FN137,79FN106,78FN15 etc.* *Label: 718107*

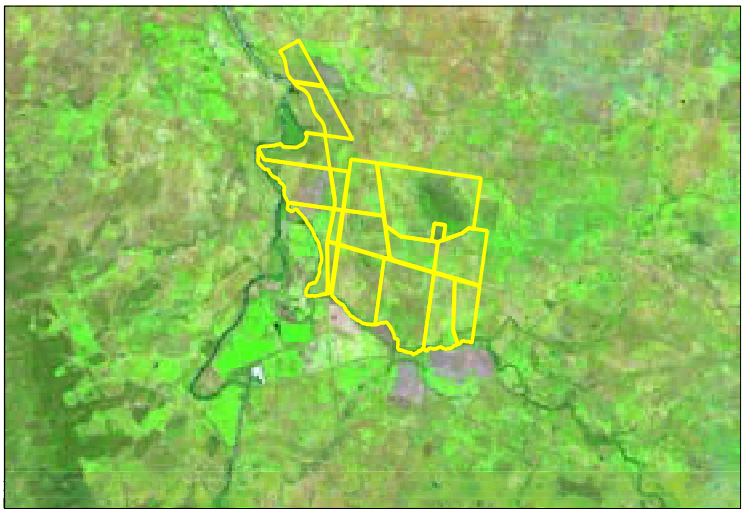
Queensland Government

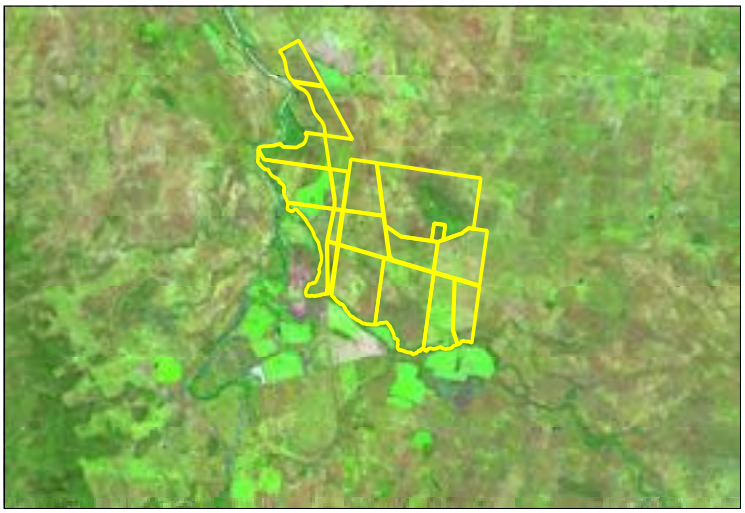
February (left) and September (right) images for 2015



