Soils, Pre-mining Land Suitability and Stripping Recommendations for Carmichael Coal Mine, Central Queensland.

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North Queensland Soil Assessment (NQSA)
Report prepared for Adani Mining Pty Ltd

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Summary

The soils within the EPC1690 area were mapped at a scale of 1:100 000 to determine their distribution and characteristics. Soils mapping was undertaken prior to inclusion of EPC1080, as such, soils survey of this additional area is not complete, but would be undertaken prior to commencement of disturbance of this area.

The EPC1690 area is dominated by moderately deep to deep (0.5 to < 1.5 m) yellow, brown or red gradational or uniform sandy soils over hard sandstone or manganese pan. Most soils have no structure throughout and fit within the Kandosol or Tenosol orders of the Australian Soil Classification. The surface of most soils contains moderate to high proportions of fine sand, which because of its lack of structure will form 'bulldust' when disturbed. This bulldust will affect both wet and dry trafficability and create issues with excess dust from vehicle movements.

Other soils mapped over the EPC1690 area include texture contrast soils with similar soil surface prone to forming bulldust, as well as areas of cracking clay soils with brigalow/gidgee vegetation.

Soil mapping undertaken for this study is in general agreement with the earlier CSIRO Land Systems Mapping. However, there are only minor similarities between this soil mapping and the land units mapped within the Desert Uplands report.

Eucalypt woodland of Ironbarks and Reid River Box, usually with scattered Desert Oak understorey, is the most common vegetation of the EPC1690 area, with shrublands of Wattles, Grevilleas and Calytrix found on the red and yellow sandy soils mainly along the western boundary. Wire grasses, black spear grass, buffel grass and soft spinifex are the most common grasses. Current bush also occurs in many areas.

Only the cracking clay soils and some texture contrast soils have excessive salt and sodium levels in the soil profile and dispersive subsoils. These together with existing eroded lands cover 4 500 ha of the 26,000 ha mapped.

The EPC1690 area is outside of the reliable rainfall zone for 'rainfed' (dryland) cropping and also outside the recently introduced Strategic Cropping Lands identified by the State Government. Agricultural Suitability Analysis is restricted to Grazing Suitability. Most of the area is assessed as Breeding Country.

Topsoil stripping recommendations are provided for all soils mapped in the EPC1690 area. Most soils are recommended for reuse only on very gentle slopes due to moderate to high proportion of fine sand. Substantial amelioration of soils would be required to enable further use.

Recommendations are based on results of a medium intensity scale soil survey at 1:100 000. More detailed soil surveys should be undertaken on specific areas to be disturbed once these are finalised, to provide sufficient data for detailed topsoil management plans for each area.

1 Introduction

1.1 Project Overview

Adani Mining Pty Ltd (Adani) is proposing to develop a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the north Galilee Basin approximately 160 kilometres (km) north-west of the town of Clermont, Central Queensland. All coal will be railed via a privately owned rail line connecting to the existing QR National rail infrastructure, and shipped through coal terminal facilities at the Port of Abbot Point and the Port of Hay Point (Dudgeon Point expansion). The Carmichael Coal Mine and Rail Project (the Project) will have an operating life of approximately 90 years.

The Project comprises of two major components:

- The Project (Mine): a greenfield coal mine over EPC1690 and the eastern portion of EPC1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and the Mine (offsite) infrastructure including:
  - A workers accommodation village and associated facilities
  - A permanent airport site
  - Water supply infrastructure
- The Project (Rail): a greenfield rail line connecting the Mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively; including:
  - Rail (west): a 120 km dual gauge portion from the Mine site running west to east to Diamond Creek
  - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah

The Project has been declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and as such, an Environmental Impact Statement (EIS) is required for the Project. The Project is also a 'controlled action' and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project EIS has been developed with the objective of avoiding or mitigating all potential adverse impacts to environmental, social and economic values and enhancing positive impacts. Detailed descriptions of the Project are provided in Volume 2 Section 2 Project Description (Mine) and Volume 3 Section 2 Project Description (Rail).

1.2 Scope of Report

Final Terms of Reference (ToR) for the Carmichael Coal Mine and Rail Project EIS, dated May 2011 Section 3.2.2 "Topography, geology and soils - Description of environmental values" includes the following:

Terms of Reference Requirement/Section Number	Section of this Report
Section 3.2.2 Topography, Geology and Soils	
Review and discuss existing land system and land unit data	Section 1.3
Undertake a soil survey of the project area at 1:100,000 scale	Section 2

Terms of Reference Requirement/Section Number	Section of this Report
Section 3.2.2 Topography, Geology and Soils	
Review and discuss the relationship of the soils, land system and land unit data sets.	Section 2.4
Describe soil profiles according to the Australian soil and land survey field handbook, grouped according to their parent material and position in the landscape and classified according to the Australian soil classification.	Section 2.3
Include the physical and chemical properties of the materials that will influence erosion potential, stormwater run-off quality, rehabilitation and agricultural productivity of the land.	Section 4
Representative soils must be sampled down the profile for laboratory analysis as outlined in the Land Suitability Assessment Techniques.	Section 4
Assess and document the depth and quality of useable topsoil and subsoil to be stripped and stockpiled for rehabilitation, and the physical and chemical properties of the soils.	Section 3.3, 3.4

NQSA was contracted by GHD on 4 July 2011 to undertake a soils assessment for the area of EPC1690 as part for the project This report details the methodology and results of the requested soil survey. Sections of this report dealing with each part of the requested information are listed above and a detailed ToR cross-reference table is included in Appendix VI.

On-site fieldwork commenced on the 15 August 2011 and was completed on 22 September 2011.

The soil survey was undertaken prior to inclusion of EPC1080 and therefore was incomplete. Further soil survey work would be undertaken prior to commencement of ground disturbing activities in this area.

1.3 Review of Previous Soil Information from CSIRO and Desert Uplands Studies

The Land System map at a scale of 1 inch equals 8 miles or approximately 1:500 000 within the CSIRO report, Land Systems of Nogoa – Belyando area (Gunn et al 1967), shows ten Land Systems within the EPC1690 area. These are:

- Durrandella (Du), Lenox (Le), Ronlow (Rn) and Tichbourne (Ti) which are described as hills, uplands, scarps or breakaways; shallow rocky soils and red and yellow earths; with bendee, lancewood scrub, silver-leafed ironbark woodland or yellow-jack woodland over eastern spinifex and /or eastern min-height grass or arid scrub grass.
- Degulla (De) described as extensive, stabilised low-gradient fans; uniform coarse-textured soils and yellow earths.
- Humboldt (Hu), Islay (I) and Blackwater (Bl) which are described as brigalow, gidgee and blackwood scrubs on plains and lowlands; acid to alkaline clay and cracking clay soils with minor texture-contrast soils.
- Alpha (Al) described as higher alluvial plains and terraces, not extensively flooded - alluvial soils, red earths, texture-contrast soils and cracking clay soils; poplar box woodland over eastern mid-height grass.

A soils map at a scale of 1 inch equals 4 miles or approximately 1:250 000 is included within the CSIRO report (Gunn *et al* 1967). This map (titled Land Systems grouped according to their dominant soil families by R.H. Gunn) shows:

- Carmichael River levee within the EPC1690 area as deep, texture contrast soils with thick, sandy surface soils (Luxor, Broadmeadow with minor Springwood, Retro and Wilpeena).
- Areas to the north of Carmichael River as dominantly Yellow earths (Struan with minor Dunrobin). On the western edge deep, texture-contrast soils with thin sandy or loamy surface occur (Retro, Taurus and Wyseby with minor Struan and Rolleston) while on the eastern edge shallow, rocky soils occur (Rugby and Shotover with minor Petrona). There is also an area of uniform coarse-textured soils mapped in the north-eastern corner (Petrona and Highmount with minor Forrester and Annandale).
- Areas to the south of Carmichael River mapped as dominantly Yellow earths (Struan with minor Dunrobin) with deep texture contrast soils with thin sandy or loamy surface soils (Retro, Taurus and Wyseby with minor Struan and Rolleston). There are also areas of Red Earths (Dunrobin with minor Struan and Annandale).

Results of the medium intensity survey undertaken for the EPC1690 area are in general agreement with the soils map of Gunn (1967) mentioned above.

The majority of the EPC1690 area is occupied by Yellow Earths (using the older soils terminology to be consistent with the CSIRO Land Systems report or Yellow or Brown Kandosols and Yellow-Orthic and Brown-Orthic Tenosols using the ASC (Isbell 2002)) with the Carmichael River levee dominated by soils with thick sandy surfaces. There are some differences between both soil maps, given the differences in map scales.

The Desert Uplands Report (Lorrimer, M.S. 2005) has defined a second set of Land Systems, unique to that report. Four of these Land Systems have been mapped at the medium intensity 1:100 000 scale over the EPC1690 area, and are described below:

Beenboona Land System (BB) occupies the majority of the EPC1690 area both north and south of Carmichael River. The geomorphology is described as alluvial fans formed by creeks emerging from the Peneplain of the Desert Uplands. This alluvium has very high fine sand content due to its source and weathered sandstone underlies the lateritic hardpan. A range of alluvial soils characterise this land system. Silver-leaved ironbark and Reid River box communities dominate this land system.

The Land units of the BB Land System mapped within the EPC1690 area include BB1, BB2, BB3 and BB4.

Very large contiguous units of BB1 are mapped in the south and north of the EPC1690 area, with minor areas of BB2 and BB3, while BB4 occupies the entire area of the Carmichael River levee. BB1 has a generalised soil description of a texture-contrast soil profile with medium, non-gravelly, sandy loam topsoil overlying yellow, sandy clay and an ironstone hardpan between 0.5–1.0 m. It is correctly classified as a Yellow Chromosol (using ASC terminology).

Generalised soil description of BB2 is a reddish yellow, sandy clay loam gradually increasing in clay content to yellow, light clay. It was classified as a Red Kandosol but the soil description indicated more likely to be a Yellow or Brown Kandosol. Land Unit BB3 has a generalised soil description as a deep, uniform sand profile, with loose sandy topsoil and classified as a Tenosol but the soil description indicated a Red Kandosol. Generalised soil description of BB4 is a uniform sandy profile with minimal profile development other than an accumulation of organic matter in the sandy loam topsoil. It is classified as a Tenosol but the soil description provided would be better classified as a Rudosol.

Plain Creek Land System (Pk) represents the steep hill landform and folded bedrock normally found in the adjacent Brigalow bioregion. Vegetation is described as Narrow-leaved and Silver-leaved Ironbark, Ghost Gum and Reid River box. One Land Unit, Pk3 of the Pk Land System protrudes into the EPC1690 area around Labona Homestead and smaller areas to the south along the eastern boundary of EPC1690. Generalised soil description of Unit Pk3 is a texture-contrast soil profile with a thick dark brown sandy clay loam topsoil and bleached A2 horizon overlying brown light medium clay. It is classified as a brown Sodosol, but no data is provided on the level of sodicity or salinity within the

soil profile. This mapping is at odds with the CSIRO Land Systems mapping and the results of the medium intensity soil survey undertaken for this project.

Northern Plateau Land System (NP) represents an undulating landscape of low rises, moderate slopes and drainage depressions located in the central part of the Desert Uplands bioregion.

Vegetation on NP includes Silver-leaved Ironbark, scrubland of acacia-melaleuca species including isolated Applejack, Lancewood, Normanton Box, Reid River box and River red gum. Three Land Units NP1, NP2 and NP3 are mapped over the EPC1690 area.

Generalised soil description of NP1 is a shallow, texture-contrast soil profile with medium sandy loam topsoil over brown, sodic sandy clay with a hardpan at depth of approximately 0.5 m. It is classified as a Brown Chromosol, but this classification does not match the soil description provided. No information is provided on the level of sodicity or salinity in the subsoil. Land Unit NP2 has a generalised soil description as a dark reddish brown sandy clay loam topsoil gradually increasing in clay content to red, light clay subsoil. It is correctly classified as a Red Kandosol. Generalised soil description of NP3 is a texture-contrast soil profile with thick sandy loam topsoil over brownish yellow, sodic clay with an ironstone hardpan at approximately 2 m depth. It is classified as a Yellow Chromosol, which does not appear to match the soil description. No information is provided on the level of sodicity or salinity in the subsoil.

Willandspey Land System (Wy) is characterised by an extensive plain of deep, grey and red-brown clay soils, part of the Brigalow belt bioregion. The deep clay soils have developed from the fine colloidal sediment deposited on the bed of an extensive lake system. Vegetation includes Ironbark, Box and Ghost Gum on the crests and upper hillslopes and Brigalow and Gidgee on the gentle slopes and plains. One Land Unit WY4 protrudes into the eastern boundary of the EPC1690 area to the south of Labona homestead and extends to the levee of Carmichael River. Generalised soil description of WY4 is young sandy deposits, of variable depth, overlie uniform clay soils. Soil classification was not provided, but the soil description most likely is within the range of a Rudosol. The special features noted with WY4 include constantly changing channel systems and active processes of deposition and erosion which occur on this seasonally flooded landscape.

One very minor unit of Land Unit DT2 from the Desert Land System is found in the north-western corner of the EPC1690 area.

There is some broad agreement between the description of some Land Types from the Land Systems of the Desert Uplands Report (Lorrimer 2005) and the soils identified during the medium intensity soil survey conducted during this investigation. Both Lorrimer (2005) and this report note the high fine sand content of most soils of the EPC1690 area.

However, there are only minor similarities between the mapped distribution of soils and Land Types from the Lorrimer (2005) report and the soils mapped in this report. The correlation between both soil maps is far less than what is expected between soil maps of the same or similar scales.

1.4 Other Existing Land and Soil Information

Rogers *et al* (1999) completed a 1: 250 000 scale land resource survey of the Dalrymple Shire. The south-eastern corner of this survey is very close to the north-western boundary of the EPC1690 area.

One soil unit, PERL occurs near the study boundary. This unit is a joint association of Pentland soil (PE) described as dark reddish brown to dark brown sandy clay loam grading to earthy red light clay and Rolston (RL) described as dark reddish brown sandy loam over structured red to yellowish red clay.

Vegetation on unit PERL is described as Eucalypts including Ironbarks, Bloodwood and Reid River Box with black spear grass wire grasses, golden beard grass and buck spinifex. The geological unit of PERL is Cainozoic sediments.

Due to the different geology between the PERL unit and that of the EPC1690 area, no correlation between this soil unit and the soils identified within the EPC1690 area could be achieved, although some similarities can be found.

2 Land Resource Assessment

2.1 Methodology

While the earlier CSIRO land systems mapping provides good general information on the soil distribution over a large area such as the project site, it was insufficient in detail to determine the soils within the site due to the mapping scale.

Soil and land features including vegetation were recorded at 146 ground observation sites within the 26 015 ha EPC1690 area, or 1 per 178 ha which is well within the standards required for a 1:100 000 scale mapping project (Reid 1988).

Google Earth rectified images at approximately 1:30 000 scale covering the EPC1690 area were examined for changes in patterns, colours and tones, which usually reflect soil or vegetation changes and indicate soil boundaries. Preliminary soil boundaries were drawn on the Google earth images prior to field investigations. Ground observation sites were located where possible to determine possible soil changes reflected on the Google earth images, or in some instances where changes in soil, landform or vegetation were observed which were not reflected within the Google Earth images. Location of ground observation sites was generally restricted to existing access tracks and fence lines as well as recently "graded" lines established for drilling rig access. Some ground observation sites were located by walking from existing access points and excavating soil cores by hand auger.

Location of ground observation sites was recorded on the Google earth images. Information collected and recorded from these sites was used to modify and finalise the preliminary soil boundaries directly onto the Google earth images, which were then utilised for drafting of the final soil map.

Soil cores were excavated generally to the depth of underlying rock or pan and described at most ground observation sites. Some ground observation sites were "check cores" where surface details and vegetation were similar to areas with existing full cores to confirm a predicted soil. Check cores were also used to check the boundary of two soil types to ascertain the boundary is more accurately drawn between them.

Most soil profiles were excavated in the field from trailer mounted soil-coring equipment, which provided a fresh, generally undisturbed soil core for examination. This equipment allowed an undisturbed 50 mm diameter soil core to be examined at each ground observation, with most profiles examined to depth of 1.8 m or underlying rock or hardpan. Some soil profiles were recorded from fresh pits recently excavated by the drillers when deep drilling for geological sampling.

Photos of the soil sampling equipment excavating soil cores and soil profiles being described from soil pits are provided in Plate 1.

One hundred and twenty two soil cores for examination were extracted by the soil coring equipment (or 84 per cent of the total number of ground observation sites) with 10 "check sites"' where soil and land features as well as brief soil notes were recorded (or 7 per cent of the total). The soil profile was described from pits or exposures at 8 ground observation sites (5 per cent of total) and from 6 hand auger excavations (or 7 per cent of the total) where the soil was rocky and obviously very shallow or where vehicle access was difficult. These statistics are well within the standards for a medium intensity (1:100 000) scale soil survey (Reid 1988).

Location of the ground observations where the soil and land information was recorded is shown on the accompanying soils map located at the back of the report.

Detailed field descriptions of the 146 ground observation sites examined in this study are included in **Appendix I**. In these descriptions, the terminology and codes are as per National Committee on Soil and Terrain (2009) (commonly referred to as the Yellow field book 3rd edition), and soil classifications recorded as per Australian Soil Classification (ASC, Isbell 2002) and World Reference Soil Group (IUSS Working Group WRB. 2007).

AMG co-ordinates were taken from field readings of a hand held GPS system (accurate to within 5–10 m), recorded on Australian Datum 1994 and added to the detailed field descriptions.

Plate 1 Sampling soil profiles from soil coring machine or drilling pits

2.2 Geology, Landform and Vegetation

The EPC1690 area straddles two 1: 250 000 Geology maps, Buchannan Sheet SF 55-6 (Olgers, 1970) and Galilee Sheet SF 56-10 (Vine & Doutch, 1972). Most of the area is covered by two surface Geological units – Qs, described as sand, soil, gravel and rubble or sand, sandy soil and colluvium, and Qa described as silt, sand and gravel or alluvium, sand, silt and clay. Dunda beds, unit Rld, outcrop just north-west of Carmichael River, notably in the Red Hill area and are also mapped to the south-west of Murphys Bore. Unit Rld is described as labile to quartz sandstone, siltstone and mudstone. The Dunda beds vary from quartzose to lithic, commonly contain a kaolinitic matrix and are generally fine-grained.

Argillaceous sandstone, sandy mudstone, clay and some Ferricrete (unit T) is mapped just to the south-west of Carmichael River and in smaller isolated areas to the north-east of Carmichael River. Ferricrete or ironstone gravels are characteristic of unit T.

The results from this study show that the area of Qs and Qa are overestimated within the EPC1690 area. Soils formed on fine-grained sandstone from the Dunda beds (unit Rld) occupy the largest proportion of the area, with large areas of soils formed on the sediments of unit T with ironstone gravels and iron-manganese pan also occurring.

Most of the site occurs on gentle Rises with broad Hillcrests and gently sloping Hillslopes. Slopes are generally < 3 per cent. Areas of broad low-lying melon-hole clay flats as well as Low Hills also occur, such as Red Hill and along the eastern and western EPC1690 area boundaries. The levee of Carmichael River is about 1 km wide on either side of the river course, which runs through central-south of the proposed mine. The area to the south of the Carmichael River levee is generally flatter compared to the area to the north.

Eucalypt woodland of Ironbarks and Reid River Box usually with Desert Oak is the most common vegetation within the EPC1690 area, with shrublands of many species found on the red and yellow sandy soils mainly along the western boundary. Wire grass, black spear grass, buffel grass and some

soft spinifex are the most common grasses. Other less-frequently occurring species include Ghost Gum, Flindersia and Blue Gums on the Carmichael River Levee.

Appendix II lists the common and scientific names of the species identified within the EPC1690 area.

Photos of the common vegetation identified within the EPC1690 area are presented in **Plates 2 to 5** on the following pages.

Plate 2 Typical Landscape scenes with Eucalypts, black spear grass, wire grasses and wattles, currant bush

Plate 3 Patchy growth of black spear grass on moderately deep, red Kandosol (mapped soil Lb1)

Plate 4 Shrubs on sandy shallow soils

Plate 5 Typical very thick wattles, Grevilleas and Calytrix on deep red or yellow sandy soils (Kandosols)

2.3 Soils

Nineteen soils were defined over the EPC1690 area, based on geology, landform, native vegetation and soil profile features. Soil profile morphology such as depth to underlying rock, texture, colour and structure were used to delineate and classify the soils based on ASC. These soils could not be directly correlated with the soils defined within the CSIRO Land Systems (Gunn et al 1967) as these earlier descriptions are too broad to define the soil differences identified and mapped.

Soils were given a symbol based on two letters representing major topographical features of the EPC1690 area, followed by a number to delineate the soils identified. For example, Cr symbol represents soils formed on the recent alluvium from Carmichael River, and the numbers 1, 3 and 4 delineate the three soils identified and mapped within that alluvium. Other symbols used include Gc (Gregors Corner), Tm (Ten mile bore), Lb (Labona), Ln (Lignum road), Eb (Boundary Road) and Mb (Murphies bore).

The physical extent of the soils, as mapped at the medium intensity 1:100 00 scale, is depicted on the soil map at the back of this report. Brief description of the soils including Vegetation and Australian Soil Classification is given in **Table 1**.

51 soil samples from 10 soil profiles were collected for chemical analyses. These samples were analysed in a NATA accredited Laboratory for chemical properties that are important in assessing grazing suitability and topsoil stripping suitability. Full results are given in **Appendix III.** The results are assumed to represent the chemical properties of each soil analysed.

The surface of most soils contains moderate to high proportions of fine sand, which because of its lack of structure, will form 'bulldust' when disturbed. This bulldust will affect both wet and dry trafficability and create issues with excess dust from vehicle movements. **Plate 6** shows the very fine 'bulldust' surface of soil Mb4.

Plate 6 Very fine bulldust surface soil Mb3

Table 1 Brief description of soils mapped over EPC1690 area

		Vegetation	ASC
Soils with sandstone < 1.5 m on Dunda beds (Geology Rld) * Note: based on geological testing it is noted that this sandstone has not formed in-situ through erosion and deposition over this area			
Gc1	Very shallow (<0.25 m), gravelly, acid to neutral, brown loam to clay loam	Eucalypts	Leptic Rudosol
Gc 2	Shallow to moderately deep (0.25–1.0 m), gravelly, acid to neutral, bleached loam to clay loam	Eucalypts	Bleached-Leptic Tenosol
Lb 1	Moderately deep (0.5–1.0 m) acid to neutral soil with moderately thick loamy surface grading to red, massive fine sandy clay subsoil	Eucalypts	Red Kandosol
Lb 2	Moderately deep (0.5–1.0 m) acid to neutral soil with medium to thick loamy surface grading to yellow-brown massive fine sandy clay subsoil	Eucalypts	Yellow or brown Kandosol
Lb 4	Moderately deep (0.5 – 1.0 m), acid to neutral, yellow-brown, massive sand to loam.	Eucalypts	Yellow-Orthic or brown-orthic Tenosol
Ln	Shallow to moderately deep (< 0.75 m), slightly gravelly, acid to neutral, red well-structured clay.	Eucalypts	Red Dermosol
Tm1	Deep (0.9 – 1.2 m) texture contrast soil with thick sandy surface over acid to neutral, massive, yellow-brown fine sandy clay subsoil	Eucalypts	Yellow or brown Chromosol

		Vegetation	ASC
Tm2	Deep (> 1.0 m) texture contrast soil with thick loamy surface over acid to neutral, well structured, yellow-brown fine sandy clay subsoil.	Eucalypts	Yellow or brown Chromosol
Tm4	Deep (> 1.0 m) texture contrast soil with thick, bleached, sandy to loamy surface over alkaline, mottled, yellow-brown fine sandy clay subsoil.	Eucalypts	Yellow or brown Sodosol or Chromosol
Soils of older alluvium (Qs and T Geology units)			
Moderately deep soils (0.5 – 1.0 m to rock)			
Mr2	Moderately deep, gravelly, acid to neutral bleached sand to loam	Eucalypts	Bleached-Leptic Tenosol
Deep to very deep soils (> 1.0 m to rock)			
Eb1	Texture contrast soil with thick, bleached sandy to loamy surface over alkaline, mottled, yellow-brown fine sandy clay subsoil.	Eucalypts	Yellow or brown Sodosol
Eb2	Grey, brown or red cracking clay with hard-setting surface and moderate to strong gilgai or melon holes.	Brigalow / Gidgee	Red, brown or grey Vertosol
Eb3	Texture contrast soil with moderately thick, bleached loamy surface over alkaline, mottled, yellow-brown medium clay subsoil.	Brigalow/ Gidgee	Yellow or brown Chromosol or Sodosol
Mb2	Yellow-brown, acid to neutral, massive, bleached sand to loam.	Eucalypts	Bleached-Orthic Tenosol

		Vegetation	ASC
Mb3	Red, acid, massive sand to loam.	Shrubs	Red-Orthic Tenosol
Mb4	Yellow to brown, acid, massive sand to loam.	Shrubs	Yellow-Orthic and Brown-Orthic Tenosol
Very deep soils of recent alluvium (Qa Geology unit)			
Cr1	Acid to neutral, yellow-brown, massive and loose, sand to loam	Eucalypts	Yellow-Orthic and Brown-Orthic Tenosol
Cr3	Texture contrast soil with moderately thick loamy surface over alkaline red, well-structured light medium clay subsoil.	Eucalypts	Red Chromosol
Cr4	Texture contrast soil with moderately thick sandy to loamy surface over acid to neutral, brown, massive to weakly structured light medium clay subsoil.	Eucalypts	Brown Chromosol
* Australian Soil Classification (Isbell 2002) Classification given only to most common Order and Suborder			

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Areas of each soil mapped within the boundaries of EPC1690 area are given in **Table 2**, while **Table 3** lists the areas of each soil classified to Order and Suborder of the Australian Soil Classification.

Table 2 Mapped areas of each soil and number of mapped units within the EPC1690 area

Soil	Area mapped (Ha)	Number of UMAs
Gc1	849	9
Gc2	353	2
Lb1	423	4
Lb2	7,521	9
Lb4	482	4
Ln	214	2
Tm1	3,037	5
Tm2	188	1
Tm4	903	3
Mr2	695	3
Eb1	951	2
Eb2	2,199	6
Eb3	639	3
Mb2	1,347	1
Mb3	2,795	11
Mb4	1,653	4
Cr1	849	1
Cr3	531	1
Cr4	129	1
E	257	1
Totals	**26,015**	**73**

Notes:

- Areas calculated assuming dominant soil occupies 100 per cent of each UMA and does not take into account minor areas of each soil within other UMAs.
- Unique Map Area = unique mapped area of soil within the EPC1690 area.

Soil Lb2 which comprises moderately deep, yellow-brown Kandosols, ranks the highest in terms of area mapped with 7 500 ha. A deep, yellow-brown Chromosol with a thick, sandy surface, Tm1, occupies the next largest area with just over 3 000 Ha while a Vertosol generally with large melon-holes, Eb2, occupies almost 2 200 Ha. Sandy red or yellow-brown Tenosols, Mb2, Mb3 and Mb4, together occupy almost 6 000 Ha of the EPC1690 area. Most of these soils have thick shrub vegetation (see Plate 5 above).

Table 3 Areas of soils mapped within the EPC1690 area classified to the Order and Suborder of the Australian Soil Classification

Soil Order (and Suborder)	Area (Ha)
Chromosol	3,885
Dermosol	214
Red Kandosol	423
Yellow or Brown Kandosol	7,521
Rudosol & Leptic Tenosol	1,897
Sodosol	2,493
Red-Orthic Tenosol	2,795
Yellow & Brown-Orthic Tenosol	4,331
Vertosol	2,199
Erosion	257
Total	**26,015**

Sandy or loamy yellow-brown or red Kandosols or Tenosols, consistent with the CSIRO Land System report (Gunn *et al* 1967) of red or yellow earths, occupy just over 15,000 ha of the total EPC1690 area (or 58 per cent). This result is similar to the mapping over the area by Gunn *et al* 1967.

Chromosols occupy 15 per cent while Sodosols occupy almost 10 per cent of the total EPC1690 area. Vertosols occupy 8 per cent while shallow soils (Rudosols and Leptic Tenosols) occupy 7 per cent of the total area.

The Vertosols of Eb2 have high salinity levels close to the soil surface. This salt can be seen in a soil profile exposure shown in **Plate 7** below.

Plate 7 Subsoil salinity in a soil profile exposure mapped as soil Eb2

Many soils formed on Dunda beds (Geology unit Rld) and soil Mr2 formed on Geology unit T are shallow to moderately deep over hard sandstone or manganese pan. Geological modelling indicates

that this shallow sandstone formation is a result of erosion and surface deposition. In some localities this pan is exposed on the surface. **Plate 8** below shows examples of the underlying or exposed manganese pan, while the hard sandstone can be seen in **Plate 9**.

Plate 8 Manganese pan often associated with soils formed on Dunda beds

Plate 9 Soil Lb4 formed on Sandstone of the Dunda beds

2.4 Detailed Soil Descriptions

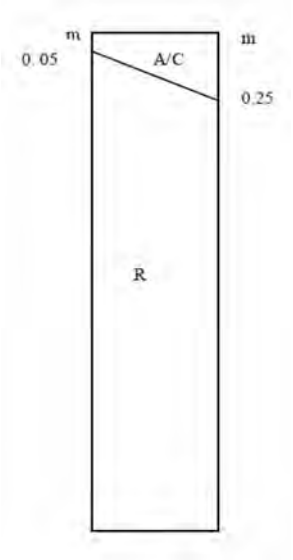
Detailed descriptions of each soil including geology, landform, vegetation, Australian Soil Classification (Isbell 2002) and suitability start on the next page. Chemical and physical data including fertility from analysed profiles are included where appropriate as well as a summary of soil properties and management issues for soil reuse within mine rehabilitation processes. World Reference Base Reference Soil Group (IUSS Working Group 2007) is also included for each soil to provide an international context.

Terminology for soil, vegetation and landform features is consistent with The National Committee on Soil and Terrain (2009). A list of common and scientific names of the vegetation species associated with each soil are provided in Appendix II. The results of agricultural suitability analysis (see section 4 for details) for each soil are also included below. Rainfed or dryland cropping suitability is not included as the site is located outside of the reliable rainfall zone for such cropping. Grazing suitability assessment is included as this is the predominant pre-mining land use of the site.

Land Condition is an assessment of the ability of the land to respond to rain and produce useful forage for beef cattle grazing developed for the Burdekin Dry Tropics (Karfs *et al* 2009). Section 4.3 of this report provides more detail of this assessment. .

Soil Gc1	Very shallow, gravelly, acid to neutral, brown loam to clay loam
Australian Soil Classification	Leptic Rudosols
Area mapped	849 ha
World Reference Base Reference Soil Group	Leptosols
Landform	Hillcrests and upper hillslopes, rocky outcrops. Flat to < 3 per cent on crests; side slopes 5 – 20 per cent
Geology	Dunda beds (Rld)
Land Condition	D
Vegetation	Mid-dense to sparse tall Ironbarks, Reid River Box and Grey Bloodwood, commonly with Yellow Jacket. Understory of soap tree, wattles and some currant and quinine bush. Black spear grass and wire grasses.
Run-off, Perm. & Drainage	Very rapid run-off, highly permeable and rapidly drained
Surface features	Common to many cobbles, stone and some rock outcrops
Surface Fertility	Expected to be very low
Estimated PAWC	5 - 25 mm
Investigation sites	8, 37, 66, 68, 69, 70, 72, 86, 127
Sample sites	

Soil profile description



A/C - Brown to red (10 YR, 7.5 YR 5/4; 5YR, 2.5 YR 4/6), loamy fine sand to clay loam fine sandy, single grain to massive, few to abundant, angular sandstone pebbles to cobbles.

R - Hard sedimentary rock or Manganese pan by 0.05 to 0.25 m.

Soil chemical and physical data

- Soil depth <0.25 m.
- No detailed chemical data
- Expected to be very low in fertility, salinity, sodicity and dispersion.
- High fine sand levels expected, based on field textures.

Summary

The soil occurs on rocky hillcrests, mainly associated with Red Hill and also near Gregors Corner. Pasture growth is poor due to the shallow, rocky soil which is likely to be very low in fertility. Control of wattle regrowth is a problem on this soil. Topsoil stripping is not recommended due to shallow soil depth and the amount of surface cobbles, stones and rock outcrop.

Soil reuse recommendations

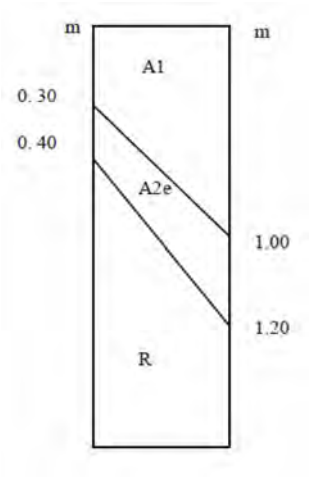
Method	Material	Lower depth	Recommendation
Two stage stripping	Topsoil	Not relevant	Not recommended
	Subsoil	Not relevant	Not recommended
Single stage stripping	Combined	Not relevant	Not recommended

Grazing suitability assessment

Land use	Suitability class	Main Limitations
Grazing	Class 5 Unsuitable land for production of export quality cattle and marginal as breeding country all year round	m4, nd4, r5, vm4

Soil Gc2	Shallow to moderately deep, gravelly, acid to neutral, bleached loam to clay loam.
Australian Soil Classification	Bleached-Leptic Tenosols
Area mapped	353 ha
World Reference Base Reference Soil Group	Arenosols
Landform	Hillcrests and mid to upper hillslopes. Slope < 3 %
Geology	Dunda beds (Rld)
Land Condition	C or D
Vegetation	Mid-dense to sparse tall Ironbarks, Grey Bloodwood and Desert Oak. Black spear grass, wire grasses, and soft spinifex. Wattle growth is significant. Woody weeds include Flannel weed.
Run-off, Perm. & Drainage	Moderately rapid run-off, highly permeable and well-drained
Surface features	Soft sandy surface which will form bulldust once disturbed.
Surface Fertility	Moderate Phosphorus, Very low Nitrogen and Low Calcium
Estimated PAWC	40 – 60 mm
Investigation sites	7, 36, 71,117
Sample sites	7

Soil profile description



A1 - Brown to yellow (10 YR, 7.5 YR 5/3, 5/4, 6/3, 6/4), loamy fine sand to clay loam fine sandy, single grain to massive.

A2e - As above but conspicuously bleached. Acid to Neutral pH.

R - Hard sandstone by 0.4 - 1.2 m.

Soil chemical properties – data from site 7

Sample depth (m)	pH (water)	EC (dS/m)	Cl (mg/kg)	CEC or /ECEC (meq/100g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
0.10	5.9	0.05	17	3.6	2.30	0.74	<0.08	0.31		
0.30	6.2	0.03	18	2.2	1.15	0.73	<0.08	0.15		
0.60	6.5	0.02	14	2.0	0.95	0.63	<0.08	0.19		

- pH is acid throughout
- EC and chloride levels are very low throughout
- Very low sodium levels indicate no subsoil dispersion
- Very low CEC indicates soil nutrients are readily leached and not retained in the soil profile
- ESP and Ca:Mg ratio calculations are difficult to interpret due to very low CEC levels

Soil physical properties – data from site 7

Sample depth (m)	Particle size analysis (%)				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/Clay	Sodicity rating	Salinity rating	Ca:Mg rating
0.10	58	33	2	6			Low	Low	
0.30	60	33	3	5			Low	Low	
0.60	54	39	3	6			Low	Low	

Summary

The soil occurs on hillcrests and mid to upper hillslopes. Pasture growth is poor due to the shallow, sandy soil. Control of wattles and woody weeds such as flannel weed is a problem on this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

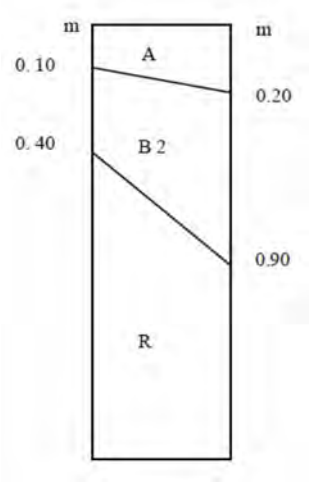
Method	Material	Lower depth	Recommendation
Two stage stripping	Topsoil	0.20 m	Strip topsoil/upper subsoil to 0.20 m for topsoil/seed source material
	Subsoil	0.40 m	Avoid subsoil stripping below 0.40 m depth as depth to underlying rock varies.
Single stage stripping	Combined	0.40 m	Avoid subsoil stripping below 0.40 m depth as depth to underlying rock varies.

Grazing suitability assessment

Land use	Suitability class	Main Limitations
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round	m4, vm4

Soil Lb1	Moderately deep soil with medium to thick clay loamy surface grading to red massive fine sandy clay subsoil.
Australian Soil Classification	Red Kandosols
Area mapped	423 ha
World Reference Base Reference Soil Group	Lixisols
Landform	Hillcrests and mid to upper hillslopes. Slope 1 - 5 %
Geology	Dunda beds (Rld)
Land Condition	C
Vegetation	Mid-dense to sparse tall Ironbarks, Grey Bloodwood, Ghost Gum and occasional Desert Oak. Patchy buffel grass with wire grass and black spear grass. Thick, patchy currant bush is common on this soil.
Run-off, Perm. & Drainage	Very slow run-off, highly permeable and well-drained
Surface features	Hardsetting, but may become bulldust once disturbed.
Surface Fertility	High Phosphorus, Very low Nitrogen, Moderate Calcium
Estimated PAWC	40 - 90 mm
Investigation sites	1, 2, 4, 13, 21, 24, 30, 73, 131
Sample sites	24

Soil profile description



A - Brown to red (7.5 YR, 5 YR, 2.5 YR 4/3, 4/4), clay loam fine sandy, massive.

B2 - Red (5YR to 10 R 3/6, 4/4, 5/6), fine sandy light clay, massive, acid to neutral pH.

R - Hard sandstone by 0.4 – 0.9 m.