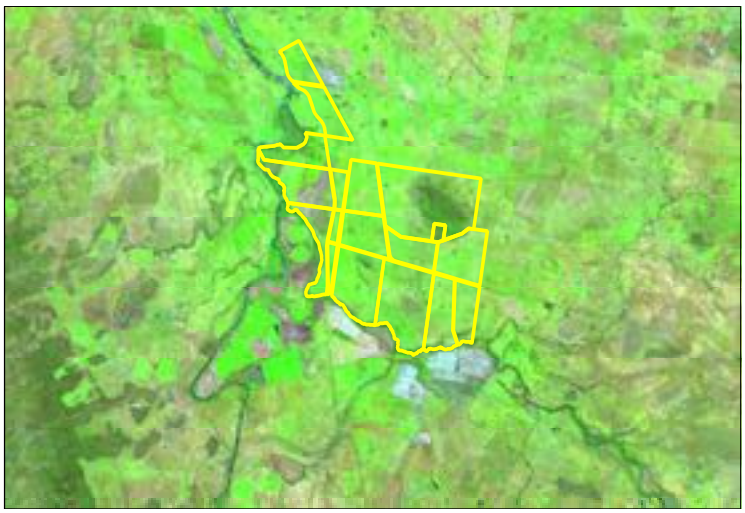


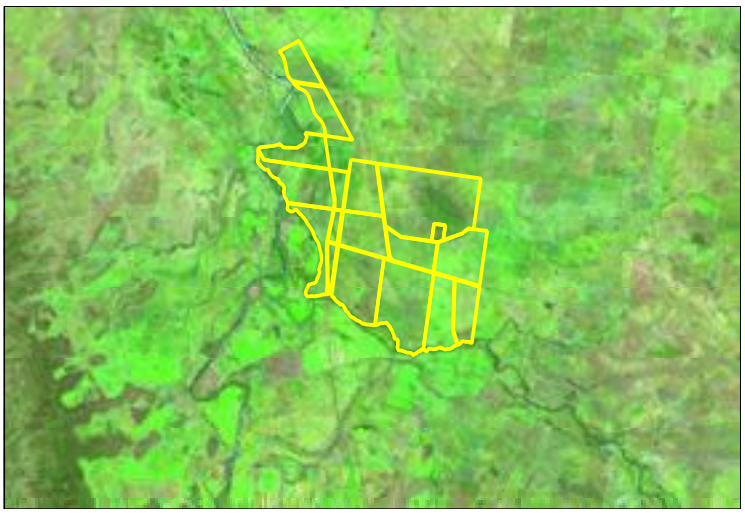
February (left) and September (right) images for 2016





February (left) and September (right) images for 2017





FORAGE REPORT: CROP FREQUENCY

http://www.longpaddock.qld.gov.au/forage *March 6, 2019* *Lot on Plan: 145FN502,141FN137,79FN106,78FN15 etc.* *Label: 718107*

Queensland Government

February (left) and September (right) images for 2018

Reference

Pringle, M., Schmidt, M., and Tindall, D. (2018): Multi-decade, multi-sensor time-series modelling based on geostatistical concepts to predict broad groups of crops. Remote Sensing of Environment.