Soil chemical properties – data from site 24

Sample depth (m)	pH (water)	EC (dS/m)	Cl (mg/kg)	CEC or/ECEC (meq/100g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
0.10	6.8	0.04	< 10	4	2.13	0.65	<0.1	0.43		
0.30	6.9	0.03	< 10	3	1.91	0.50	< 0.1	0.49		
0.60	6.9	0.02	16	3	1.48	0.91	<0.1	0.35		
0.90	6.7	0.02	< 10	4	1.65	1.34	<0.1	0.22		

- pH is neutral throughout
- EC and chloride levels are very low throughout
- Very low sodium levels indicate no subsoil dispersion
- Very low CEC indicates soil nutrients are readily leached and not retained in the soil profile
- ESP and Ca:Mg ratio calculations are difficult to interpret due to very low CEC levels

Soil physical properties – data from site 24

Sample depth (m)	Particle size analysis (%)				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/Clay	Sodicity rating	Salinity rating	Ca : Mg rating
0.10	37	50	3	9			Low	Low	
0.30	32	51	3	14			Low	Low	
0.60	35	42	3	20			Low	Low	
0.90	34	38	5	24			Low	Low	

- CEC levels and clay percentage are very low with high fine sand and coarse sand.
- High fine sand content and lack of topsoil structure implies this soil will become bulldust once disturbed.
- High fine sand level indicates soil will be subject to water erosion on all but very gentle slopes.
- Adverse soil physical properties are unlikely due to low sodicity and salinity levels, but are likely due to high fine sand levels.

Summary

The soil occurs on hillcrests and mid to upper hillslopes. Pasture growth is poor due to the shallow to moderately deep, sandy soil. Control of currant bush may be difficult in some locations of this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

Method	Material	Lower depth	Recommendation
Two stage stripping	Topsoil	0.20m	Strip topsoil/upper subsoil to 0.2 m for topsoil/seed source material
	Subsoil	0.40 m	Avoid subsoil stripping below 0.40 m depth as depth to underlying rock varies.

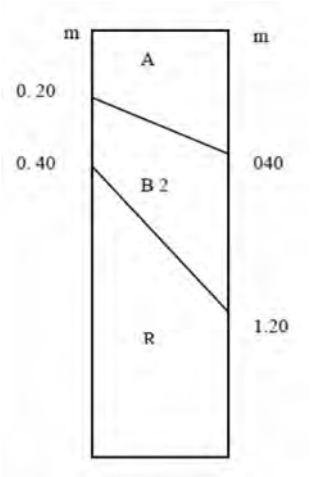
Single stage stripping	Combined	0.40 m	Avoid subsoil stripping below 0.40 m depth as depth to underlying rock varies.

Grazing suitability assessment

Land use	Suitability class	Main Limitations
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round	m4, vm4 (common)

Soil Lb2	Moderately deep to deep soil with moderately thick clay loamy surface grading to yellow to brown, massive, fine sandy clay subsoil.
Australian Soil Classification	Yellow to Brown Kandosols
Area mapped	7531 ha
World Reference Base Reference Soil Group	Lixisols
Landform	Lower to Mid hillslopes. Slope < 2 %
Geology	Dunda beds (Rld)
Land Condition	C
Vegetation	Mid-dense to sparse tall Ironbarks, Reid River Box, Grey Bloodwood, Ghost Gum and Desert Oak, usually with currant bush. Black spear grass with wire grasses and patchy buffel grass.
Run-off, Perm. & Drainage	Slow run-off, moderately permeable and moderately well-drained
Surface features	Hardsetting, but may become bulldust once disturbed.
Surface Fertility	High Phosphorus, Very Low Nitrogen, Low Calcium
Estimated PAWC	40 - 90 mm
Investigation sites	35 sites as this soil occupies large areas
Sample sites	35

Soil profile description



A - Brown to yellow (7.5 YR, 10 YR 4/3 to 5/4), clay loam fine sandy, massive.

B2 - Brown to yellow (7.5YR, 10 YR 5/4 to 6/6 , 7/6), fine sandy light clay, massive, acid to neutral pH.

R - Hard sandstone or manganese pan by 0.4 to 1.20 m.

Soil chemical properties – data from site 35

Sample depth (m)	pH (water)	EC (dS/m)	Cl (mg/kg)	CEC or/ECEC (meq/100g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
0.10	6.5	0.02	8	4	2.87	0.69	<0.1	0.27		
0.30	6.8	0.03	10	5	3.57	0.99	<0.1	0.31		
0.60	7.4	0.03	15	5	2.87	1.27	<0.1	0.30		
0.90	7.5	0.02	10	4	1.47	1.61	<0.1	0.37		

- pH is neutral throughout
- EC and chloride levels are very low throughout
- Very low sodium levels indicate no subsoil dispersion
- Very low CEC indicates soil nutrients are readily leached and not retained in the soil profile
- ESP and Ca:Mg ratio calculations are difficult to interpret due to very low CEC levels

Soil physical properties – data from site 35

Sample depth (m)	Particle size analysis (%)				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/Clay	Sodicity rating	Salinity rating	Ca : Mg rating
0.10	30	50	7	13			Low	Low	
0.30	31	45	7	17			Low	Low	
0.60	28	41	8	24			Low	Low	
0.90	24	41	7	28			Low	Low	

- CEC levels and clay percentage are very low with high fine sand and coarse sand.
- ESP and Ca:Mg ratio calculations are difficult to interpret due to very low CEC levels
- High fine sand content and lack of topsoil structure implies this soil will become bulldust once disturbed.
- High fine sand level indicates soil will be subject to water erosion on all but very gentle slopes.
- Adverse soil physical properties are unlikely due to low sodicity and salinity levels, but are likely due to high fine sand levels.

Summary

The soil occurs on gentle lower hillslopes. Pasture growth is poor due to low soil water holding capacity. Currant bush may be hard to control on this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

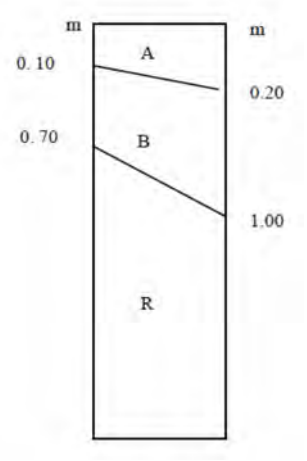
Method	Material	Lower depth	Recommendation
Two stage stripping	Topsoil	0.20m	Strip topsoil/upper subsoil to 020 m for topsoil/seed source material
	Subsoil	0.40m	Avoid subsoil stripping below 0.40 m depth as depth to underlying rock varies.
Single stage stripping	Combined	0.40 m	Avoid subsoil stripping below 0.40 m depth as depth to underlying rock varies.

Grazing suitability assessment

Land use	Suitability class	Main Limitations
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round	m4, vm4 (common)

Soil Lb4	Moderately deep, acid to neutral, yellow to brown, massive sand to loam.
Australian Soil Classification	Yellow-Orthic or Brown-Orthic Tenosols
Area mapped	482 ha
World Reference Base Reference Soil Group	Arenosols
Landform	Mid to Lower hillslopes. Slope < 1 %
Geology	Dunda beds (Rld)
Land Condition	B or C
Vegetation	Mid-dense to sparse tall Ironbarks and Desert Oak, usually with currant bush and wattles. Wire grass and black spear grass, often with soft spinifex.
Run-off, Perm. & Drainage	Very slow run-off, highly permeable and well to rapidly drained
Surface features	Soft to hardsetting surface, but may become bulldust once disturbed.
Surface Fertility	Expected to be low
Estimated PAWC	56 – 72 mm
Investigation sites	10, 82, 85, 95, 121
Sample sites	

Soil profile description



A - Brown (7.5 YR, 10 YR 5/3 to 5/4), loamy fine sand to fine sandy loam, massive.

B - Brown to yellow (7.5YR, 10 YR 5/4 to 6/6, 7/6), loamy fine sand to fine sandy loam, massive, acid to neutral pH.

R - Hard sandstone or manganese pan by 0.7 - 1.0 m.

Soil chemical and physical data

- No detailed chemical data
- Expected to be very low in fertility, salinity, sodicity and dispersion.
- High fine sand levels expected based on field texture.

Summary

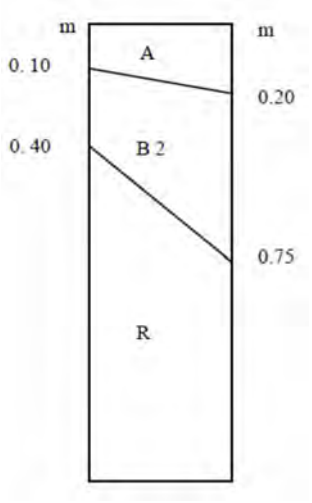
The soil occurs as relatively small areas within lower hillslopes, broad flats or pediments. Pasture growth is poor due to the sandy soil which is expected to be low to very low in fertility. Control of wattle regrowth and woody weeds such as currant bush may be difficult on this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations			
Method	**Material**	**Lower Depth**	**Recommendation**
Two stage stripping	Topsoil	0.20m	Strip topsoil/upper subsoil to 0.2 m for topsoil/seed source material
	Subsoil	0.70 m	Avoid subsoil stripping below 0.70 m depth as depth to underlying rock varies.
Single stage stripping	Combined	0.70 m	Avoid subsoil stripping below 0.70 m depth as depth to underlying rock varies.

Grazing suitability assessment		
Land Use	**Suitability Class**	**Main Limitations**
Grazing	Class 5 Unsuitable land for production of export quality cattle and marginal as breeding country all year round	m4, nd4, vm4

Soil Ln	Shallow to moderately deep, slightly gravelly, acid to neutral, red well-structured clay.
Australian Soil Classification	Red Dermosols
Area mapped	214 ha
World Reference Base Reference Soil Group	Nitisols
Landform	Broad low rise and occasionally small creek lines. Slope < 1 to 2 %
Geology	Dunda beds (Rld) & occasionally Qa
Land Condition	B
Vegetation	Mid-dense to sparse tall Ironbark, Reid River Box and Desert Oak, with currant bush and Emu apple. Patchy buffel grass with black spear grass and wire grass. Occasionally Brigalow present.
Run-off, Perm. & Drainage	Slow runoff, moderately permeable and moderately-well drained.
Surface features	Hardsetting, poached where cattle have walked when wet
Surface Fertility	Expected to be medium to high.
Estimated PAWC	36 - 75 mm
Investigation sites	12, 77
Sample sites	

Soil profile description



A - Brown to red (5 YR, 7.5 YR, 10 YR 5/3 to 5/4), fine sandy light medium clay. Moderately structured.

B2 - Red (5YR, 2.5 YR 4/4 to 4/6), fine sandy light medium clay. Strong 10 – 20 mm blocky srtucture. Neutral pH.

R - Hard sandstone by 04 – 0.75 m.

Soil chemical and physical data

- No detailed chemical data
- Expected to be low to moderate in fertility and very low salinity, sodicity and dispersion.
- High fine sand levels expected based on field texture.

Summary

The soil occurs on a broad low rise and edge of creek line. Cleared with evidence of Eucalypt vegetation. Buffel grass is growing well but wire grass and black spear grass also occur. However PAWC and hence pasture growth will be limited by shallow depth to underlying rock. Some currant bush is present which may be hard to control on this soil. Subsoil sodicity, sodicity and dispersion are expected to be low in this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

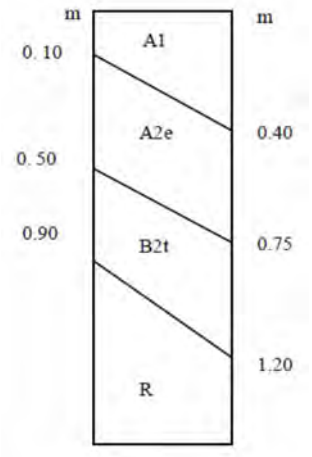
Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.20m	Strip topsoil/upper subsoil to 0.20 m for topsoil/seed source material
	Subsoil	0.40 m	Avoid subsoil stripping below 0.40 m depth as depth to underlying rock varies.
Single stage stripping	Combined	0.40 m	Avoid subsoil stripping below 0.40 m depth as depth to underlying rock varies.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round in good seasons	m4, nd4, vm4

Soil Tm1	Deep texture contrast soils with thick, bleached sandy to loamy surface over acid to neutral, massive, yellow to brown fine sandy light to light medium clay subsoil.
Australian Soil Classification	Yellow or brown Chromosols
Area mapped :	3041 ha
World Reference Base Reference Soil Group	Luvisols
Landform	Gentle lower hillslopes to broad flats. Slope < 1 %
Geology	Dunda beds (Rld)
Land Condition	B or C
Vegetation	Mid-dense to sparse tall Ironbarks, Ghost gum, Grey Bloodwood and Desert Oak, usually with currant bush and wattles. Wire grass and black spear grass.
Run-off, Perm. & Drainage	Slow run-off, moderately permeable and moderately-well drained.
Surface features	Soft to firm which will form bulldust once disturbed.
Surface Fertility	High Phosphorus, Moderate Nitrogen, Low Calcium
Estimated PAWC	70 mm
Investigation sites	45, 46, 47,48, 49, 54, 56, 61, 62, 80, 120, 139, 140
Sample sites	45

Soil profile description



A1 - Grey to brown (10 YR 4/3, 4/3), loamy fine sand to fine sandy loam, massive.

A2e – As above but conspicously bleached

B2t – Brown to yellow (7.5YR, 10 YR 5/4 to 6/6, 7/6) often red or yellow mottled, fine sandy light to light medium clay, massive. Neutral pH

R - Hard sandstone below 0.90 – 1.20 m.

Soil chemical properties – data from site 45

Sample Depth	Ph (water)	EC (dS/m)	Cl (mg/kg)	CEC or/ECEC (meq/100 g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
0.10	6.5	0.03	5	4	2.71	0.37	<0.1	0.19	<1	
0.30	6.9	0.01	4	2	1.27	0.24	<0.1	0.07	1	
0.60	7.1	0.01	9	2	0.94	0.73	<0.1	0.13	1	
0.90	7.3	0.02	20	3	0.78	1.45	0.11	0.29	4	
1.20	7.7	0.04	75	5	0.65	3.03	0.89	0.22	17	

- pH is neutral throughout
- EC and chloride levels are very low to 0.90 m but moderate to high below.
- ESP data indicate no subsoil dispersion to 0.90 m, but likely to be moderate below.
- Very low CEC indicates soil nutrients are readily leached and not retained in the soil profile

Soil physical properties – data from site 45

Sample Depth	Particle Size Analysis				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/ Clay	Sodicity rating	Salinity rating	Ca : Mg rating
0.10	44	40	8	7			Low	Low	
0.30	42	43	8	7			Low	Low	
0.60	40	39	7	15			Low	Low	
0.90	37	34	7	21			Low	Low	
1.20	29	28	7	37			Moderate	Low	

- CEC levels and clay percentage are very low with high fine sand and coarse sand.
- ESP and Ca:Mg ratio calculations are difficult to interpret due to very low CEC levels
- High fine sand content and lack of topsoil structure implies this soil will become bulldust once disturbed.
- High fine sand level indicates soil will be subject to water erosion on all but very gentle slopes.
- Adverse soil physical properties are unlikely due to low sodicity and salinity levels to 0.90 m, but are likely due to high fine sand levels.

Summary

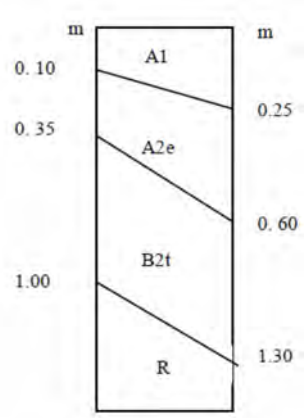
The soil occurs on gentle lower hillslopes to broad flats. Pasture growth is poor due to the thick sandy topsoil. Wattle and currant bush will be hard to control on most areas of this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes. Stripping below 0.90 m is not recommended to minimise capture of sodic soil material.

Soil reuse recommendations			
Method	**Material**	**Lower Depth**	**Recommendation**
Two stage stripping	Topsoil	0.20 m	Strip topsoil/upper subsoil to 0.20 m for topsoil/seed source material
	Subsoil	0.90 m	Avoid subsoil stripping below 0.90 m depth to avoid sodic and dispersive subsoil or underlying rock.
Single stage stripping	Combined	0.90 m	Avoid subsoil stripping below 0.90 m depth to avoid sodic and dispersive subsoil or underlying rock.

Grazing suitability assessment		
Land Use	**Suitability Class**	**Main Limitations**
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round	m4, vm4 (occasionally)

Soil Tm2	Deep texture contrast soil with thick clay loamy surface over acid to neutral, well structured, yellow to brown fine sandy light to light medium clay subsoil.
Australian Soil Classification	Yellow or brown Chromosols
Area mapped	188 ha
World Reference Base Reference Soil Group	Luvisols
Landform	Lower hillslope. Slope < 1 %
Geology	Dunda beds (Rld)
Land Condition	B or C
Vegetation	Mid-dense to sparse tall Ironbarks, Reid River Box and Desert Oak, usually with currant bush. Buffel grass with black spear grass.
Run-off, Perm. & Drainage	Slow run-off, moderately permeable and moderately-well drained
Surface features	Hardsetting, but may form bulldust when disturbed.
Surface Fertility	Expected to be moderate to high in Phosphorus, Low in Nitrogen with Moderate Calcium levels
Estimated PAWC	94 - 96 mm
Investigation sites	11, 18, 98
Sample sites	45

Soil profile description



A1 - Grey to brown (10 YR 5/2, 5/4), clay loam fine sandy, massive.

A2e - As above but conspicously bleached

B2t - Brown to yellow (7.5YR, 10 YR 5/4 to 6/6, 7/8), weakly to moderately red or yellow mottled, fine sandy light to light medium clay, strong 10 -20 mm polyhedral to prismatic structure, neutral pH.

R - Hard sandstone below 1.00 – 1.30 m.

Soil chemical and physical data

- No detailed chemical data
- Expected to have moderate to high fertility, but low salinity, sodicity and dispersion.
- High fine sand levels expected due to field textures.

Summary

The soil occurs on a lower hillslope or pediment. Pasture growth is reasonable. Control of currant bush may be difficult on this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

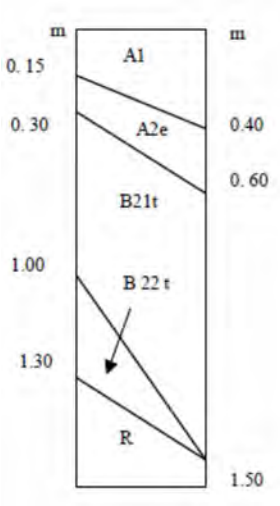
Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.20m	Strip topsoil/upper subsoil to 0.20 m for topsoil/seed source material
	Subsoil	1.00 m	Avoid subsoil stripping below 1.00 m depth as depth to underlying rock varies.
Single stage stripping	Combined	1.00 m	Avoid subsoil stripping below 1.00 m depth as depth to underlying rock varies.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 3 – Suitable land for the production of 2-3 year old, grassfed, export quality cattle, but only in good seasons	m3, nd3

Soil Tm4	Deep texture contrast soil with thick, bleached, sandy to clay loamy surface over alkaline, mostly mottled, yellow to brown light medium to medium clay subsoil.
Australian Soil Classification	Yellow or brown Chromosol or Sodosols
Area mapped	903 ha
World Reference Base Reference Soil Group	Luvisols or Solonetz
Landform	Gentle lower hillslopes to broad flats. Slope < 1 % . This soil is found in some locations below more permeable soils, and could be influenced by groundwater movement.
Geology	Dunda beds (Rld)
Land Condition	C / D
Vegetation	Mid-dense to sparse tall Ironbarks and Reid River Box, with currant bush. Wire grass and black spear grass, often with soft spinifex.
Run-off, Perm. & Drainage	Moderately rapid run-off, very slowly to slowly permeable and imperfectly drained
Surface features	Hardsetting, but may form bulldust when disturbed
Surface Fertility	Expected to be low
Estimated PAWC	24 - 60 mm
Investigation sites	44, 84, 89, 93, 104, 123
Sample sites	44, 67

Soil profile description



A1 - Grey to brown (7.5 YR, 10 YR 5/2 to 5/4), loamy fine sand to clay loam fine sandy, massive.

A2e – As above but conspicously bleached

B21t – Brown to yellow (7.5YR, 10 YR 5/3 to 6/4, 6/6), mostly moderately to strongly orange or yellow mottled, fine sandy light medium to medium clay, strong 10 -20 mm columnar to prismatic structure, alkaline pH throughout or neautral becoming alkaline at depth. May be higly saline by 0.60 – 0.90 m.

B 22t – As above but prismatic to blocky structure with carbonate nodules and / or gypseous crystals.

R - Hard sandstone may occur below 1.30 m.

Soil chemical properties – data from sites 44, 67

Sample Depth	Ph (water)	EC (dS/m)	Cl (mg/kg)	CEC or/ECEC (meq/100g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
Site 67 - 0.6 m	6.6	0.06	27	9	3.14	4.07	1.06	0.21	12	
Site 44 -1.50 m	9.1	0.14	291	6	0.70	3.27	1.84	0.21	29	

- pH is neutral at 0.60 m and strongly alkaline below.
- EC and chloride levels are low to moderate for both samples analysed. However, field data sho some profiles are highly saline and probably highly sodic by 0.60 – 0.90 m.
- ESP data indicate high subsoil dispersion in both samples analysed.

Soil physical properties – data from sites 44 & 67

Sample Depth	Particle Size Analysis				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/ Clay	Sodicity rating	Salinity rating	Ca : Mg rating
Site 67 0.5-0.6 m	23	41	10	25			Low	Low	High
Site 44 1.4-1.5 m	47	25	3	26			High	Low	High

- CEC levels and clay percentage are very low with high fine sand and coarse sand.
- High fine sand content and lack of topsoil structure implies this soil will become bulldust once disturbed.
- High fine sand level indicates soil will be subject to water erosion on all but very gentle slopes.
- Adverse soil physical properties are likely due to sodicity and salinity levels and high fine sand levels.

Summary

The soil occurs on gentle lower hillslopes and broad flats. Pasture growth is poor due to alkaline, sodic and/or saline subsoil. Currant bush may be hard to control in some localities of this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.10 m	Strip topsoil/upper subsoil to 0.1 m for topsoil/seed source material
	Subsoil	0.30 m	Avoid subsoil stripping below 0.30 m to avoid alkaline and sodic and/or saline subsoil.

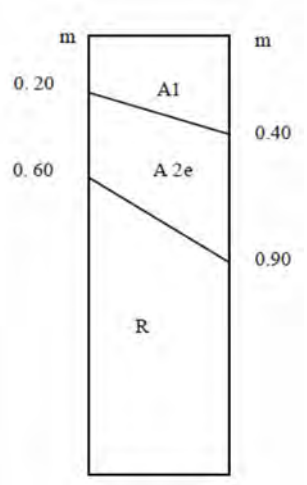
Single stage stripping	Combined	0.30 m	Avoid subsoil stripping below 0.30 m to avoid alkaline and sodic and/or saline subsoil.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round	m4, nd 4

Soil Mr2	Moderately deep, gravelly, acid to neutral, bleached sand to loam.
Australian Soil Classification	Bleached-Leptic Tenosols
Area mapped :	695 ha
World Reference Base Reference Soil Group	Arenosols
Landform	Upper hillslopes and hill crests. Slope 3 - 5 %
Geology	T
Land Condition	D
Vegetation	Very sparse low to medium Rough-leaved bloodwood, Brushhouse paperbark and yellow jacket. Understory of closed shrubs – Townsville wattle, Calytrix, Golden Parrot Tree, & *Jacksonia ramocissima.* Ground cover of soft spinifex and BillyButton Daisy.
Run-off, Perm. & Drainage	Slow run-off, highly permeable and well drained
Surface features	Bulldust, occasional rock outcrop
Surface Fertility	Expected to be very low
Estimated PAWC	48 - 80 mm
Investigation sites	102, 103, 144
Sample sites	

Soil profile description



A1 - Brown to yellow (10 YR, 7.5 YR 5/3, 5/4, 6/3, 6/4), loamy fine sand to fine sandy loam, single grain to massive.

A2e – As above but conspicuously bleached. Acid to Neutral pH.

R - Hard sandstone from 0.6 – 0.9 m

Soil chemical and physical data

- No detailed chemical data
- Expected to be very low in fertility, salinity, sodicity and dispersion.
- High fine sand levels expected based on field texture.

Summary

The soil occurs on hillcrests and mid to upper hillslopes. Pasture growth is very poor due to the shallow, sandy soil which is very low in fertility. Control of wattles and other shrubs will be difficult on this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

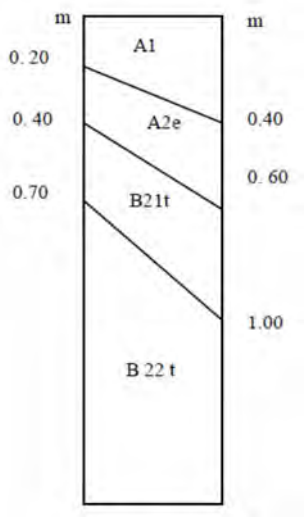
Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.20m	Strip topsoil/upper subsoil to 0.20 m for topsoil/seed source material
	Subsoil	0.60 m	Avoid subsoil stripping below 0.60 m depth as depth to underlying rock varies.
Single stage stripping	Combined	0.60 m	Avoid subsoil stripping below 0.60 m depth as depth to underlying rock varies.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 5 Unsuitable land for production of export quality cattle and marginal as breeding country all year round	m4, nd4, vm4

Soil Eb1	Very deep, texture contrast soil with thick, bleached sandy to clay loamy surface over alkaline, mottled, yellow to brown fine sandy to medium clay subsoil.
Australian Soil Classification	Yellow or brown Sodosols
Area mapped :	951 ha
World Reference Base Reference Soil Group	Luvisols or Solonetz
Landform	Upper hillslope to rise (Slope < 1 %).
Geology	Qs
Land Condition	C
Vegetation	Mid-dense to sparse tall Ironbarks, Reid River Box and Grey Bloodwood, usually with currant bush. Very patchy buffel grass with wire grass and black spear grass.
Run-off, Perm. & Drainage	Moderately rapid run-off, very slowly to slowly permeable and imperfectly drained
Surface features	Soft to hardsetting, but will form bulldust when disturbed
Surface Fertility	Expected to be low.
Estimated PAWC	40 -60 mm
Investigation sites	39, 40, 57, 64, 134
Sample sites	75

Soil profile description



A1 - Grey to brown (7.5 YR, 10 YR 5/2 to 5/4), fine sandy loam to clay loam fine sandy, massive.

A2e – As above but conspicously bleached

B21t – Brown to yellow (7.5YR 5/4; 10 YR 6/4, 7/4, 7/6), moderately to stronglyorange or yellow mottled, fine sandy light medium to medium clay, strong 10 -20 mm columnar to prismatic structure, alkaline pH throughout or neautral becoming alkaline at depth. Maganese concretions

B 22t – As above but prismatic to blocky structure with carbonate nodules

Field EC levels and sodicity indicators are variable between soil profiles.

Soil chemical properties – data from site 57

Sample Depth	Ph (water)	EC (dS/m)	Cl (mg/kg)	CEC or/ECEC (meq/100g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
0.90	7.6	0.05	102	8	2.98	2.95	1.35	0.25	17	1.0
1.20	8.4	0.08	166	8	2.64	2.87	1.58	0.23	21	0.9

- pH is neutral at 0.90 m and alkaline below
- EC and levels are very low and chlorine low at 0.90 and 1.20
- ESP is high at both 0.90 and 1.20 m, and expected to be also high at 0.60 m due to, columnar structure.

Soil physical properties – data from site 57

Sample Depth	Particle Size Analysis				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/ Clay	Sodicity rating	Salinity rating	Ca : Mg rating
0.90	27	34	8	31		0.26	High	Low	High
1.20	28	36	9	29		0.28	High	Low	Moderate

- CEC levels and clay percentage are very low with high fine sand and coarse sand.
- CEC/Clay ratio is low, indicating the presence of shrink/swell clay is minimal.
- High fine sand content and lack of topsoil structure implies this soil will become bulldust once disturbed.
- High fine sand level indicates soil will be subject to water erosion on all but very gentle slopes.
- Adverse soil physical properties are likely due to high sodicity levels from 0.90 m and are also likely throughout due to high fine sand levels. Some profiles have high field salinity and indicators of high sodicity from 0.60 m.

Summary

The soil occurs on rises and upper hillslopes. Pasture growth is poor due to alkaline, sodic and/or saline subsoil. Currant bush will be hard to control on most of the area of this soil. This soil will become bulldust upon disturbance. Salinity and sodicity levels in the subsoil are variable, with some profiles highly saline and sodic from 0.60 m. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to very high fine sand content and is therefore recommended for reuse only on very gentle slopes. Reuse of material below 0.60 m should be avoided to minimise highly sodic layers in the final mix.

Soil reuse recommendations

Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.20m	Strip topsoil/upper subsoil to 0.20 m for topsoil/seed source material
	Subsoil	0.40 m	Avoid subsoil stripping below 0.40 m to avoid sodic/saline subsoil.

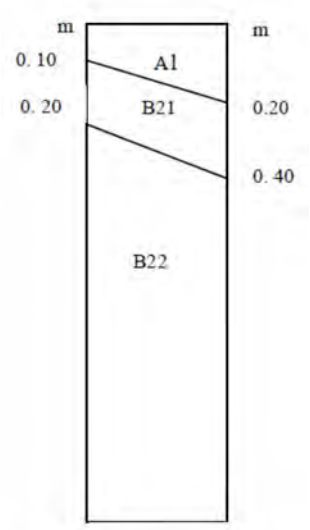
Single stage stripping	Combined	0.40 m	Avoid subsoil stripping below 0.40 m to avoid sodic/saline subsoil.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round	M4, nd 4, vm4

Soil Eb2	Very deep, grey, brown or red cracking clay with moderate to strong gilgai or melon holes and hard-setting surface.
Australian Soil Classification	Red, brown or grey Vertosols
Area mapped :	2620 ha
World Reference Base Reference Soil Group	Vertisols
Landform	Broad flats, generally low-lying. Slope <1 %
Geology	Qs
Land Condition	A or B
Vegetation	Mid-dense to sparse tall Brigalow / Gidgee (cleared), often with patches of currant bush and occasionally Parthenium weed and/or Prickly Acacia. Often thick buffel grass. Occasional Bauhinia tree.
Run-off, Perm. & Drainage	Slow run-off, very slowly permeable and imperfectly drained
Surface features	Hardsetting and cracking; Melon holes or gilgai 0.20 – 1.2 m deep.
Surface Fertility	High Phosphorus, Low Nitrogen, High Calcium
Estimated PAWC	60 - 80 mm
Investigation sites	14, 18, 23, 81, 115, 124, 126, 128, 133, 135
Sample sites	18

Soil profile description



A1 – Dark grey to brown (10YR 4/1 – 4/3), occasionally mottled, light medium to medium heavy clay, medium blocky structure. Field pH 5.5 to 8.5

B 21 – Grey, brown or red (5YR, 7.5 YR 4/4 – 4/6; 10YR 5/2, 4/2, 2.5Y 5/3, 6/4) medium to heavy clay with strong blocky structure. Field pH 5.5 – 9.0.

B22 – Similar but with grey or gley mottles; strong lenticular structure and prominent slickenside; carbonate nodules and often gypseous crystals. Field pH 5.0 – 10.0.

Occasionally carbonate throughout (associated with more alkaline profiles). Field EC values (where measured) were high to extreme by 0.30 – 0.90.

Soil chemical properties – data from site 18

Sample Depth	Ph (water)	EC (dS/m)	Cl (mg/kg)	CEC or/ECEC (meq/100g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
0.10	7.4	0.07	22	17	9.95	4.96	1.37	0.37	8.0	2.0
0.30	9.0	0.23	137	21	12.0	5.65	2.54	0.27	12	2.1
0.60	9.1	1.05	1125	31	18.3	6.96	5.29	0.32	17	2.6
0.90	9.2	0.98	1088	20	8.76	5.40	5.07	0.25	26	1.6
1.20	9.1	1.21	2378	20	8.11	6.19	5.31	0.32	26	1.3
1.50	8.9	1.31	2135	18	5.23	6.59	5.50	0.36	31	0.80

- pH is neutral at 0.10, rising quickly to strongly alkaline by 0.30 m
- EC and chloride levels are extremely high at and below 0.60, which limits effective rooting depth and hence estimated PAWC.
- ESP data indicate subsoil dispersion from 0.30 m, but the effect may be counteracted to some degree by the calcium levels, (high Ca:Mg ratio).

Soil physical properties – data from site 18

Sample Depth	Particle Size Analysis				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/ Clay	Sodicity rating	Salinity rating	Ca : Mg rating
0.10	24	44	9	21		0.81	Moderate	Low	High
0.30	23	33	10	34		0.62	Moderate	Moderate	High
0.60	26	38	9	28		1.11	High	Extreme	High
0.90	28	36	8	29		0.69	Very High	Extreme	High
1.20	23	37	5	34		0.59	Very High	Extreme	High
1.50	20	36	8	36		0.50	Very High	Extreme	High

- CEC levels and clay percentage as well as fine sand and coarse sand are high throughout.
- CEC/Clay ratio is high throughout, confirming presence of shrink/swell clay.
- High fine sand and high sodicity levels indicate this soil will be subject to water erosion on all but very gentle slopes.
- Adverse soil physical properties are likely due to high sodicity levels from 0.90 m and are also likely throughout due to high fine sand levels. Some profiles have high field salinity and indicators of high sodicity from 0.30 m.

Summary

This soil occurs on generally low-lying broad alluvial flats, usually with melon holes. Pasture growth is mostly good, especially as a result of the last few wet seasons, but weeds such as currant bush and Parthenium as well as patches of Sodosols (Eb3) may limit productivity in some locations. Shallow effective rooting depth due to high to extreme salinity and sodicity will limit PAWC. Soil reuse should be restricted to less than 0.30 m to avoid material with high salt, sodium and therefore dispersion. A**chieving this will be difficult over most of the area of this soil due to the depth and frequency of melonholes. Therefore reuse of this soil material is not recommended, unless in areas of less prominent melonholes.**

Soil reuse recommendations

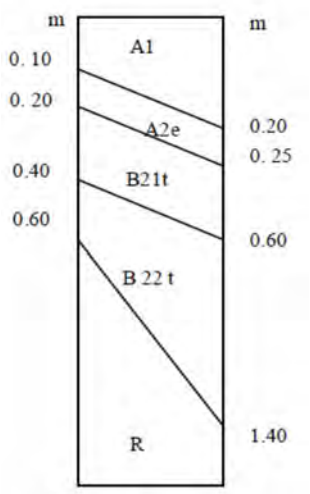
Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.10 m	Strip topsoil to 0.10 m depth for topsoil seed/source material. This will be difficult to achieve over most of the area of this soil due to melonholes.
	Subsoil	0.30 m	Avoid subsoil stripping below 0.30 m depth to avoid material with high salinity and sodicity. This will be difficult to achieve over most of the area of this soil due to melonholes.
Single stage stripping	Combined	0.30 m	Avoid subsoil stripping below 0.30 m depth to avoid material with high salinity and sodicity. This will be difficult to achieve over most of the area of this soil due to melonholes.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round	sa4, pH4

Soil Eb3	Moderately deep to deep, texture contrast soil with moderately thick, bleached clay loamy surface over alkaline, mottled, yellow to brown medium clay subsoil
Australian Soil Classification	Yellow or brown Chromosols or Sodosols
Area mapped :	219 ha
World Reference Base Reference Soil Group	Luvisols
Landform	Lower hillslopes to broad flats. Slope < 1 %
Geology	Qs
Land Condition	C or B
Vegetation	Mid-dense to sparse tall Brigalow/ Gidgee, usually with currant bush. Occasionally Dawson Gum occurs. Wire grass and black spear grass, often with soft spinifex.
Run-off, Perm. & Drainage	Moderately rapid run-off, moderately to slowly permeable and imperfectly to Moderately-well drained
Surface features	Hardsetting surface that may form bulldust when disturbed.
Surface Fertility	High Phosphorus, Low Nitrogen and Moderate Calcium levels
Estimated PAWC	30 - 80 mm (assumed mostly > 60 mm)
Investigation sites	19, 20, 63
Sample sites	63

Soil profile description



A1 - Grey to brown (7.5 YR, 10 YR 5/2 to 5/4), clay loam fine sandy, massive.

A2e – As above but conspicuously bleached

B21t – Brown to yellow (7.5YR, 10 YR 4/3 to 6/4), moderately to strongly orange or yellow mottled, fine sandy light medium to medium clay, strong 10 - 20 mm blocky structure, alkaline pH throughout or neutral becoming alkaline at depth.

B 22t – As above but with carbonate nodules and alkaline.

Field EC varies from very high to extreme at 0.30 – 0.60 m to low to moderate at 1.20 m.

R - Decomposing and hard sandstone present below 0.6 – 1.40 m

Soil chemical properties – data from site 63

Sample Depth	Ph (water)	EC (dS/m)	Cl (mg/ kg)	CEC or/ECEC (meq/100g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
0.10	6.3	0.04	13	7.7	5.39	1.42	<0.08	0.53	0.5	3.8
0.30	6.4	0.04	13	10.9	6.75	3.14	0.17	0.53	1.6	2.1
0.60	7.3	0.04	12	11.7	6.26	4.13	0.48	0.42	3.9	1.5
0.90	8.9	0.11	19	16.1	8.27	6.00	1.18	0.35	7.2	1.4
1.20	9.3	0.28	91	25.3	14.7	7.52	2.45	0.38	9.7	2.0

- pH is acid to neutral in the topsoil and upper subsoil becoming strongly alkaline at depth.
- EC and chloride levels are very low throughout
- ESP levels are moderate from 0.90 m. The high Ca: Mg ratios are expected to minimise any effect on dispersion levels.
- However, one out of three Eb3 soil profiles described is strongly alkaline with high field EC levels from 0.30 m which indicates this soil may have very low PAWC but high subsoil sodicity and dispersion.

Soil physical properties – data from site 63

Sample Depth	Particle Size Analysis				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/ Clay	Sodicity rating	Salinity rating	Ca : Mg rating
0.10	17	41	13	29		0.26	Low	Low	High
0.30	14	34	11	40		0.27	Low	Low	High
0.60	15	36	11	38		0.31	Low	Low	High

- CEC levels and clay percentage are moderate to high with high fine sand and coarse sand.
- CEC/Clay ratio is low, indicating the presence of shrink/swell clay is minimal.
- High fine sand content and lack of topsoil structure implies this soil will become bulldust once disturbed.
- High fine sand level and sodic subsoil indicate this soil will be subject to water erosion on all but very gentle slopes.
- Adverse soil physical properties are unlikely due to low sodicity and salinity levels to 0.60 m, but are likely due to high fine sand levels. However, some soil profiles may have dispersive subsoils.

Summary

The soil occurs within gentle lower hillslopes and broad brigalow/gidgee flats. Soil Eb2 is usually associated as a minor soil, which has high EC levels and dispersible subsoil. Soil pH, field salinity and possible sodicity levels vary between profiles of this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes. Any reuse of soil material below 0.30 m should be restricted to avoid media with high sodium or salinity It is recommended that further testing of this soil unit is undertaken prior to disturbance due to the variable depth to material with adverse chemical properties. .