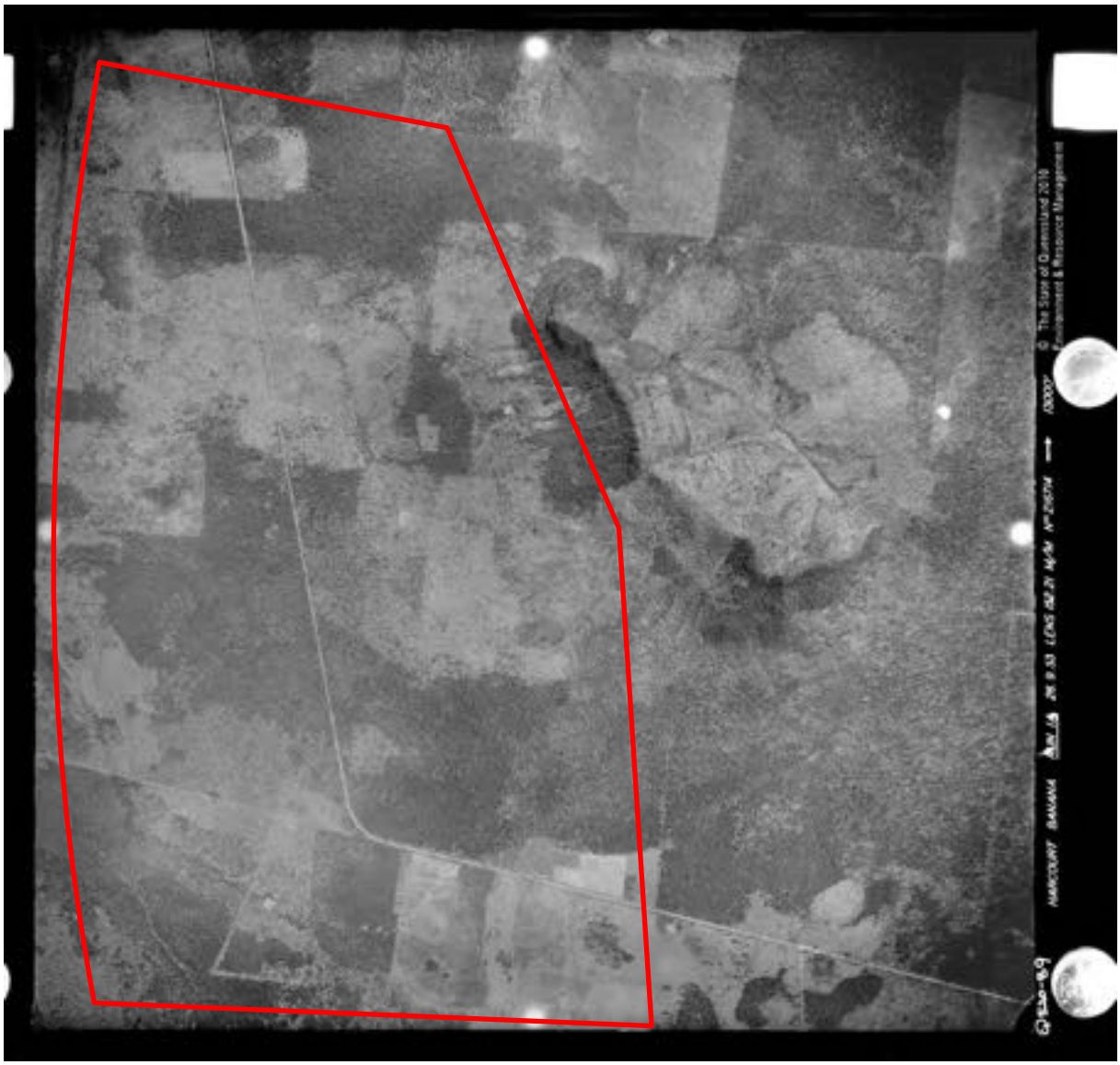
Disclaimer

APPENDIX E: HISTORICAL PHOTOGRAPHS

1953


HARCOURT BANANA RUN 11 11.9.53 LENS 2/6574 152.21 M/M
© The State of Queensland 2020

1953



1953


BANANA RUN 1 4-6-65 MAO 23S LENS 20S 152·70 MM 25,000
© The State of Queensland 2012
Environment & Resource Management
Q1527
73

1965


HARCOURT
RUN 2
LENS 122
151-75mm
MAG 294
16-5-1968
16,840'
© The State of Queensland 2012
Environment & Resource Management
Q1785
58

1968

1968


HARCOURT
RUN 2
LENS 122
151-75mm
MAG 294
16-5-1968
16,840'
© The State of Queensland 2012
Environment & Resource Management
Q1785
58

1968


BARALABA
RUN 4
UA# 323
152.56mm
8.6.1972
MAG. 171
24,000 ft.
© The State of Queensland 2017
Dept of Natural Resources and Water

1972


8849 1-IV
BARALABA
4800M
RUN 6
MAG 498
15-5-1975
LENS 464
152.22mm
© The State of Queensland 2012
Environment & Resource Management
Q2957
132

1975


8849 1-IV
BARALABA
4800M
RUN 6
MAG 498
15-5-1975
LENS 464
152.22mm
© The State of Queensland 2012
Environment & Resource Management
Q2957
132

1975


8849 1-IV
BARALABA
4800M
RUN 6
MAG 498
15-5-1975
LENS 464
152.22mm
© The State of Queensland 2012
Environment & Resource Management
Q2957

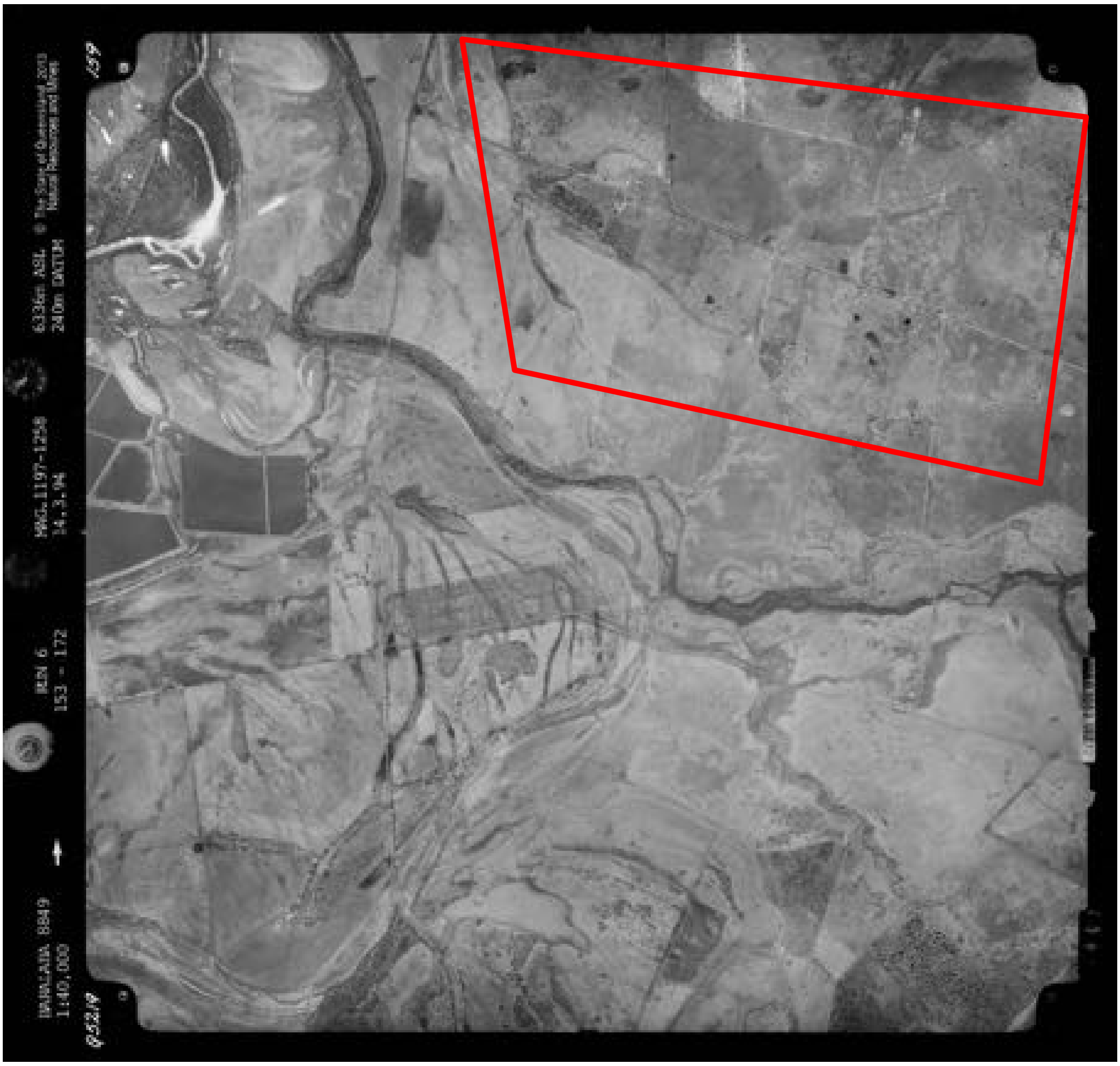
1975

1975

1983


BARALABA 8849
1:40,000
REN 5
173 - 193
MAG:1197-1258
14.3.94
6336m ASL
240m DATUM

1994



1994


DAWSON RIVER
APPROXIMATE SCALE 1:25000
RUN 8
001-025
MAG 4206-3669
3.5.99
3960m ASL
183m DATUM
© The State of Queensland 2014
Natural Resources and Mines
DAP
5742
006

1999


DAWSON RIVER
APPROXIMATE SCALE 1:25000
RUN 7
026-051
MAG 4206-3669
3.5.99
3960m ASL
183m DATUM
© The State of Queensland, 2014
Natural Resources and Mines

1999


DAWSON RIVER
APPROXIMATE SCALE 1:25000
RUN 7
028-061
MAG 4206-3869
3.5.99
396m ASL
183m DATUM

1999

2002

2006

2009

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

2013

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

2017

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

2017

ENVIRONMENTAL EARTH SCIENCES
CONTAMINATION RESOLVED

APPENDIX F: EMR/CLR SEARCH RESULTS

Department of Environment and Science (DES)
ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA
www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528167 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 5 Plan: KM50
1384 ALBERTA RD
ALBERTA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority

Department of Environment and Science (DES)
ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA
www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528174 EMR Site Id: 24185 02 May 2019
Client Reference:
Cheque Number:

This response relates to a search request received for the site:
Lot: 6 Plan: KM50

EMR RESULT

The above site IS included on the Environmental Management Register.
Lot: 6 Plan: KM50
Address: ALBERTA ROAD
BARALABA 4702

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.
LIVESTOCK DIP OR SPRAY RACE - operating a livestock dip or spray race facility.

For the majority of rural properties only a small area may be affected by the chemicals used in livestock dips and spray races. The Department of Environment and Science may hold further information relating to the location of the dip site within this property.
PETROLEUM PRODUCT OR OIL STORAGE - storing petroleum products or oil -
(a) in underground tanks with more than 200L capacity; or
(b) in above ground tanks with -
(i) for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code - more than 2, 500L capacity; or
(ii) for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code - more than 5, 000L capacity; or
(iii) for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia - more than 25, 000L capacity.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-
1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities)

if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority

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ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA
www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528173 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 4 Plan: FN514
749 HARCOURT BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528172 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 25 Plan: FN130
HARCOURT BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority

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ABN 46 640 294 485
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GPO Box 2454, Brisbane QLD 4001, AUSTRALIA
www.des.qld.gov.au