Soil reuse recommendations

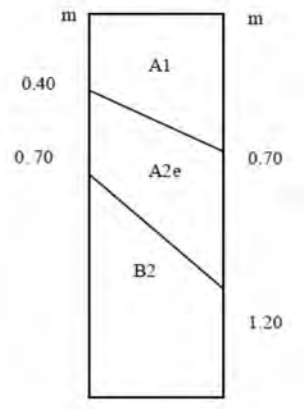
Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.10m	Strip topsoil/upper subsoil to 0.10 m for topsoil/seed source material
	Subsoil	0.30 m	Avoid subsoil stripping below 0.30 m to avoid sodic/saline subsoil
Single stage stripping	Combined	0.30 m	Avoid subsoil stripping below 0.30 m to avoid sodic/saline subsoil

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 3 – Suitable land for the production of 2-3 year old, grassfed, export quality cattle only in good seasons or Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round depending on soil pH, sodicity and salinity levels.	Sa 3 or 4, pH 3 or 4

Soil Mb2	Very deep, yellow to brown, acid to neutral, bleached sand to loam.
Australian Soil Classification	Bleached-Orthic Tenosols
Area mapped :	1347 ha
World Reference Base Reference Soil Group	Lixisols
Landform	Gentle lower slopes and broad flats. Slope < 1 – 3 %.
Geology	Qs
Land Condition	C
Vegetation	Mid-dense to sparse tall Ironbarks, Reid River Box, Ghost Gum and Desert Oak with wire grass, black spear grass and soft spinifex.
Run-off, Perm. & Drainage	Slow run-off, highly permeable and well-drained
Surface features	Bulldust, soft sandy surface
Surface Fertility	Expected to be very low
Estimated PAWC	60 mm
Investigation sites	43, 50, 51, 52, 53, 55
Sample sites	

Soil profile description



A1 - Grey to brown (7.5 YR, 10 YR 4/2 to 4/4), loamy fine sand to fine sandy loam, massive.

A2e – As above but conspicously bleached

B2 – Yellow to brown (7.5 YR, 10 YR 5/3, 5/4, 5/6, 6/6, 7/6, 7/8), loamy fine sand to fine sandy loam, massive, acid to neutral pH

Soil chemical and physical data

- No detailed chemical data.
- Expected to be very low in fertility, salinity, sodicity and dispersion.
- High fine sand levels based on field textures.

Summary

The soil occurs on lower hillslopes and broad flats. Pasture growth is poor due to the rapidly drained sandy soil which is low in fertility. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

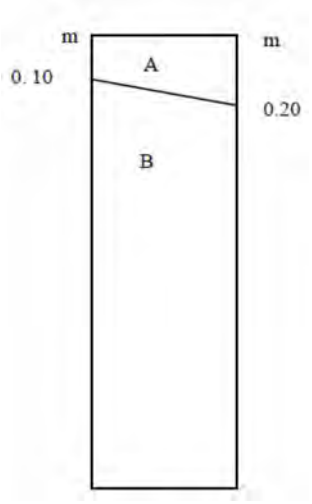
Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.30 m	Strip topsoil/upper subsoil to 0.3 m for topsoil/seed source material
	Subsoil	0.90 m	Avoid subsoil stripping below 0.90 m depth as soil will have adverse physical properties due to the level of fine sand.
Single stage stripping	Combined	0.90 m	Avoid subsoil stripping below 0.90 m depth as soil will have adverse physical properties due to the level of fine sand.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round	m4, nd4

Soil Mb3	Very deep, red, acid, massive sand to loam.
Australian Soil Classification	Red-Orthic Tenosols
Area mapped :	2 797 ha
World Reference Base Reference Soil Group	Arenosols
Landform	Rises and upper hillslopes. Slope 3 - 5 %
Geology	T
Land Condition	D
Vegetation	Very sparse low to medium Rough-leaved blood wood, Brushhouse paper bark and yellow jacket. Understory of closed shrubs – Townsville wattle, Calytrix, Golden Parrot Tre *& Jacksonia ramocissima.* Ground cover of soft spinifex and BillyButton Daisy
Run-off, Perm. & Drainage	Very slow run-off, highly permeable and rapidly drained
Surface features	Bulldust, soft sand
Surface Fertility	Expected to be very low
Estimated PAWC	60 mm
Investigation sites	41, 79, 87
Sample sites	63

Soil profile description



A - Red (2.5 YR, 10 R 4/4, 4/6), loamy fine sand to fine sandy loam, massive

B – Red (2.5 YR, 10 R 4/4, 4/6, 5/8), loamy fine sand to fine sandy loam, massive, acid to neutral pH.

Soil chemical and physical data

- No detailed chemical data.
- Expected to be very low in fertility, salinity, sodicity and dispersion.
- High fine sand levels expected based on field textures.

Summary

This soil occurs on broad rises and upper hillslopes. Pasture growth is poor due to the rapidly drained sandy soil which is likely to be very low in fertility. Thick wattles and other shrubs will be hard to control on this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes

Soil reuse recommendations

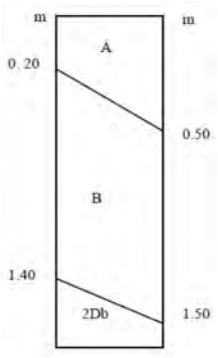
Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.30m	Strip topsoil/upper subsoil to 0.3 m for topsoil/seed source material
	Subsoil	0.90 m	Avoid subsoil stripping below 0.90 m depth as soil will have adverse physical properties due to the level of fine sand.
Single stage stripping	Combined	0.90 m	Avoid subsoil stripping below 0.90 m depth as soil will have adverse physical properties due to the level of fine sand.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 5 Unsuitable land for production of export quality cattle and marginal as breeding country all year round	m4, nd4, vm4

Soil Cr1	Very deep, acid to neutral, yellow to brown, massive and loose, sand to loam.
Australian Soil Classification	Yellow-Orthic or brown-orthic Tenosols
Area mapped :	849 ha
World Reference Base Reference Soil Group	Arenosols
Landform	Levee of Carmichael River . Slope < 1 %, but may be up to 10 % directly into the river bed
Geology	Recent alluvium associated with Carmichael River (Qa)
Land Condition	B or C
Vegetation	Mostly cleared or 'recently pulled' but likely to be Mid-dense to sparse very tall Narrow-leaved Ironbark, Blue Gum, Pink Bloodwood and Moreton Bay Ash. Patchy Wire grass and black spear grass and some buffel grass. Sally wattles and flannel weed also occur in patches
Run-off, Perm. & Drainage	Slow run-off, highly permeable and well to rapidly drained
Surface features	Some eroded gullies leading into directly into the river course; patches of small pebbles. Some uneven topography including alluvial swales. Soft sandy surface becoming deep bulldust where disturbed by vehicle access
Surface Fertility	High Phosphorus, Low Nitrogen and Moderate Calcium levels
Estimated PAWC	60 mm
Investigation sites	19, 20, 63
Sample sites	63

Soil profile description



A - Brown (7.5 YR, 10 YR 5/3 to 5/4), loamy fine sand to fine sandy loam, massive

B – Brown to yellow (7.5YR, 10 YR 5/3 to 6/4), loamy fine sand to fine sandy loam, massive, acid to neutral pH

2Db - (where present) Red (5 YR 5/6), fine sandy loam, massive, acid to neutral pH

Soil chemical properties – data from site 28

Sample Depth	Ph (water)	EC (dS/m)	Cl (mg/kg)	CEC or/ECEC (meq/100g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
0.10	7.2	0.08	14	5	2.70	0.91	<0.1	0.87	1	
0.30	6.8	0.03	8	4	3.15	0.61	<0.1	0.40	<1	
0.60	7.5	0.02	5	3	2.40	0.25	<0.1	0.20	<1	
0.90	7.9	0.02	5	3	2.00	0.18	<0.1	0.13	1	
1.20	8.2	0.02	7	3	2.03	0.19	<0.1	0.10	1	
1.50	8.2	0.02	9	2	1.81	0.21	<0.1	0.11	1	

- pH is neutral throughout
- EC and chloride levels are very low throughout
- ESP data indicate no subsoil dispersion
- Very low CEC indicates soil nutrients are readily leached and not retained in the soil profile

Soil physical properties – data from site 28

Sample Depth	Particle Size Analysis				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/ Clay	Sodicity rating	Salinity rating	Ca : Mg rating
0.10	13	75	6	6			Low	Low	
0.30	15	74	5	6			Low	Low	
0.60	17	73	6	6			Low	Low	
0.90	15	76	4	6			Low	Low	
1.20	17	75	3	6			Low	Low	

- CEC levels and clay percentage are very low with high fine sand and coarse sand.
- ESP and Ca:Mg ratio calculations are difficult to interpret due to very low CEC levels
- High fine sand content and lack of soil structure implies this soil will become deep bulldust once disturbed.
- High fine sand level indicates soil will be subject to water erosion on all but very gentle slopes.
- Adverse soil physical properties are unlikely due to low sodicity and salinity levels, but are likely due to high fine sand levels.

Summary

The soil occurs on the levee of Carmichael River. Pasture growth is poor due to low estimated PAWC. This soil will become deep bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

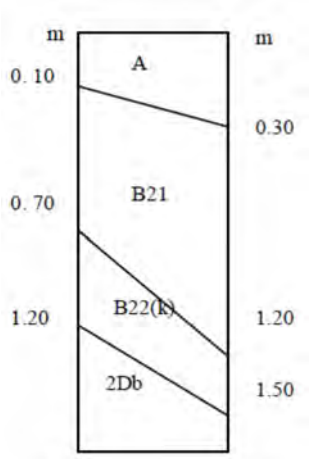
Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.30m	Strip topsoil/upper subsoil to 0.3 m for topsoil/seed source material
	Subsoil	0.90 m	Avoid subsoil stripping below 0.90 m depth as soil will have adverse physical properties due to the level of fine sand.
Single stage stripping	Combined	0.90 m	Avoid subsoil stripping below 0.90 m depth as soil will have adverse physical properties due to the level of fine sand.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 4 Marginal for production of export quality cattle, but suitable as breeding country all year round	m4

Soil Cr3	Very deep texture contrast soil with moderately thick clay loamy surface over alkaline, red, well-structured light medium to medium clay subsoil
Australian Soil Classification	Red Chromosols
Area mapped :	531 ha
World Reference Base Reference Soil Group	Luvisols
Landform	Small backplain, slope < 1 %
Geology	Recent alluvium associated with Carmichael River (Qa)
Land Condition	B or C
Vegetation	Mid-dense to sparse tall Reid River Box and Moreton Bay Ash with currant bush and Flindersia. Patchy buffel grass
Run-off, Perm. & Drainage	Slow run-off, moderately permeable and moderately-well drained
Surface features	Bulldust soil when disturbed.
Surface Fertility	Moderate Phosphorus, Low Nitrogen and High Calcium
Estimated PAWC	114 - 128 mm
Investigation sites	17, 25 and 130
Sample sites	130

Soil profile description



A - Red (5 YR, 2.5 YR 4/4, 4/6), clay loam fine sandy, massive.

B21 – Red (5 YR, 2.5 YR 4/4, 5/4) light medium to medium clay (fine sandy), strong 10- 20 mm prismatic structure, pH neutral to alkaline

B22(k) - as above but may be yellow (7.5 YR 6/6) and with calcium nodules and strongly alkaline pH

2Db - (where present) – Red (5YR 6/6) fine sandy loam and alkaline pH

Some uniform silty clay profiles are associated.

Soil chemical properties – data from site 28

Sample Depth	Ph (water)	EC (dS/m)	Cl (mg/ kg)	CEC or/ECEC (meq/100g)	Exchangeable cations (meq/100 g)				Calculated ratios	
					Ca	Mg	Na	K	ESP	Ca:Mg
0.10	7.0	0.04	12	5.6	3.63	1.00	<0.08	0.64	0.5	3.6

0.30	6.9	0.02	15	6.0	4.05	1.18	<0.08	0.28	0.3	3.4
0.60	7.2	0.02	18	10.1	6.84	2.40	<0.08	0.40	0.6	2.9
0.90	8.8	0.10	14	28.7	24.1	3.70	0.14	0.41	0.5	6.5
1.20	8.9	0.10	16	24.5	19.2	4.33	0.26	0.39	1.1	4.4
1.50	9.0	0.09	16	20.6	15.2	4.44	0.34	0.33	1.7	3.4

- pH is neutral at the surface becoming strongly alkaline in the subsoil
- EC and chloride levels are very low throughout
- CEC is moderate in the surface becoming high at depth.
- ESP data and calcium dominated chemistry (very high Ca:Mg ratio) indicate no subsoil dispersion

Soil physical properties – data from site 28

Sample Depth	Particle Size Analysis				Calculated ratios and ratings				
	C sand	F sand	Silt	Clay	R1 Dispersion	CEC/ Clay	Sodicity rating	Salinity rating	Ca : Mg rating
0.10	19	54	14	13		0.43	Low	Low	High
0.30	18	50	12	21		0.28	Low	Low	High
0.60	13	39	11	39		0.26	Low	Low	High
0.90	14	41	12	34		0.84	Low	Low	High
1.20	13	46	12	33		0.74	Low	Low	High

- CEC levels are high with CEC:Clay ratio low to moderate to 0.60 m but high below indicating mixed clay types which is not unexpected from a soil formed from recent alluvium.
- Clay percentages indicate a texture contrast soil, but are less than the field texture indicates. However the field textures are more in agreement with the proportion of clay plus silt, which may indicate incomplete dispersion during particle size analysis tests.
- Very high fine sand content and massive topsoil implies this soil will become bulldust once disturbed and indicates soil will be subject to water erosion on all but very gentle slopes.
- Adverse soil physical properties are unlikely due to low sodicity and salinity levels, but are very likely due to high fine sand levels.

Summary

The soil occurs on a small backplain associated with Carmichael River. Currant bush will be hard to control on this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.30m	Strip topsoil/upper subsoil to 0.3 m for topsoil/seed source material

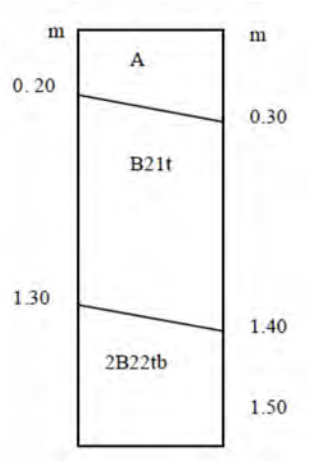
	Subsoil	0.70 m	Avoid subsoil stripping below 0.70 m depth as the soil becomes strongly alkaline.
Single stage stripping	Combined	0.70 m	Avoid subsoil stripping below 0.70 m depth as the soil becomes strongly alkaline.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 3 – Suitable land for the production of 2-3 year old, grassfed, export quality cattle, but only in good seasons	nd3

Soil Cr4	Very deep texture contrast soil with moderately thick sandy to loamy surface over acid to neutral, brown, massive to weakly structured light medium to medium clay subsoil.
Australian Soil Classification	Brown Chromosols
Area mapped :	129 ha
World Reference Base Reference Soil Group	Luvisols
Landform	Small backplain, slope < 1 %
Geology	Recent alluvium associated with Carmichael River (Qa)
Land Condition	B or C
Vegetation	Cleared - but likely to have been mid-dense to sparse tall Ironbarks, Reid River Box, with currant bush. Buffel grass, wire grass and black spear grass
Run-off, Perm. & Drainage	Slow run-off, moderately permeable and moderately-well drained
Surface features	Soft sandy surface that will turn bulldust once disturbed.
Surface Fertility	Expected to be moderate
Estimated PAWC	108 - 112 mm
Investigation sites	58, 129
Sample sites	

Soil profile description



A - Grey to brown (7.5 YR, 10 YR 4/2 to 4/4), loamy fine sand to fine sandy loam, massive.

B21t – Brown (7.5 YR, 10 YR 4/6, 5/6), fine sandy light medium to medium clay, massive to weakly

2 B22t b - Brown to yellow (7.5 YR, 10 YR 4/6, 5/6, 6/6), fine sandy light medium to medium clay, strongly 10 – 20 mm blocky or prismatic structure, pH 6.0 – 8.0

Soil chemical and physical data

- No detailed chemical data
- Expected to have moderate fertility but very low fertility, salinity, sodicity and dispersion.
- High fine sand levels expected based on field textures.

Summary

The soil occurs on a small backplain associated with Carmichael River. Currant bush will be hard to control on this soil. This soil will become bulldust upon disturbance. Any salvaged material from this soil is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on very gentle slopes.

Soil reuse recommendations

Method	Material	Lower Depth	Recommendation
Two stage stripping	Topsoil	0.30m	Strip topsoil/upper subsoil to 0.3 m for topsoil/seed source material
	Subsoil	0.90 m	Avoid subsoil stripping below 0.90 m depth as soil will have adverse physical properties due to the level of fine sand.
Single stage stripping	Combined	0.90 m	Avoid subsoil stripping below 0.90 m depth as soil will have adverse physical properties due to the level of fine sand.

Grazing suitability assessment

Land Use	Suitability Class	Main Limitations
Grazing	Class 3 – Suitable land for the production of 2-3 year old, grassfed, export quality cattle, but only in good seasons	nd3

3 Soil Reuse for Mining Operation

The methodologies for both topsoil stripping and Agricultural Land Suitability assessment were taken largely from QDME 1995, except where indicated. The following discussion is based on Burgess (2010) which is expanded from the Growth Media Management Section of QDME 1995.

3.1 Topsoil Striping – General Assumptions and Explanations

Topsoil stripping recommendations are primarily determined by inherent soil characteristics and spatial soil variability within the landscape. Suitability of materials available for stripping depends not only on the presence/absence and severity of inherent limitations (such as salinity or dispersive behaviour) but also on the landform design and final end uses of the material. Different landform designs and final end uses will change acceptable soil parameters and recommended stripping depths accordingly. Stripping recommendations where commitments are made to reinstate pre-mining cropping or grazing suitability to high agricultural potential, will be very different to those where final uses with no or limited agricultural potential are planned.

Stripping recommendations are presented in these reports which have been purposefully designed to maximize the salvage of soil resources (primary and secondary growth media) suitable for the establishment of functional native vegetation ecosystems capable of sustainably rehabilitating and stabilizing slopes designed according to the soil properties. Soil materials recommended for salvage have been selected to provide suitable growth media for the establishment and long term survival of selected/adapted native tree and groundcover species. Poor outcomes in terms of reduced productivity and excessive erosion risk could be expected where attempts to implement agricultural activities other than appropriately managed cattle breeding operations on rehabilitated land without revising the stripping recommendations in this report to ensure they were appropriate and purpose specific. Stripping recommendations presented in this report do not consider reinstating the land to a higher agricultural value than cattle grazing after the mining operation has ceased as most of the EPC1690 area is assessed in the pre-development state as 'breeding country' with limited agricultural potential. Revision of the findings and outcomes from this investigation would be required where end uses are envisaged other than the stabilisation through the establishment of sustainable native vegetation cover of slopes designed according to the soil properties

3.2 Limitations of Data

The discussions outlined below are based on results from a medium intensity soil survey of 1:100 000 scale and provide good general information on soil properties of the EPC1690 area that may affect suitability for reuse. Whilst this is a suitable level of assessment for the purposes of environment impact assessment, more detailed soil surveys should be undertaken on specific areas to be disturbed once these are finalised, to provide sufficient data for appropriate topsoil management plans for each area.

3.3 Topsoil Management Planning

In any topsoil stripping, stockpiling and replacement operation, planned activities need to carefully follow actions outlined in a detailed topsoil management plan. The aim of any such plan should be to ensure optimal allocation of appropriate media reserves across all future rehabilitation activities proposed for the mine. It is important ongoing topsoil management planning is implemented during the normal operation of the mine to minimize shortfalls in rehabilitation media.

Selection of material to be stockpiled for planned activities must consider proposed landform designs, nature of the rehabilitated material and intended rehabilitation methods to be employed. A management plan should outline the intended depth and surface treatment of material to be reinstated and the intended type/nature of vegetative cover to be established. In practice, a detailed topsoil management plan should clearly outline:

- areas to be disturbed;
- volumes/characteristics of suitable materials available from areas proposed for disturbance;
- methodology for optimal soil management during stockpiling;

- areas for reinstatement;
- physical conditions expected at each rehabilitation site (e.g. slope degree/length, spoil characteristics, proposed rehabilitation technique);
- selection methodology to identify the most appropriate soil materials from available stockpiled resources for different rehabilitation scenarios; and volumes and characteristics of material (or other cover materials) required for stripping to meet rehabilitation requirements.

In general:

- Soil material with poor physical properties (such as slaking and sealing) should only be utilised on very gentle slopes to minimise erosion risk. Soil improvements may be undertaken to enable stockpiling at increased slopes.
- Stockpiles containing soil material for reuse should ideally be formed no more than 1.5 m in height and should be ripped and seeded (with species selection based on the desired outcome of rehabilitation) as soon as practical following stockpile laydown.
- Stripped materials should be segregated into stockpiles, which have similar reuse characteristics. Soils with good surface physical characteristics should not be stockpiled with soils with poorer physical attributes.

3.3.1 Two Stage Stripping

Two stage stripping and replacement is widely recognised as best management practices for the salvage and reuse of soil/rehabilitation media from areas of mining disturbance. Two stage stripping recommendations for each soil within the EPC1690 area are included in the detailed soil descriptions in Section 2.4. Where two-stage stripping is the preferred salvage method the following issues need to be addressed in a topsoil management plan:

- Where recommended stripping depth exceeds 0.30 m two-stage stripping and replacement is recommended to minimize mixing of surface soil and subsoil materials. Materials stripped using a two-stage process is referred to as primary and secondary growth media respectively. Separation of these materials will optimize physical conditions in stockpiled resources and assist in preserving seed source potential.
- Salvage of primary growth media or topsoil should be maximised from all disturbed areas to an optimal depth 0.1-0.3 m (depending on soil properties) and should be stockpiled separately from secondary growth media material, where practical and appropriate to achieve the desired rehabilitation goals.
- Primary growth media which may contain at least some native seed source should be segregated and stockpiled separately where possible from material which is likely to contain heavy loads of introduced pasture or weed seed, where this is desirable to achieve the rehabilitation goals.
- Stockpiles of primary growth media which potentially contain significant native seed should be used in preference to other stockpiled resources, wherever possible, to obtain maximum benefit from the available native seed stores; providing this fits with the rehabilitation plans and soil and cover types required.

Suitable primary growth media for rehabilitation of mine spoil should ideally conform to most, if not all, of the following characteristics:

- Represent that part of the natural soil profile with maximum biological activity and seed source potential (i.e. immediate surface soil);
- Have a particle size distribution that is dominated either by the coarse sand fraction or alternatively the reactive clay fraction; preferably with limited fine sand and/or silt fractions;
- Have a pH range appropriate for plant growth;
- Be characterized by non-sodic/non-dispersive physical behaviour, particularly in the case of clay material;
- Have very low levels of soluble salts; and

- Have fertility levels appropriate for the plant species to be grown. (which can be overcome if appropriate by additions of fertilizer to achieve rehabilitation goals)

Materials conforming to these general principles would typically be considered appropriate for salvage as primary growth media during two-stage stripping operations. Where materials are suitable except for elevated fine sand/silt fractions, as applies for most soils identified in the EPC1690 area, salvage may still be possible but reinstatement should be restricted to very low slope angles because of increased runoff and erosion risk, unless significant treatments to improve spoils suitability are undertaken.

Suitable root zone material should ideally conform to most, if not all, of the following characteristics:

- Have a particle size distribution that is dominated either by the clay loam fraction or alternatively by the clay fraction; preferably with limited fine sand and/or silt fractions;
- Have a pH range appropriate for plant growth;
- Have a non-sodic (optimal) to weakly sodic (acceptable) clay fraction;
- Be characterized by non-dispersive (optimal) or low to moderately dispersive (acceptable) physical behaviour, particularly where clay materials are being considered for stripping;
- Have very low (optimal) to moderate (acceptable) levels of soluble salts.

Materials conforming to these general principles would typically be considered appropriate for salvage as secondary growth media during two stage stripping operations. Where materials are suitable except for elevated fine sand/silt fractions, as applies for most soils identified in the EPC1690 area, salvage may still be possible but reinstatement should be restricted to lower slope angles because of reduced permeability and increased erosion risk.

3.3.2 Single Stage Stripping

It is recognised however that single stage stripping which involves the salvage of maximum quantities of useable soil material, irrespective of its source, is often the preferred stripping methodology for many mines. Recommendations for single stage stripping outlining one-off salvage depths for the retrieval of all useable materials for each soil within the EPC1690 area are also included in the detailed soil descriptions in Section 2.4.

Single stage stripping will result in greater mixing of discordant materials and a dilution of soil quality. When compared with two stage reinstatement, single stage material will usually be subject to slower infiltration and higher runoff rates, with plant establishment typically slower and less successful overall. Initial erosion control will be of increased importance during the establishment phase but over time as plant/ground cover increases and profile leaching, biological activity and structural improvement occur, erosion risk may decrease.

The primary objective with single stage stripping is the one off salvage of maximum volumes of useable material, irrespective of original soil depth or origins (i.e., salvage of all suitable topsoil, subsoil and/or substrate material). Typically, surface soil and subsoil materials with differing characteristics are not kept segregated and are subject to significant mixing during stripping operations. Because any of the stripped material, whether topsoil or subsoil, can potentially be exposed as final surface cover on reshaped spoil, all materials to be salvaged should have characteristics capable of supporting this use. For these reasons, generalized goals for single stage stripping are similar in many ways to those presented above for topsoil materials under two stage stripping.

Materials to be stripped during single stage operations should ideally conform to most, if not all, of the following characteristics:

- Have a particle size distribution that is dominated either by the coarse sand fraction; or alternatively the reactive clay fraction; preferably with limited fine sand and/or silt fractions;
- Have a pH range appropriate for plant growth;
- Be characterized by non-sodic/non-dispersive physical behaviour, particularly in the case of clay material; and

- Have very low levels of soluble salts.
- Have fertility levels appropriate for the plant species to be grown.

Materials conforming to these general principles would typically be considered appropriate for salvage during single stage stripping. Where materials are suitable except for elevated fine sand/silt fractions, as applies for most soils identified in the EPC1690 area, salvage may still be possible but reinstatement will be restricted to very low slope angles because of increased runoff and erosion risk unless substantial soils improvements were undertaken.

Careful identification of the limitations and undesirable attributes associated with inferior soil resources is essential to ensure only the least hostile and therefore most appropriate media are selected, and that such materials are used in accordance with their capability (i.e., capable of sustaining the end use to which they are put)

For most rehabilitation situations, subsoil clays with elevated levels of soluble salts (e.g., soluble chloride contents >300-600 ppm or EC1:5 >0.6 dS/m), such as areas of soil Eb2, are not recommended for salvage. Reinstatement of such materials, particularly as surface materials, will typically be subject to poor physical behaviour (sodicity, dispersion and coarse/dense structure) and limited plant establishment. Cumulatively, these effects restrict the development of ground and canopy cover and slow water relations and structural recovery in the surface soil. Such effects impact significantly on rehabilitation outcomes at a site by increasing both erosion risk and the potential for localized rehab failure.

Where available soil mapping indicates high levels of subsoil salinity or sodicity may be present or significant spatial variability in salinity or sodicity levels exists, localized field testing of materials prior to salvage is recommended.

3.4 Depths of Soil Reuse Recommended

Detailed soil descriptions in Section 2.4 include a summary of soil properties, recommended stripping depth and management issues for soil reuse within mine rehabilitation processes. These are summarised in Table 4. Areas of some soils are not recommended for reuse or stockpiling due to adverse soil or land properties. These are also included in Table 4 as well and discussed below.

Reuse of material from soil Gc1 is not recommended due the amount of surface 'rocks' and shallow depth to hard rock. Reusing material from the cracking clay soil Eb2 is not recommended due to the shallow depth to sodic and saline subsoil. Effectively and practically removing the topsoil for reuse without incorporating the sodic or saline material will be very difficult due to the depth and amount of melon-holes over most of the area of this soil.

The main limitation to soil reuse from most of the soils within the EPC1690 area is variable depth to hard sandstone or manganese pan. Depth to saline or sodic subsoil will limit depth of useable material from Tm1, Tm4, Eb1 and Eb3 soils while depth to strongly alkaline soil will limit the depth of useable material from soil Cr3.

All soils have high fine sand contents throughout the recommended maximum depth for reuse. Any salvaged material is likely to be subject to slaking, sealing and have poor physical properties due to this very high fine sand content and is therefore recommended for reuse only on very gentle slopes. **Design of stockpiles must consider this soil property to ensure side-slope stability and minimise susceptibility to failure due to erosion risk.**

3.5 Mine Design Considerations

The high fine sand content of the surveyed topsoils combined with very poor structure and low organic matter results in the soils having poor structural integrity. This can result in rapid bulldust formation when dry which will in turn create trafficability problems, particularly for heavy vehicles. When wet, bogging of vehicles and otherwise low trafficability are likely. Any design process should consider that the soil material is prone to bulldust formation in dry conditions and becomes spewy and boggy in wet conditions. Indeed any on-site infrastructure should be appropriately engineered and designed so that the very fragile physical nature of the soil material is considered.

Detailed engineering designs of any spoil heaps or other structures to minimise slope length and slope angle should be undertaken so that potential water erosion is minimised. Structures such as appropriately designed water ways and contour banks to direct water along the slopes rather than down the slopes would be beneficial.

Adequate and appropriate water supplies, spray-on chemicals or techniques should be investigated to minimise water erosion, bulldust formation and associated trafficability and dust control difficulties.

Table 4 Soil reuse recommendations for EPC1690 area[1]

Soil	Two stage process		Single stage reuse	Comments
	Primary growth media	Secondary growth media		
Gc1				Not recommended for reuse due to shallow, rocky soil
Gc2	0.20 m	0.40 m	0.40 m	Not recommended for reuse > 0.40 m due to variable underlying rock.
Lb1	0.20 m	0.40 m	0.40 m	Not recommended for reuse > 0.40 m due to variable underlying rock.
Lb2	0.20 m	0.40 m	0.40 m	Not recommended for reuse > 0.40 m due to variable underlying rock.
Lb4	0.20 m	0.70 m	0.70 m	Not recommended for reuse > 070 m due to variable underlying rock.
Ln	0.20 m	0.40 m	0.40 m	Not recommended for reuse > 0.40 m due to variable underlying rock.
Tm1	0.20 m	0.90 m	0.90 m	Not recommended for reuse > 0.90 m due to sodic/dispersive subsoil or underlying rock.
Tm2	0.20 m	1.00 m	1.00 m	Not recommended for reuse > 1.00 m due to variable underlying rock.
Tm4	0.10 m	0.30 m	0.30 m	Not recommended for reuse > 0.30 m due to sodic/saline subsoil.
Mr2	0.20 m	0.60 m	0.60 m	Not recommended for reuse > 0.60 m due to variable underlying rock.
Eb1	0.20 m	0.40 m	0.40 m	Not recommended for reuse > 0.40 m due to sodic/saline subsoil.
Eb2				Not recommended for reuse due to shallow depth to saline/sodic subsoil and depth and frequency of melon holes.

[1] Recommendations are based on results of a medium intensity scale soil survey. More detailed soil surveys should be undertaken on specific areas to be disturbed once these are finalised, to provide sufficient data for appropriate topsoil management plans for each area.

All soils except Gc1 and Eb2 have high fine sand contents throughout the recommended maximum depth of reuse. Any salvaged material is likely to be subject to slaking, sealing and have poor physical properties due to the very high fine sand content and is therefore recommended for reuse only on level to very low slopes.

Soil	Two stage process		Single stage reuse	Comments
	Primary growth media	Secondary growth media		
Eb3	0.10 m	0.30 m	0.30 m	Not recommended for reuse > 0.30 m due to possible saline/sodic subsoil.
Mb2	0.30 m	0.90 m	0.90 m	Not recommended for reuse > 0.90 m due to high fine sand content.
Mb3	0.30 m	0.90 m	0.90 m	Not recommended for reuse > 0.90 m due to high fine sand content.
Mb4	0.30 m	0.90 m	0.90 m	Not recommended for reuse > 0.90 m due to high fine sand content.
Cr1	0.30 m	0.90 m	0.90 m	Not recommended for reuse > 0.90 m due to high fine sand content.
Cr3	0.30 m	0.70 m	0.70 m	Not recommended for reuse > 0.70 m to avoid strongly alkaline subsoil.
Cr4	0.30 m	0.90 m	0.90 m	Not recommended for reuse > 0.90 m due to high fine sand content.

4 Agricultural Suitability

4.1 Agricultural Assessment Methodology

The EPC1690 area is outside of the reliable rainfall zone for 'rainfed' (dryland) cropping and also outside the recently introduced Strategic Cropping Lands identified by the State Government. For this study, agricultural suitability analysis is restricted to Grazing Suitability.

Grazing suitability is defined in terms of the ability of the pasture system to produce grassfed, export quality cattle >600 kg live weight at 2–3 years of age, with 12-18 mm of rump fat without inputs other than pasture development. Success in this regard is directly dependent on the plan of nutrition cattle receive from weaning through to finishing, which in turn is dependent on the level of inherent soil fertility driving the system.

The framework of QDME 1995 is the basis for assessing Grazing Suitability for this report as per the ToR outlined previously (see section 1.1). A more specific grazing suitability scheme was being developed by the former Queensland Government Department of Environment and Resource Management (DERM), but after discussions with DERM it was recognised for this project the QDME 1995 suitability scheme should be used as the newer version has not been published to date. However, the newer Grazing Suitability Scheme of Burgess (in prep) has more definitive classes for water availability (m) and Nutrient deficiency (nd) limitations. After discussions with DERM staff, these newer classes for both m and nd were adopted in this study instead of those defined in QDME 1995.

A grazing suitability classification assumes pasture improvement has been undertaken, particularly the establishment of a legume component on all sandy or loamy surfaced soils, and that the pasture system is well managed and in good condition, in a "normal season" and without significant regrowth. However, there are significant vegetation management issues that have been identified within the EPC1690 area, such as management of wattles and weeds such as currant bush and flannel weed and legumes have not been introduced into the more sandy soils.

Pre-mining agricultural potential has been assessed within the EPC1690 area using a five class land suitability classification (Land Resources Branch Staff (1990), QDME (1995)). The five classes used in this study are taken from the QDME 1995 guidelines which in turn are based on the 1990 DPI Guidelines. The classes adopted for this study are outlined in **Table 5** below.

Land is considered less suitable as the severity of limitations for a land use increase.

Increasing limitations may reflect either:

a) reduced potential for production; and/or

b) increased inputs to achieve an acceptable level of production; and/or

c) increased inputs required to prevent land degradation.

Table 5 Definition of Agricultural Land Suitability Classes (ALC) 1995 Guidelines

Agricultural Land Class	Definition
Class 1	**Suitable land with negligible limitations** that is highly productive and requires only simple management practices to maintain economic production
Class 2	**Suitable land with minor limitations** which either slightly reduce productivity or require more than the simple management practices of Class 1 to maintain economic production

Agricultural Land Class	Definition
Class 3	**Suitable land with moderate limitations** which either further lower productivity or require more than the management practices of Class 2 to maintain economic production
Class 4	**Marginal land with severe limitations** which make it doubtful whether the benefits from the activity will outweigh the inputs/costs required to achieve and maintain production in the long-term
Class 5	**Unsuitable land with extreme limitations** that preclude its use.

Suitability classes 1 to 3 are considered suitable for a specified land use because the benefits from using the land for that use outweigh the inputs required to initiate and maintain production. Typically, the benefits from using Class 4 land approximate the inputs required for production and its long-term suitability for the specified land use is doubtful, due either to increasing costs and/or increasing land degradation. Class 4 is also used in situations where reducing the effect of a particular limitation may suggest production is possible, but additional studies are needed to determine the feasibility of such actions (e.g., leveling of melon holes may assist cultivation and wetness problems but subsoil salinity levels require investigation).

In contrast, Class 5 land has limitations that in aggregate are so severe that the benefits are unlikely to ever justify the inputs required to initiate and maintain production. It would require a major change in economics, technology or management expertise before Class 5 land could be considered suitable for a particular land use. Many Class 5 lands have physical characteristics that totally preclude any form of development (e.g., mountains or eroded areas) and will always remain unsuitable for agriculture.

The suitability framework for Grazing outlined in QDME 1995, assesses land using limitations. These are outlined in **Table 6**.

Table 6 Limitations for Grazing Suitability Assessment

	Symbol
Water availability	m
Nutrient deficiency	nd
Soil physical factors	p
Salinity	Sa
Rockiness	R
Microrelief	g
pH	pH
ESP	ESP
Wetness	w
Topography	t
Water erosion	e
Flooding	f
Vegetation management	vm

The class definitions for each limitation are as per the QDME 1995 Guidelines, with the exception of both the Water availability (m) and nutrient deficiency (nd) limitations which are based on the updated classed of Burgess (in prep. 2011).

Water availability limitation (m) is based on PAWC and soil permeability classes.

The estimated Plant Available Water Capacity (PAWC) of the soils, which was not directly measured in the field, is an important soil property considered as part of the agricultural suitability assessment. However, it is notoriously difficult, time consuming and costly to measure in the field for most soils. Therefore, it is often estimated from soil morphology and chemical data.

In this study, PAWC was estimated separately for each soil, based on the average or mean soil properties recorded on the morphological descriptions of the soil profiles described. The average or mean morphological soil properties used in this estimation are the lower depth, texture and structure of the A and B Horizons.

The Effective Rooting Depth (ERD) was determined for each soil by:

- Depth to hard pan or weathered or hard rock
- Depth to high salinity (EC > 1 dS/m or Cl > 600 ppm)
- Depth to high sodicity (Exch.Na > 6 per cent of CEC if CEC >5 meq per cent and Ca:Mg < 1; or Exch.Na > 14 per cent of CEC)
- Depth to magnesium dominant clays (Ca:Mg ratio of < 0.5 if CEC >5 meq per cent and/or Mg+Na > 80 per cent of CEC)
- Where there is no restriction, the maximum rooting depth for pastures considered in this study is 100 cm, based on the assumption that Buffel grass is the main pasture species supporting beef cattle grazing.

The Total Available Water (TAW) as mm water per metre depth of soil was estimated for the A and B Horizon of each soil based on mean soil texture and structure using the TAW data from Table 29.3 in *Guidelines for Surveying Soil and Land Resources* (McKenzie *et al* 2008).

The estimated PAWC was then calculated as the sum of the estimated TAW to the ERD, and was added to the detailed data presented for each soil in Section 2.4 above.

The ERD is limited by depth to hard pan or decomposing or hard rock for moist soils formed on Dunda beds. The depth to high salinity or high sodicity limited the ERD for both the cracking clay Eb2 and the sodic soils Tm4, Eb1 and Eb3.

Estimated PAWC was limited by the depth of sandy textured horizons in many soils, such as Lb4 and Mb2, Mb3 and Mb4 as well Cr1.

The results for estimated PAWC was very low for soils such as Gc1 (5 – 25 mm), ERD limited by soil depth and Tm4 (24 – 60 mm) limited by subsoil chemistry. It was moderate to high for soil Cr3, (114 – 128 mm)and 108 – 112 m for Cr4.

Although PAWC is an important concept in determining water available in the soil for plant growth, the amount of water intercepted, trapped and stored within the root zone compared with the amount lost to deep drainage determines the level of stored moisture available for plant growth (Burgess in prep.). The quantity of water that reaches the soil surface is a function of rainfall, evaporation and runoff, while the rate of water entry and downward drainage is dependent on the infiltration rate of the surface soil and the permeability of the least permeable layer within the soil (usually the subsoil) respectively. Surface texture, clay mineralogy, structural development, pore size, total pore space and structural stability of the soil surface are particularly important in this process.

Because PAWC by itself does not account for the rate of water entry into the soil (water infiltration) or losses in potential stored moisture associated with excess runoff and long-term deep drainage, qualitative descriptors to account for these factors have been added to the water availability limitation (m) within the suitability framework (based on Burgess in prep.). The descriptors use a combination of surface structure, surface texture and surface condition to describe relative differences in infiltration and runoff response between soils.

Sandy (where the soil surface does not readily seal after rainfall) and self-mulching descriptors are assigned to soils where runoff losses are minimal and infiltration rates do not restrict the ability of the soil to achieve its full PAWC when adequate rainfall is received. In contrast, soils assigned a hardsetting to weakly self-mulching description or suffer significant runoff losses when subject to the same rainfall conditions rarely achieve PAWC because of water entry restrictions associated with slow infiltration rates. Similarly, soil permeability descriptors based on the classes of National Committee on Soil and Terrain (2009) have been used to separate slowly drained soils (e.g. sodic texture contrast soils and clays), where long term deep drainage is minimal, from freely drained soils where PAWC losses may continue indefinitely. Most soils of the EPC1690 area have bulldust surfaces which will seal after rainfall.

The Nutrient deficiency limitation (nd) is based on results of surface fertility analysis of representative soil profiles for most soils. Where no samples were analysed soil fertility status was assumed from the analysis of samples from similar soils or from previous experience. For example, deep massive sandy red or yellow soils with wattles and Calytrix are highly leached soils very low in fertility.

Nitrogen and phosphorus are the dominant nutrients controlling grazing productivity in the Bowen Basin and combined levels of these two nutrients provide a useful framework for evaluating overall nutrient availability. Soil analyses that are important to determine limitation classes include Bicarb or Colwell Phosphorus which estimates Phosphorus availability for plant growth and total Nitrogen to determine Nitrogen availability. Calcium also needs to be considered both as an essential nutrient for plant and animal growth and also as an indicator of leaching history and current leaching status within the soil. Available calcium from cation analysis provides a good indicator of soil calcium status.

4.2 Agricultural Assessment results

The results of agricultural suitability analysis for each soil identified in this study are included in the detailed descriptions in **Section 2.4.** Results for individual mapping units or UMAs as mapped at the medium intensity scale of this report are provided in the UMA data file, which is presented in **Appendix IV**. Areas of grazing suitability classes within EPC1690 and their definitions are presented in **Table 7**.

Most of the soils of the EPC1690 area are classified as Class 4 or 5 for Grazing, which is marginal to unsuitable land for production of export quality cattle but suitable to marginal for cattle breeding. This class of land is often referred to as Cattle Breeding Country. Class 5 land is typically only utilized for cattle breeding over the wet season and destocked over the dry season, unless it is utilized with other land in the same paddock.

Table 7 Grazing Suitability Analysis Results

Results of Grazing Suitability analysis	
Class 1 - Land suitable for the production of 2 year old, grassfed, export quality cattle in all seasons	0 Ha
Class 2 - Land suitable for the production of 2-3 year old, grassfed, export quality cattle in most seasons	0 Ha
Class 3 – Suitable land for the production of 2-3 year old, grassfed, export quality cattle, but only in good seasons	964 Ha
Class 4 - Marginal land for production of export quality cattle, but suitable as breeding country all year round	18 502 Ha
Class 5 Unsuitable land for production of export quality cattle and marginal as breeding country all year round	6 549 Ha
Total Area	**26 015 Ha**

The main limitations for grazing that result in an assessment of Class 4 or 5 for most soils are water availability (m) due to low estimated PAWC and water entry, nutrient deficiency (nd) for soils such as the deep massive sandy soils, and vegetation management (vm) for soils with significant wattles or other shrubs or currant bush growth. Soil Eb2 has limitations of salinity (sa), and pH which also places it in Class 4. Mapped areas (UMAs) of soil Eb3 vary from Class 3 or Class 4 due to the variable levels of subsoil salinity, and hence salinity limitation.

Areas of Class 3 land – suitable for production of export cattle in good seasons are mostly restricted to better soils associated with Carmichael River levee. These soils have higher estimated PAWC and good fertility. Their extent over the EPC1690 area is minor compared to the other soils.

4.3 Assessment of Land Condition

The EPC1690 area is within the Burdekin Dry Tropics Rangelands as the Carmichael River is a tributary of the Belyando River which is in turn a tributary of the Burdekin River. An assessment of Land Condition for each soil and UMA was undertaken using the standards for the Burdekin Dry Tropics (Karfs *et al* 2009).

Land Condition assessment is based on the ability of the land to respond to rain and produce useful forage for beef cattle grazing.

Assessment of Land condition is based on a combination of pasture density, pasture type, ground cover, soil condition and presence and density of introduced weeds (but also including native plants that can impede pasture production). Soil condition assessment includes erosion susceptibility, nature and severity of active soil erosion and degree of transported material. Karfs *et al* (2009) provides photos of each land condition for the 15 major land types (based on vegetation, geology and soils) of the Burdekin Dry Tropics Rangelands.

There are four land condition classes in the Land Condition Suitability Framework, using an A, B, C, D system. These are defined in general terms in **Table 8,** as well as the area of each class mapped in this study**.** Note that this assessment relates to utilising land for beef cattle grazing and does not provide a general ranking based on environmental condition of the land at the time of survey.

Table 8 Land Condition Classes for the Burdekin Dry Tropics Rangelands

Condition rating	General description	Area mapped
A	High density and coverage of preferred grasses	522 Ha (or 2 %)
B	Moderate density of preferred or high density of intermediate grasses.	5 112 Ha (or 20 %)
C	Moderate to low density of preferred grasses or moderate density of intermediate grasses. Higher numbers of annual grasses and forbs, some woody thickening.	16 713 Ha (or 64 %)
D	General lack of any perennial grasses or forbs or severe erosion and large bare areas or high numbers of weeds/annuals or thickets of woody plants covering much of the area	3 668 Ha (or 14 %)
	Total	26 015 Ha

The class of Land Condition assessed in the field for each UMA and soil is included in the detailed soil descriptions given in Section 2.4 and in the UMA database given as Appendix IV.

Most of the EPC1690 area is assessed as Land Condition C. This land class has high proportions of black spear grass but moderate proportion of non-preferred grasses such as wire grasses or soft spinifex. The presence of currant bush in many localities also downgrades the land condition class. Thick wattles and shrubs with little grass cover on areas of deep, red or yellow sandy soils and shallow rocky areas downgrades these areas to Land Condition D

Soils Eb2 and Eb3 with black spear grass cover and some buffel grass with weeds such as currant bush or Parthenium weed (Eb2 only), often with Brigalow regrowth, are assessed as Land Condition Class B,. Only some areas of soil Eb2 without weeds or brigalow regrowth is assessed as Land Condition A.

5 Post Mining Land Use

Post mining land use is likely to be restricted to Cattle Breeding Country, given the physical properties of the soils, the difficulty of ameliorating those physical properties, and the lack of reliable rainfall or irrigation water. With regard to the depths of soils deemed suitable for reuse and excepting those soils deemed inappropriate for reuse in Table 4 or mapped as 'E' for existing erosion in Figure 1, the following reuse recommendations apply.

An elevated risk of erosion exists due to the high fine sand content of the majority of soils surveyed, making them prone to slaking, sealing and crusting. Erosion control measures will be required prior to achieving stabilisation. The sodic or saline subsoils observed in soils Tm1, Eb1 and Eb3 may exacerbate these physical problems, if reused.

Amelioration of the adverse physical properties of the soil is likely to be difficult and costly, given the remoteness of the site, size and transport cost of equipment, and difficulty of access especially after significant rainfall. However, if amelioration is performed, reinstatement may be possible at slopes up to 10 per cent. Any final rehabilitation structures should take into account the mine design considerations in Section 3.5.

Amelioration options include the following:

- Conduct insitu soil conditioning and productivity trials prior to stripping in order to inform rehabilitation and stockpile management methodologies.
- Encourage growth of grass or native vegetation species by direct seeding of the soil surface or application of seed in geotech mats. This measure will help to stabilize the soil surface.
- Apply mulch or woodchips from any cleared timber or native vegetation as a mix within the soil or as a surface layer of maximum practical thickness, to increase soil organic matter and encourage development of micro flora and fauna within the soil. This measure will help to offset poor physical properties of the soil.
- Whatever organic matter can be practically and cost-effectively sourced, to further add this matter to the mix or apply as a surface layer would also be beneficial.

Watering will be required for the establishment of grass or native vegetation and to encourage activity of soil microbes. Watering may present challenges due to the physical properties of the soil and the procurement of water. Application of fertiliser will also encourage growth of grass or native vegetation and the activity of soil microbes.

6 Conclusions

Data and results from a medium intensity (scale 1:100 000) soil survey over the 26 015 ha of EPC1690 shows:

- Ironbarks and Reid River Box with desert oak understorey and black spear grass, wire grasses is the most common native vegetation. Soft spinifex, buffel grass and currant bush also occur, with wattles and shrubs dominating on deep leached sandy soils.
- 19 soils were mapped with differing soil morphology and chemical properties.
- Most soils have loose, high fine sand surfaces which are prone to forming bulldust once disturbed.
- Most of the land has been assessed as Cattle Breeding Country, Grazing suitability classes 4 or 5
- Most of the land is assessed as Land Condition Type C within the Burdekin Dry Tropics Rangelands.
- Most salvageable material is recommended for reuse only on very gentle slopes.

More detailed surveys are required over specific areas to be disturbed by mining operations to more accurately define topsoil management plans and depth of useable soil material.

Similarly with the inclusion of the EPC1080 area it is proposed that additional surveys be undertaken to define these areas.

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Appendix I Soil profile descriptions from ground observations

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	1	McCJI	16-Aug-2011	Lb1	Rld	434377 E	7566197 N	C	Lixisols			KA	AA	AG	CD	B	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		I	H	99	99	w1.0	7SEucreb, Eumel, Codall		

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	A	Notes	
					C	HCR		RIS		0	1	4	5	Red earth. V.hard/dry. Ironbark, Ghostgum. Site on edge of broad HCR/Rise. Unit: PK3?					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS			V	0	0		D6
B2		0.20	1.35	2.5YR 4/6	0	FSLC			V	0	0		P6

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.8		6.8		6.8		6.8		6.8										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	2	McCJI	16-Aug-2011	Lb1	Rld	435328 E	7565833 N	C	Lixisols			KA	AA	AG	CD	B	E	M	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		I	H	1	99	w1.0	7SEucreb, Eumel, Codall		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Red / yellow earth. Similar LF veg to last site. More buffel growing here though but also curant bush in thick patches. Looks like ZS stopped auger from 1.15 m. Minor gidgee clay in unit as weel.					
				SE	M	HSL		RIS		0	2	4	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20			CLFS			V				
B21		0.20	0.80	5YR 4/4		FSLC			V				
B22		0.80	1.15	7.57R 5/6		FSLC			V				
BC?		1.10	1.15	7.5YR 6/6	33DR	FSLC		22AZSV	V	2MN1			
C/R		1.15				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.8		5.8		6.8		6.8		6.8										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	3	McCJI	16-Aug-2011	Lb2	Rld	436318 E	7565684 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0			H	99	99	w1.0	7SEucreb, Eumel, Codall		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Similar to last 2 sites but slope to E. to low flat which is outside project area					
				E	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	FSCL		0	V				
B		0.20	0.60	10YR 6/6	0	FSC		0	V				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.5		6.0		6.0														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	4	McCJI	16-Aug-2011	Lb1	Rld	433059 E	7564048 N	C	Lixisols			KA	AA	AG	CD	B	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucreb, Eumel, Codall		
																			s3.0	4MAccor, Coesta, Flmac		
																			g1.0	3SAristiaspp, Hecont, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%											very deep, red soil on SA Creek line realy shows some SA cobbles associated & red clay baked (hard). Lots of bare/red surface. Site near Red Hill Road turnoff. Not as dry or hard as previous sites. Broad HCR or rise.					
					C	HCR		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.10	2.5YR 4/4	0	CLFS		0	V	0			
B21		0.10	0.35	10R 4/6	0	FSLC		0	V	0			
B22		0.35	1.60	10R 3/6	0	FSLC		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.8		6.5		6.5		6.5		6.8		6.8								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	5	McCJI	16-Aug-2011	Lb2	Rld	433160 E	7563315 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		I	H	1	99	w1.0	7SEucreb, Eumel, Codall		
																			s3.0	4MAccor, Coesta, Flmac		
																			g1.0	3SCecill, Aristidaspp, Hecont, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	A	Notes	
Eval	Height (m AHD)	Eval	%											Appears slightly lower cf last site. Good buffel grass. Yellow ant hills. Almost pure Ironbarks here. Odd flannel weed along roadside. Yellow version of last site - but SA from 70 cm					
				SE	L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS			V	0			
B2		0.20	0.70	10YR 6/4	0	FSLC			V	0			
BC		0.60	0.70		0	FSLC		32ASA	V	0			
C/R					0	RSA				0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.06		0.06		0.05														
Field pH (1:5)				7.0		7.0		6.8														Odd flannel weed along roadside. Yellow version of last site, but Sandstone @70cm.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	6	McCJI	16-Aug-2011	Lb2	Rld	432934 E	7562472 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		I	H	0.90	99	w1.0	7SEucreb, Eumel, Codall		
																			s3.0	4MAcspp, Coesta, Flmac		
																			g1.0	3SCecill, Aristiaspp, Hecont, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	A/B	Notes	
Eval	Height (m AHD)	Eval	%											No change site 5 south to site 6. Same vegetation but more shrubs *Acacia* Spp. Good grass cover but includes black spear grass. Hard SA at 0.90 m.					
				SE	L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS		0	V	0			
B2		0.20	0.75	10YR 6/6	0	FSLC		0	V	0			
BC		0.75	0.90		0	FSLC		0	V	0			
C/R		0.90			0	RSA		0					

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.04		0.04		0.04		0.04												
Field pH (1:5)				6.6		5.5		5.8		6.7												
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	7	McCJI	16-Aug-2011	Gc2	Rld	432441 E	7556997 N	C	Arenosols	ab,eu		TE	GZ	CZ	AR	D	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	1	99	w1.0	7SEucreb, Eumel, Coclark		
																			s3.0	4MAcspp, Sicor		
																			g1.0	3SAristiaspp, Hecont		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											RSA @ 75cm. Good grass cover but thick flanel weed. Wattle regrowth. Sit on mid to lower HSL of long gentle slope to the east.					
		E	1.5	E	M	HSL		RIS		0	3	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10	7.5YR 6/3	0	FSL		0	G	0			D0
A21		0.10	0.60	7.5YR 6/4	0	FSL		0	G	0			D0
A22e		0.60	0.75	10YR 8/3 (d)	0	FSL		31RQZ	G	0			D0
C/R		0.75				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
Lab EC				0.05		0.03		0.02														
Field EC				0.05		0.03		0.02														
Field pH (1:5)				5.9		6.2		6.5														
CEC				3.6		2.2		2.0														ESP or Ca:Mg ratio is not calculated for soils with CEC < 5.0
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	8	McCJI	16-Aug-2011	GC1	Rld	431504 E	7556807 N	C	Leptosols			RU	CY	CZ		F	K	T		

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				2	4	A	SA	0		I	S	0.25	99	w1.0	7SCobrach, Eusim		
																			s3.0	4DAcspp, Grevspp, Alphexcel		
																			g1.0	3SAristiaspp,		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Coarse grained sandstone @ 25cm. Site on edge of broad HCR of significant rise. No buffel grass = no fertility? Very coarse sandstone / almost conglomerate.					
					C	HCR		LOW		0	5	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A/C		0.00	0.25		0	LS		12ASA	G	0			
		0.25			0	RSA							

Test depth (m)		0.02		0.10		0.25		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP						5.2																
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	9	McCJI	17-Aug-2011	Lb2	Rld	435607	7567130 N	P	Lixisols			KA	AC	AG	CD	B	E	M	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0				99	99	w1.0	7SEucreb, Eumel, Coclark		

Elevation		Slope																			
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
					H	HCR		RIS		0	2	3	4	Excavation at camp site. Variable depth to Fe / Mn pan. Bulldust surface here. Ironbark veg. Site on edge of broad HCR					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.25		0	CLFS		0	V	0			
B2		0.25	0.50	10YR 6/6	22DR	FSLC		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP						6.0																
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	10	McCJI	17-Aug-2011	Lb4	Rld	432096 E	7559526 N	C	Arenosols			TE	CY	CZ	AR	B	E	L	L	U

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		I	H	0.50	99	w1.0	7SEucreb, Eumel, Codall		
																			s3.0	3SAcspp, Caovata, Sida spp		
																			g1.0	3SHecon, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Hard sandstone @ 50cm. Bulldust soil. Flannel weed. Good grass cover but species bad. Black spear grass. Kangaroo grass.					
		A	2.0	S	L	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20	10YR 5/4	0	FSL			V	0			
B		0.20	0.50	10YR 6/4	0	FSL			V	0			
C/R		0.50				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.6		5.6		5.7														
Field EC																						
Field pH (1:5)																						T6v. Ironarks + few ghost gums. Midslope long gentle slope for red/fill to soutth and to the east. Comet bush wattles.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	11	McCJI	17-Aug-2011	Tm2	Rld	432375 E	432375 E 7558999 N	C	Luvisols			CH	AC	AG	AZ	C	E	M	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		I	H	1.35	99	w1.0	7SEucreb, Eumel, Eubrownii		
																			s3.0	3SGrglauca, Caovata		
																			g1.0	3SHecon		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Buffle - reasonable. Spear grass. Currant bush . Ironbark/ Reid River Box.Bulldust surface. Mid to lower HSL of long gentle slope. Hard SA from 1.35 m					
		A	2.0	SE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.25	10YR 5/2	0	CLFS			V	0			
A2e	A	0.25	0.35	10YR 8/4 (d)	0	CLFS			V	0			
B21t		0.35	0.75	10YR 6/4	33DB	LMC			S5PR	0			
B22t		0.75	1.35	10YR 5/4	0	LMC		11ASA	V	0			
C/R		1.35				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.04		0.01		0.09		0.40		0.69										
Field pH (1:5)				5.7		5.7		6.5		7.0		7.6										Hard sandstone @ 1.35m. Mid to lower HSL of long gentle slope.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	12	McCJI	17-Aug-2011	Ln	Rld	432968 E	7559296 N	C	Nitisols			DE	AA	AG	CD	B	F	O	O	U

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				2	4	A	SA	0		4	H	0.50	99				

Elevation		Slope			Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Broad HCR rise on sandstone. Cleared - some Emu Apple, currant bush, partchy buffle. Other grasses. Different rise to last site					

Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage
C	HCR		RIS		0	2	3	4

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.10		0	FSLMC			M4AB				
B		0.10	0.50	5YR 4/4	0	FSLMC		22ASA	S4AB				
C/R		0.50				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.8		6.8																
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	13	McCJI	17-Aug-2011	Lb2	Rld	433730 E	7558877 N	C	Lixisols			KA	AB	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0	1	S	SA	0		4	H	0.60	99				
									1													

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Lower HSL below site 12. Edge of gilgai brigalow to east. Near drill pad C008. Buffel with currant bush.					
		A	1.5		L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.10		0	FSLC		0	V	0			
B21		0.10	0.35	10YR 5/4	0	FSLC		0	W4AB	0			
B22		0.30	0.60	10YR 6/4	0	FSLC		11ASA	W4AB	0			
C/R		0.60				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		7.7		8.8														
Field EC						0.03		0.14														
Field pH (1:5)						7.2		7.2														
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	14	McCJI	17-Aug-2011	Eb2	Qs	435778 E	7560864 N	C	Vertisols			VE	AA	GS	GG	E	S	S	W	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
M	B	1.2	25	M	0				0				0		4	H	1.20	99				
																G						

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%											Cleared brigalow / gidgee melon hole clay. Regrowth of brigalow reasonably thick. HS - no SM surface. Buffel grass looks reasonable but not much growing in depressions.					
					F	PLA		PLA		2	2	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.10		0	MHC		0	S4AB				D6
B21		0.10	0.60	5YR 4/4	0	MHC		0	S5LE	2KN3	K3P		D6
B22		0.60	1.20	5YR 6/6	22DG	MHC		0	S5LE	2KN3/2YX1	K3P		D6
C/R		1.20				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.35		1.83		2.03		1.63		2.04										
Field pH (1:5)				7.2		7.3		4.0		5.6		5.3										Near drill pad C006. B5 - surface salt from erosion line. Field EC: 1.06. Field pH: 8.4
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	15	McCJI	17-Aug-2011	Lb2	Rld	434704 E	7559873 N	C	Luvisols			DE	AC	AF	DQ	C	E	M	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	1.20	99				

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
					L	HSL		RIS		0	2	3	4	Cleared Ironbarks ?? Soil profile looks similar to site 9 at camp? Reasonable buffel but 30-40% currant bush here. ?? Note structure in the B horizon of this profile Tm2 but not a good fit Lm2 but not a good fit - stuctured B Hard SA at 1.2 m			

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10	7.5YR 5/4	0	SCLFS			V				
A3?		0.10	0.60	7.5YR 6/6	0	CLFS			V				
B2		0.60	1.20	7.5YR 7/8	32DR	FSLC		11ASA	S4P0	1MS2			
C/R		1.20			21DG	RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5		6.5		7.0		7.8										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	16	McCJI	17-Aug-2011	Lb2	Rld	434003 E	7559878 N	C	Lixisols			KA	AB	AG	CD	B	F	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				2	4	A	IS	0		4	S	1.00	99				
									2	2	A	IS										

Elevation		Slope												Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Broad HCL flat slightly higher than site 15. wire grass, black spear grass, grader grass? and kangaroo grass. Bulldust soil SA at 1.0,					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15		0	CLFS		0	V				
B21		0.15	0.40	7.5YR 5/4	0	FSLC		0	V				
B22		0.40	0.85	7.5YR 6/6	0	FSLC		0	V				
B3/BC		0.85	1.00	10YR 6/6	0	FSLC		21ASA	V				
C/R		1.00				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.8		6.0		6.5		6.8												
Field EC																						
Field pH (1:5)																						Bulldust soil. Sandstone @ 1.00m. Cleared. Regrowth of AC. CORIACEA.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	17	McCJI	17-Aug-2011	Cr3	Qa	433796 E	7560739 N	E				RU	ER							

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Type	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					W	A	3	B	0				0		4	H	99	99				
					W	A	3	T														

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Eroded creek bank over Mn/Fe PAN @ 1.7m - photos. Layers of IS 5mm thick throughout profile. Soil doesn't fit main soil types - call it E area but call soil Cr3 over buried soil over Pan. Very dispersive subsoil - tunnel erosion					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.70	7.5YR 5/4	0	FSL		11AIS	V				
2Ab		0.70	0.80	10YR 4/2	0	CLFS		11AIS	V				
2Bb		0.80	1.70	10YR 6/6	0	MC		11AIS	S4AB				
		1.70								PSA			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.5		7.5		7.5		7.5		7.5		7.5								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	18	McCJI	18-Aug-2011	Eb2	Qs	434185 e	7564390 N	C	Vertisols	son, ha		VE	AD	GS	BN	E	Q	R	X	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
M	A	0.50	25	M	0				0				0		4	H	99	99				
																G						

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	A/B	Notes	
Eval	Height (m AHD)	Eval	%											Weakly cracking / HS. Cleared brigalow. Good buffle some prickly acacia though so weed control will be an issue Site located C021 bore pad. Sampled Some duplex soils associated.					
					F	PLA		PLA		0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
Aj		0.00	0.15	10YR 4/2		LMC		0					
B21		0.15	0.40	10YR 4/2		MC		0					
B22		0.40	0.60	10YR 4/2		MC		0	S5LE		K3P		
B23		0.60	1.00	10YR 4/2		MC		0	S5LE	2KN2	K3P		
B24		1.00	1.50	10YR 6/4	32FO	MC		0	S5LE	2KN2/2KS3	K3P		

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
Fileld EC				0.07		0.50		0.90		1.10		1.40		1.80								
Field pH (1:5)				6.0		8.8		9.7		9.7		9.8		9.5								
CEC				17		21		31		20		20		18								
Lab EC				0.07		0.23		1.05		0.98		1.21		1.31								
ESP				8		12		17		26		26		31								
Ca/Mg				2.0		2.1		2.6		1.6		1.3		0.8								

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	19	McCJI	18-Aug-2011	Eb3	Qs	435278 E	7563029 N	C	Solonetz			S0	AC	ES	AH	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				3	1	A	CH	0		4	H	0.60	99				

Elevation		Slope												Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Surface chert Patches better buffel as well. Bare patches here as well - crunched tip at 20 cm in first hole here Cleared Brigalow / Reid River Box and occassional Dawson Gum Minor cracking clay as well					
		A	1.5	NW	L	HSL		RIS		0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CL			W2PL	0			
B21		0.20	0.30	10YR 6/4	23FB	MC		21ACH	S5AB	0			
B22		0.30	0.60	10YR 4/3	0	MC		31ACH	S5AB	0			
C/R		0.60				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.12		0.96		1.73														
Field pH (1:5)				8.1		8.0		8.4														
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	20	McCJI	18-Aug-2011	Eb3	Qs	435515 E	7562425 N	C	Solonetz			S0	AB	ES	CV	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	0.90	99				

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											cleared brigalow. Currant bush. Sandstone stopped augter 90cm Long gentle slope to W from here. Some cracking clay and some sandier surface soils as well.					
				NE	L	HSL		RIS		0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.08		0	CLFS			V				
B21		0.08	0.40	10YR 5/3	0	LMC			S5AB	2MN1			
B22		0.40	0.90	10YR 5/3	0	MC			S5AB	2KN2			
C/R		0.90				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.10		0.08		0.24		0.39												
Field pH (1:5)				7.5		8.1		9.8		9.9												
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	21	McCJI	18-Aug-2011	Lb1	Rld	436465 E	7560004 N	C	Lixisols			KA	AA	AG	CD	B	E	M	M	U

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	0.50	99				

Elevation		Slope			Landform							Land use		Land condition	A	Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Element	Location	Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Site located on broad HCR - highest point of lease. Other than red soil in the SE of lease. SA stoped auger at 30 cm in first soil core. Ironbarks, buffel and currant bush - cleared on this side of the fence.					
					C	HCR		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15		0	CLFS		12ASA	V	0			
B2		0.15	0.40	5YR 4/4	0	CLFS		12ASA	V	0			
BC/B3		0.40	0.50		0	CLFS		32ASA	V	0			
C/R		0.50				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.8		7.8																
Field EC																						
Field pH (1:5)																						Some small silcret nodules on the edge of the road.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	22	McCJI	18-Aug-2011	Cr1	Qa	435944 E	7554974 N	C	Arenosols			TE	IO							

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	F	99	99				

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Levee from Carmichael R - broad flat. Very deep bulldust soil/ v fine sand throughout Surface is soft and easy to dig! Cleared - recently pulled Blue gum, pink bloodwood, Moreton bay ash. Also sally wattle, flannel weed and some buffel					
					F	LEV		ALP		1	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A	G	0.00	0.50	7.5YR 5/4	0	FSL		0	V	0			D0
2 B 21 b	G	0.50	1.40	7.5YR 5/4	0	LFS		0	V	0			D0
3 B 22 b		1.40	1.60	5YR 5/6	0	FSL		0	V	0			D0

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		7.0		7.0		7.0		7.0		7.0								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	23	McCJI	18-Aug-2011	Eb2	Qs	436196 E	7557336 N	C	Vertisols			VE	AB	GS	BN	E	S	S	X	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
M	B	1.0	2.1	M	0				0				0		4	G	99	99				
																H						

Elevation		Slope												Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	cleared Brigalow Melon hole grey cracking clay. HS surface. Reid River Box as well. Buffel not as thick + weeds - including Bauhinia regrowth and some prickly acacia. No obvius gypsum in profile.					
					F	PLA		PLA		0	2	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.10		0	MHC		11RLC	S4AB	0			
B21		0.10	0.70	2.5Y 5/3	0	MHC		11RLC	S5LE	2KN2	K3P		
B22		0.70	0.90	2.5Y 6/4	0	MHC		11RLC	S5LE	1KN1	K3P		
B23		0.90	1.30	2.5Y 6/4	0	MHC		11RLC	S5LE	1MN1	K3P		

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.12		0.15		0.29		0.76		1.57										
Field pH (1:5)				8.8		8.8		9.5		9.2		8.4										
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	24	McCJI	18-Aug-2011	Lb1	Rld	436226 E	7558168 N	C	Lixisols	le		KA	AA	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	0.95	99				

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	A/B	Notes	
		A	4.0	E	M	HSL		RIS		0	1	4	5	Sampled profile. Cleared. Grey bloodwood. Mid to upper HSL of small RIS. Buffel growing OK here. Weeds - desert Oak. Looks like hard SA stopped auger at 0.95 m.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15	7.5YR 8/3	0	CLFS		0	V	0	0	0	D4
B21		0.15	0.40	5YR 5/6	0	FSLC		0	V	0	0	0	D4
B22		0.40	0.80	2.5YR 5/6	0	FSLC		22ASA	V	0	0	0	D4
B3/BC		0.80	0.95	2.5YR 5/6	0	FSLC		32ASA	V	0	0	0	D4
C/R		0.95				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.0		7.0		7.0		7.0												
Field pH (1:5)																						
Lab EC				0.04		0.03		0.02		0.02												ESP or Ca:Mg ratio is not calculated for soils with CEC < 5.0
CEC				4		3		3		4												
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	25	McCJI	18-Aug-2011	Cr3	Qa	434128 E	7555773 N	C	Luvisols			DE	AB	AG	CD	B	E	N	N	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	99	99				

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Cleared - leapordwood regrowth now though with currant bush. Buffel grass but also with odd brigalow regrowing. Small backplain or depression - almost swamp but dried out ? within Carmichael River Levee.					
					D	BRP		ALP		1	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.25		0	ZC		0	S4AB	0			
B2		0.25	0.90	7.5YR 5/4	0	ZC		0	S4AB	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		7.0		7.5		8.0												
Field EC																						
Field pH (1:5)																						Profile does not really fit any other Levee soil described in this survey
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	26	McCJI	19-Aug-2011	Cr3	Qa	437364 E	7556574 N	C	Luvisols			CH	AA	AH	CD	B	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	99	99				

Elevation		Slope			Landform												
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Element	Location	Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
					L	LEV		ALP		1	2	3	4	Not bleached A2. Cleared - Bauhinia now with old brigalow / gidgee. Some weak surface cracking but profile looks duplex. Buffel very poor and patchy with lots of currant bush here Backlope of Carmichael River Levee					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10		0	CLFS		0	V				
A2		0.10	0.25		0	CLFS		0	V				
B21t		0.25	0.60	5YR 4/4	0	FSMC		0	S4AB				
B22t		0.60	1.00	5YR 5/4	0	FSMC		0	S4AB	1KN2			
B23t		1.00	1.20	5YR 4/4	0	FSMC		0	S4AB	2MN1			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.7		8.1		9.2		8.9		9.1										
Field EC				0.05		0.10		0.62		1.27		1.01										
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	27	McCJI	19-Aug-2011	Cr3	Qa	433608 E	7555466 N	C	Luvisols			CH	AA	AH	CD	B	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	99	99				

Elevation		Slope												Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Similar soil to 26? Buffel with pare patches. Leopardwood and currant bush Dry and very hard below 0.9 m depth. Site on rise and backslope of Carmichael River Levee					
		A	2.0		R	LEV		ALP		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20	2.5YR 4/4	0	CLFS		0	V				
A2		0.20	0.30	5YR 7/6 (d)	0	CLFS		0	V				
B21t		0.30	0.70	5YR 4/4	0	FSMC		0	S4AB				
B22tk		0.70	1.20	7.5YR 6/6	0	FSMC		0	S4AB	2KN2			
B22t		1.20	1.50	7.5YR 6/6	0	FSMC		0	S4AB				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.03		0.09		0.20		0.31		0.38		0.40								
Field pH (1:5)				7.1		7.8		9.0		9.6		9.8		9.8								
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	28	McCJI	19-Aug-2011	Cr1	Qa	438915 E	7555962 N	C	Arenosols			TE	IR							

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	F	99	99				

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	A	Notes	
					F	LEV		ALP		1	2	4	5	Carmichael R levee soil. Good buffel grass. Cleared. Some EUTES / CODAL. Large sandalwood. Good buffel grass though patchy. Sampled					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20	7.5YR 5/4	0	FSL		0	V	0	0	0	D0
A3		0.20	0.90	7.5YR 5/6	0	FSL		0	V	0	0	0	D0
B2		0.90	1.50	7.5YR 6/6	0	FSL		0	V	0	0	0	D0

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
Lab EC				6.6		7.0		7.0		7.0		7.0		7.0								
Lab EC				0.08		0.03		0.02		0.02		0.02		0.02								
Field pH (1:5)																						
CEC				5		4		3		3		3		2								ESP or Ca:Mg ratio is not calculated for soils with CEC< 5.0
ESP				1.0																		
Ca/Mg				2.9																		

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	29	McCJI	19-Aug-2011	Lb2	Rld	436854 E	7554204 N	E	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Type	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					W	A	2	G	4	2	R	IS	0		1	F	99	99	w1.0	7SEucreb, Eumel, Eubrownii		
																			g1.0	3SAristidaspp, Hecon		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Exposure - erosion gully. Photos. Concentrated by erosion. Ironbarks. Wire grasses. Looks like well structured subsoil here ?? Profile doesn't really fit any dscribed soil so far					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.30		0	SCL		42RIS	V				
B2		0.30	0.80	10YR 7/6	32DR	CLFS			S3PR				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP						6.5		6.5														
Lab pH																						
Lab EC																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	30	McCJI	19-Aug-2011	Lb1	Rld	436697 E	7553766 N	C	Lixisols			KA	AA	AG	CD	B	E	L	M	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.00	99	w1.0	7SEucreb, Eumel		
																			s3.0	3VCaovata		
																			g1.0	3SAristidaspp, Hecon		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Ironbarks - wire grass+ black spear grass and Currant bush - odd ones. T6M. Mid to L HSL of Gently Undulating Rise Auger grinding rock from 1.0 m.					
		A	1.5	W	L	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10		0	FSL		0	V				
A2		0.10	0.40		0	FSL		0	V				
B2		0.40	1.00	5YR 5/6	0	FSCL		0	V				
BC/C		1.00	1.20		0	FSCL		32RSA	V				
R		1.20				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.0		6.5		6.0		5.5		5.5										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	31	McCJI	19-Aug-2011	Tm1	Rld	436664 E	7552743 N	C	Luvisols			CH	AC	AG	CD	B	E	L	M	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0			H	1.30	99	w1.0	7SEucreb, Eumel		
																			s3.0	3VCaovata		
																			g1.0	3SAristidaspp, Hecon		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Very similar to site 30 - same LF + Veg. Soft deco Sandstone here > 1.0m. A2 not bleached					
				W	L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20		0	FSL		0	V	0			
A2		0.20	0.30		0	FSL		0	V	0			
B2t		0.30	1.00	7.5YR 6/6	0	CLFS		0	W5PR	0			
BC		1.00	1.30		43DR	FSCL							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.0		6.5		6.0		6.5		6.8										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	32	McCJI	19-Aug-2011	Mb4	T	435774 E	7551041 N	C	Arenosols			TE	IP	AO	AR	B	E	L	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	F	99	99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/D	Notes	
					U	HCR		RIS		0	1	4	6	Yellow soil at site but located at edge of red soil photopattern Shrubs - acacias, grevilleas very pretty when in flower little or no grass ground cover Photopattern is broad HCR or Rise					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15		0	FSL		0	G				D1
B		0.15	1.50	7.5YR 7/8	0	FSL		0	V				D1

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.5		5.5		6.0		6.0		7.0		7.0								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	33	McCJI	19-Aug-2011	Mb4	T	436197 E	7550321 N	C	Arenosols			TE	IO	AO	AR	B	E	L	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucreb, Eumel		
																			w1.0	5SAccoriacea		
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Ironbarks, ghost gums, desert oak. Flat very gentle slope to east <1%. Grasses Black spear grass / wire grasses / no buffel					
		A	<1.0	E	M	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20	10YR 3/2	0	FSL		0	V	0			
A2		0.20	0.30	7.5YR 5/4	0	FSL		0	V	0			
B21		0.30	0.80	7.5YR 5/6	0	FSL		0	V	0			
B22		0.80	1.40	10YR 5/6	0	FSL		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.0		7.0		6.5		6.5		6.5		6.5								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	34	McCJI	20-Aug-2011	Lb2	Rld	436547 E	7549884 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0			H	0.85	99	w1.0	7SEucreb, Eumel, Codall		
																			W1.0	5SAccoriacea		
																			g1.0	3SHecon, Aristidaspp, Cecill		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											HS soil / hard to dig when dry Site at bore 220-40 Ironbarks. AC COR. Black spear grass. Patches buffel. Deco SA from 0.75 m					
				E	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.30			CLFS		0	V	0			
B		0.30	0.75	10YR 6/6		FSLC		0	V	0			
BC		0.75	0.85		32DR								

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		7.0		7.0														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	35	McCJI	20-Aug-2011	Lb2	Rld	436859 E	7549056 N	C	Lixisols			KA	AB	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.10	99	w1.0	7SEucreb, Eumel		
																			w1.0	5SAccoriacea		
																			g1.0	3SHecon, Aristidaspp, Thaus, Cecill		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Wire grass, black spear grass, kangaroo grass, some buffel. Ironbarks, ghostgums, desert oak. No currant bush just here. Flat, very gentle slope to E. Auger grinding sandstone from 90cm. Sampled					
				E	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.12	10YR 3/2	0	CLFS		0	V	0	0	0	D3
A2		0.12	0.20	10YR 5/3 m (6/4 (d))	0	CLFS		0	V	0	0	0	D3
B2		0.20	0.90	10YR 5/4	0	FSLC		0	V	0	0	0	D3
C/R		0.90			32DR	RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5		7.0		7.0												
Lab EC				0.02		0.03		0.03		0.02												
Lab pH				6.5		6.8		7.4		7.5												ESP or Ca:Mg ration not calculated for soils with CEC< 5.0
CEC				4		5		5		4												
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	36	McCJI	20-Aug-2011	Gc2	Rld	437371 E	7548222 N	C	Arenosols			TE	AW	CZ	AR	C	E	K	K	U

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	F	0.40	99	w1.0	7SEucreb, Eumel,Codall		
																S						
																			g1.0	3SHecon, Aristidaspp, Triopungens.		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Shallow beached sand over sandstone. Much lower in landscape than previous site. Ironbarks, bloodwoods, wire grasses, black spear grass, Billy Button Daisy, Soft spinifex here					
		A	2.5	E	M	HSL		RIS		0	3	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.30	7.5YR 5/4 (m)	0	LFS			G				
A2e		0.30	0.40	10YR 8.4 (d)	0	LFS			G				
C/R		0.40				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.8		5.8																
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	37	McCJI	20-Aug-2011	Gc1	Rld	437758 E	7547390 N	C	Leptosols			RU	CY	CZ	AR	F	L	T		

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				2	4	A	SA	1	SA	1	H	0.10	99	w1.0	7SEubrownii		
																			w1.0	4SErmit, Grstr		
																			g1.0	3SHecon, Aristidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Obviously shallow soil, rocky near Gregors Corner. SA otucrops here as well. Reid River Box with false sandalwood, currant bush. No much buffel to be seen.					
		A	5.0	N	U	HSL		RIS		0	5	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A/C		0.00	0.10	7.5YR 5/4	0	FSL		23ASA					
C/R		0.10				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	38	McCJI	20-Aug-2011	Lb2	Rld	438483 E	7547897 N	C	Lixisols			KA	AB	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1	99	w1.0	7SEucreb, Eumel, Eubrownii		
																			w1.0	5SAccoriacea		
																			g1.0	3SHecon, Aristidaspp, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%											Sandstone @ 90cm. Iron barks / Ried Red Box. Minor buffel Desert oak. Currant bush. Wire grasses, black spear grass, kangaroo grass. Site at drilling pad 240-40 Soil best fit is Lb2, but structured lower B					
		A	1.5	NE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS				0			
B21		0.20	0.40	10YR 5/4	0	FSLC			W3PR	0			
B22		0.40	0.90	10YR 7/6	21DR	FSLC			M3PR	0			
C/R		0.90				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5		7.0		7.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	39	McCJI	20-Aug-2011	Eb1	Qs	440174 E	7549253 N	C	Solonetz			S0	AC	FN	AH	C	E	L	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEubrownii		
																			w1.0	4VErmit		
																			g1.0	3SHecon, Aristidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Reid River Box here - no Ironbark. Layered sandstone > 1.20m. Ermot, Caovata site on long, gentle slope to NE near Lignum Gate.					
					L	HSL		RIS		0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10	10YR 5/3	0	FSL		0	V				
A21		0.10	0.40	7.5YR 5/4	0	FSL		0	V				
A22e		0.40	0.50	10YR 8/1 (d)	0	FSL		0	V				
B21t		0.50	0.70	10YR 6/4	33PY	FSLC		0	S5CO				
B22t		0.70	1.00	10YR 7/4	33PY	FSLC		0	S5PR				
B23t		1.00	1.20	10YR 7/4	23DR	FSLMC		22ASA	S5PR	2KN2			
BC		1.20	1.50										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.2		6.8		7.6		8.8		9.6		9.6								
Field EC				0.09		0.08		0.15		0.26		0.67		0.48								
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	40	McCJI	20-Aug-2011	Eb1	Qs	441377 E	7550279 N	E	Solonetz			S0								

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					G	A	2		0				0				99	99				

Elevation		Slope			Landform							Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Element	Location	Pattern	RMS	Flooding	Run-Off	Permeability	Drainage				
					L	HSL		RIS		0				Ironbark / bloodwood. Soft saurfce exposing hard caly subsoil - assume sodic and nasty Site on old track erosion exposure. Photopattern appears as some caracking clay on Brigalow in this unit as well			

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.15			FSL							
A2 e ?		0.15	0.30	7.5YR 6/6		FSL							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	41	McCJI	20-Aug-2011	Mb3	T	438860 E	7546580 N	C	Arenosols			TE	IN	AO	AR	B	E	L	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	99	99	w1.0	E5SEusim, Cosetosa		
																			w3.0	4SAclept, Alpexcelsa		
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C?	Notes	
Eval	Height (m AHD)	Eval	%											Wiregrass, spear grass, Yellow jacket, rough barked bloodwood, tve wattle, soap tree. Obviously red sandy area lower HSL of rise to Nth of site - Gc1 at Gregors Corner					
		A	1.0	S	L	HSL		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20	2.5R 4/6	0	FSL		0	V	0	0	0	D1
B		0.20	1.50	10R 4/6	0	FSL		0	V	0	0	0	D1

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.5		6.5		6.5		6.5		6.5										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	42	McCJI	20/8	Lb2	Rld	439171 E	7545936 N	C	Lixisols			KA	AC	AG	CD	B	E	L	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucreb, Eumel, Codall		
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B / C	Notes	
Eval	Height (m AHD)	Eval	%											Lower HSL than red site 41. Ironbarks, Ghostgum, black spear grass Long, very gentle slope to south					
		A	1.0	S	L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20	10YR 5/3	0	FSL		0	V	0			
A3/B1		0.20	0.60	10YR 5/4	0	CLFS		0	V	0			
B2		0.60	1.30	10YR 6/6	0	FSLC		0	V	0			
BC		1.30	1.40										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.8		7.0		7.0		7.0		7.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	43	McCJI	21-Aug-2011	Mb2	Qs	439342 E	7544979 N	C	Arenosols			TE	GZ	AO	AR	D	E	K	K	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	99	99	w1.0	7SEucreb, Eumel, Codall		
																F			w1.0	5VMespp		
																			g1.0	3SHecon, Aristidaspp, Caovata,Sispp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Soft sandy surface, flannel weed, Ironbarks, Melaluca, odd bloodwood, currant bush, Wiregrass, speargrass. Buried clay from 1.30 m - better as sandy soil rather than deep surface duplex ? Suspect this clay part of underlyng SA ?					
				S	L	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20	10YR 5/3		LFS		0	V	0			
A21		0.20	0.70	10YR 6/4 (m)		LFS		0	V	0			
A22e		0.70	1.30	10YR 8/4(d)		LFS		0	V	0			
2BCb ?		1.30	1.50	10YR 6/3	43DO	FSLC		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.5		6.5		6.8		7.0								
Field EC																						
Field pH (1:5)																						Similar landform/vegetation, geol to site 42
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	44	McCJI	21-Aug-2011	Tm4	Rld	439732 E	7544195 N	C	Luvisols			CH	AC	AG	BA	D	E	K	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucreb, Eumel, Codall		
																			g1.0	3SHecon, Aristidaspp, Caovata,Sispp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											simlar soil different theme - different photo patern. Similar veg but more CoDall here. Deco and hard SA from 1.6 m. Lower B texture feels sodic					
					M	HSL		RIS		0	3	2	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.15			CFS		0	V	0			
A2e		0.15	0.85	10YR 7/6(d)		CFS		0	V	0			
B2t		0.85	1.60	10YR 6/6	43PY	FSLMC		0	V	0			
BC		1.60	1.65										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.0		8.5		9.9								
Field EC										0.07		0.14		0.40								
Field pH (1:5)										6.9		8.3		8.8								
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	45	McCJI	21-Aug-2011	Tm1	Rld	439853 E	7542964 N	C	Luvisols			CH	AC	AG	AT	C	E	K	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.30	99	w1.0	7SEucreb, Eumel, Codall, Coclark		
																			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp, Caovata,Sispp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%											Ironbarks / ghost gums / grey bloodwood / desert oaks / black spear grass / not much buffel grass cover good here but LC downgraded by species V gentle slope to SE < 1 % SA at 1.30 m SAMPLED					
					F	PLA		PLA		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10	10YR 4/2	0	LFS			V	0	0		D1
A2e		1.00	0.50	10YR 6/4 (m) 8/4 (d)	0	LFS			V	0	0		D1
B2t		0.50	1.00	10YR 7/6	0	FSLC			V	0	0		D5
B3?		1.00	1.30	10YR 7/3	22DR	FSLMC		22ASA	V	0	0		T3
C		1.30				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5		6.5		7.3		7.3										
Field EC																						
Lab EC				0.03		0.01		0.01		0.02		0.04										ESP or Ca:Mg not calculated for soils with CEC < 5.0
CEC				4		2		2		3		5										
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	46	McCJI	21-Aug-2011	Tm1	Rld	439464 E	7541511 N	C	Luvisols			CH	AC	AG	AZ	C	E	L	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucreb, Eumel, Codall, Coclark		
																			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp, Caovata,Sispp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use	B/C	Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Ironbarks / Desert Oak / Black Spear Grass / Wiregrass, B horizxon is massive and porous as per all similar soil profiles. Very gentle slope to south around 0.5 %					
		E	0.5	SE	F	PLA		PLA		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.15			FSL		0	V				
A2e		0.15	0.55			FSL		0	V				
B2t		0.55	1.00	10YR 7/6	33DY	FSLMC		0	V				
BC/B3		1.00	1.30		33DR			33ASA					

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.5		6.5		6.0		6.0		6.5										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	47	McCJI	21-Aug-2011	Tm1	Rld	440656 E	7542051 N	C	Luvisols			CH	AC	AG	AZ	C	E	L	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	F	99	99	w1.0	7SEucreb, Eumel, Codall		
																S			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp, Caovata,Sispp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Same again more CODALL though than previous site					
					F	PLA		PLA		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20			FSL			V				
A2e		0.20	0.55			FSL			V				
B2t		0.55	0.85	10YR 6/4	44DO / 33FG	FSLC			V				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.5		6.5		7.0		8.3												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	48	McCJI	21-Aug-2011	Tm1	Rld	442289 E	7542258 N	C	Luvisols			CH	AC	AG	AZ	D	E	K	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0				99	99	w1.0	7SEucreb, Eumel, Codall, Menerv		
																			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C?	Notes	
Eval	Height (m AHD)	Eval	%											Ironbark / CODAC / Melaluca / Desert Oak / black spear grass / wire grass					
					F	PLA		PLA		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10		0	LFS		0	V				
A21		0.10	0.60		0	LFS		0	V				
A22e		0.60	0.75		0	LFS		0	V				
B2t		0.75	0.85	10YR 6/4	44PO	FSLC		0	V				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.5		5.8		6.0		7.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	49	McCJI	21-Aug-2011	Tm1	Rld	443238 E	7544296 N	C	Luvisols			CH	AB	AG	AZ	C	E	L	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucreb, Eumel, Codall, Menerv		
																			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp, Caovata, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Site doesn't look as sandy as previous sites. Ironbark / desert oak / black spear grass / wire grass / kanfagoor grass/ thick currant bush here though Still the same flat here as previous sites					
					F	PLA		PLA		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20		0	FSL			V	0			
A2e		0.20	0.50		0	FSL			V	0			
B2t		0.50	0.85	10YR 5/4	33DY	FSLC			V	0			
B3/BC		0.85	1.30		33DY			22ASA					

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		7.0		7.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	50	McCJI	21-Aug-2011	Mb2	Qs	443056 E	7545262 N	C	Arenosols			TE	IP	AO	AR	D	E	K	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	99	99	w1.0	7SEucreb, Eumel, Codall		
																F			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope															
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
					L	HSL		RIS		0	1	4	6	Soft sand to 1.5m here, similar vegetation & landform to other sites & grasses					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20	10YR 5/2	0	LFS			V	0			
A3		0.20	0.70	10YR 6/4	0	FSL			V	0			
B		0.70	1.50	10YR 7/4	0	FSL		21ASA	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.0		6.5		6.5		6.5		6.0		6.0								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	51	McCJI	21-Aug-2011	Mb2	Qs	441854 E	7545177 N	C	Arenosols			TE	GZ	AO	AR	D	E	K	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucreb, Eumel, Codall		
																			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope															
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
					L	HSL		RIS		0	1	4	5	Same vegetation, same landform Soil not a good fit for Mr2 or Mb4 but Mr2 is closest fit to give this profile a soil name. Same long very gentle slope as previous sites.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A11		0.00	0.20	10YR 4/2	0	FSL		0	V	0			
A21		0.20	0.80	10YR 6/6	0	LFS		0	V	0			
A22		0.80	1.20	10YR 7/6	0	LFS		0	V	0			
A23e		1.20	1.35	10YR 8/4 (d)	0	LFS		0	V	0			
B2		1.35	1.70	10YR 7/4	33DY	LFS		22ASA	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.0		6.0		7.0								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	52	McCJI	21-Aug-2011	Mb2	Qs	440524 E	7545082 N	C	Arenosols			TE	GZ	CZ	AR	D	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.90	99	w1.0	7SCodall, Eubrownii, Coclark		
																			w1.0	5VAccor, Menervosa		
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											No ironbark just have Bloodwood / CODAL / Desert Oak / Melalucas / black spear grass / wiregrasses, no currant bush. Auger grinding SA from 0.90 m, but partly deco to 1.30 m +.					
					L	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.25	10YR 5/4	0	FSL		0	V	0			
A2e		0.25	0.90	10YR 8/4 (d)	0	FSL		0	V	0			
2C/Rb		0.90	1.30		33DR			32ASA					

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.5		6.6		6.6		6.6												
Field EC																						
Field pH (1:5)																						Auger grinding sandstone from 90 cm but able to punch through on partially decomposing rock.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	53	McCJI	22-Aug-2011	Mb2	Qs	439718 E	7546550 N	C	Arenosols			TE	IO	AO	AR	D	E	K	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	99	99	w1.0	7SEucreb, Eumel, Eubrownii, Codall		
																F			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Similar vegetation to other sites here, at 1.90 - just starts to get odd piece of deco SA. Mid to lower HSL of very gently long rise or slope to E					
					L	HSL		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20	10YR 4/2	0	LFS		0	V				
A3/B1		0.20	0.40	10YR 5/4	0	FSL		0	V				
B2		0.40	1.90	10YR 7/8	0	FSL		0	V				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.5		6.5		6.8		7.0		7.0						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	54	McCJI	21-Aug-2011	Tm1	Rld	440700 E	7546896 N	C	Luvisols			CH	AC	AG	AZ	C	E	K	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	99	99	w1.0	7SEucreb, Eumel, Codall		
																F			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp, Caovata, Sidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%											Flat to very gentle low slope to East. Ironbarks / ghost gum / desert oak / odd currant bush and flannel weed / black spear grass / wire grasses Still well-drained soil as are most of these sandy duplexes					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20		0	LFS		0	V	0			
A2e		0.20	0.50	10YR 7/4 (a)	0	LFS		0	V	0			
B21t		0.50	1.20	10YR 7/6	23FY	FSLC		0	V	0			
B22t		1.20	1.70	10YR 6/4	44PY	FSLC		21ASA	V	0			
B3/BC		1.70	1.90	10YR 5/4	44PR	FSLC		22ASA	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5		6.5		6.0		7.0		7.0		7.0						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	55	McCJI	22-Aug-2011	Mb2	Qs	441781 E	7546332 N	C	Arenosols			TE	GZ	AO	AR	D	E	L	K	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0			F	99	99	w1.0	7SEucreb, Eumel		
																S						
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Similar surface & landform but vegetation - pure Ironbark with ironwood?, wire grasses / black spear grass poor coverage. Different phptopattern - different soil and mappable ?? Very hard below 0.85 m.					
					L	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.15		0	FSL		0	V				D1
A2e		0.15	0.70		0	FSL		0	V				D1
A3?		0.70	0.85	10YR 6/4	0	LFS		0	V				D1

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				4.8		6.0		6.5		7.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	56	McCJI	22-Aug-2011	Tm1	Rld	441786 E	7547550 N	C	Luvisols			CH	AC	AG	AZ	C	E	K	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		F	99		99	w1.0	7SEucreb, Eumel, Eubrownii, Codall		
															S				w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											ironbark, bloodwood and desert oak much currant bush as well porr coverage of inferior grasses - wire grasses					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10	10YR 4/2	0	LFS		0	V	0			
A21		0.10	0.40	10YR 6/4	0	LFS		0	V	0			
A22e		0.40	0.50	10YR 8/3 (d)	0	LFS		0	V	0			
B2t		0.50	0.60	10YR 7/6	33DY	FSLC		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.8		7.0														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	57	McCJI	22-Aug-2011	Eb1	Qs	442698 E	7548399 N	C	Solonetz			SO	AC	FN	AH	C	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0				99	99	w1.0	7SEucreb, Eumel, Codall		
																			g1.0	3SHecon, Aristidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											B-horizon texture feels sodic - sampled, wire grasses, Ghost gum / odd ironbark / thick currant bush B horizon sampled					
					L	HSL		RIS		0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.40			CLFS		0	V		0	0	
A2e		0.40	0.60			CLFS		0	V		0	0	
B2t		0.60	1.20	10YR 7/6	33DY	MHC		0	S5AB	2MS3	0	0	

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.8		5.8		6.5		7.5		9.0										
Field EC																						
Lab EC										0.05		0.08										
CEC										8		8										
ESP										17.0		21.0										
Ca/Mg										1.0		0.9										

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	58	McCJI	23-Aug-2011	Cr4	Qa	436410 E	7556841 N	C	Luvisols			CH	AB	AG	CD	C	E	L	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	99	99				

Elevation		Slope			Landform							Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Element	Location	Pattern	RMS	Flooding	Run-Off	Permeability	Drainage						
					F	LEV		ALP		1	2	3	4	HS surface, cleared Reid Red Box, good coverage of buffel, with some wire grass, currant bush Carmichael River Levee - will form bulldust again badly.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.30	7.5YR 4/4	0	FSL		0	V				
B21		0.30	0.75	7.5YR 5/6	0	LMC		0	V				
2B2b		0.75	1.40	10YR 4/6	0	LMC		0	S3AB	1MSR			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.0		6.0		6.5								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	59	McCJI	23-Aug-2011	Mb3	T	435725 E	7550332 N	A												

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0				99	99				

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Check hole - walked through thick shrubs from 32 and 33 - same red sand and vegetation all the way					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.10	5 YR 4/4	0	LFS		0	G	0	0		D 0

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	60	McCJI	23-Aug-2011	Lb2	Rld	436963 E	7552075 N	C	Lixisols			KA	AB	AG	CD	C	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucreb, Eumel, Eubrownii, Codall		
																			w1.0	5VAccor		
																			g1.0	3SHecon, Thaus, Caovata		

Elevation		Slope																
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
					L	HSL		RIS		0	2	3	4	Bulldust soil again - patches of soft Deco SA from 1.0 m but still more like B2 rahter than B3 or BC horizon. But soil still deeper to hard SA than normal Lb2. Site on long, gentle lower HSL from Rise to West or could be a Pediment ?					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.15	10YR 4/2	0	CLFS			V	0			
A2		0.15	0.30	10YR 5/3	0	CLFS			V	0			
B21		0.30	1.00	7.5YR 5/6	0	FSLC			V	0			
B22		1.00	1.90	10YR 7/6	33DR	FSLC		22ASA	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5		6.8		7.0		7.0		7.0		7.2						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	61	McCJI	23-Aug-2011	Tm1	Rld	438195 E	7552462 N		Luvisols			CH	AB	AG	CD	C	E	L	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SCoclark, Codall		
																			w1.0	5VAccor, Cosetosa		
																			g1.0	3SHecon, Thaus, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Very slight slope to the east, bulldust again, same vegetation but grey bloodwood replaces Ibarks. Also Cosetosa, currant bush. Auger greinding soft SA from 1.40 m.					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	FSL		0	V	0			
B21		0.20	0.40	7.5YR 5/6	0	FSLC		0	V	0			
B22		0.40	1.40	7.5YR 6/6	0	FSLC		0	V	0			
B3/BC		1.40	1.80	7.5YR 6/6	0	FSLC		22ASA	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.8		6.8		6.8		6.8		6.8		6.8						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	62	McCJI	23-Aug-2011	Tm1	Rld	438932 E	7552518 N	C	Luvisols			CH	AA	AG	CD	C	E	L	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	F	1	99	w1.0	7SEucre, Eumel, Codall		
																S			w1.0	5VAccor		
																			g1.0	3SHecon, Aristidaspp, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Same again but here ironbarks dominate Auger grinding soft SA from 1.0 m, Hard Sa from 1.3 m.					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10	10YR 4/3	0	FSL			V				
A2		0.10	0.15	7.5YR 5/4	0	FSL			V				
B21		0.15	0.40	5YR 6/6	0	FSLC			V				
B22		0.40	1.00	5YR 6/6	0	FSLC		12ASA	V				
BC/B3		1.00	1.30	7.5YR 6/6	0	FSLC		22ASA	V				
C/R		1.30				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.8		6.8		6.8		6.8		6.8										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	63	McCJI	23-Aug-2011	Eb3	Qs	439332 E	7553823 N	C	Luvisols			CH	AB	CV	BA	C	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	6MAcharp, Accamb, Eucamb		
																			w1.0	4VErmit		
																			g1.0	4VCecil,Hecon,Caovata		

Elevation		Slope														
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
					L	HSL		RIS		O	3	1	3	Site in small patch if Gidgee / brigalow. + some Dawson Gum and currant bush. B horizon textrue feels sodic. Some minor Melonhole cracking clay as well. Sampled Site within long, gentle lower slope from rise to west			

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20		0	CLFS		0	V	0			D6
A2e		0.20	0.25		0	CLFS		0	V	0			D6
B21t		0.25	0.60	10YR 5/4	0	FSMC		0	S4AB	0			D8
B22t		0.60	1.40	10YR 5/4	0	FSMC		0	S4AB	2KN3			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.9		7.5		8.0		9.0										
Field EC				0.04		0.04		0.04		0.11		0.28										
Field pH (1:5)				6.3		6.4		7.3		8.9		9.3										
CEC				7.7		11.0		12.0		16.0		2.5										
ESP				0.5		1.6		3.9		7.2		9.7										
Ca/Mg				3.8		2.1		1.5		1.4		2.0										

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	64	McCJI	23-Aug-2011	Eb1	Qs	439425 E	7554960 N	C	Solonetz			SO	AB	ES	CV	C	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Eubrownii		
																			w1.0	4VErmit		
																			g1.0	3SHecon, Aristidaspp, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/D	Notes	
Eval	Height (m AHD)	Eval	%											Note much buffel grass here. B horizon textures feel strongly sodic. Marginal rise here above Carmichael River alluvium. Site probably in older alluvium of the river or is it towards end of gentle lower HSL from Rise to West ?					
					L	HSL		HSL		0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.25		0	CLFS		0	V	0			
A2e	A	0.25	0.40		0	CLFS		0	V	0			
B21t		0.40	0.70	7.5YR 5/4	0	FSLMC		0	S5PR	0			
B22tk		0.70	1.10	7.5YR 6/6	0	FSLMC		0	S4AB	2KN3			
2B23tb ?		1.10	1.50	7.5YR 4/6	0	FSLMC		0	S3AB	2MN1			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.04		0.05		0.49		1.00		0.87		0.87								
Field pH (1:5)				6.0		5.6		8.4		8.7		8.7		8.7								B-horizon texture felt sodic. ??. Marginal rise ??
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	65	McCJI	23-Aug-2011	Lb2	Rld	434229 E	7565639 N	C	Lixisols			KA	AC	AG	CD	C	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.70	99	w1.0	7SEucre, Eumel, Eubrownii		
																			g1.0	3SHecon, Aristidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	A/B	Notes	
Eval	Height (m AHD)	Eval	%											Sandstone @ 70 cm, Edge of broad HRC					
		A	1.5	NE	C	HCR		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS		0	V				
B2		0.20	0.70	7.5YR 6/6	0	FSLC		0	V				
C/R		0.70				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.6		6.6		6.9														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	66	McCJI	24-Aug-2011	Gc1	Rld	434928 E	7564375 N	A	Leptosols			RU	CY	CZ	AR	H	L	U		

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				6	1	A	CH	2	SA	4	H	0.30	99				
									3	4	A	CH										
									2	6	A	CH										

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
		A	4	W	C	HCR		RIS		0	5	4	6	Site on edge sharp rise in rocky outcrop. Cleared - probably not big enough to map out unit here. Cleared but regrowth of currant bush and Eucalypts. Slope measured as 4 % to W but 2% to S Sanstone but also Mn pan outcrops as well.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A/C		0.00	0.30	10YR 5/4	0	FSL		42ASA	V	0			
C		0.30				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP						6.6																
Field EC																						
Field pH (1:5)																						Slope 4% to West, 20% to South
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	67	McCJI	24-Aug-2011	Tm4	Rld	432671 E	7561571 N	C	Solonetz			SO	AB	ES	AH	C	G	M	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				3	1	A	CH	0		4	H	99	99				

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
		A	3	N	L	HSL		RIS		0	3	1	3	North facing pediment or HSL below Red Hill. Cleared, B-horizon textures feel sodic - one sample taken for analysis. Eroded area to W of site. Slope 3-4 %					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.35		0	CLFS			V	0			
B21		0.35	0.90	7.5YR 4/3	0	CLFS			S3PR	0			
B22		0.90	1.10	7.5YR 5/4	0	FSMC			S4AB	0			
BC		1.10	1.30	5YR 3/1	0	FSLMC		33ASA	M4PR	2MV1			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
Lab EC								0.06														
Field EC				0.70		0.11		0.11		0.15		0.22										
Field pH (1:5)				6.0		5.7		6.7		7.8		8.6										
CEC								9														
ESP								12.0														
Ca/Mg								0.8														

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	68	McCJI	24-Aug-2011	Gc1	Rld	432594 E	7561374 N	A	Leptosols			RU	CY	CZ	AR	H	L	T		

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				4	4	A	SA	0		1	H	0.05	99	w1.0	7SEupersistence		
									5	2	A	SA							w1.0	4VAcspp		
																			g1.0	3SAristidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	D	Notes	
Eval	Height (m AHD)	Eval	%											Part of red hill itself, slope on side 5-10%, very little soil here - almost entirely surface 'rocks'					
		A	5		C	HCR		RIS		0	5	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A/C		0.00	0.05	5YR 4/6	0	FSL		32ASA					
C/R		0.05				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	69	McCJI	24-Aug-2011	Gc1	Rld	432333 E	7560650 N	A	Leptosols			RU	CY	CZ	AR	H	L	T		

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				4	1	A	IS	0		1	H	0.20	99	w1.0	7SEupersistence, Eumel, Coclark		
									4	4	A	SA							w1.0	4VAcspp,Cosetosa		
																			g1.0	3SAristidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Red hill HCR - Comm. Tower nearby. Side slope 10-15% but flat on broad HCR Some Mn pan and conglomerate exposed on the surface and from minor gullying along edge of dirt road. Photos of surface 'rocks' taken.					
		A	10		C	HCR		RIS		0	5	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A/C		0.00	0.20	2.5YR 4/6	0	FSL		41ASA	V	0			
C/R		0.20				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0																		
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	70	McCJI	24-Aug-2011	Gc1	Rld	432258 E	7560157 N	C	Leptosols			RU	CY	CZ	AR	F	M	U		

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				2	3	A	SA	0		1	H	0.25	99	w1.0	7SEumel		
									2	1	A	SA							w1.0	4VAccor		
																			g1.0	3SHecon		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Ironbark, desert oaks, black spear grass. Surface coarse fragements includes SA, Mn pan and Mn comglomerate.					
					C	HCR		RIS		0	5	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A/C		0.00	0.25			CLFS		21ASA	V				
C/R		0.25				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.2																		
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Surface - some sandstone, large pebbles, but with? Mn Pan conglomerate?

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	71	McCJI	24-Aug-2011	Gc2	Rld	432309 E	7557730 N	C	Arenosols			TE	GZ	CZ	AR	D	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0			H	99	99				

Elevation		Slope												Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Black spear grass. Mid to lower HSL. Slope 2-3% BC is deco SA					
		A	2	E	L	HSL		RIS		0	3	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.70	10YR 5/3	0	FSL		0	V	0			
A2e		0.70	0.80	10YR 8/4 (d)	0	FSL		0	V	0			
BC		0.80	1.00										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		7.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	72	McCJI	24-Aug-2011	Gc1	Rld	431701 E	7560898 N	A	Leptosols			RU	CY	CZ		I				

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				6	3	A	SA	2	SA	1	S	0.05	99	w1.0	7SEupersistence		
									3	5	A	SA				H			w1.0	4VAcspp		
																			g1.0	3STripungens		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	D	Notes	
Eval	Height (m AHD)	Eval	%											Site in rocky area and eroded. Variable topography - HCR and narrow creek lines and escarpments No or little soil here - all rock. Sloep at siote 8% but can vary up to 20 % on scarps.					
		A	8	E	U	HSL		RIS		0	5	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	73	McCJI	24-Aug-2011	Lb1	Rld	432310 E	7564029 N	C	Lixisols			KA	AA	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.8	99	w1.0	7SEumel, Eucre, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Site on edge of main public road. M/L HSL slope 2-3%, some buffel edge of road but none further in here. SA at 0.80 m					
		A	2	NE	L	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS		0	V	0			
B21		0.20	0.40	2.5YR 4/4	0	FSLC		0	V	0			
B22		0.40	0.80	2.5YR 4/6	0	FSLC		0	M4AB	0			
C/R		0.80			0	RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5		7.0														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	74	McCJI	25-Aug-2011	Lb2	Rld	431722 E	7562943 N	C	Lixisols			KA	AB	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.70	99	w1.0	7SEumel, Eucre, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%											Some vegetation - very little buffel. Bulldust soil. Very gentle slope to NE from site. Bore pad 130 20/C004 this unit to be mapped as yellow KA with minor Red KA probably 20 %					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS		0	V	0			
B		0.20	0.70	7.5YR 5/6	0	FSLC		0	V	0			
C/R		0.70				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.9		6.0														
Field EC																						
Field pH (1:5)																						Bulldust soil, very gentle slope to North-east, bore EER01??
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	75	McCJI	25-Aug-2011	Lb2	Rld	431309 E	7563904 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.20	99	w1.0	7SEumel, Eucre, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Thaus, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Same vegetation + LF Auger grinding SA from 1.20 m.					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.12		0	CLFS		0	V	0			
B21		0.12	0.40	10YR 7/6	0	FSLC		0	V	0			
B22		0.40	1.20	10YR 7/6	0	FSLC		21ASA	V	0			
BC		1.20	1.30										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.0		6.7		7.0		7.0		7.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	76	McCJI	25-Aug-2011	Lb2	Rld	430774 E	7563904 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	U

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.40	99	w1.0	7SEumel, Eucre, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Thaus, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											20m away - hole was bleached LFS over rock at 40cm. Same vegetation but more currant bush. Very gentle rise here					
					L	HSL		RIS		0	2	3	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15		0	CLFS		0	V				
B2		0.15	0.40	7.5YR 6/6	0	FSLC		0	V				
R		0.40				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP						7.0																
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	77	McCJI	25-Aug-2011	Ln	Rld	430529	7563365 N	C	Nitisols			DE	AA	AG	CD	B	F	O	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				2	3	A	SA	0		1	H	0.75	99	W1.0	7SEubrownii		
																			W1.0	5SAcharp, Ermit		
																			g1.0	3SCecill, Hecon, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Narrow patch brigalow with Reid Rive Box here, follows eroded creek line, mappable? Could be alluvium - sandstone could be floater? Some bare areas and sandy surface in unit as well. Gentle slope to Nth (< 1%)					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	LMC		0	M5AB	0			
B21		0.20	0.50	5YR 4/6	0	MC		0	S4AB	21MN			
B22		0.50	0.75	7.5YR 4/4	0	MC		21ASA	S4AB	31MN			
C/R		0.75			0	RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.5		5.0		6.0														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	78	McCJI	25-Aug-2011	Lb2	Rld	429748 E	7562925 N	C	Lixisols			KA	AB	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.70	99	w1.0	7SEumel, Eucre, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Thaus, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Same as previous - definate rise here though, site on mid to upper HSL, near drill pad 120-25. Auger grinding SA from 0.70 m.					
		A	3	NE	U	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.25		0	CLFS		0	V	0			
B		0.25	0.70	7.5YR 5/6	0	FSLC		0	V	0			
C/R		0.70				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.5		5.5														
Field EC																						
Field pH (1:5)																						auger grinding sandstone @ 70 cm, bear bore 120-25
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	79	McCJI	25-Aug-2011	Mb3	T	428754 E	7561971 N	C	Arenosols			TE	IN	AO	AR	B	E	L	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Site is sand (red) on very broad higher flat or HCR, side slope 2-3% at best. Similar Acacias & Grevilleas other simialr soils.					
		A	2		C	HCR		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.10	10 R 4/4	0	FSL		0	V	0			D0
B2		0.10	1.25	10 R 4/6	0	FSL		0	V	0			D0

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.5		5.5		5.8		6.0		6.5										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	80	McCJI	25-Aug-2011	Tm1	Rld	432192 E	7564850 N	C	Luvisols			CH	AC	AG	AT	D	E	L	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	99	99	w1.0	7SEumel, Eucre		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Thaus, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Minor soil with YB soil unit, occupies only small sandy area here, still bulldust soil. Deco SA from 1.20 m.					
		A	1.5	E	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.30		0	FSL		0	V				
A21		0.30	0.60		0	FSL		0	V				
A22e		0.60	0.88	10YR 7/4 (d)	0	FSL		0	V				
B2t		0.88	1.20	10YR 6/6	33D0	FSLC		0	V				
BC		1.20	1.30										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.0		7.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	81	McCJI	5-Sep-2011	Eb2	Qs	433783 E	7565433 N	C	Vertisols			VE	AB	GS	BN	E	R	S	X	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
N	C	0.20	12	M	0				0				0		4	G	99	99				
																H						

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Cleared - brigalow, Gidgee and Bauhinia trees, Rhodes grass / also parthenium weed. Profile moist to 15 cm from recent storm rain					
					F	PLA		PLA		1	2	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	MC	Z	0	M3PR	0			
B21		0.20	0.40	7.5YR 4/3	0	MHC		0	S4AB	2KN1			
B22		0.40	0.80	7.5YR 4/4	0	MHC		0	S4LE	2MS2	K2D		
B23		0.80	1.40	7.5YR 5/4	33DG	MHC		0	S4LE	0	K2D		

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.0		9.9		9.0		6.0		5.0										
Field EC																						
Field pH (1:5)																						Profile moist to 15cm from recent rain.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	82	McCJI	6-Sep-2011	Lb4	T	428151 E	7563043 N	C	Arenosols			TE	CY	CZ	AR	B	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	0.50	99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SHecon, Sidaspp.		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Site located on edge red/deep sand with grevillea Veg to west, YB gradually Sa to east, edge of boundary road / main road fence. Site almost at soil boundary. SA from 0.50 m.					
					L	HSL		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15	5YR 4/4	0	FSL			V	0			
B2		0.15	0.50	7.5 YR 5/6	0	FSL			V	0			
C1		0.50	1.00		0	FSL		52RSA					
C2/R		1.00				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	83	McCJI	6-Sep-2011	Lb2	Rld	427507 E	7564464 N	C	Lixisols			KA	AC	AG	AT	C	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.95	99	w1.0	7SEubrownii, Eumel		
																			w1.0	4VAccor,Grstr		
																			g1.0	3SHecon,Arisidaspp, Thaus, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Slope to NE - very long / gentle.					
		A	1.5	NE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.40		0	CLFS		0	V				
A2e		0.40	0.60	10YR 7/4 (d)	0	CLFS		0	V				
B2		0.60	0.95	10YR 6/4	33DO	FSLC		0	V				
C / R		0.95				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.7		5.9		6.0		6.5												
Field EC																						
Field pH (1:5)																						Buffel, wire grass, kangaroo grass, some CAOVATA.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	84	McCJI	6-Sep-2011	Tm4	Rld	427392 E	7565213 N	C	Solonetz			SO	AB	ES	AH	C	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEubrownii, Eumel, Eucre		
																			w1.0	4VAccor,Grstr		
																			g1.0	3SHecon,Arisidaspp, Tripung, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/D	Notes	
Eval	Height (m AHD)	Eval	%											very poor soil / veg / grass, lots of bare areas, soft spinifex, black spear grass, currant bush B horizon textures feel obviously sodic. darker photopattern to E matches Brigalow on RE mapping.					
		E	<1	E	M	HSL				0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.30		0	FSL		0	V	0			
A2e		0.30	0.40		0	FSL		0	V	0			
B2h		0.40	0.60	10YR 5/3	33DB	FSMC		0	S5CO	0			
B22t		0.60	1.00	10YR 6/4	33DB	FSMC		0	S5AB	0			
B23ty		1.00	1.20	10YR 7/4	33DB	FSMC		0	S5AB	2XY2			
B24t		1.20	1.60	10YR 6/4	33DB	FSMC		0	S5AB	2MV1			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.05		0.08		0.51		0.82		1.36		0.94								
Field pH (1:5)				5.6		5.7		8.2		9.0		9.6		8.4								
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	85	McCJI	6-Sep-2011	Lb4	Rld	428188 E	7565149 N	C	Arenosols			TE	IP	CZ	AR	B	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.70	99	w1.0	7SEumel, Eucre		
																			w1.0	4VAcspp		
																			g1.0	3SHecon,Arisidaspp, Tripung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Site in darker photo pattern, ironbaks plus wattles, no currant bush but black spear grass, soft spinifex. Profile similar to site 82. Red sand 'Rise" to Norht on photopattern. Auger stopped by rounded SA "gravels" from 0.70 m.					
					L	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15	10YR 5/3	0	FSL			V	0			
B21		0.15	0.50	7.5YR 6/6	0	FSL			V	0			
B22		0.50	0.70	7.5YR 7/6	0	FSL			V	0			
BC / C/R		0.70	0.80					52RSA					

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0														
Field EC																						
Field pH (1:5)																						Profile similar to site 82, red sand to north on photo pattern, grinding?
CEC																						Sandstone gravels > 70cm, looks flat here?
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	86	McCJI	6-Sep-2011	Gc1	Rld	429181 E	7565116 N	A				RU	CY	CZ						

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				5	4	A	SA	0		1	H	0	99				

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	D	Notes	
Eval	Height (m AHD)	Eval	%											Check site only - similar scarp type soil to site 68. Large Fe/Mn Pan exposed (photos taken). Site located on edge of active erosion area. Slope 5 - 10 % Many areas of so much surface rock that it is very hard to dig some soil profile.					
		E	10																

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A/C		0.00	0.05			CLFS							
C / R		0.05				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10			
pH - RP																					
Field EC																					
Field pH (1:5)																					
CEC																					
ESP																					
Ca/Mg																					

pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)

Brigalow/Gidgee to north of site and red sand rise with shrubs to north west. Mallee Box, wattles and soft spinifex also at this site.

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	87	McCJI	6-Sep-2011	Mb3	T	429181 E	7565116 N	C	Arenosols			TE	IN	AO	AR	B	E	L	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	99	99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Tripung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Wire grass, patches of soft spinefex, gradual horizon boundaries. Obvious red soil consistent photopattern Site lcolated on very broad rise rather than narrow HCR.					
					C	HCR		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.10		0	FSL		0	V				
B21		0.10	0.60	10 R 4/6	0	FSL		0	V				
B22		0.60	1.40	10 R 5/8	0	FSL		0	V				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.7		6.0		6.0		6.6										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	88	McCJI	6-Sep-2011	Mb4	T	426805 E	7565965 N	C	Arenosols			TE	IP	AO	AR	B	E	L	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Tripung		

Elevation		Slope																
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
					M	HSL		RIS		0	1	4	6	Similar vegetation to red soil to south of here. Site located at bore pad C90/25					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	FSL		0	V	0			
B21		0.20	1.00	10YR 6/6	0	FSL		0	V	0			
B22		1.00	1.40	10YR 7/6	0	FSL		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.7		6.7		6.7		6.7		6.7										
Field EC																						
Field pH (1:5)																						
CEC																						Near bore bad C90/25
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	89	McCJI	6-Sep-2011	Tm4	Rld	427325 E	7566350 N	C	Solonetz			SO	AB	ES	AH	D	E	K	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.30	99	w1.0	7SEubrownii		
																			w1.0	4VAccor,Grstr		
																			g1.0	3SHecon,Arisidaspp, Caovata		

Elevation		Slope														
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/D	Notes	
					L	HSL		RIS		0	3	1	3	Nasty Sodic duplex soil, Co B with this core core between Columns (that's why B21 here). Soil properties could be explained by landscape position - lower HSL below Permeable soil to east and west (Mb3 & Mb4).				

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.25		0	LFS			V	0			
A2j		0.25	0.40		0	LFS			V	0			
A2e		0.40	0.58		0	LFS			V	0			
B21tj		0.58	0.70		0	FSLC			S5CO	0			
B22t		0.70	0.95	10YR 5/3	0	FSMC			S5PR	0			
BC		0.95	1.30		0	FSLMC		22RSA	M4RL	0			
C/R		1.30				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		7.0		9.0		9.9										
Field EC																						
Field pH (1:5)																						
CEC																						Site located a C 90/50 drill pad - red sand area to East
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	90	McCJI	7-Sep-2011	Mb4	T	426520 E	7566847 N	C	Arenosols			TE	IO	AO	AR	D	E	L	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	F	99	99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Tripung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/D	Notes	
Eval	Height (m AHD)	Eval	%											Same as 88 landform / vegetation					
					M	HSL		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.15		0	FSL		0	V	0			
A3?		0.15	0.80	7.5YR 5/6	0	FSL		0	V	0			
B21		0.80	1.45	7.5YR 6/8	0	FSL		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.5		6.8										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	91	McCJI	7-Sep-2011	Mb4	T	425976 E	7568157 N	C	Arenosols			TE	IP	AO	AR	B	E	L	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	F	99	99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Tripung		

Elevation		Slope																
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/D	Notes	
					M	HSL		RIS		0	1	4	6	Same as 90 landform / vegetation					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.12		0	FSL		0	V	0			
B21		0.12	1.00	10YR 6/6	0	FSL		0	V	0			
B22		1.00	1.25	10YR 5/4	0	FSL		0	V	0			
B23		1.25	1.40	10YR 6/3	0	FSL		52RSA	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.0		6.6										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	92	McCJI	7-Sep-2011	Mb4	T	426173 E	7569146 N	C	Arenosols			TE	IO	AO	AR	B	E	L	L	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Tripung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Photo of I'bark here. Deep A-horizons may have buried Tm4 soil from lower slope to E of site ? could be gentle slope off low hills to north-west?					
		A	2	SE	M	HSL		RIS		0	2	2	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10	10YR 4/2	0	CFS		0	V	0			
A2		0.10	0.50	10YR 5/3	0	CFS		0	V	0			
A3		0.50	1.10	10YR 6/4	0	CFS		0	V	0			
?A2e	S	1.10	1.40	10YR 8/3 (d)	0	CFS		0	G	0			
2B22tb		1.40	1.50	10YR 5/4	33DB	FSMC		0	S5CO	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.6		5.0		6.0		6.0		6.6		7.5								
Field EC																						
Field pH (1:5)																						Gentle slope to South-east, wire grasses / black spear grass / soft spinifex / slope 2-3% to south-east.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	93	McCJI	7-Sep-2011	Tm4	Rld	426840 E	7569950 N	C	Solonetz			SO	AB	FO	BD	C	E	M	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0				99	99	w1.0	7SEubrownii		
																			w1.0	4VAccor,Grstr		
																			g1.0	3SHecon,Arisidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Field pH indicates very nasty sodic duplex soil No obvious gypsum in profile to depths examined. Site at drill pad 70/15					
		A	2.0	SE	M	HSL		RIS		0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.30	10YR 5/3	0	CLFS		0	V	0			
A21		0.30	0.40	7.5YR 5/4	0	CLFS		0	V	0			
A22e		0.40	0.55	10YR 8/3 (d)	0	CLFS		0	V	0			
B21t		0.55	1.00	10YR 5/4	44PO	FSMC		0	S5CO	0			
B22t		1.00	1.20	10YR 6/4	44PO	FSMC		0	S4PR	2KS2			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.0		5.5		7.5		10.0		10.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	94	McCJI	7-Sep-2011	Lb2	Rld	427614 E	7570688 N	C	Lixisols			KA	AC	AG	CD	C	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Eubrownii		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Arisidaspp, Thaus, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Seen this soil lots of times before but will turn bulldust vey quickly, ironbarks dominant here. Minor buffel struggling buffel grass. Also patches of soft spinifex.					
		A	1.5	SE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.10		0	CLFS			V	0			
A3		0.10	0.40		0	CLFS			V	0			
B2		0.40	0.65	10YR 6/6	0	FSLC			V	0			
B/C		0.60	0.70		0	FSL		32RSA					

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.5														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	95	McCJI	7-Sep-2011	Lb4	Rld	428455 E	7571362 N	C	Arenosols			TE	IP	CZ	AR	B	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.00	99	w1.0	7SEucre, Eumel		
																			w1.0	4VAccor, Acspp		
																			g1.0	3SHecon,Arisidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/B	Notes	
Eval	Height (m AHD)	Eval	%											Pure ironbarks here. 95 cm plus is auger grinding SA - soil coring tp broke off into hole.					
		A	1.0	SE	M	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20	10YR 5/3	0	FSL		0	V	0			
B21		0.20	0.50	10YR 7/6	0	FSL		0	V	0			
B22		0.50	0.95	7.5YR 7/6	0	FSL		0	V	0			
B3 / BC?		0.95	1.00		0	FSL		22RSA?					
C/R		1.00				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.8		6.5		6.5												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	96	McCJI	7-Sep-2011	Lb2	Rld	428908 E	7571756 N	P	Lixisols			KA	AC	AG	CD	B	E	M	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Eubrownii		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Arisidaspp, Thaus, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Drill ptt at drill pad 70 - 25. Photos taken here of very flat soil boundaries and uniform depth to underlying SA Site located on very gentle lower HLS to E					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS	-	0	V	0			
B21		0.20	1.00	10YR 7/6	0	FSLC		0	V	0			
B22		1.00	1.40	10YR 7/6	0	FSLC		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.5		6.5		6.5		6.5		6.5										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	97	McCJI	7-Sep-2011	Lb2	Rld	429164 E	7572438 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					G	A	1		0				0		1	H	1.00	99	w1.0	7SEucre, Eumel, Codall		
																			w1.0	4VAcspp,Eusimilis		
																			g1.0	3SHecon,Arisidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Site located on M/L HSL on eastern boundary of lease, above C70 / ten mile rd intersetion. Many areas bare of grass as well around this site. Some minor gully erosion where tun-off concentrated by poorely maintained farmer track.					
		A	3	E	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS				V	0		
B		0.20	0.60	7.5YR 6/6	0	FSLC				V	0		
B3 / BC		0.60	1.00		0	FSLC			32RSA	V	0		
C/R		1.00				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.6		5.5		6.5		7.0												
Field EC																						
Field pH (1:5)																						Site on M/L HSL east boundary of lease above C70/10 mile road intersection??
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	98	McCJI	7-Sep-2011	Tm2	Rld	427406 E	7571617 N	C	Luvisols			CH	AC	AG	AZ	D	E	L	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel		
																			w1.0	4VAcspp		
																			g1.0	3SHecon,Arisidaspp, Cecill, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											B-horizon very hard to excavate - bufel slghtly better growing than at previous site Site located on long, gentle slope to SE					
		A	1.5	SE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20		0	FSL	+	0	0	0			
A21		0.20	0.60		0	FSL		0	0	0			
A22e		0.60	0.90		0	FSL		0	0	0			
B2t		0.90	1.10	10YR 6/6	44DO	FSLMC		0	S4PR	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.5		7.0										
Field EC																						
Field pH (1:5)																						Wiregrass / black spear grass / CAOVATA, site on long, gentle slope to south-east.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	99	McCJI	7-Sep-2011	Lb2	Rld	426345 E	7570984 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	x

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Arisidaspp, Tripungs		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/B	Notes	
Eval	Height (m AHD)	Eval	%											Ibarks, ghost gum, desert oak, balck spear and wire grasses, soft spinifex lots of bare surface areas but no currant bush here.					
		A	2.0	SE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS		0	V	0			
B21		0.20	1.00	10YR 7/6	0	FSLC		0	V	0			
B22		1.00	1.50	10YR 6/6	0	FSLC		12RSA	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.5		7.0		7.0		7.0		7.0		7.0								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	100	McCJI	7-Sep-2011	Lb2	Rld	425377 E	7570346 N	C	Lixisols			KA	AC	AG	CD	C	E	M	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.20	99	w1.0	7SEucre, Eumel		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Arisidaspp, Tripungs		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Similar landform / vegetation as 99 but slightly higher on same gentle slope to south-east, mid to upper HSL.					
		A	1.5	SE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20		0	FSCL		0	V				
A3		0.20	0.60		0	CLFS		0	V				
B2		0.60	1.10	10YR 6/6	0	FSLC		0	W3PR				
BC		1.10	1.20		33DO	FSLC		21RSA					
C/R		1.20				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.9		5.6		6.0		6.5		6.7										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	101	McCJI	7-Sep-2011	Mb4	T	424924 E	7569969 N	C	Arenosols			TE	IO	AO	AR	B	E	M	M	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S		99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Tripung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Similar shrubs to other red or yellow TE. Very thick ACACIA LEPTOTACIA, Gradual boundaries, some gentle east/south-east slope - upper to mid slope??					
		Eval	1.5	SE	M	HSL		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15	10YR 4/3	0	FSCL		0	V	0			
B21		0.15	0.65	7.5YR 5/6	0	FSCL		0	V	0			
B22		0.60	1.45	7.5YR 6/6	0	FSCL		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.9		6.0		6.0		6.0		6.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	102	McCJI	8-Sep-2011	Mr2	T	423979 E	7569056 N	C	Arenosols			TE	GZ	CZ	AR	C	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.60	99	w1.0	E5CoSetosa		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Hecon, Tripung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Similar vgetation to last site - site located high in landscape than last site on stripy photopattern. Auger grindind SA from 0.60 m. Site very close to W boundary of lease area.					
				N	U	HSL		RIS		0	2	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.20	7.5YR 4/3	0	FSL		0	V	0			
A21		0.20	0.40	7.5YR 6/6 (m)	0	FSL		0	V	0			
A22e		0.40	0.60	7.5YR 8/6 (d)	0	FSL		0	V	0			
C/R		0.60											

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	103	McCJI	8-Sep-2011	Mr2	T	424048 E	7569193 N	C	Arenosols			TE	GZ	CZ	AR	C	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.55	99	w1.0	E4Metam, Eusimilis		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro, Jaram		
																			g1.0	3SArisidaspp, Hecon, Tripung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											150m north/north-west site 102 - similar bleached soil over sandstone but different vegetation, Melaluca tamatieina (p. 126 of book), Townsville Wattles, soft spinifex, golden parrot. Auger grinding SA from 55 cm					
					U	HSL		RIS		0	2	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.40		0	FSL		0	V	0			
A2e		0.40	0.55	10YR 8/3 (d)	0	LFS		0	V	0			
C/R		0.55	0.65										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.6		6.0		6.5														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	104	McCJI	8-Sep-2011	Tm4	Rld	424779 E	7571158 N	C	Solonetz			SO	AB	FO	AH	C	E	M	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEumel, Eucre, Eubrownii		
																			g1.0	3SHecon, Arisidaspp, Cecill, Sidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%											Some buffel, flannel weed Ibarks with silver-leaved dominant. Textures of B horizon feel strongly sodic. No segs to 1.10 m. Site located on long, gentle slope to E.					
		E	<1	E	M	HSL		RIS		0	2	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.35		0	CLFS		0	V	0			
A2e	S	0.35	0.50	10YR 8/1 (d)	0	CLFS		0	V	0			
B21t		0.50	0.70	10YR 5/4	33DB	FSMC		0	S5CO	0			
B22t		0.70	1.10	10YR 6/4	0	FSMC		0	S4AB	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.10		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.8		6.0		7.4		9.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	105	McCJI	8-Sep-2011	Mb4	T	423400 E	7570749 N	C	Arenosols			TE	IP	AO	AR	D	E	K	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	99	99	w1.0	E5CoSetosa, Eusimilis		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Tripung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Similar veg to site 103 but here are lots of bare surface areas as well. Gradual boundaries in this soil profile.					
		A	1.0	SE	U	HSL		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.15		0	LFS		0	V	0			
A3?		0.15	1.00	10YR 7/6	0	LFS		0	V	0			
B?		1.00	1.50	10YR 7/6	0	FSL		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		7.0		7.0		7.0		7.0		7.0								
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	106	McCJI	8-Sep-2011	Mb4	T	422808 E	7570130 N	P	Arenosols			TE	IP							

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0					99				

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Check site C 50/ 25 drill pad site SW boundary road. Yellow sand to 1.5 m + Massive subsoil. > 1.40m some red 'mottles' of decomposing sandstone Stripy photopattern - map separately if possible. Minor soils here - Mr2, Lb1, Tm1 and Lb2 in this unit.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	107	McCJI	8-Sep-2011	Lb2	Rld	424918 E	7571966 N	P	Lixisols			KA	AC	AG	CD	C	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.72	99	w1.0	7SEucre, Eumel		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Arisidaspp, Tripungs		

Elevation		Slope																
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
					L	HSL		RIS		0	2	3	4	Site at drill pad C50 / 15. Typical veg for this soil but with very little buffel grass here. FSC for B texture mostly here - but varies within drill pit from SL to FSC.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A	G	0.00	0.45	10YR 5/4	0	FSCL		0	V	0			
B21		0.45	0.72	7.5YR 6/6 (m)	0	FSLC		0	V	0			
C/R		0.72	1.50										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.2		5.5		5.8														
Field EC																						
Field pH (1:5)																						From 72 - harder deco/sandstone, one site of pit B-SL?????
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	108	McCJI	8-Sep-2011	Lb2	Rld	425528 E	7572695 N	C	Lixisols			KA	AC	AG	AT	C	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.00	99	w1.0	7SEucre, Eumel, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Arisidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Similar vegetation - bad bulldust here No currant bush observed Auger grinding SA from 90 cm					
		E	<1	SE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.25		0	CLFS		0	V	0			
A2e		0.25	0.40	10YR 8/3 (d)	0	CLFS		0	V	0			
B2		0.40	0.90	10YR 6/4	22DO	FSLC		0	V	0			
BC		0.90	1.00										
C/R		1.00				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.8		6.0		6.6		7.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	109	McCJI	8-Sep-2011	Lb2	Rld	427023 E	7573882 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.55	99	w1.0	7SEucre, Eumel		
																			w1.0	4VAcspp		
																			g1.0	3SHecon,Arisidaspp, Tripungs		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											drill pad c50 - drilling leftovers showed lots of Fe/Mn pan here, part of significant rise Auger grinding Hard Pan from 55 cm					
		A	3.0	W	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15		0	CLFS		0	V	0			
B2		0.15	0.55	10YR 6/6	0	FSLC		0	V	0		3MCV	
C/R		0.55	0.60										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.8		6.0		6.5														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	110	McCJI	8-Sep-2011	Tm1	Rld	425878 E	7574345 N	C	Luvisols			CH	AC	AG	AZ	C	E	L	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Eubrownii		
																			w1.0	4VAcspp		
																			g1.0	3SHecon,Arisidaspp, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Site on slope to east before rise further east, thick black spear grass + kangaroo grass, Ironbarks / Reid River box / Desert Oak / some Wattles. 10 Mile Road looks very sandy here and subejct to bulldust					
		A	2.0	E	L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.30		0	FSL		0	V	0			
A2e		0.30	0.50	10YR 8/4 (d)	0	FSL		0	V	0			
B2t		0.50	0.80	10YR 7/6	32DO	FSLC		22RSA	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.8		6.5		6.8														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	111	McCJI	8-Sep-2011	Lb2	Rld	422960 E	7575893 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.90	99	w1.0	7SEucre, Eumel, Eubrownii		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Arisidaspp, Cecill		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Site at drill pad C20 - 10 Very gentle slope to E / SE. Drill Pit at site shows soil horizon boundaries are fery flat as well as depth to sandstone. Auger grinding SA from 90 cm.					
		E	<1	E	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS		0	V	0			
B		0.20	0.90	10YR 6/4	0	FSLC		21ASA	V	0			
C?		0.90	1.00										

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.9		6.5		6.8												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	112	McCJI	8-Sep-2011	Mb4	T	422179 E	7575764 N	A	Arenosols			TE	IP							

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0				99	99				

Elevation		Slope												Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Sight in obvious yellow sand area - located 1.2 kms W of 10 mile bore. Consisitent photopattern. Shrubs - wattles and grevillea large yellow anthills here as well. Some slight erosion here as well					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	1.00			LFS		0	G				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	113	McCJI	8-Sep-2011	Lb2	Rld	425020 E	7575905 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.90	99	w1.0	7SEucre, Eumel, Eubrownii		
																			w1.0	4VAccor Ermit		
																			g1.0	3SHecon,Arisidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Site at dill pad here C30/05. Auger grinding SA from 0.90 m.					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.35		0	CLFS		0	V	0			
B2		0.35	0.90	10YR 6/4	0	FSLC		0	V	0			
C/R		0.90											

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.9		6.5		7.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	114	McCJI	8-Sep-2011	Mb4	T	424472 E	7575551 N	C	Arenosols			TE	IP	CZ	AR	B	E	L	L	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	1.20	99	w1.0	E5Cosetosa, Eusimilis		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Hecon		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Obvious sandy unit - surface and vegetation as per others, Still flat though. Consistent photopattern excep this profile over rock from 1.20 m.					
					L	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	FSL		0	V	0			
B1		0.20	0.60	10YR 6/6	0	FSL		0	V	0			
B2		0.60	1.20	10YR 7/6	0	FSL		0	V	0			
C/R		1.20	1.35					52RSA					

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.3		5.3		5.3		5.3		6.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	115	McCJI	9-Sep-2011	Eb2	Qs	433019 E	7566457 N	C	Vertisols			VE	AB	GS	BN	E	R	R	X	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
M	C	0.50	12	M	0				0				0		4	G	99	99				
																H						

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
Eval	Height (m AHD)	Eval	%											Relatively large area of flat, MH brigalow clay, Parthenium weed along roadside, cleared brigalow + some Dawson Gum, HS surface. Gyspum at 70 - 130 cm. Good buffel grass, regrowth of Leopardwood.					
					F	PLA		PLA		0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.12	10 YR 4/3	0	FSMC		0	S3PL	0			
B21		0.12	0.30	7.5YR 5/3	0	FSMC		0	S5AB	0			
B22		0.30	0.70	7.5YR 5/4	0	FSMC		0	S5LE	1KN2	2KP		
B23y		0.70	1.30	7.5YR 5/4	0	FSMC		0	S5LE	2YX2	2KP		
B24		1.30	1.80	5YR 5/4	23DG	FSMC		0	S5LE	2MV1	2KP		

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.14		0.17		0.50		2.00		1.66		1.10		1.66						
Field pH (1:5)				6.6		7.7		8.7		7.8		7.8		7.4		6.9						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	116	McCJI	9-Sep-2011	Ln ?	Rld	431258 E	7568328 N	C	Luvisols			CH	AA	AH	CD	B	E	L	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.00	99	w1.0	7SEucre, Eumel, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon,Arisidaspp, Caovata		

Elevation		Slope																
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
					L	HSL		RIS		0	2	3	4	red soil - clay assume sandstone > 100cm. Profile doesn't fit soils established for this project. Not much buffel grass. Soil textures almost silty. Site on flat or gently sloping to SE			

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	FSL		0	V	0			
B21		0.20	0.70	10 R 4/6	0	FSLMC		0	W3PO	0			
B22		0.70	1.00	2.5YR 5/6	0	FSLMC		0	W3AB	0			
C/R		1.00				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5		7.5		8.0		8.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	117	McCJI	9-Sep-2011	Gc2	Rld	431079 E	7569364 N	C	Arenosols			TE	GZ	CZ	AR	D	E	K	L	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	F	1.20	99	w1.0	7SEucre, Eumel, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											T7M, Ironbarks, minor currant bush, desert oak, odd ghost gum, black spear grass, some buffel, bulldust soil again.					
					L	HSL		RIS		0	3	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.70	10YR 4/3	0	LFS		0	V	0			
A21		0.70	1.00	10YR 6/4	0	FSL		0	V	0			
A22e		1.00	1.20	10YR 7/3 (d)	0	FSL		0	V	0			
C/R		1.20											

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.5		6.5		6.5		6.5		6.5										
Field EC																						
Field pH (1:5)																						
CEC																						Auger grinding sandstone from 120cm, deep bleached sand over rock?
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	118	McCJI	9-Sep-2011	Lb2	Rld	430677 E	7570323 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.40	99	w1.0	7SEucre, Eumel, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon, Aristidaspp, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/B	Notes	
Eval	Height (m AHD)	Eval	%											Ironbarks and similar vegetation to previous sites. Auger grinding SA from 1.40 m.					
		A	3.5	E	L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.30	10YR 4/3	0	FSCL		0	V	0			
A2	G	0.30	0.40	10YR 7/6 (d)	0	FSCL		0	V	0			
B2		0.40	1.40	10YR 6/6	0	FSLC		0	V	0			
C/R		1.40				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.2		6.5		6.5										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	119	McCJI	9-Sep-2011	Lb2	Rld	428853 E	7569970 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.00	99				

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C/B	Notes	
Eval	Height (m AHD)	Eval	%											>100 auger grinding sandstone, ironbarks / Reid River box, currant bush, soft spinifex, black spear grass, some buffel.					
					F														

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.25		0	CLFS		0	V	0			
B2		0.25	1.00	10YR 7/6	0	FSLC		0	V	0			
C/R		1.00				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.0												
Field EC																						
Field pH (1:5)																						bore pad 801/10??
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	120	McCJI	9-Sep-2011	Tm1	Rld	429850 E	7568923 N	C	Luvisols			CH	AC	AG	AT	D	E	L	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.40	99	w1.0	7SEubrownii		
																			w1.0	4VAccor		
																			g1.0	3SHecon, Aristidaspp, Tripung, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Site at C90/10 drill pad. Thick currant bush here. Auger grinding SA from 1.40 m.					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.50		0	FSL		0	V	0			
A2e		0.50	0.65		0	FSL		0	V	0			
B2t		0.65	1.40	10YR 6/4	44DO	FSLC		0	V	0			
C/R		1.40											

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.5		7.5										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	121	McCJI	9-Sep-2011	Lb4	Rld	426398	7573514 N	P	Arenosols			TE	IP	CZ	AR	B	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.70	99	w1.0	7SEucre, Eumel		
																			w1.0	4VAccor, Acspp		
																			g1.0	3SHecon, Aristidaspp		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Soil pit at drill pad C50/05. Pit shows hard Mn pan from 0.70 m.					
					L	HSL		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15	10YR 5/3	0	FSL		0	V	0			
B2		0.15	0.70	10YR 6/6	0	FSL		0	V	0			
C/R		0.70				PSA						4MCC	

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.8		5.8														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	122	McCJI	9-Sep-2011	Lb2	Rld	423968 E	7574848 N	P	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.95	99	w1.0	7SEucre, Eumel, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon, Aristidaspp, Cecill		

Elevation		Slope															
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes	
					L	HSL		RIS		0	2	3	4	Soil pit at drill pad C30/10. Ironbarks, ghost gum, desert oak, black spear grass / wire grass / buffel Soil pit over hard SA from 0.95 m					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS		0	V	0			
B2		0.20	0.95	10YR 7/6	0	FSLC		0	V	0			
C/R		0.95				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.7		7.0		7.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	123	McCJI	9-Sep-2011	Tm4	Rld	422314 E	7574950 N	C	Solonetz			SO	AC	FN	AH	D	E	L	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Codall		
																			w1.0	4VAccor, Acspp, Ermit		
																			g1.0	3SHecon, Aristidaspp, Tripung, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Ironbarks, some wattle and currant bush. Site on long M/U HSL Suspect SA comes in noit much deeper - some SA fragments from 1.15 m.					
		A	2.0		M	HSL		RIS		0	2	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.30	10YR 4/2	0	FSL		0	V	0			
A21		0.30	0.50	10YR 6/4 (d)	0	FSL		0	V	0			
A22e		0.50	0.70	10YR 8/3 (d)	0	FSL		0	V	0			
B21t		0.70	1.00	10YR 6/4	43PO	FSLC		0	S5CO	0			
B22t		1.00	1.30	10YR 7/6	43DO	FSLC		0	S4PR	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.1		6.0		7.0		9.1										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	124	McCJI	19-Sep-2011	Eb2	Qs	433703	7556848 N	C	Verisols			VE	AB	GS	GI	E	Q	Q		

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
N	B	15	10	M	0				0				0		4	G	99	99				
																H						

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Drill pad C170/30, cleared brigalow, 70 % cracking caly with gilgai and 30 % HS duplex (Sodosol?) here but overall unit probably more like 60 % duplex and 40 % crackgion clay.					
					F	PLA		PLA		0	2	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
Aj		0.00	0.12		22FO	LC	(2)						
B21		0.12	0.30	10YR 5/3		LMC							
B21		0.30	0.45	7.5YR 5/4		LMC		S5LE					
B23		0.45	0.90	7YR 5/4		LMC		S5LE		3KN3 / 1YX1			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.7		7.5		9.9		9.9												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	125	McCJI	19-Sep-2011	Cr1	Qa	434566	7555023 N		Arenosols			TE								

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	S	99	99				
																F						

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
														Check hole still on Carmichael River Levee. Deep, sandy soil here - cleared Large blue gums, Ried River Box. Similar soil to site 28 and also Bulldust. Ricky rise to south of this site. GPS says 1.05 Km SE of site 27, 1380 m W of site 22.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	126	McCJI	19-Sep-2011	Eb2	Qs	436041 E	7559056 N		Verisols			VE								

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
M	C	1.5	22	M	0				0				0		4	G	99	99				
																H						

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	A / B	Notes		
														Cleared Melon hole Brigalow clay. Strongly cracking here with weak, patchy course self-mulching but mostly HS surface. Cane grass in depressions. Generally good buffel here and not much woody weeds.						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	127	McCJI	19-Sep-2011	Gc1	Rld	435210	7558306 N	C	Leptosols			RU	CY	CZ	AR	G	M	U		

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				3	2	A	SA	0		4	H	0	99				

Elevation		Slope												Land use		Land condition	C/D	Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Cleared as part of Rise -mostly better deeper Red soil. Resonably thick current bush here - Little amount of grass with lots of bare areas and rocky surface rocky areas.					
					U	HSL		RIS		0	5	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A/C		0.00	0.30	10YR 5/3	0	CLFS		32ASA	V	0			
R		0.30	0.45			RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5																
Field EC																						
Field pH (1:5)																						Auger grinding sandstone from 30cm.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	128	McCJI	19-Sep-2011	Eb2	Qs	434840 E	7557971 N	C	Vertisols			VE	AB	GS	GI	F	S	S	X	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
M	C	1.00	22	M	0				1	2	A	LC	0		4	G	99	99				
									2	1	A	LC				M						
																H						

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B	Notes	
					F	PLA		PLA		0	2	1	3	Cleared Brigalow MH cracking clay - weak SM evident + surface sandstone & silcrete gravels, no gypsum. Site looks flat but maybe very gentle slope to W ?					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A11		0.00	0.04		33DO	MHC		0	W3GR				
A12		0.04	0.12		0	MHC		0	S3AB				
B21		0.12	0.30	7.5YR 5/4	0	MHC		0	S5AD				
B22		0.30	0.80	7.5YR 5/4	0	MHC		0	S5LE	2KN1	K2D		
B23		0.80	1.20	10YR 5/3	33DO	MHC		0	S5LE	2MV1	K3P		

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				7.5		8.7		8.7		7.8		6.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	129	McCJI	19-Sep-2011	Cr4	Qa	437386 E	7557572 N	C	Luvisols			CH	AB	AG	CD	C	E	L	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	99	99				

Elevation		Slope			Landform								Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Element	Location	Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Cleared Reid River Box regrowth, some buffel but very thick currant bush. Small backplain of Carmichael Rive Levee. Some sandy soil in this unit - Cr1 probably as well as minor areas of crackling clay.					
					F	BKP		ALP		2	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.30			FSL		0	V				
A3 / B1 ?		0.30	0.80	7.5YR 5/6		FSLMC		0	W5AB	22MN			
B21 t		0.80	1.35	10YR 6/6	22DO	MC		0	S5AB	32MN			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.6		6.9		7.0		7.8		7.8										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	130	McCJI	19-Sep-2011	Cr3	Qa	436891 E	7556360 N	C	Luvisols			CH	AA	AG	CD	B	E	M	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		4	H	99	99				

Elevation		Slope			Landform												
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Element	Location	Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
					F	LEV		ALP		2	1	3	4	Sampled, Red Ch on backslope of Carmicael River. Cleared Reid River Box / TESS, Buffel - quite good, Current bush here though					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20	5YR 4/4	0	CLFS		0	V				
B21t		0.20	0.75	2.5R 4/6	0	MC		0	S4PR				
B22tk		0.75	1.40	2.5YR 5/6	0	MC		0	S5PR	3KN2			
2 D b ?		1.40	1.70	5YR 5/6	0	FSLC		0	S4PR		C 3 P		

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.04		0.02		0.02		0.10		0.10		0.09								
Field pH (1:5)				7.0		6.9		7.2		8.8		8.9		9.0								
CEC				6		6		10		29		25		21								
ESP				0.5		0.3		0.6		0.5		1.1		1.7								
Ca/Mg				3.6		3.4		2.9		6.5		4.4		3.4								

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	131	McCJI	20-Sep-2011	Lb1	Rld	437297 E	7550588 N	C	Lixisols			KA	AA	AG	CD	B	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Codall, Ervesp		
																			w1.0	4VAccor, Hibhet		
																			g1.0	3SHecon, Aristidaspp, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Very little buffel not the same range of shrubs here as found on this soil north of Carmichael-Moray Road. Native hibiscus present here though.					
					L	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS		0	V	0			
B21		0.20	0.45	5YR 5/6	0	FSLC		0	V	0			
B22		0.45	1.30	5YR 6/6	0	FSLC		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				5.9		6.5		6.6		6.6		6.7										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	132	McCJI	20-Sep-2011	Lb2	Rld	438123 E	7551479 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Codall, Ervesp		
																			w1.0	4VAccor		
																			g1.0	3SHecon, Aristidaspp, Thaus		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Sandstone from 110 - but not deco by 1.35m. Similar vegetation and LF to last site. Slope very gentle here to E or SE.					
					L	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20			CLFS		0	V	0			
B21		0.20	0.70	7.5 YR 6/6		FSLC		0	V	0			
B22		0.70	1.10	7.5 YR 5/4		FSLC		0	V	0			
B3 / BC		1.10	1.35	7.5YR 5/4	22DR	FSLC		22ASA	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.6		6.6		6.6		7.0		7.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	133	McCJI	20-Sep-2011	Eb2	Qs	439184 E	7551964 N		Vertisols			VE								

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
M	C	1.00	12		0				0				0				99	99				

Elevation		Slope												Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Check site only - cleared Brigalow clay with Melon holes. 930 m NE of site 132. Weakly self-mulching surface. Buffel looks good but probaly salty at depth.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	134	McCJI	20-Sep-2011	Eb1	Qs	438516 E	7549862 N	C	Solonetz			SO	AC	FN	AH	D	E	M	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Eubrownii		
																			w1.0	4VAccor		
																			g1.0	3SHecon, Aristidaspp, Caovata, Cecill		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Site located at drill pad C30 - 35. B-horizon texture feels sodic - couldn't dig deeper as lost tube tip down hole - bulldust surfaceBuffel grass very poor here.					
					L	HSL		RIS		0	3	1	3						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.55			CLFS		0	V	0			
A2e	A	0.55	0.65			CLFS		0	V	0			
B21t		0.65	0.95	10YR 6/4	33PO	MC(FS)		0	S4PR	0			D 6

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		5.9		5.6		6.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	135	McCJI	20-Sep-2011	Eb2	Qs	440510 E	7551769 N	C	Vertisols			VE	AC	GS	GH	F	R	S	X	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
M	C	1.00	20	M	0				2	1	C	LC	0		4	G	99	99				
																H						

Elevation		Slope																		
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
					L	HSL		RIS		0	2	1	3	Cleared brigalow gidgee MH cracking clay - Lower HSL and Rises here with currant bush and samdalwood amongst brigalow regowth. Buffel looks good - no parthenium. pH probe would not work correctly.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.15		0	MC		0	S4AB				
B21k		0.15	0.70	10YR 6/4	0	HC		0	S5LE	3KS3 / 2YX1	K2P		
B22		0.70	1.35	10YR 5/4	33DB	HC		0	S5LE	2KS3 / 1YX1	K3P		

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC				0.30		0.81		1.45		3.56		1.56										
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	136	McCJI	20-Sep-2011	Lb2	Rld	432198 E	7567113 N	E	Lixisols			KA	AC	AG	CD	C	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					B	A	1		0				0		1	H	1	99				

Elevation		Slope			Landform								Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Site described is exposure from minor creek line. Ried River Box and some Brigalow - vegetation boundary here is very diffuse over several hundred meters.					
					L	HSL		RIS		3	3	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.30			CLFS			V				
B2		0.30	0.70	10 YR 7/6		FSLC			V				
C / R		0.70			3 3 D R	Sandstone							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP								6.6														
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	137	McCJI	20-Sep-2011	Lb2	Rld	420961 E	7573969 N	A	Lixisols			KA	AC	AG	CD	C	E	M	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Eubrownii		
																			w1.0	4VAccor		
																			g1.0	3SHecon, Aristidaspp, Yhaus		

Elevation		Slope																
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes
					L	HSL		RIS		0	2	3	4	Site located at drill pad 20 / 20. Back to hand augering - couldn't start rig motor. At 90 cm - few SA greavels starting to appear - almost edge of BC or C hroizon.				

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.40		0	CLFS		0	V	0			
B		0.40	0.90	10YR 7/6	0	FSLC		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.5		6.6												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	138	McCJI	20-Sep-2011	Mb3	T	427828 E	7566926 N	P	Arenosol			TE	IN							

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0				99	99				

Elevation		Slope												Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Site is exposed pit at C90 / 20 drill pad. Obvious red sand again shrubs, yellow jacket, wattles and rogh-barked bloodwood consistent photopattern again odd ghost gum black spear grass wire grass					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A/B		0.00	0.90	10 R 4/6		FSL		O	V				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP										7.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	139	McCJI	20-Sep-2011	Tm1	Rld	428334 E	7567040 N	A	Luvisols			CH	AB							

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					B	A	1		0				0				99	99				

Elevation		Slope												Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%	Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage						
														Tm1 best fit - minor brigalow in unit Minor soils Lb2, Eb2 and Lb4. Reid River Box, Sandalwood. Wire grasses and soft spinifex Sandy surfaced soil on Eucalypt flat. Some creek lines and ersoion associated.					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.60			FSL		0	V				
B		0.60	0.70	10 YR 5/4	0	FSL		0	V				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	140	McCJI	21-Sep-2011	Tm1	Rld	424442 E	7571703 N	C	Luvisols			CH	AC	AG	AT	C	E	L	O	

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	99	99	w1.0	7SEucre, Eumel, Codall		
																			w1.0	4VAccor		
																			g1.0	3SHecon, Aristidaspp, Tipung, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	B/C	Notes	
Eval	Height (m AHD)	Eval	%											Ironbark / odd ghost gum / desert oak / CAOVATA, black spear grass / soft spinifex / wiregrasses.					
		A	2.5	NE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.35		0	FSL		0	V				
A2e		0.35	0.50		0	FSL		0	V				
B2t		0.50	0.90	10YR 6/6	0	FSLC		0	V				

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.6		6.6		7.0		7.0												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	141	McCJI	21-Sep-2011	Mb4	T	424151 E	7572709 N	C	Arenosols			TE	IP	AO	AR	B	E	K	L	X

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	F	99	99	w1.0	7SEucre, Eumel, Codall		
																S			w1.0	4VAccor, Acspp, Melspp		
																			g1.0	3SHecon, Aristidaspp, Tipung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Yellow sand downslope of red sand - consistant photopattern					
		A	2.0	NE	M	HSL		RIS		0	1	4	6						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	LFS		0	V	0			
B21		0.20	0.60	10YR 6/6	0	FSL		0	V	0			
B22		0.60	1.40	10YR 7/8	0	FSL		0	V	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.7		6.5		5.8		6.5		7.0										
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	142	McCJI	21-Sep-2011	Tm1	Rld	423730 E	7573672 N	C	Luvisols			CH	AC	AG	AT	C	E	L	O	W

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	1.10	99	w1.0	7SEucre, Eumel, Coclark, Codall		
																			w1.0	4VAccor, Acspp		
																			g1.0	3SHecon, Aristidaspp, Tipung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Site located on M/U HSL between 2 drainage lines. Auger grinidng SA from 1.1 m.					
		A	1.0	NE	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.40		0	FSL		0	V	0			
A2e		0.40	0.60		0	FSL		0	V	0			
B2t		0.60	1.10	10YR 7/6	0	FSLMC		11ASA	V	0			
BC		1.10											

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.5		6.7		6.7												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	143	McCJI	21-Sep-2011	Mb3	T	422313 E	7573303 N	A	Areonsols			TE	IN							

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0				99	99				

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											C30 Line - check hole - obvious red, bulldust loose sand consistend photopattern shrubs, wattles, yellow jacket, black spear grass. Slight rise here - boundary is near road to the W of site. Photos of bulldust taken here.					
		A	4.0	E	M	HSL		RIS											

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.05	2.5 YR 4/6		LFS		0	G	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	144	McCJI	21-Sep-2011	Mr2	T	421993 E	7572975 N	C	Arenosols			TE	GZ	AO	AR	D	E	L	L	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	S	0.90	99	w1.0	E5CoSetosa, Eusimilis, Coclark		
																			w3.0	D5Aclept, Grpter, Pespp, Calmicro		
																			g1.0	3SArisidaspp, Tripung		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Consistent strippy photopattern - bulldust soil again, bleached sand over rock, auger grinding sandstone from 90cm.					
	A	A	4.0		U	HSL		RIS		0	1	4	5						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A1		0.00	0.30		0	FSL		0	V	0			
A21		0.30	0.85	10YR 7/6	0	FSL		0	V	0			
A22 e		0.85	0.90	10YR 8/4 (d)	0	FSL		0	V	0			
C/R		0.90				RSA							

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.0		6.5												
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification								
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	145	McCJI	21-Sep-2011	Lb2	Rld	423217 E	7574969 N	C	Lixisols			KA	AC	AG	CD	B	E	M	O	V

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0		1	H	0.90	99	w1.0	7SEucre, Eumel		
																			w1.0	4SAccor		
																			g1.0	3SHecon, Thaus, Tipung, Caovata		

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition	C	Notes	
Eval	Height (m AHD)	Eval	%											Ironbark, more desert oak than other site, black spear grass / kangaroo grass / soft spinifex, minor currant bush. Auger grinding SA from 0.90 m.					
		A	2.0	E	M	HSL		RIS		0	2	3	4						

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.20		0	CLFS		0	V	0			
B2		0.20	0.90	10YR 7/6	0	FSLC		0	V	0			
		0.90											

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP				6.0		6.0		6.5		6.7												
Field EC																						
Field pH (1:5)																						Auger grinding sandstone from 90cm.
CEC																						
ESP																						
Ca/Mg																						

Survey	Site	Desc by	Date	Soil Name	Geology	AMG Location		Observation Type	World Reference Base		Australian Soil Classification									
						Accuracy	Datum GDA 94		Reference Soil Group	Qualifiers	Conf	Order	S.Ord	G Grp	S Grp	Fam 1	Fam 2	Fam 3	Fam 4	Fam 5
CC	146	McCJI	21-Sep-2011	Mb4	T	435742 E	7551964 N	A	Arenosols			TE	IP							

Microrelief					Erosion				Surface coarse fragments				Rock Outcrop		Site Disturbance	Surface Condition	R hor depth (m)	Free water depth (m)	Vegetation			
Type	PROP	V.I. (m)	H.I. (m)	Prop Sample	Type	State	Degree	Gully Depth	Abund	Size	Shape	Lith	Abund	Lith					Formation (Level 1 & 2)	Broad floristic formation (Level 3)	Broad floristic subformation (Level 4)	Wetland Type & Gr.form
Z					0				0				0					99				

Elevation		Slope		Aspect	Morph Type	Landform Element	Location	Landform Pattern	RMS	Flooding	Run-Off	Permeability	Drainage	Land use		Land condition		Notes	
Eval	Height (m AHD)	Eval	%											Check site - travelled west along ill-defined track from site 60. Obviously still very sandy soil unit here and from site 60. Ironbarks Yellow Anthills. Still very much bulldust					

Horizon	Boundry	Depth (m)		Colour	Mottles	Field Texture	Qual	Coarse Fragments	Structure	Segregations	Cutans or Voids	Pans	SWS & Consistence
		Upper	Lower	Hue : Value / Chroma									
A		0.00	0.05			LFS		0	G	0			

Test depth (m)		0.02		0.10		0.30		0.60		0.90		1.20		1.50		1.80		2.10				pH Rp (Raupach field pH); Field EC (1:5 soil:water - ds/m)
pH - RP																						
Field EC																						
Field pH (1:5)																						
CEC																						
ESP																						
Ca/Mg																						

Appendix II Vegetation species – common and scientific names

Appendix II Vegetation species common and scientific names

Acacia spp	
Gidgee	*Ac. cambagei*
Desert Oak	*Ac. coriacea*
Brigalow	*Ac. harpophylla*
Townsville Wattle	*Ac. leptostachya*
Prickly acacia	Ac. *nilotica**
Sally Wattle	*Ac. salicina*
Corymbia spp	
Grey bloodwood	*Co. clarkinsonia*
Ghost gum	Co. dolichocarpa
Pink blood wood	*Co. intermedia*
Rough-leaved Bloodwood	*Co. setosa*
Moreton-Bay ash	*Co. tessellaris*
Eucalypt spp	
Reid River Box	*Eu. brownii*
Dawson gum	*Eu. cambageana*
Narrow-leaved Ironbark	*Eu. crebra*
Silver-leaved Ironbark	*Eu. melanophloia*
Mallee box	Eu. persistens
Yellow jacket	Eu similis
Blue Gum	Eu. tereticornis
Soap tree	*Alphitonia excelsa*
Wire grasses	Aristida spp
Calytrix	*Calytrix microcoma*
Currant bush	*Carrisa ovata*
Batswing Coral tree	*Erythrina vespertilio*
Billy button daisy	Chrysocephalum apiculatum
Flindersia	Flindersia spp
Native hibiscus	*Hibiscus heterophyllus*
Black spear grass	Heteropogan contortus
Golden Parrot Tree	*Grevillea pteridifolia*
no common name	*Jacksonia ramosissima*
Leopardwood	*Flindersia maculosa*
bauhinia tree	Lysiphyllum cunninghamii
Brushhouse paperbark	*Melaleuca tamariscina*
Emu apple	Owenia acidula
Parthenium weed	*Parthenium hysterophorus**
Quinine bush	Petalostigma pubescens
Flannel weed	*Sida spp**
soft spinifex	*Triodia pungens*.

* Introduced species

Appendix III Chemical analyses results from selected soil samples

Agricultural Chemistry Pty Ltd

For Info Refer ESSA Pty Ltd
PO Box 442 Sunnybank Q 4109

Phone: 0403245560

email: e.s.s.a@bigpond.net.au

Reference: **11/60/56300y**

Date Received: 1/10/2011
Date Completed: 17/10/2011

FINAL REPORT

Project:

Carmichael River No2 (230911)

All results in this report relate only to the items tested. Results are expressed on an "as received basis".

Client Name: NQSA

Contact: MR J Mc Clurg

Sample Type: Soil

Number of samples: 17

Agricultural Chemistry Pty Ltd

Soil Analysis Report
Batch Number: 11/60/56300y

Date Received: 1/10/2011
Date Completed: 17/10/2011

Client: NQSA

ESSA yara Ref	field ref	Soil pH	Soil EC	Soil Cl	P (Olsen)	Exch.K	Exch. Mg	Exch.Ca	Exch. Na	ESP	Soil CEC
			dS/m	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g	%Na/CEC	meq/100g
B056300-001	7 B 0-10	6.6	0.06	15	7	0.61	0.94	1.86	-0.08	1.1	3.63
B056300-002	7 0-10	5.9	0.05	17		0.31	0.74	2.3	-0.08	1.1	3.62
B056300-003	7 20-30	6.2	0.03	18		0.15	0.73	1.15	-0.08	0.9	2.24
B056300-004	7 50-60	6.5	0.02	14		0.19	0.63	0.95	-0.08	1.5	2.01
B056300-005	63 B 0-10	6.1	0.05	18	24	0.54	1.06	4.81	-0.08	0.7	6.81
B056300-006	63 0-10	6.3	0.04	13		0.53	1.42	5.39	-0.08	0.5	7.65
B056300-007	63 20-30	6.4	0.04	13		0.53	3.14	6.75	0.17	1.6	10.86
B056300-008	63 50-60	7.3	0.04	12		0.42	4.13	6.26	0.46	3.9	11.69
B056300-009	63 80-90	8.9	0.11	19		0.35	6	8.27	1.16	7.2	16.05
B056300-010	63 110-120	9.3	0.28	91		0.36	7.52	14.71	2.45	9.7	25.33
B056300-011	130 B 0-10	7.4	0.07	15	11	0.62	1.21	7.32	-0.08	0.3	9.43
B056300-012	130 0-10	7	0.04	12		0.64	1	3.63	-0.08	0.5	5.6
B056300-013	130 20-30	6.9	0.02	15		0.28	1.18	4.05	-0.08	0.3	5.92
B056300-014	130 50-60	7.2	0.02	18		0.4	2.4	6.84	-0.08	0.6	10.06
B056300-015	130 80-90	8.8	0.1	14		0.41	3.7	24.07	0.14	0.5	28.65
B056300-016	130 110-120	8.9	0.1	16		0.39	4.33	19.23	0.26	1.1	24.51
B056300-017	130 140-150	9	0.09	16	4	0.33	4.44	15.22	0.34	1.7	20.58

Sample No	field ref	Org Mat.	Nitrate	S	Mn	B	Cu	Fe	Zn
Depth cm		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
7 B 0-10	7 B 0-10	1.4	7	3	8	0.2	0.2	21	1.3
63 B 0-10	63 B 0-10	3.1	1	5	10.9	0.3	0.6	61	0.6
130 B 0-10	130 B 0-10	0.6	<1	3	58.5	0.8	0.6	32	0.6

Lab No	Sample No	Site	Depth	PSA-CS	PSA-FS	PSA-Silt	PSA-Clay	ADMC
			cm	%	%	%	%	%
B056300-001	7 B 0-10	7	0 - 10	58	33	2	6	0.5
B056300-002	7 0-10		20 - 30	60	33	3	5	0.2
B056300-003	7 20-30		50 - 60	54	39	3	6	0.2
B056300-006	63 0-10	63	0 - 10	17	41	13	29	1.8
B056300-007	63 20-30		20 - 30	14	34	11	40	2.6
B056300-008	63 50-60		50 - 60	15	36	11	38	2.2
B056300-012	130 0-10	130	0 - 10	19	54	14	13	1.0
B056300-013	130 20-30		20 - 30	18	50	12	21	1.3
B056300-014	130 50-60		50 - 60	13	39	11	39	2.6
B056300-015	130 80-90		80 - 90	15	41	12	34	2.4
B056300-016	130 110-120		110 - 120	13	46	12	33	2.7
B056300-017	130 140-150		140 - 150	10	53	9	28	2.3

Agricultural Chemistry Pty Ltd

METHOD DESCRIPTIONS

Soil

Methods used to Analyse Samples

Analyte	ALHS*	Uncertainty %	LOQ	Unit	Name	Method Description
Ca (Alc)	15C1	7.2	0.18	meq/100g	Exchangeable calcium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
Mg (Alc)	15C1	4.7	0.31	meq/100g	Exchangeable magnesium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
Na (Alc)	15C1	9.6	0.09	meq/100g	Exchangeable calcium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
K (Alc)	15C1	4.8	0.02	meq/100g	Exchangeable calcium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity	KNO3 + Ca(NO3)2 extr, (AA) colorimetric
DTPA-Cu	12A1	17.1	0.26	mg/kg	DTPA ext. copper	DTPA extraction, AAS
DTPA-Zn	12A1	16.4	0.10	mg/kg	DTPA ext. zinc	DTPA extraction, AAS
DTPA-Mn	12A1	9.0	0.32	mg/kg	DTPA ext. manganese	DTPA extraction, AAS
DTPA-Fe	12A1	13.0	0.23	mg/kg	DTPA ext. iron	DTPA extraction, AAS
ADMC	2A1	11.9	0.4	%	Air Dried Moisture Content	Gravimetric oven dry @ 105C
R1	NA	20.2	NA		Dispersion Ratio	Ratio [Aqueous dispersible (Silt + Clay):Total (Silt + Clay)]
SO4-S	10B3	11.5	0.6	mg/kg	Sulfate sulfur	Ca(H2PO4)2 @ pH 4.0 extractable sulfate-sulfur, ICPOES
Sand	no ref	22.1	1.0	%	Particle size, sand	Hydrometer, gravimetric
Silt	no ref	16.6	1.0	%	Particle size, silt	Hydrometer, gravimetric
Clay	no ref	12.7	1.0	%	Particle size, clay	Hydrometer, gravimetric
TN	7A2	12.9	0.01	%	Total Kjeldahl Nitrogen	Sulphuric acid digest, (AA) colorimetric

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

For Manager
Analytical Services: _____

Agricultural Chemistry Pty Ltd

QUALITY CONTROL DATA

Soil

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

Test Method	Units		Actual Value	Acceptance Criteria [Range]
pH	pH	B		5.0 - 5.3
EC	dS/m	B		0.27 - 0.32
Cl	mg/kg	B		10 - 35
NO3-N	mg/kg	B		10 - 16
NH4-N	mg/kg	NA		NA
Bicarb.P	mg/kg	B		51 -75
Total Kjeldahl N	%	ASPAC 34	0.110	.100 - .120
Total P	%	ASPAC 34	0.02	.019 - .021
Organic Carbon	%	B		1.82 - 2.3
Ca (Exch. cations)pH7	meq/100g	B		6.96 - 8.04
Mg (Exch. cations)pH7	meq/100g	B		1.88 - 2.22
Na (Exch. cations)pH7	meq/100g	B		.057 - .182
K (Exch. cations)pH7	meq/100g	B		1.209 - 1.411
Exch. Acidity	meq/100g			NA
ECEC	meq/100g	A		NA
CEC	meq/100g	S12		58 - 73
ESP	%	A		NA
Coarse sand	%	B	17.0	17.3 - 22.4
Fine Sand	%	B	22.0	20.0 - 25.7
Silt	%	B	16.0	10.5 - 19.8
Clay	%	B	44.0	37.9 - 48.9
R1		B		0.23 - 0.38

Test Method	Units	Test Soil	Actual Value	Acceptance Criteria [Range]
DTPA-Cu	mg/kg	SB		2.37 - 3.25
DTPA-Zn	mg/kg	SB		3.15 - 3.81
DTPA-Mn	mg/kg	SB		97.7 - 149.0
DTPA-Fe	mg/kg	SB		24.3 - 32.6
0.33 Bar	%	G		32 - 51
15 Bar	%	G		23 - 30
Ca (Exch. cations)pH8.5	meq/100g	S12		27.7 - 35.4
Mg (Exch. cations)pH8.5	meq/100g	S12		22.88 - 24.5
Na (Exch. cations)pH8.5	meq/100g	S12		2.0 - 2.28
K (Exch. cations)pH8.5	meq/100g	S12		1.64 - 2.09

Agricultural Chemistry Pty Ltd

For Info Refer ESSA Pty Ltd
PO Box 442 Sunnybank Q 4109

Phone: 0403245560

email: e.s.s.a@bigpond.net.au

Reference: **11/68/56294y**

Date Received: 5/9/2011
Date Completed:

INT REPORT

Project:

Carmichael River No1 (050911)

All results in this report relate only to the items tested. Results are expressed on an "as received basis".

Client Name: NQSA

Contact: MR J Mc Clurg

Sample Type: Soil

Number of samples: 34

Agricultural Chemistry Pty Ltd

Soil Analysis Report
Batch Number: 11/56294y

Date Received: 5/9/2011
Date Completed:

Client: NQSA CC1

ESSA y Ref	field ref	Soil pH	Soil EC	Soil Cl	P (Olsen)	Exch.K	Exch. Mg	Exch.Ca	Exch. Na	ESP	Soil CEC
	depth cm		dS/m	mg/kg	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g	%Na/CEC	meq/100g
B056294-001	CC18 B0-10	6.4	0.07	24	13	0.63	3.04	6.17	0.44	4	11
B056294-002	CC18 0-10	7.4	0.07	22	5	0.37	4.96	9.95	1.37	8	17
B056294-003	CC18 20-30	9	0.23	137	3	0.27	5.65	11.99	2.54	12	21
B056294-004	CC18 50-60	9.1	1.05	1125	2	0.32	6.96	18.28	5.29	17	31
B056294-005	CC18 80-90	9.2	0.98	1088	5	0.25	5.4	8.76	5.07	26	20
B056294-006	CC18 110-120	9.1	1.21	2378	2	0.32	6.19	8.11	5.31	26	20
B056294-007	CC18 140-150	8.9	1.31	2135	5	0.36	6.59	5.23	5.5	31	18
B056294-008	CC24 B0-10	6.9	0.05	14	7	0.61	1.07	3.01	<0.1	1	5
B056294-009	CC24 0-10	6.8	0.04	<10	5	0.43	0.65	2.13	<0.1	1	4
B056294-010	CC24 20-30	6.9	0.03	<10	6	0.49	0.5	1.91	<0.1	1	3
B056294-011	CC24 50-60	6.9	0.02	16	6	0.35	0.91	1.48	<0.1	1	3
B056294-012	CC24 80-90	6.7	0.02	<10	5	0.22	1.34	1.65	<0.1	1	4
B056294-013	CC28 B0-10	7.2	0.02	<10	6	0.32	0.35	2.93	<0.1	0	4
B056294-014	CC28 0-10	7.2	0.08	14	11	0.87	0.91	2.7	<0.1	1	5
B056294-015	CC28 20-30	6.8	0.03	8	11	0.4	0.61	3.15	<0.1	0	4
B056294-016	CC28 50-60	7.5	0.02	5	10	0.2	0.25	2.4	<0.1	0	3
B056294-017	CC28 80-90	7.9	0.02	5	6	0.13	0.18	2	<0.1	1	3
B056294-018	CC28 110-120	8.2	0.02	7	5	0.1	0.19	2.03	<0.1	1	3
B056294-019	CC28 140-150	8.2	0.02	9	17	0.11	0.21	1.81	<0.1	1	2
B056294-020	CC35 B0-10	6.9	0.05	16	5	0.56	1.06	3.93	<0.1	0	6
B056294-021	CC35 0-10	6.5	0.02	8	4	0.27	0.69	2.87	<0.1	1	4
B056294-022	CC35 20-30	6.8	0.03	10	5	0.31	0.99	3.57	<0.1	0	5
B056294-023	CC35 50-60	7.4	0.03	15	5	0.3	1.27	2.87	<0.1	1	5
B056294-024	CC35 80-90	7.5	0.02	10	6	0.37	1.61	1.47	<0.1	1	4
B056294-025	CC45 B0-10	6.3	0.06	29	5	0.36	0.66	2.47	<0.1	1	4
B056294-026	CC45 0-10	6.5	0.03	5	5	0.19	0.37	2.71	<0.1	0	4
B056294-027	CC45 20-30	6.9	0.01	4	4	0.07	0.24	1.27	<0.1	1	2
B056294-028	CC45 50-60	7.1	0.01	9	19	0.13	0.73	0.94	<0.1	1	2
B056294-029	CC45 80-90	7.3	0.02	20	10	0.29	1.45	0.78	0.11	4	3
B056294-030	CC45 110-120	7.7	0.04	75	5	0.22	3.03	0.65	0.89	17	5
B056294-031	CC44 140-150	9.1	0.14	291	13	0.21	3.27	0.7	1.84	29	6
B056294-032	CC57 80-90	7.6	0.05	102	4	0.25	2.95	2.98	1.35	17	8
B056294-033	CC57 110-120	8.4	0.08	166	4	0.23	2.87	2.64	1.58	21	8
B056294-034	CC67 50-60	6.6	0.06	27	14	0.21	4.07	3.14	1.06	12	9

Sample No	field ref	Org Mat.	Nitrate	S	Mn	B	Cu	Fe	Zn	Colwell P
Depth cm		%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
B056294-001	CC18 B0-10	1.9	<1	5	40.7	0.6	0.8	62	0.7	37
B056294-008	CC24 B0-10	1.5	<1	3	18	0.5	0.3	17	0.6	29
B056294-013	CC28 B0-10	<0.5	<1	2	17.6	0.2	0.3	10	0.3	26
B056294-020	CC35 B0-10	1.6	<1	2	15.6	0.4	0.3	18	0.3	24
B056294-025	CC45 B0-10	1.1	5.9	2	18.4	0.3	0.2	30	0.1	23

Lab No	Sample No	Site	Depth	PSA-CS	PSA-FS	PSA-Silt	PSA-Clay	ADMC
			cm	%	%	%	%	%
B056294-002	CC18 0-10	CC18	0 - 10	24	44	9	21	1.3
B056294-003	CC18 20-30		20 - 30	23	33	10	34	3.4
B056294-004	CC18 50-60		50 - 60	26	38	9	28	2.9
B056294-005	CC18 80-90		80 - 90	28	36	8	29	2.8
B056294-006	CC18 110-120		110 - 120	23	37	5	34	3.5
B056294-007	CC18 140-150		140 - 150	20	36	8	36	3.5
B056294-009	CC24 0-10	CC 24	0 - 10	37	50	3	9	0.5
B056294-010	CC24 20-30		20 - 30	32	51	3	14	0.5
B056294-011	CC24 50-60		50 - 60	35	42	3	20	1.1
B056294-012	CC24 80-90		80 - 90	34	38	5	24	1.1
B056294-014	CC28 0-10	CC 28	0 - 10	13	75	6	6	0.4
B056294-015	CC28 20-30		20 - 30	15	74	5	6	0.4
B056294-016	CC28 50-60		50 - 60	17	73	6	6	0.2
B056294-017	CC28 80-90		80 - 90	15	76	4	6	0.3
B056294-018	CC28 110-120		110 - 120	17	75	3	6	0.2
B056294-019	CC28 140-150		140 - 150	19	72	4	5	0.3
B056294-021	CC35 0-10	CC 35	0 - 10	30	50	7	13	0.3
B056294-022	CC35 20-30		20 - 30	31	45	7	17	0.4
B056294-023	CC35 50-60		50 - 60	28	41	8	24	1.0
B056294-024	CC35 80-90		80 - 90	24	41	7	28	0.9
B056294-026	CC45 0-10	CC 45	0 - 10	44	40	8	7	0.4
B056294-027	CC45 20-30		20 - 30	42	43	8	7	0.3
B056294-028	CC45 50-60		50 - 60	40	39	7	15	0.4
B056294-029	CC45 80-90		80 - 90	37	34	7	21	0.6
B056294-030	CC45 110-120		110-120	29	28	7	37	0.9
B056294-031	CC44 140-150	CC 44	140 - 150	47	25	3	26	1.0
B056294-032	CC57 80-90	CC 57	80 - 90	27	34	8	31	1.0
B056294-033	CC57 110-120		110 - 120	28	36	9	29	0.8
B056294-034	CC67 50-60	CC 67	50 - 60	23	41	10	25	0.9

Agricultural Chemistry Pty Ltd

METHOD DESCRIPTIONS

Soil

Methods used to Analyse Samples

Analyte	ALHS*	Uncertainty %	LOQ	Unit	Name	Method Description
Ca (Alc)	15C1	7.2	0.18	meq/100g	Exchangeable calcium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
Mg (Alc)	15C1	4.7	0.31	meq/100g	Exchangeable magnesium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
Na (Alc)	15C1	9.6	0.09	meq/100g	Exchangeable calcium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
K (Alc)	15C1	4.8	0.02	meq/100g	Exchangeable calcium	1M NH4Cl (alcoholic) @ pH 8.5 leach, AAS
CEC	15I3	5.7	1.0	meq/100g	Cation Exchange Capacity	KNO3 + Ca(NO3)2 extr, (AA) colorimetric
DTPA-Cu	12A1	17.1	0.26	mg/kg	DTPA ext. copper	DTPA extraction, AAS
DTPA-Zn	12A1	16.4	0.10	mg/kg	DTPA ext. zinc	DTPA extraction, AAS
DTPA-Mn	12A1	9.0	0.32	mg/kg	DTPA ext. manganese	DTPA extraction, AAS
DTPA-Fe	12A1	13.0	0.23	mg/kg	DTPA ext. iron	DTPA extraction, AAS
ADMC	2A1	11.9	0.4	%	Air Dried Moisture Content	Gravimetric oven dry @ 105C
R1	NA	20.2	NA		Dispersion Ratio	Ratio [Aqueous dispersible (Silt + Clay):Total (Silt + Clay)]
SO4-S	10B3	11.5	0.6	mg/kg	Sulfate sulfur	Ca(H2PO4)2 @ pH 4.0 extractable sulfate-sulfur, ICPOES
Sand	no ref	22.1	1.0	%	Particle size, sand	Hydrometer, gravimetric
Silt	no ref	16.6	1.0	%	Particle size, silt	Hydrometer, gravimetric
Clay	no ref	12.7	1.0	%	Particle size, clay	Hydrometer, gravimetric
TN	7A2	12.9	0.01	%	Total Kjeldahl Nitrogen	Sulphuric acid digest, (AA) colorimetric

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QUALITY CONTROL DATA

Soil

*** Australian Laboratory Handbook of Soil and Water Chemical Methods (1992)**

Test Method	Units		Actual Value	Acceptance Criteria [Range]
pH	pH	B		5.0 - 5.3
EC	dS/m	B		0.27 - 0.32
Cl	mg/kg	B		10 - 35
NO3-N	mg/kg	B		10 - 16
NH4-N	mg/kg	NA		NA
Bicarb.P	mg/kg	B		51 -75
Total Kjeldahl N	%	ASPAC 34	0.110	.100 - .120
Total P	%	ASPAC 34	0.02	.019 - .021
Organic Carbon	%	B		1.82 - 2.3
Ca (Exch. cations)pH7	meq/100g	B		6.96 - 8.04
Mg (Exch. cations)pH7	meq/100g	B		1.88 - 2.22
Na (Exch. cations)pH7	meq/100g	B		.057 - .182
K (Exch. cations)pH7	meq/100g	B		1.209 - 1.411
Exch. Acidity	meq/100g			NA
ECEC	meq/100g	A		NA
CEC	meq/100g	S12		58 - 73
ESP	%	A		NA
Coarse sand	%	B	17.0	17.3 - 22.4
Fine Sand	%	B	22.0	20.0 - 25.7
Silt	%	B	16.0	10.5 - 19.8
Clay	%	B	44.0	37.9 - 48.9
R1		B		0.23 - 0.38

Test Method	Units	Test Soil	Actual Value	Acceptance Criteria [Range]
DTPA-Cu	mg/kg	SB		2.37 - 3.25
DTPA-Zn	mg/kg	SB		3.15 - 3.81
DTPA-Mn	mg/kg	SB		97.7 - 149.0
DTPA-Fe	mg/kg	SB		24.3 - 32.6
0.33 Bar	%	G		32 - 51
15 Bar	%	G		23 - 30
Ca (Exch. cations)pH8.5	meq/100g	S12		27.7 - 35.4
Mg (Exch. cations)pH8.5	meq/100g	S12		22.88 - 24.5
Na (Exch. cations)pH8.5	meq/100g	S12		2.0 - 2.28
K (Exch. cations)pH8.5	meq/100g	S12		1.64 - 2.09

Appendix IV UMA database

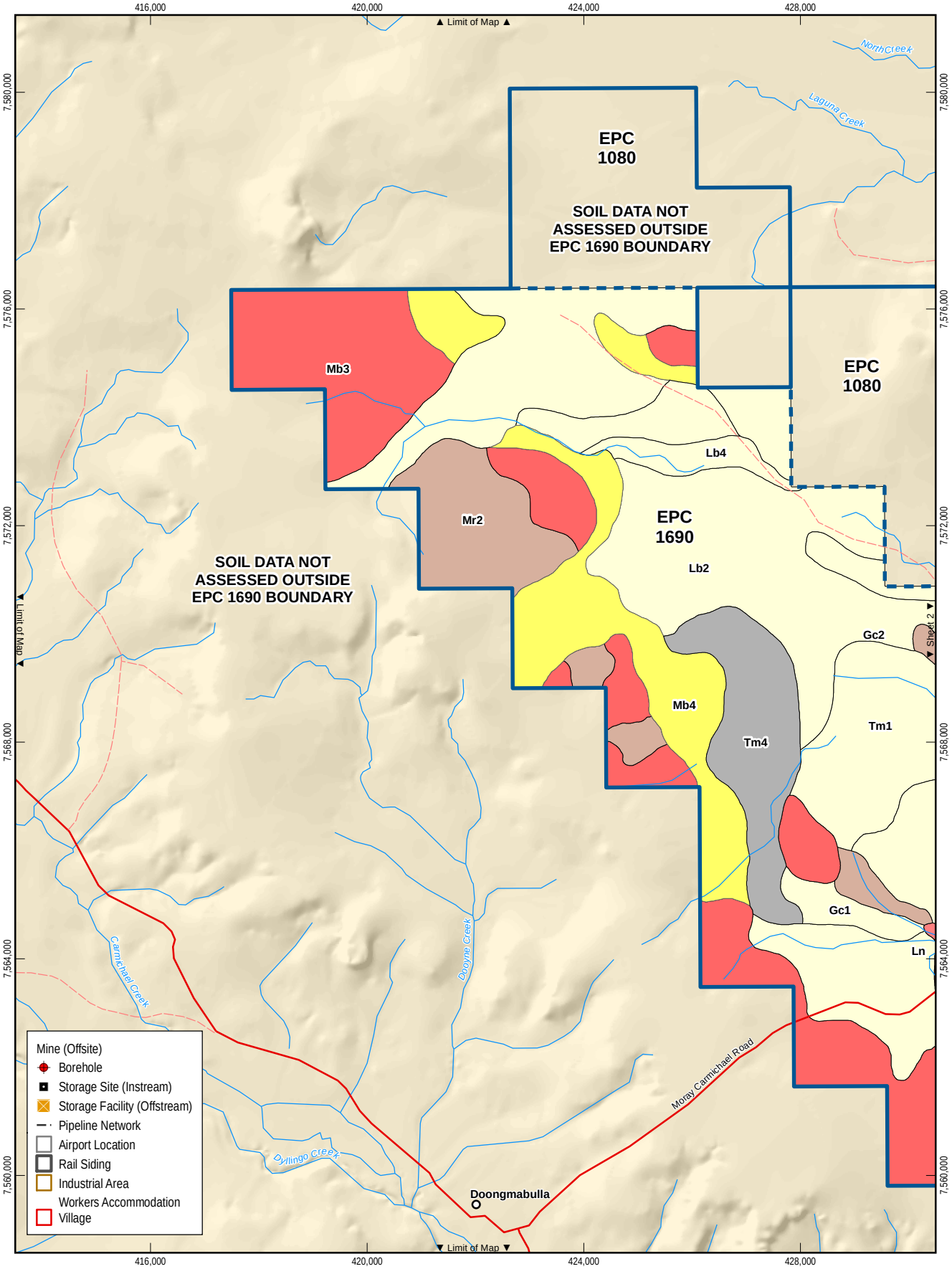
UMA no.	Name	Area (Ha)	Sites	MSoil1	MSoil2	Msoil3	Veg	Geol	LF	Slope	Landcond	Water avail (m)	Nutrient Deficiency (nd)	Soil physical factors (p)	Salinity (sa)	Rockiness (R)	Microrelief (g)	pH	ESP	Wetness (w)	Topography (t)	Water erosion (e)	Flooding (F)	Vegetation management (vm)	Graz.Suit
1	Tm1	1356.4	45, 46, 47, 48, 49	Tm4 05	Tm2 05		IB	Rld	PLA	< 1	C	4	3	1	1	1	1	2	1	1	1	1	1	1	4
2	Tm4	170.3	44				IBGG	Rld	PLA	< 1	C	4	4	2	1	1	1	3	3	1	1	1	1	1	4
3	Mb2	1347.3	42, 43, 50, 51, 52, 53, 55	Lb2 05			IBGGBW	Qs	LHSL	1-3	C	4	4	1	1	1	1	2	1	1	1	1	1	1	4
4	Mb3	200.4	41				Yjshrubs	T	Rise	1	C	4	4	1	1	1	1	2	1	1	1	1	1	4	5
5	Tm1	261.8	54, 56	Lb2 05	Eb2 05		IBBW	Rld	PLA	< 1	C	4	3	1	1	1	1	2	1	1	1	1	1	4	4
6	Gc1	313.5	36, 37	Gc2 25	E 05	R 05	IBRRB	Rld	UHSLH CR	3-5	D	4	4	1	1	3	1	1	1	1	1	2	1	4	5
7	Eb2	116.2		Eb3 20			BrigGidg	Qs	Rise	< 1	B	3	3	3	4	1	3	4	2	2	1	1	1	2	4
8	Eb1	854.7	57, 40, 39, 134	Eb2 10	Eb3 05		IBRRB	Qs	Rise	1-2	C	3	4	2	1	1	1	2	3	1	1	1	1	4	4
9	Eb2	66.9		Eb3 10			BrigGidg	Qs	Rise	< 1	B	3	3	3	4	1	3	4	2	2	1	1	1	2	4
10	Eb2	485.0	133, 135	Eb3 10			BrigGidg	Qs	PLA	< 1	A	3	3	3	4	1	3	4	2	2	1	1	1	2	4
11	Tm1	286.8	61, 62	Lb2 05			IB	Rld	LHSL	1	C	4	3	2	1	1	1	2	1	1	1	1	1	1	4
12	Eb3	116.6	63	Eb1 05	Eb2 05		BrigGidg	Qs	PLA	< 1	B	3	3	2	1	1	1	2	2	2	1	2	1	1	3
13	Cr1	848.9	22, 28, 125	Cr4 10			Cleared	Qa	LEV	1-2	C	4	3	1	1	1	1	2	1	1	1	1	2	2	4
14	Gc1	84.3		Gc2 25	E 05	R 05	IBRRB	Rld	UHSLH CR	3-5	D	4	4	1	1	3	1	1	1	1	1	2	1	4	5
15	Mb4	459.7	33, 146	GC1 05			IBGG	T	LHSL	< 1	C	3	4	1	1	1	1	2	1	1	1	1	1	1	4
16	Mb3	252.5	32, 59	Mb4 15			Shrubs	T	Rise	<1	D	4	4	1	1	1	1	2	1	1	1	1	1	4	5
17	Lb2	1575.1	29, 30, 31, 34, 35, 38, 60, 131, 132	Lb1 15	Tm1 15		IBRRB	Rld	LHSL	1-2	C	4	3	2	1	1	1	2	1	1	1	1	1	1	4
19	Cr3	530.4	19, 25, 26, 27, 130	Cr1 10	Eb2 10		RRB	Qa	LEV	1-2	C	1	3	2	1	1	1	2	1	1	1	1	2	1	3
20	Eb2	37.4		Eb3 10			BrigGidg	Qs	PLA	< 1	A	3	3	3	4	1	3	4	2	2	1	1	1	2	4
21	Cr4	128.6	58, 129	Cr1 10			RRB	Qa	LEV	1-2	C	1	3	2	1	1	1	2	1	1	1	1	2	1	3

UMA no.	Name	Area (Ha)	Sites	MSoil1	MSoil2	Msoil3	Veg	Geol	LF	Slope	Landcond	Water avail (m)	Nutrient Deficiency (nd)	Soil physical factors (p)	Salinity (sa)	Rockiness (R)	Microrelief (g)	pH	ESP	Wetness (w)	Topography (t)	Water erosion (e)	Flooding (F)	Vegetation management (vm)	Graz.Suit
22	Eb3	420.7	124	Eb2 40			Brig	Qs	PLA	< 1	B	3	3	2	4	1	2	4	2	2	1	1	1	2	4
23	Gc2	280.3	7, 71	E 05			IBBLOOD	Rld	MLHSL	2	C	4	3	1	1	1	1	1	1	1	1	1	1	4	4
24	Tm2	188.3	11				IBRRB	Rld	LHSL	1 - 2	B	1	3	1	1	1	1	2	1	1	1	1	1	1	3
25	Gc1	57.4	8	Gc2 25	E 05	R 05	Shrubs	Rld	UHSL	3-5	D	4	4	1	1	3	1	1	1	1	1	2	1	4	5
26	Lb4	43.4	10	GC2 10			IBGG	Rld	PED	2	C	4	4	2	1	1	1	2	1	1	1	1	1	4	5
27	Lb1	171.3	24, 127	Gc1 20	LB2 05		IBBLOOD	Rld	Rise	3-5	C	4	3	1	1	1	1	2	1	1	1	2	1	1	4
28	Mb3	805.0	79, 87	Mb405	Mr2 05		Shrubs	T	Rise	1	D	4	4	1	1	1	1	2	1	1	1	1	1	4	5
29	Lb2	557.2	78, 82, 83	Lb4 10	Lb1 10		IBRRBGG	Rld	MLHSL	1-2	B	2	3	2	1	1	1	2	1	1	1	1	1	4	4
30	Ln	68.5	77	Lb2 05	E 05		Brig	Rld	LHSL	< 1	C	4	3	3	1	1	2	1	2	2	1	1	1	4	4
31	Eb2	781.1	23, 128, 126, 14	Eb3 10			BrigGidg	Qs	PLA	< 1	B	3	3	3	4	1	3	4	2	2	1	1	1	4	5
32	Lb1	34.8	21	Lb2 05			IB	Rld	Rise	3-5	B	4	3	1	1	1	1	2	1	1	1	2	1	4	4
33	E	257.1	17				Cleared	Qa													4	5			5
34	Gc1	175.3	69, 70, 72	R 20			IBBLOOD	Rld	HCRSC ARP	8-15	D	4	4	1	1	4	1	1	1	1	4	3	1	4	5
35	Ln	145.8	12				Cleared	Rld	Rise	1	B	4	3	2	1	1	1	2	1	1	1	1	1	4	4
36	Lb2	298.6	13, 15, 16	Tm2 15	Lb1 10		Cleared	Rld	LHSL	1-2	B	4	3	2	1	1	1	2	1	1	1	1	1	4	4
37	Gc1	38.8	68	R 25			IB	Rld	HCRSC ARP	5-10	D	4	4	1	1	4	1	1	1	1	4	2	1	4	5
38	Tm4	57.7	67	Gc1 05			Cleared	Rld	PED	3-4	C	4	4	2	1	1	1	3	3	1	1	3	1	1	4
39	Eb3	102.1	20, 19	Eb2 10	Eb1 10		BrigGidg	Qs	PLA	< 1	B	3	3	2	4	1	1	2	2	2	1	2	1	1	4
40	Lb2	45.9		Lb1 10			Cleared	Rld	MLHSL	1-2	C	4	3	2	1	1	1	2	1	1	1	1	1	4	4
41	Lb2	573.3	65, 2, 3, 9	Lb1 30			IB	Rld	UMHSL	1-2	B	4	3	2	1	1	1	2	1	1	1	1	1	1	4
42	Lb1	190.6	1	LB2 20			IB	Rld	UHSLH CR	1-3	C	4	3	1	1	1	1	2	1	1	1	1	1	1	4
43	Eb2	712.1	18, 81, 115	Eb3 05			BrigGidg	Qs	PLA	< 1	B	3	3	3	3	1	3	4	2	2	1	1	1	2	4
44	Mb3	886.9		Gc1 10	Lb2 10	Mr2 05	Shrubs	T	Rise	1	D	4	4	1	1	1	1	2	1	1	1	1	1	4	5
45	Mb4	142.4	112				Shrubs	T	MLHSL	1	C	3	4	1	1	1	1	2	1	1	1	1	1	4	4

UMA no.	Name	Area (Ha)	Sites	MSoil1	MSoil2	Msoil3	Veg	Geol	LF	Slope	Landcond	Water avail (m)	Nutrient Deficiency (nd)	Soil physical factors (p)	Salinity (sa)	Rockiness (R)	Microrelief (g)	pH	ESP	Wetness (w)	Topography (t)	Water erosion (e)	Flooding (F)	Vegetation management (vm)	Graz.Suit
46	Lb2	1001.6	111, 113, 122, 123, 137, 145	Tm4 15	Lb1 10		IBRRB	Rld	LHSL	1-2	B	4	3	2	1	1	1	2	1	1	1	1	1	1	4
47	Mb3	57.3		Lb2 20			Shrubs	T	Rise	1	D	4	4	1	1	1	1	2	1	1	1	1	1	4	5
48	Mb4	93.5	114				Shrubs	T	LHSL	1	C	3	4	1	1	1	1	2	1	1	1	1	1	4	4
49	Lb2	150.9	109	GC2 10	GC1 10		IB	Rld	PED	3	C	4	3	2	1	1	1	2	1	1	1	2	1	4	4
50	Tm1	257.9	110, 142	Lb4 05			IBBW	Rld	MLHSL	1-2	C	4	3	1	1	1	1	2	1	1	1	1	1	1	4
51	Mr2	580.1	144	Mb3 10	R 10		Yjshrubs	T	UHSL	3-5	C	4	4	1	1	2	1	2	1	1	1	2	1	4	5
52	Mb3	196.3	143	Mr2 05			Yjshrubs	T	MLHSL	4	D	4	4	1	1	1	1	2	1	1	1	2	1	4	5
53	Lb2	1580.5	118, 119, 94, 96, 97, 98, 99, 100, 104, 107, 108, 140	Tm1 10	Tm4 05	Tm2 05	IB	Rld	Ped	3-5	C	4	3	2	1	1	1	2	1	1	1	2	1	1	4
54	Lb4	124.8	95	GC2 05			IB	Rld	MLHSL	1	C	2	4	2	1	1	1	2	1	1	1	1	1	4	4
55	Gc2	72.5	117				IB	Rld	LHSL	1	C	4	3	1	1	1	1	1	1	1	1	1	1	4	4
56	Mb3	97.1		Mr2 05			Yjshrubs	T	MLHSL	1	D	4	4	1	1	1	1	2	1	1	1	1	1	4	5
57	Mr2	60.9		Mb3 10	R 05		Yjshrubs	T	UHSL	3-5	C	4	4	1	1	2	1	2	1	1	1	2	1	4	5
58	Mb3	97.6		Mr2 05			Yjshrubs	T	MLHSL	1	D	4	4	1	1	1	1	2	1	1	1	1	1	4	5
59	Mr2	54.3	102, 103	Mb3 10	R 10		Yjshrubs	T	UHSL	3-5	C	4	4	1	1	2	1	2	1	1	1	2	1	4	5
60	Mb3	17.8		Mr2 05			Yjshrubs	T	MLHSL	1	D	4	4	1	1	1	1	2	1	1	1	1	1	4	5
61	Mb4	957.6	88, 90, 91, 92, 101, 105, 106, 141	Lb1 10	Tm1 05	Lb2 05	Shrubs	T	PLA	1 -2	C	3	4	1	1	1	1	2	1	1	1	1	1	4	5

UMA no.	Name	Area (Ha)	Sites	MSoil1	MSoil2	Msoil3	Veg	Geol	LF	Slope	Landcond	Water avail (m)	Nutrient Deficiency (nd)	Soil physical factors (p)	Salinity (sa)	Rockiness (R)	Microrelief (g)	pH	ESP	Wetness (w)	Topography (t)	Water erosion (e)	Flooding (F)	Vegetation management (vm)	Graz.Suit
62	Gc1	33.4		R 10	E 05		IBRRB	Rld	UHSLH CR	3-5	D	4	4	1	1	3	1	1	1	1	1	2	1	4	5
63	Gc1	32.0	66	R 10			IB	Rld	MLHSL	2 - 4	C	4	4	1	1	3	1	1	1	1	1	2	1	4	5
64	Lb4	141.9	85	MB3 05	LB2 05		IB	Rld	LHSL	1	C	2	4	2	1	1	1	2	1	1	1	1	1	4	4
65	Mb3	124.0	138	Lb2 05	Tm1 05		Yjshrubs	T	Rise	1	D	4	4	1	1	1	1	2	1	1	1	1	1	4	5
66	Gc1	93.1	86	R 20	E 10		IBBLOOD	Rld	Rise	5-10	D	4	4	1	1	4	1	1	1	1	1	2	1	4	5
67	Mb3	59.8					Yjshrubs	T	Rise	1	D	4	4	1	1	1	1	2	1	1	1	1	1	4	5
68	Lb1	26.4	4				IB	Rld	Rise	1-3	C	4	3	1	1	1	1	2	1	1	1	1	1	4	4
69	Tm4	674.9	84, 89, 93				RRB	Rld	PED	1	C	4	4	2	1	1	1	3	3	1	1	2	1	1	4
70	Tm1	874.7	116, 120, 139	Lb2 10	Eb2 05	Lb4 05	IBRRB	Rld	PED	1 - 2	C	4	3	1	1	1	1	2	1	1	1	1	1	4	4
71	Lb2	1738.2	5, 6, 73, 74, 75, 76, 80, 136	Lb1 10	Gc2 10	E 05	IBRRB	Rld	Ped	1-2	C	4	3	2	1	1	1	2	1	1	1	1	1	4	4
72	Gc1	21.2		Lb2 30			IB	Rld	Rise		D	4	4	1	1	5	1	1	1	1	1	5	1	1	5
73	Eb1	96.7	64				RRB	Qs	Rise	1-2	C	3	4	2	1	1	1	2	3	1	1	1	1	4	4
74	Lb4	171.5	121	Lb2 05	Tm1 10		IB	Rld	LHSL	1	C	4	4	2	1	1	1	2	1	1	1	1	1	4	5

Appendix V Soils map of EPC1690, Grazing Suitability Map of EPC1080

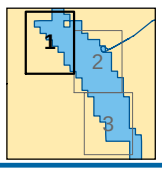


LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Rail (West)
- Mine (Onsite)
- Mine Infrastructure Area

GHD Soil Survey

- Gc1, Gc2, Mr2
- Lb1, Ln
- Mb3
- Lb2, Lb4, Tm1, Tm2
- Mb2, Mb4
- Cr1, Cr3, Cr4
- Eb2
- E
- Tm4
- Eb1, Eb3



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1:100,000 (at A4)

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Kilometres

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Grid: Map Grid of Australia 1994, Zone 55

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Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Soil Survey Results for EPC1690

Job Number 41-25215
Revision C
Date 24-09-2012

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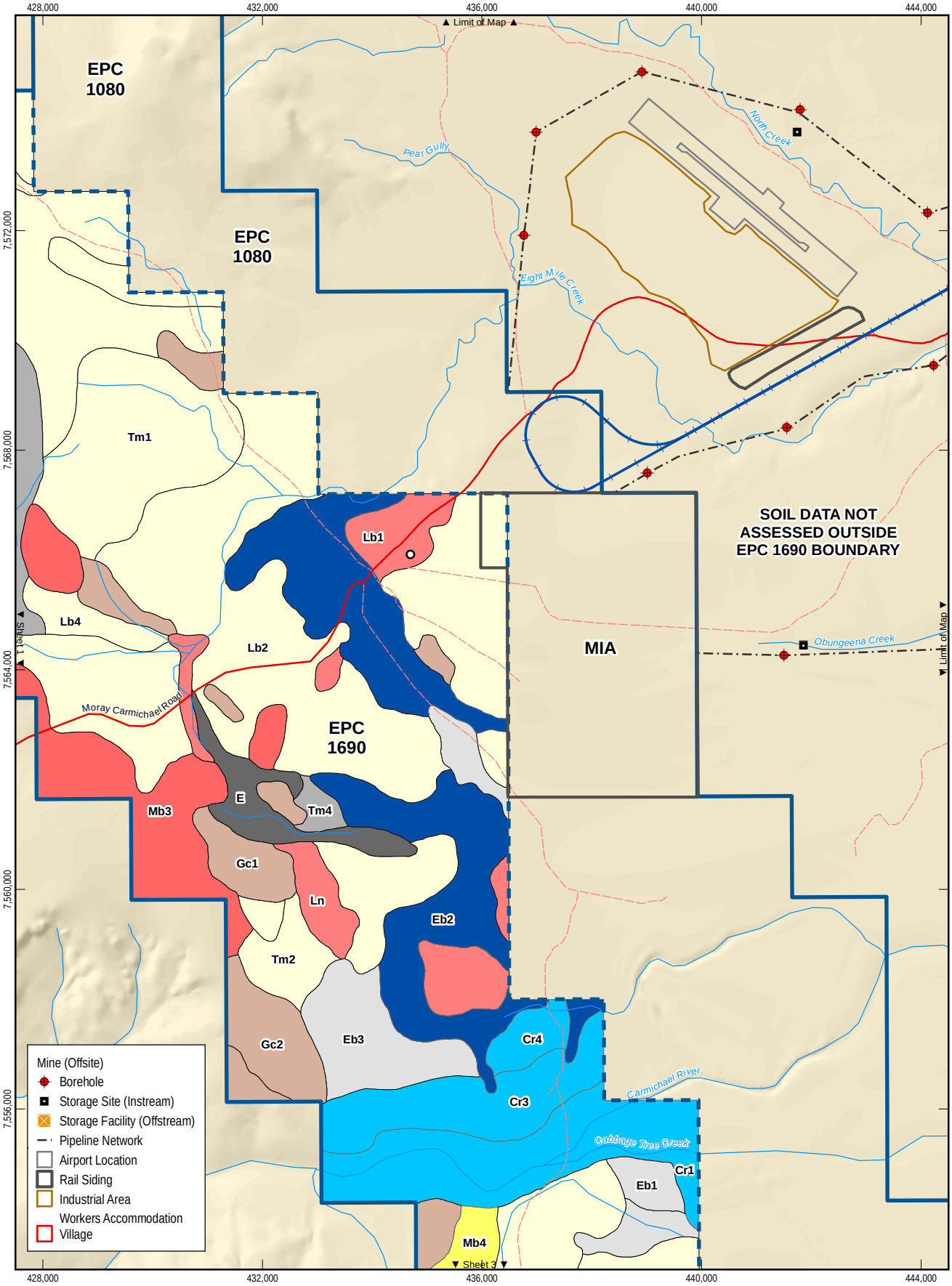

LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Rail (West)
- Mine (Onsite)
- Mine Infrastructure Area

GHD Soil Survey

- Gc1, Gc2, Mr2
- Lb1, Ln
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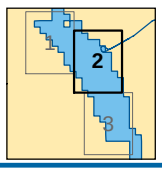
- Lb2, Lb4, Tm1, Tm2
- Mb2, Mb4
- Cr1, Cr3, Cr4
- Eb2
- E
- Tm4
- Eb1, Eb3



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Carmichael Coal Mine and Rail Project

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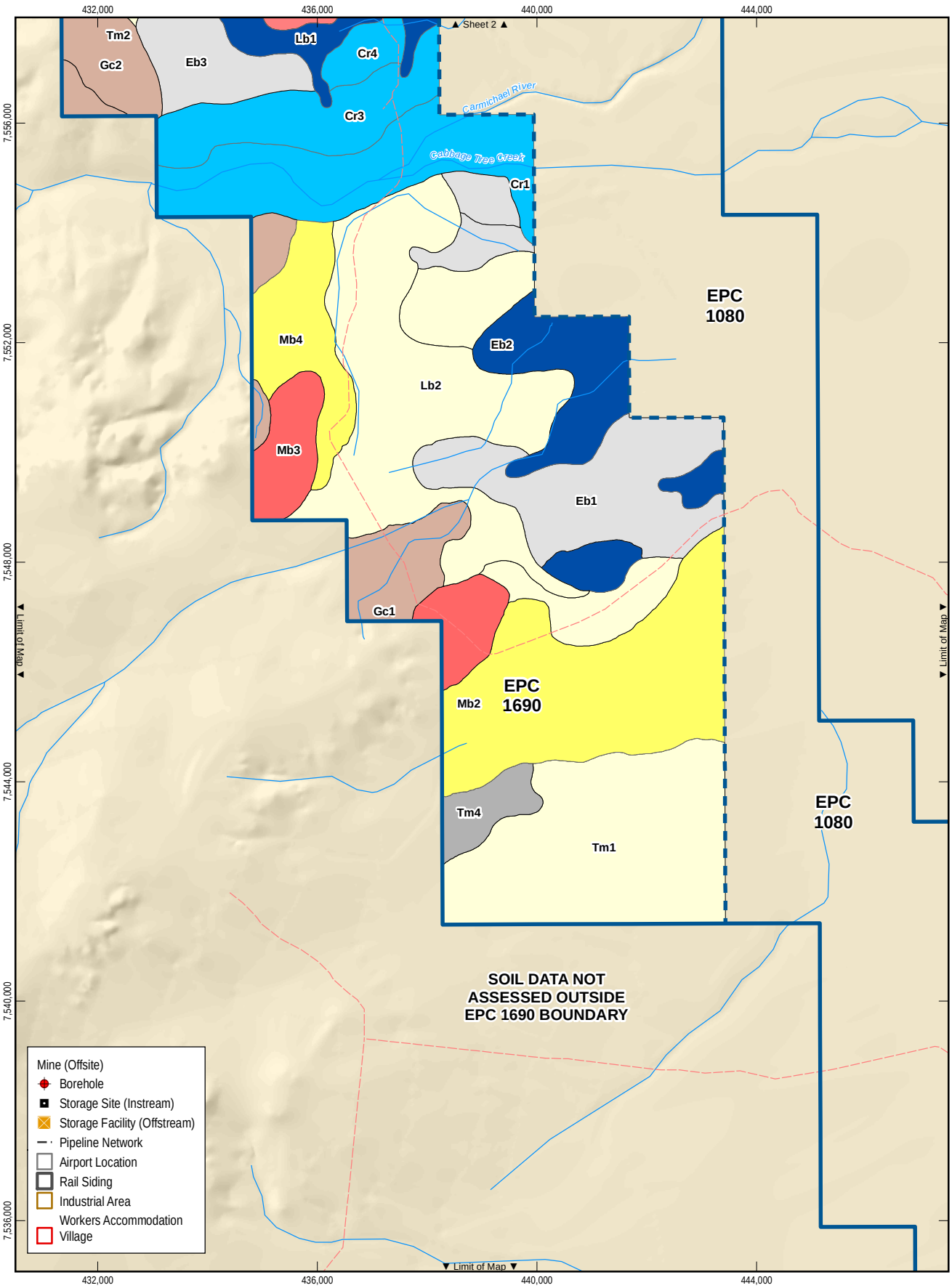
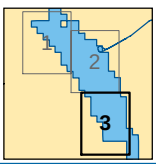


LEGEND

- Homestead
- Local Road
- Track
- Watercourse
- Rail (West)
- Mine (Onsite)
- Mine Infrastructure Area

GHD Soil Survey

- Gc1, Gc2, Mr2
- Lb1, Ln
- Mb3
- Lb2, Lb4, Tm1, Tm2
- Mb2, Mb4
- Cr1, Cr3, Cr4
- Eb2
- E
- Tm4
- Eb1, Eb3



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Carmichael Coal Mine and Rail Project

Soil Survey Results for EPC1690

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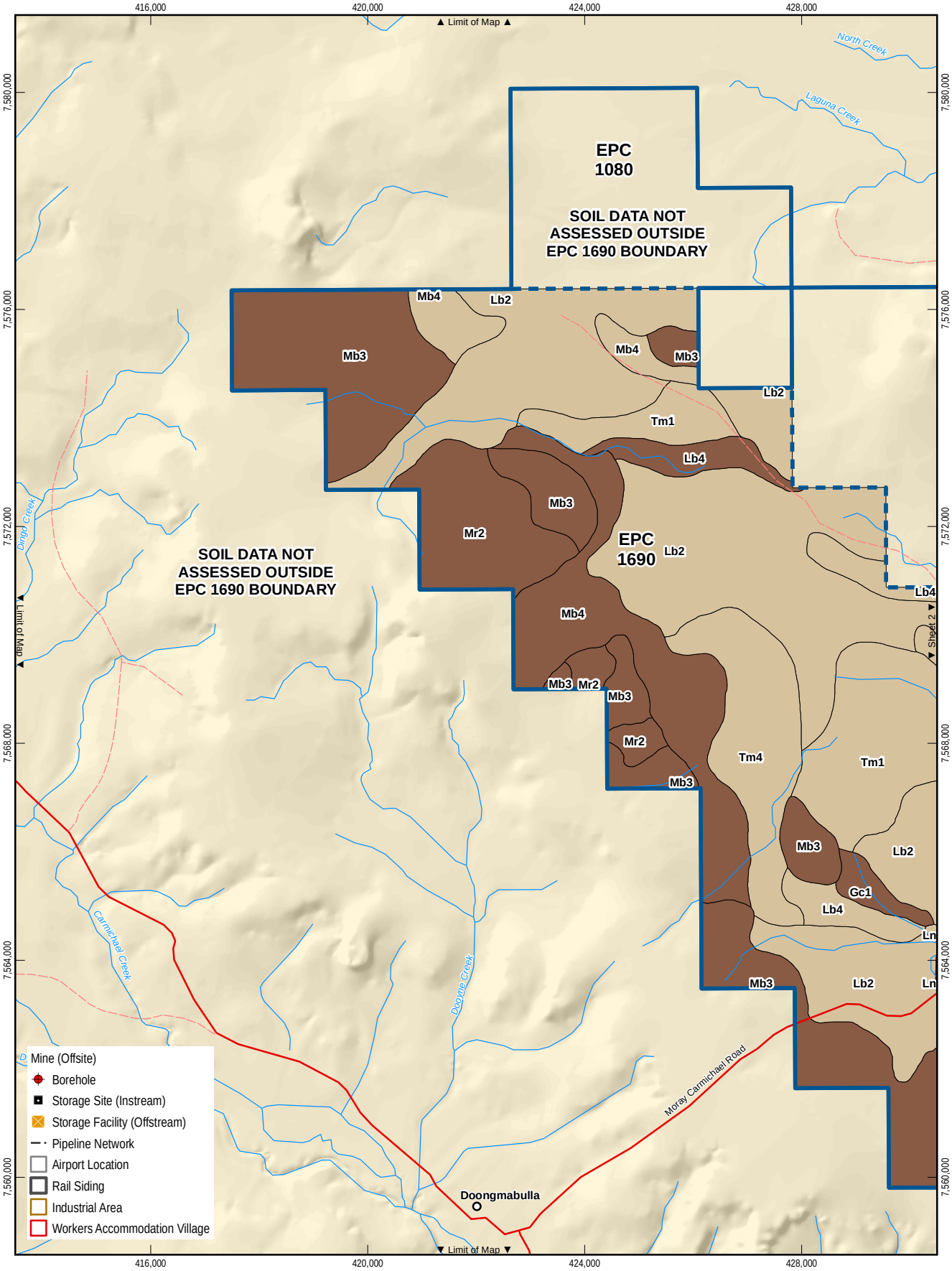
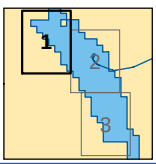


LEGEND

- Homestead
- Local Road
- Track
- Watercourse

GHD Grazing Suitability
- 3
- 4
- 5

- Rail (West)
- Mine (Onsite)
- Mine Infrastructure Area



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Carmichael Coal Mine and Rail Project

Grazing Suitability

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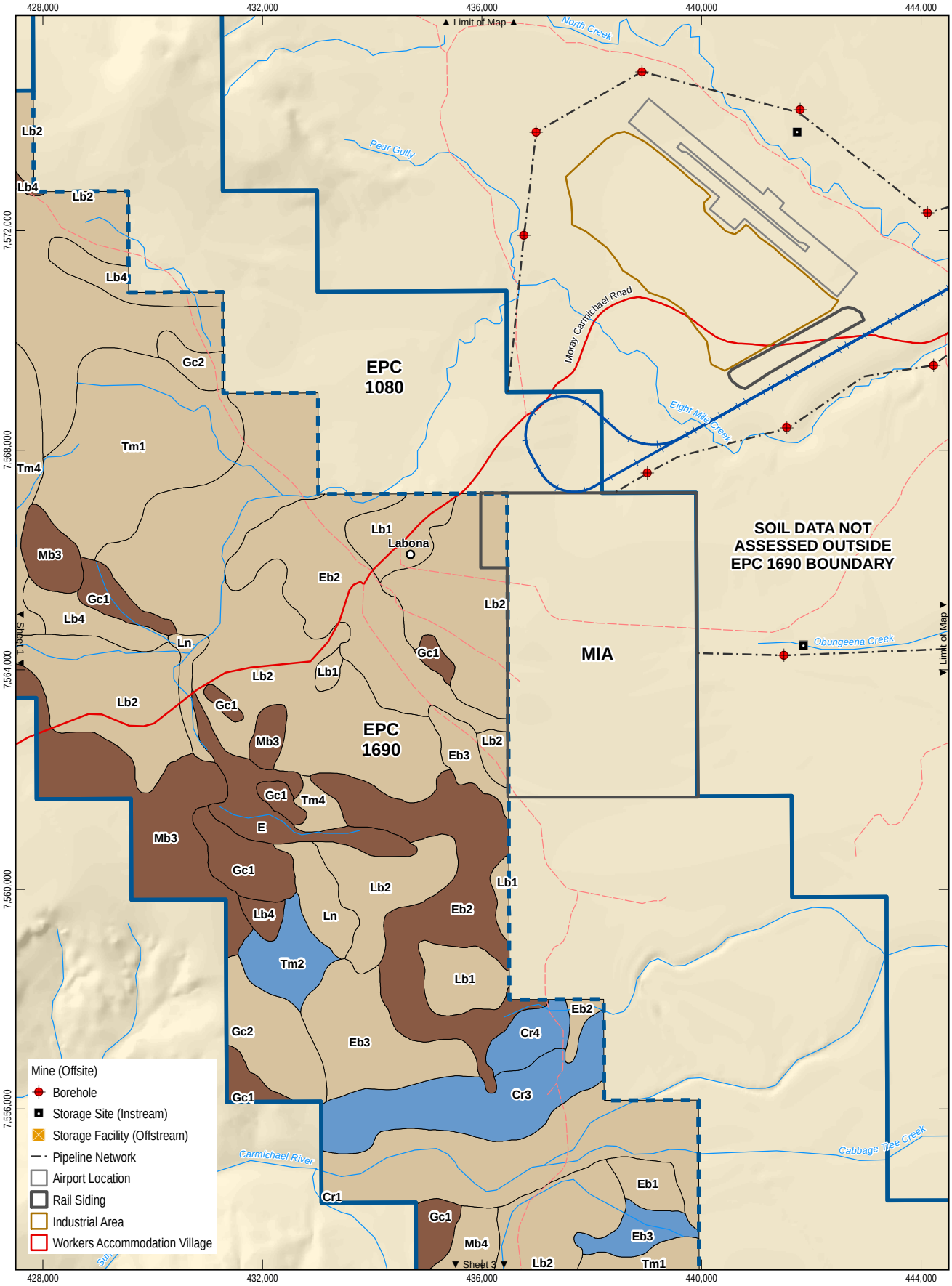

LEGEND

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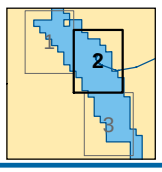

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Carmichael Coal Mine and Rail Project

Grazing Suitability

Job Number 41-25215
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Date 24-09-2012

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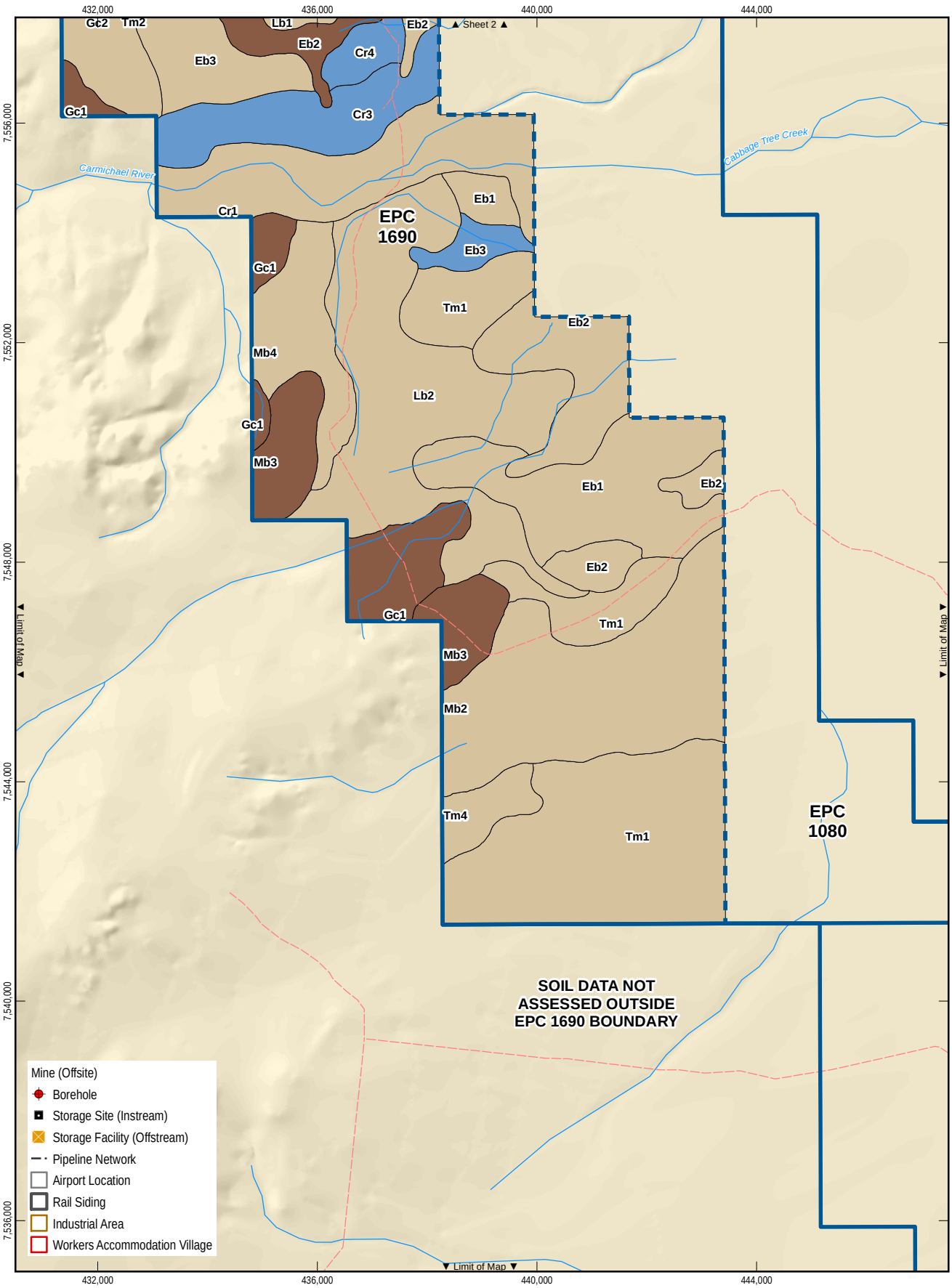


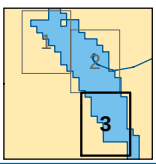
LEGEND

- Homestead
- Local Road
- Track
- Watercourse

GHD Grazing Suitability

- 3
- 4
- 5

- Rail (West)
- Mine (Onsite)
- Mine Infrastructure Area



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Carmichael Coal Mine and Rail Project

Grazing Suitability

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Figure 2
Sheet 3 of 3

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Data Source: © Copyright Commonwealth of Australia - Geoscience Australia: Road, Homestead, Watercourse (2007); DME: EPC 1690 (2010)/EPC 1080 (2011); GHD: Carmichael Soil Survey (2011); Adani: Alignment Opt9 Rev3 (2012); Gassman/Hyder: Mine (Offsite) (2012); Created by: BW.

Appendix VI Terms of Reference Cross-reference

Terms of Reference Requirement/Section Number	Section of this Report
Section 3.2.2 Topography, Geology and Soils	
Description of environmental values	
Provide maps locating the project in state, regional and local contexts. The topography should be detailed with contours at suitable increments, shown with respect to Australian height datum. On the maps, highlight and comment on significant features of the landscape and topography.	Volume 2 Section 4.3
Provide a description, map and a series of cross-sections of the surficial and solid geology of the project area relevant to the project components.	Volume 4 Appendix R
Describe geological properties that may influence ground stability, occupational health and safety, or the quality of stormwater leaving any area disturbed by the project. In locations where the age and type of geology is such that significant fossil specimens may be uncovered during construction/operations, the EIS must address the potential for significant finds.	Volume 4 Appendix R and Volume 2 Section 4.3
Review and discuss existing land system and land unit data of the Nogoa-Belyando Area2 and land management units identified within Lorimer, MS 2005, The Desert Uplands: an overview of the Strategic Land Resource Assessment Project, Technical Report, Environmental Protection Agency, Queensland, for the project area.	Section 1. 3 of this report.
A soil survey of the project area should be conducted at 1:100,000 scale, following the standards in Land Suitability Assessment Techniques in the Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.3	Section 2 of this report.
Review and discuss the relationship of the soils, land system and land unit data sets.	Section 2.4 of this report.
Describe soil profiles according to the Australian soil and land survey field handbook,4 grouped according to their parent material and position in the landscape and classified according to the Australian soil classification.5 Include the physical and chemical properties of the materials that will influence erosion potential, stormwater run-off quality, rehabilitation and agricultural productivity of the land	Section 2.3 of this report
Representative soils must be sampled down the profile for laboratory analysis as outlined in the Land Suitability Assessment Techniques.[3]	Section 4 of this report.

[2] CSIRO, *Lands of the Nogoa-Belyando Area, Queensland, comprising papers of RH Gunn (and others)*, Land Research Series, No. 18, CSIRO, Melbourne, 1967.

[3] Department of Minerals and Energy, *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland*, Department of Mines and Energy, 1995, viewed 10 January 2010, www.derm.qld.gov.au/environmental_management/land/mining/technical_guidelines.html

[4] National Committee on Soil and Terrain, *Australian soil and land survey field handbook*, 3rd edn, CSIRO Publishing, Collingwood, 2009.

[5] R Isbell, *Australian soil classification*, CSIRO Publishing, Collingwood, 2002.

Terms of Reference Requirement/Section Number	Section of this Report
Section 3.2.2 Topography, Geology and Soils	
Assess and document the depth and quality of useable topsoil and subsoil to be stripped and stockpiled for rehabilitation, and the physical and chemical properties of the soils.	Section 3.3 and 3.4 of this report.
The *State Planning Policy 2/02: Planning and Management of Development involving Acid Sulfate Soils* should be addressed as part of the Rail Corridor (particularly option 3) investigations.	Volume 4 Appendix Z
Acid sulfate soil investigations should be undertaken in accordance with the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998*.	Volume 4 Appendix Y
An acid sulfate soil management plan should be prepared in accordance with the *Queensland Acid Sulfate Soil Technical Manual – Soil Management Guidelines Version 3.8 (Dear et al, 2002).*	Volume 4 Appendix Y
Mineral Resources	
Summarise the results of studies and surveys undertaken to identify and delineate the mineral, extractive and petroleum and gas resources within the project area (including any areas underlying or adjacent to related infrastructure including rail).	Volume 4 Appendix M and Appendix Z
Describe in detail the location, tonnage and quality of the mineral, extractive and petroleum and gas resources within the project area (including underlying or adjacent to related infrastructure including rail) as indicated below. For coal projects, where possible, present the discussion on a 'seam by seam' basis and include the modifying factors and assumptions made in arriving at the estimates. Estimate and report the mineral resources in accordance with the *Australasian Code for Reporting of Mineral Resources and Ore Reserves* (the JORC Code),[6] the principles outlined in the *Australian Guidelines for the Estimating and Reporting of Inventory Coal, Coal Resources and Coal Reserves*.[7]	Volume 2 Sections 1 and 2
In addition, provide maps (at appropriate scales) showing the general location of the project area, in particular, the: • location and aerial extent of the mineral resources to be developed or mined • location and boundaries of mining tenures, granted or proposed, to which the project area is, or will be subject • location of the proposed mine excavation(s)	Volume 2 Section 2 and Section 4.5

[6] Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia, *Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore reserves*, Joint Ore Reserves Committee, 2004, viewed 22 December 2010, www.jorc.org/main.php

[7] Coalfields Geology Council of New South Wales and the Queensland Mining Council, *Australian Guidelines for the Estimating and Reporting of Inventory Coal, Coal Resources and Coal Reserves*, Joint Ore Reserves Committee, 2003, viewed 22 December 2010, www.jorc.org/pdf/coalguidelines.pdf

Terms of Reference Requirement/Section Number	Section of this Report
Section 3.2.2 Topography, Geology and Soils	
• location and boundaries of any project sites • location and boundaries of any other features that will result from the proposed mining including waste/spoil dumps, water storage facilities and other infrastructure • location of any proposed buffers, surrounding the working areas any part of the resource not intended to be mined and any part of the resource that may be sterilised by the proposed mining operations or infrastructure	
Potential impacts and mitigation measures	
Provide details of any potential impacts to the topography or geomorphology associated with the project and proposed mitigation measures, including: • a discussion of the project in the context of major topographic features and any measures taken to avoid or minimise impact to such, if required • the objectives to be used for the project in any re-contouring or consolidation, rehabilitation, landscaping, and fencing.	Volume 4 Appendix P and Appendix AB
Identify, for all permanent and temporary landforms, the possible soil erosion rate and describe the techniques used to manage the impact. Identify all soil types and outline the erosion potential (both wind and water) and erosion management techniques to be used.	Volume 4 Appendix Y and Appendix V
An erosion-monitoring program, including rehabilitation measures for erosion problems identified during construction, must also be outlined and acceptable mitigation strategies provided.	Volume 2 Section 13 and Volume 3 Section 13
Include an assessment of likely erosion effects, especially those resulting from the removal of vegetation and construction of retaining walls both on-site and off-site for all disturbed areas.	Volume 4 Appendix Y and Appendix V
Summarise methods proposed to prevent or control erosion with regard to: • the *Soil Erosion and Sediment Control—Engineering Guidelines for Queensland Construction Sites*8 • the *Environmental Protection Authority (EPA's) Guideline: EPA Best Practice Urban Stormwater Management: Erosion and Sediment Control*[9] preventing soil loss to maintain land capability/suitability and preventing degradation of local waterways	Volume 4 Appendix Y and Appendix V

[8] Institution of Engineers Australia, *Soil Erosion and Sediment Control – Engineering Guidelines for Queensland Construction Sites*, Institution of Engineers Australia Queensland Division, Brisbane, 1996.

[9] Environment Protection Agency, *Guideline: EPA Best Practice Urban Stormwater Management – Erosion and Sediment Control*, 2008, viewed 16 December 2010, www.derm.qld.gov.au/register/p02301aa.pdf

Terms of Reference Requirement/Section Number	Section of this Report
Section 3.2.2 Topography, Geology and Soils	
Discuss the potential for acid generation by disturbing potentially acid forming materials during earthworks and construction; and propose measures for managing potentially acid forming materials and mitigating impacts for all site earthworks and construction activities.	Volume 4 Appendix V
Should action criteria be triggered by acid generating potential as a result of testing, outline management measures in an acid mine drainage management plan, prepared in accordance with the assessment and management of acid drainage guideline of the *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland* series,[10] *Managing Acid and Metalliferous Drainage*[11] and any other applicable best practice guidelines.	Volume 4 Appendix V
Discuss the potential for acid, saline, neutral or alkaline drainage from waste dumps. Characterise the potential quality of leachate from the mined waste under field conditions, including contaminants such as sulfate, pH, chloride, iron, major cations and anions, and any chemical species in sufficient quantity that is likely to cause environmental harm including nuisance.	Volume 4 Appendix V
Cross-reference to sections elsewhere in the EIS that assess in detail the potential impacts of any direct or indirect discharge of leachate on downstream sensitive environments or users of receiving waters.	Volume 4 Appendix V
Review and discuss existing land system and land unit data	Section 1.3
Resource utilisation	
Analyse the effectiveness of the mining proposal in achieving the optimum utilisation of the coal/mineral resources within the project area and consider its impacts on other resources.	Volume 2 Section 2 of the EIS
Demonstrate that the mining proposal will 'best develop' the mineral resources within the project area, minimise resource wastage and avoid any unnecessary sterilisation of these or any other of the state's coal, mineral, and petroleum (including gas and coal seam methane) resources that may be impacted upon or sterilised by the mining activities or related infrastructure.	Volume 2 Section 2 of the EIS and Volume 4 Appendix M
Subsidence	
Provide comprehensive surface subsidence predictions,	Volume 2 Section 4.3

[10] Department of Minerals and Energy, *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland*, Department of Mines and Energy, 1995, viewed 10 January 2010, www.derm.qld.gov.au/environmental_management/land/mining/technical_guidelines.html

[11] Department of Industry, Tourism and Resources, *Managing acid and metalliferous drainage: Leading Practice Sustainable Development Program for the mining industry*, Department of Industry, Tourism and Resources, Canberra, 2007, viewed 10 January 2010, www.ret.gov.au/resources/Documents/LPSDP/LPSDP-AcidHandbook.pdf

Terms of Reference Requirement/Section Number	Section of this Report
Section 3.2.2 Topography, Geology and Soils	
taking into account factors such as topographic variations and geological complexities, including a full description of the methodology and an assessment of the reliability of the predictions. The results of the predictions will be shown on maps with one metre contour increments and a scale appropriate for assessing surface subsidence impacts.	
Provide a detailed description of subsidence effects on surface and groundwater hydrology as well as on terrestrial ecosystems (including which vegetation communities and flora species are most likely to be effected by changes to surface hydrology).	Volume 4 Appendix N, Appendix P and Appendix R
Propose mitigation measures to deal with any significant impacts that would result from subsidence. The EIS and EMP should provide a detailed subsidence management plan for remediation and monitoring of subsidence cracking and ponding; with an emphasis on limiting the impact to remnant vegetation habitats. The subsidence management plan should also address impacts on fish movement within watercourses.	Volume 2 Section 13

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	J McClurg NQSA	John Loi	On file	J Keane	On file	17/12/2011
0	J McClurg NQSA	J Keane	On file	J Scott	On file	20/02/2012
1	J McClurg NQSA	J Keane		J Keane		24/09/2012