SEARCH RESPONSE

ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528171 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:

Lot: 11 Plan: FN153
3675 MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528181 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 2 Plan: FN121

BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528180 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 3 Plan: FN110

BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528179 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 5 Plan: FN110

BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority

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ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA
www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528178 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 4 Plan: FN110

BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528177 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 1 Plan: PER200304
MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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Administering Authority

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www.des.qld.gov.au

SEARCH RESPONSE

ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528194 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 8 Plan: FN215
HARCOURT BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority

Department of Environment and Science (DES)
ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA
www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528193 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 62 Plan: SP119257
DAWSON VALLEY BRANCH RLY
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528192 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 15 Plan: FN217

UNABLE TO VALIDATE (SEARCH MAY STILL PROCEED)

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528191 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 15 Plan: FN217
MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528190 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 61 Plan: SP119257
DAWSON VALLEY BRANCH RLY
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528189 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 26 Plan: FN153
3505 MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528188 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 141 Plan: FN137
4641 MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528187 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 77 Plan: FN312
MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528186 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 78 Plan: FN153
MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528185 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 27 Plan: FN153
MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528205 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 79 Plan: FN106
3675 MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528204 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 145 Plan: FN502
MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528203 EMR Site Id: 24903 02 May 2019
Client Reference:
Cheque Number:

This response relates to a search request received for the site:
Lot: 140 Plan: FN503

EMR RESULT

The above site IS included on the Environmental Management Register.
Lot: 140 Plan: FN503
Address: REMFREYS ROAD
BARALABA 4702

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.
LIVESTOCK DIP OR SPRAY RACE - operating a livestock dip or spray race facility.

For the majority of rural properties only a small area may be affected by the chemicals used in livestock dips and spray races. The Department of Environment and Science may hold further information relating to the location of the dip site within this property.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
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www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528202 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 12 Plan: FN514
600 HARCOURT RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528201 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 2 Plan: RP801031
REMFREYS RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528200 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 133 Plan: FN143
781 REMFREYS RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528199 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 132 Plan: FN156
585 REMFREYS RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528198 EMR Site Id: 24894 02 May 2019
Client Reference:
Cheque Number:

This response relates to a search request received for the site:
Lot: 28 Plan: FN154

EMR RESULT

The above site IS included on the Environmental Management Register.
Lot: 28 Plan: FN154
Address: BARALABA/BANANA ROAD
BARALABA 4702

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.
LIVESTOCK DIP OR SPRAY RACE - operating a livestock dip or spray race facility.

For the majority of rural properties only a small area may be affected by the chemicals used in livestock dips and spray races. The Department of Environment and Science may hold further information relating to the location of the dip site within this property.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528197 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 135 Plan: FN143
3890 MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528196 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 156 Plan: FN504

BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528217 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 34 Plan: FN217
MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528216 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 5 Plan: RP856832
621 ALBERTA RD
ALBERTA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
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SEARCH RESPONSE

ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528215 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 8 Plan: FN215
HARCOURT BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528214 EMR Site Id: 24892 02 May 2019
Client Reference:
Cheque Number:

This response relates to a search request received for the site:
Lot: 7 Plan: KM220

EMR RESULT

The above site IS included on the Environmental Management Register.
Lot: 7 Plan: KM220
Address: ALBERTA ROAD
BARALABA 4702

The site has been subject to the following Notifiable Activity or Hazardous Contaminant.
LIVESTOCK DIP OR SPRAY RACE - operating a livestock dip or spray race facility.

For the majority of rural properties only a small area may be affected by the chemicals used in livestock dips and spray races. The Department of Environment and Science may hold further information relating to the location of the dip site within this property.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority

Department of Environment and Science (DES)
ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454, Brisbane QLD 4001, AUSTRALIA
www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528213 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 20 Plan: FN503
REMFREYS RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528212 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 1 Plan: FN109

BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528211 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 2 Plan: FN109

BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528210 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 13 Plan: FN514
600 HARCOURT RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528209 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 21 Plan: FN502
REMFREYS RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528208 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 31 Plan: SP119256
DAWSON VALLEY BRANCH RLY
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

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2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

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SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

R E Johns
Unit 3
1 Ross Street
Newstead QLD 4006

Transaction ID: 50528207 EMR Site Id: 02 May 2019
Cheque Number:
Client Reference:

This response relates to a search request received for the site:
Lot: 1 Plan: RP801031
4221 MOURA BARALABA RD
BARALABA

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority