Attachment 17

Additional Information – Soils and Land Suitability

WINCHESTER SOUTH PROJECT

Environmental Impact Statement

Additional Information

WHITEHAVEN COAL

Resource Strategies

Soils and Land Suitability Assessment Addendum

Winchester South Project
Whitehaven WS Pty Ltd

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EXECUTIVE SUMMARY

GT Environmental Pty Ltd was commissioned by Whitehaven WS Pty Ltd (Whitehaven WS), a wholly owned subsidiary of Whitehaven Coal Limited, to conduct a soils and land suitability assessment for the Winchester South Project (the Project) to form part of a Draft Environmental Impact Statement (EIS) under the Coordinator-General's assessment process.

The Project involves the development of an open cut coal mine and associated infrastructure within the Bowen Basin, located approximately 30 kilometres south-east of Moranbah. The Project is forecast to extract 15 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal, with a forecast peak extraction of up to 17 Mtpa, for approximately 28 years. The Project study area consists of Mining Lease Application (MLAs) 700049, 700050, 700051 and MLA 700065, and three potential infrastructure corridors and a buffer to account for any future changes to potential alignments.

In 2021, Whitehaven WS submitted the Draft EIS for assessment under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). The Draft EIS was placed on public notification by the Office of the Coordinator-General from 4 August 2021 until 15 September 2021. During and following this period, government advisory agencies, organisations and members of the public provided submissions on the Draft EIS to the Office of the Coordinator-General (OCG).

Subsequent to the public notification of the Draft EIS, Whitehaven WS reviewed the mine plan and mine schedule with the aim of reducing environmental impacts of the Project and challenging the Project final landform in response to comments raised in submissions. This review also considered new geological data and the outcomes of processing trials to further refine the mine plan.

On 3 December 2021, the Coordinator-General formally requested (in accordance with section 34A of the SDPWO Act) Additional Information on the environmental effects of the Project and other matters relating to the Project.

This Addendum forms part of the Additional Information and provides an assessment of the optimised mine plan and mine schedule and responses to issues raised in submissions.

The study area for the soils and land suitability assessment covered an area of approximately 13,601 hectares (ha), of which approximately 6,951 ha is proposed to be disturbed by infrastructure and mining activities as part of the optimised mine plan.

The soils and land suitability survey was scoped and conducted in accordance with the *Guidelines for Surveying Soil and Land Resources* (McKenzie et al., 2008). These Guidelines were developed to provide a consistent approach to soil survey methodology across Australia. Soil Characteristics and Soil Profiles have been described in accordance with the *Australian Soil and Land Survey: Field Handbook* (National Committee on Soil and Terrain, 2009) and *Australian Soil and Land Survey: Guidelines for Conducting Surveys* (Gunn et al., 1988).

Collection of soil samples for laboratory analysis was undertaken in line with the Land Suitability Assessment Techniques outlined in the Department of Minerals and Energy (DME) guideline *Technical Guidelines for Environmental Management of Exploration and Mining in Queensland* (DME, 1995).

Determination of land suitability within the study area has been conducted based on the *Guidelines for Agricultural Land Evaluation in Queensland* (GALE) (Department of Science, Information Technology and Innovation [DSITI] and the Department of Natural Resources and Mines [DNRM], 2015), *Regional Land Suitability Frameworks for Queensland* (Regional Frameworks) (DSITI & DNRM, 2013) and *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (Department of Environment and Science [DES] and Department of Resources, 2021). Where guidance is not specifically provided in the GALE or Regional Frameworks, reference and assessment were also made in reference to the *Land resource survey and evaluation of the Kilcummin area, Queensland* (Shields and Williams, 1991).

The following conclusions have been made:

- Fifteen Soil Mapping Units (SMUs) are present in the study area.
- The study area includes areas of flat to gently undulating plains dominated by Vertosols with microrelief (C1-BL, C1-BR and C4), and Vertosols with no microrelief (C3-BL, C3-BR and C5), Kandosols, Sodosols, Dermosols and Chromosol soils on gently undulating or flat plains (R3, S1, S3, T1-R, T1-B, T2 and T3), Arenosol soils on plains (S4) and very shallow Rudosol soils (K1).
- Land use suitability assessment of the fifteen SMUs was determined against the Regional Frameworks (DSITI & DNRM, 2013), GALE (DSITI & DNRM, 2015), *Land resource survey and evaluation of the Kilcummin area, Queensland* (Shields and Williams, 1991) and *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (DES & DoR, 2021).
    - SMUs C3-BL, C4, C5, and T2 present moderate limitations for cropping land uses. Limitations include plant available water capacity, water erosion, erosion hazards, surface conditions and moisture range. These were assessed as Agricultural Land Class (ALC) rating A1 and suitable for a wide range of current and potential broadacre and horticultural crops.
    - SMUs S3, T1-B and T1-R were assessed as ALC rating B and are suitable for a narrow range of crops. The land is suitable for sown pastures and may be suitable for a wider range of crops.
    - The remaining SMUs were assessed as suitable for native pastures due to limitations that preclude continuous cultivation for crop production.

      SMUs C1-BL, C1-BR, C3-BR, K1, R3, S1, S4 and T3 were assessed as ALC rating C2 and are suitable for grazing native pastures, with or without the introduction of pasture species, and with lower fertility soils than C1.
    - Disturbed areas consist of 25 ha.

- Soil for rehabilitation use (e.g. able to support the establishment of native vegetation and grasses, or other appropriate species) is available from all SMUs, with S3 recommended to be analysed once stripping commences prior to use for rehabilitation due to the potential for high salinity in the topsoil. SMUs recommended for level plains or sloped backfill batters above 3% include C3-BL, C3-BR, C4, C5 and S3. SMUs recommended for level plains or slopes equal to or less than 3% include C1-BL, C1-BR, K1, R3, S1, S4, T1-B, T1-R, T2 and T3, with R3, S1, S4, T1-B, T1-R, T2 and T3 available for use on slopes above 3%.

  Appropriate management such as the application of nitrogen fertilisers, gypsum ameliorants, surface preparation including ripping of topsoils, erosion and sediment controls and reduced exposure time of bare soils through vegetation establishment would assist in rehabilitation.

  Subsoil suitable for supporting the establishment of natural vegetation growth with additional soil fertility conditioning and the potential to increase soil reserves are limited due to dispersive and salinity attributes for most SMUs. SMUs C4, C5, R3, S1, S3, S4, T1-B, T1-R and T2 may provide suitable subsoils for rehabilitation use with SMUs S1 and S4 preferably used on level plains. All remaining SMUs are not suitable for rehabilitation use and more suited as potential capping of waste rock.
- A small area of regionally mapped Strategic Cropping Area (SCA) intersects the mining lease boundary for the Project (within the Norwich Park Branch Railway corridor). However, this area of SCA is located outside the Project area (extent of disturbance), with a buffer of around 800 metres at the closest point, and therefore will not be impacted. No further assessment was conducted. No other areas of regional interest, including Priority Agricultural Areas are located within the mining lease boundary for the Project.
- Acid sulfate soils were not observed during the survey, and it is highly unlikely that the study area would include actual acid sulfate soils (AASS) and/or passive acid sulfate soils (PASS). In the unlikely event conditions of the soil during the Project's life present attributes of AASS or PASS, an Acid Sulfate Soils Management Plan (ASSMP) should be prepared and implemented.
- The proposed post-mining final land use for most of the study area may include beef cattle grazing activities and cropping activities. The residual void water bodies in the Project final landform would be of suitable quality to be water storages for agricultural production (supply water to cattle). It is expected that undisturbed areas of the study area would remain the same land use identified pre-mine.

1 INTRODUCTION

1.1 Scope of Addendum

This Addendum forms part of the Additional Information as requested by the Coordinator-General. This Addendum has been prepared to satisfy the issues and recommendations addressed by the Department of Resources (DoR) on the Winchester South Project (The Project) Draft (EIS), as summarised in Table 1-1 below.

The Addendum provides an update on relevant sections referenced and supersedes these sections as provided in the *Soils and Land Suitability Assessment* (GT Environmental Pty Ltd [GTE], 2021) (the Assessment), accordingly the sections are reflective of the numbering as provided in the Assessment (e.g. Section 2 (Background) and Section 7 (Acid Sulfate Soils Assessment) of the draft EIS has not changed, and so is not provided in this Addendum).

All sections and references with amendments that have been updated based on DoR and/or GTE review are within this Addendum. The Addendum should be read in conjunction with the Assessment (GTE, 2021). Information not included in this Addendum, has not been amended from the Assessment (GTE, 2021).

The following table outlines each issue raised by DoR in its submission and provides a response summary with section reference.

Table 1-1: DoR Issue, Recommendation and Amendment Summary

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
7	Section 2 – Project Description 2.1.5 Regional and local context	'The project is located: outside strategic cropping areas mapped as potential Strategic Cropping Land (SCL) under section 10 of the Regional Planning Interests Act 2014 (RPI Act) (Figure 2-11);' AND '*The Project is not located within an area of regional interest under the RPI Act. Areas of regional interest include priority agricultural areas, priority living areas, strategic cropping areas (SCA, formerly SCL) and strategic environmental areas.*' The project includes a small area of the regional interest of strategic cropping area as is shown in Figure 2-11.	Update the EIS to acknowledge the area of SCA that intersects the project boundary.	Refer to Section 7.2 of the Main Text of the Additional Information. Note no SCA is located within the Project area (extent of disturbance).
8	Section 2 – Project Description 2.2.9 Soils and Land Use page 2-34	While it is acknowledged this section is a summary and refers to a soil survey conducted by GTE (detailed in Appendix J) it is lacking appropriate detail e.g. descriptions such as *'K1 – Very shallow sandy loams on wide crests'* provides only limited insight into the nature of the soils on site. Additionally, while the mapping of nine (9) Australian Soil Classifications is mentioned, none are detailed in relation to the soil mapping units discussed in this section.	Update this section to include a more detailed/adequate summary of the specific soil and landscapes, as required by the Terms of Reference. As a minimum the summary should describe in more detail the content of soil mapping units using contemporary language and must include reference to the component Australian Soil Classifications (as is the case in Section 4.1 of Appendix J).	"–'Note, in response to other comments from DoR, an updated Section 4.1 of the Assessment (GTE, 2021) is provided in Section 4.1 and Table 4-1 of this Addendum. Additional detail as provided in Section 4 of this Addendum has been included in Section 7.2 of the Main Text of the Additional Information.
9	Section 2 – Project Description 2.2.10 Queensland Agricultural land audit page 2-35	'As described in Section 2.2.9, *there are no strategic cropping areas mapped within the Project area (Figure 2-11).*' This statement is incorrect.	Update the EIS to acknowledge the area of SCA that intersects the project boundary.	Refer to Section 7.2 of the Main Text of the Additional Information. Note no SCA is located within the Project area (extent of disturbance).

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
10	Appendix J – Soils and Land Suitability Assessment Executive summary – Page ES-3	'*No areas of regional interest, including any strategic cropping areas or priority agricultural areas, are located within the Project area*.' This statement is incorrect.	Update the EIS to acknowledge the area of SCA that intersects the project boundary	Refer to the Executive Summary of this Addendum for updated text.
11	Appendix J – Soils and Land Suitability Assessment Executive summary – Page ES-3	'*It is expected that undisturbed areas of the study area would remain the same classes identified pre-mine*.' This dot point discusses potential post-mine land uses, however, the final sentence introduces the concept of "Classes." It is not clear if this is referring to Agricultural Land Class.	Amend EIS to specify Agricultural Land Class (ALC) if this is the intended meaning, OR Replace "classes" with "land use" to clarify this statement.	Referred to as 'land use' in the Executive Summary of this Addendum.
12	Appendix J – Soils and Land Suitability Assessment Regulatory requirements	'*…recent discussions with the Queensland Department of Natural Resources and Mines (DNRM) (now Department of Natural Resources, Mines and Energy)….*' Incorrect department name used. As this report is dated 14 May 2021 it should reference the current departmental name – Department of Resources.	Amend the departmental name to DoR.	Noted, this Addendum refers to the current Department names, in particular Section 1.2 (Regulatory Requirements) refers to the Department of Resources.
13	Appendix J – Soils and Land Suitability Assessment Regulatory Requirements AND 4.1 Soil Mapping Units	Sections quote the use of '*Australian Soil Classification (Isbell, 2016).*' This edition of the Australian Soil Classification has been superseded by the third edition released March 2021 – prior to the report release date.	Ensure all Australian Soil Classifications assigned are in accordance with the latest (2021) edition of the Australian Soil Classification (Isbell, 2021).	Soil Mapping Units (SMUs) have been reviewed and updated to be consistent with *The Australian Soil Classification, Third Edition* (Isbell, 2021) (refer to Section 4 of this Addendum). A summary of the reviewed and updated SMUs within the study area as per Australian Soils Classification (order, sub-order) is provided in Table 4-1.

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
14	Appendix J – Soils and Land Suitability Assessment Table 3-1: Analytical Program and Number of Samples Page 9	'*Measurement of pH is a useful indicator of various soil properties (e.g. values >8.5 usually indicate high exchangeable sodium levels…*" While many soils with high exchangeable sodium levels also have high pH it is not always the case and not considered a definitive indicator.	Only calculated Exchangeable Sodium Percentage (ESP) results should be used to identify sodic soils.	The justification detailed in Table 3-1 of the Assessment (GTE, 2021) provides examples not just related to the measurement of pH in identifying acidic and alkaline soils, but also may be used to indicate other soil attributes such as alkaline soils that may be sodic. The justification for pH has been simplified and is provided in Table 3-1 of this Addendum.
15	Appendix J – Soils and Land Suitability Assessment Multiple SMU site descriptions involving Vertosol soils & Appendix A	Soil descriptions for sites classified as Vertosols do not contain the required amount of evidence to differentiate them from Dermosols. The Australian Soil Classification contains clear direction on how Vertosols differ from other soils including Dermosols.	Revisit the descriptions and classifications of all Vertosol sites and SMU. Consult the *Australian Soil Classification* (2021) definition of a Vertosol Isbell (2021).	The descriptions and classifications of all Vertosol sites and SMUs have been reviewed with consultation *The Australian Soil Classification, Third Edition* (Isbell, 2021) in regard to the definition of a Vertosol, for consistency. The definition provided in *The Australian Soil Classification, Third Edition* (Isbell, 2021), which refers to soils with all of the following attributes: • a clay field texture or 35% or more clay throughout the solum except for thin, surface crusty horizons 30 millimetres (mm) or less thick, • unless too moist, have open cracks at some time in most years that are at least 5 mm wide and extend upward to the surface or to the base of any plough layer, peaty horizon, self-mulching horizon or thin surface crusty horizon; and • at some depth in the solum, have slickenside and/or lenticular peds. Representative sites and detailed sites in SMUs C1-BL, C1-BR, C3-BL, C3-BR, C4 and C5 and Appendix A and Table 4-1 of the Assessment (GTE, 2021) have been reviewed, with surface conditions and peds amended to reflect their vertic properties. Updated SMUs are provided in Section 4 of this Addendum and an updated Appendix A is provided in this Addendum (Appendix A).

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
16	Appendix J – Soils and Land Suitability Assessment Table 4-4: Soil Profile Morphology Summary SMU C1-BL – Depression position Page 19	Results presented in Table 4-4: • "Lab texture" given although there are no Particle Size Analysis results • Field pH result for B22 horizon is at 0.6 m depth, however the horizon does not begin until 0.61 m.	Amend Table 4-4 to accurately reflect the available data and the horizon to which it belongs.	Note the lab texture for the depression position of Site 2 provided in Table 4-4 of the Assessment (GTE, 2021) included a footnote stating the laboratory texture was based on data for the mound position. Laboratory analysis (particle size analysis) was undertaken for one position, i.e. the mound position, instead of both within the site. GTE is confident the laboratory texture as based on the data for the mound position is reflective of the depression position based on the field textures undertaken. Notwithstanding, Table 4-4 of the Addendum provides an updated version of Table 4-4 of the Assessment which includes an amended field pH depth of 0.61 m and reflects available data. Note no cross-horizon sampling/field tests were undertaken (GTE, 2022).
17	Appendix J – Soils and Land Suitability Assessment Table 4-9: Soil Profile Morphology Summary SMU C1-BR – Depression position Page 25	Results presented in Table 4-4: • "Lab texture" given although there are no Particle Size Analysis results • Field pH result for B21 horizon is at 0.6 (m) depth, however the horizon terminates at 0.38 m.	Amend Table 4-9 to accurately reflect the available data and the horizon to which it belongs.	As described above, the laboratory texture for the depression position of Site 9 provided in Table 4-9 of the Assessment (GTE, 2021) included a footnote stating the laboratory texture was based on data for the mound position. Particle size analysis was only undertaken for one position, i.e. the mound position, instead of both within the site. GTE is confident the laboratory texture as based on the data for the mound position is reflective of the depression position based on the field textures undertaken. Notwithstanding, Table 4-9 of the Addendum provides an updated version of Table 4-9 of the Assessment which includes an amended field pH depth and reflects available data. Note no cross-horizon sampling/field tests were undertaken (GTE, 2022).

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
18	Appendix J – Soils and Land Suitability Assessment Multiple SMU site descriptions	"Lab texture" given although there are no Particle Size Analysis results.	Remove "Lab texture" descriptions from tables/sites where no particle size analysis (PSA) results were obtained, to accurately reflect the available data.	Laboratory texture descriptions have been reviewed and amended to provide clarity on results presented. Amended texture descriptions for the following SMUs are provided in Section 4 of this Addendum: • C1-BL (Table 4-4); • C1-BR (Table 4-9); • C4 (Table 4-20); • C5 (Table 4-24); and • T1-R (Table 4-45).
19	Appendix J – Soils and Land Suitability Assessment 4.1.6 C5: Black Vertosol Page 43	'*Site 70, mound position was selected as a representative site of this SMU for chemical analysis.*' It is unclear if this statement indicates there is micro-relief (i.e. mounds and depressions). If so, no corresponding depression sample was included.	Clarify the existence of any micro-relief at site 70. If micro-relief is present, then justify why only the mound data is presented OR include data for soils found in depressions.	Micro-relief is not present at Site 70, the amended Section 4.1.6 of this Addendum does not include reference to microrelief at Site.
20	Appendix J – Soils and Land Suitability Assessment Table 4-26: Land Summary SMU K1	ASC is stated as *Brown Tenosol*. This is incorrect, soils with only minimal development of an A horizon (as described in Table 4-27) belong to the Rudosol classification.	Amend the Australian Soil Classification for Site 55 to Rudosol.	GTE note initial review of SMU K1 did include assessment between a Rudusol and Tenosol. GTE has reviewed the fieldnotes, photo and other attributes of the site and GTE acknowledges that this SMU was marginal and reviewed on the more conservative side of soil structure to a Tenosol, rather than a Rudosol. Accordingly, the SMU has been amended consistent with DoR's comment and guidance provided in *The Australian Soil Classification, Third Edition* (Isbell, 2021), refer to Table 4-1 and Section 4.1.7 for the updated SMU classification.
21	Appendix J – Soils and Land Suitability Assessment 4.1.8 R3 Red Kandosol	While changes suggested in previous review have been implemented, the *Soil characteristics* and *chemistry* section continues to refer to R3 as a texture contrast soil. Kandosols are not texture contrast soils.	Remove reference to "texture contrast" from *Soil characteristics* and *chemistry* section.	The amended Section 4.1.8 provided in this Addendum does not include reference to 'texture contrast'.

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
22	Appendix J – Soils and Land Suitability Assessment Multiple SMU site descriptions	Where soils have low CEC it is not good practice to describe them as sodic as it requires only small concentrations of sodium to produce a large ESP result.	Amend report to remove reference to sodicity where cation exchange capacity (CEC) is less than 5 milliequivalent (meq)/100 grams (g).	GTE has reviewed the Assessment and based on DoR's issue and recommendation, only SMU S4 subsoil has been described as sodic (ESP greater than 6 and CEC is less than 5 meq/100 g). This description has been amended from the Assessment, refer to Section 4.1.11 and Table 4-38 for the amended description. Note *The Australian Soil Classification, Third Edition* (Isbell, 2021) states an ESP of 6 has been widely used as a critical limit for the adverse effects of sodicity The remaining SMUs where sodic attributes (subsoils) have been described, the CEC result was reviewed (if greater than 5 meq/100 g). The following SMUs were assessed as including sodic attributes but have not been amended as they met the criteria of ESP >6 and CEC greater than (>) 5 meq/100 g.: • C1-BL mound/depression subsoil (>0.2 metre below ground level [mbgl]), • C1-BR mound/depression subsoil (>0.2 mbgl), • C3-BL, • C3-BR, • C4 mound/depression subsoil,(>0.3 mbgl), • C5, • S1, and • T3. No other amendments have been made. An amended definition of ESP has been included Section 12 (Glossary) of the Addendum.

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
23	Appendix J – Soils and Land Suitability Assessment 4.1.12 T1-B: Brown Dermosol	Texture description is clay loam over light clay which is a Dermosol. Dermosols are not texture contrast soils.	Amend Section 4.1.12 to remove reference to "texture contrast."	This reference has been removed, refer to amended description provided in Section 4.1.12 of the Addendum.
24	Appendix J – Soils and Land Suitability Assessment 4.1.13 T1-B: Red Dermosol	Texture description is clay loam over light clay which is a Dermosol. Dermosols are not texture contrast soils.	Amend Section 4.1.13 to remove reference to "texture contrast."	As per Issue 23. This reference has been removed, refer to amended description provided in Section 4.1.13 of the Addendum.
25	Appendix J – Soils and Land Suitability Assessment 4.1.14 T2: Red Kandosol	These soils are soils with a strong texture contrast and pH >5.5. They cannot be classified as Kandosols. The correct soil order is Chromosol. The Australian Soil Classification does not use the term '*weak texture contrast*.'	Amend this section to reflect the correct soil classification (Chromosol) and remove references to "weak texture contrast."	SMU T2 was not classified as a Chromosol due to the soil profile not having a clear or abrupt textural B horizon absolute increase of at least 20% clay (Isbell, 2021). Review of the laboratory results of SMU T2, Site 75 between the A2 and B21 horizon shows a 19% increase in clay. In consideration to DoRs recommendation, the SMU has been re-classified as a Chromosol. Reference to weak texture contrast reference has been removed, refer to amended description provided in Section 4.1.14 of the Addendum.
26	Appendix J – Soils and Land Suitability Assessment 4.1.15 T3: Brown Chromosol	There is no texture contrast evident in the soil description given – silty loam over a clay loam. Additionally, gradational soils cannot be described as Chromosols. The Australian Soil Classification does not use the term '*weak texture contrast*.'	Amend this section to reflect the correct soil classification (Dermosol/Kandosol – based on structure) and remove reference to "weak texture contrast."	Amended Section 4.1.15 provided in the Addendum includes reclassification of – MU T3 as a Dermosol based on review of soil profile structure (specifically the B21 horizon) and reference to weak texture contrast removed.

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
27	Appendix J – Soils and Land Suitability Assessment 6.1 Assessment of Strategic Cropping Areas	*'SCL was not identified in the Project area and was located to the west, within 10 m away at its closest point (within the Norwich Park Branch Railway corridor). No further assessment is required.'* Review of the shapefiles provided with the EIS (dated 07/07/2021) and the departmental SCL trigger map identified that SCL does intersect the project area. It is a small area along the railway corridor shown inside red square in images below.	Update this section to reflect the presence of SCL.	As described above, the SCL is not within the Project area, which is defined as the extent of disturbance associated with the Project, however it is within the Mining Lease Application (MLA) area for the Project. The optimised mine plan provides an approximate buffer of 800 m from the edge of the regional SCL mapped. Section 6.1 of the Assessment has been amended to reflect this and is provided in Section 6.1 of this Addendum (GTE, 2022).
28	Appendix J – Soils and Land Suitability Assessment 8.2.1 Soil amelioration and management	'*SMUs such as C3-BL with alkaline pH and SMUs T1-R, C3-BR, T1-B, C4 and C5 with marginal alkaline levels may have reduced nitrogen availability for plant growth during revegetation. The use of nitrogen specific fertilisers during rehabilitation (as required during the targeted management of native vegetation or pasture development), will bolster nitrogen levels and would be suitable for alkaline soils*' Care should be taken when adding nitrogen in this situation as the added nitrogen will itself become unavailable due to high pH. Any attempt to lower pH should also consider the possibly large amount of available nitrogen liberated and therefore lost.	Include a note on the potential risks of adding further nitrogen to these soils and/or reducing pH.	Section 8.2.1 of the Assessment has been amended to include recommendations and potential risks of adding further nitrogen, this discussion is provided in Section 8.2.1 of the Addendum.
29	Appendix J – Soils and Land Suitability Assessment 8.2.1 Soil amelioration and management	'*Gypsum ameliorants may be used to reduce any dispersive attributes for subsoils.*' Applied gypsum will only be effective when thoroughly mixed with soils and more than one application may be required. Adding a surficial or unmixed dose of gypsum will not be effective in aiding soil dispersion.	Include a methodology for applying gypsum to achieve maximum reduction in soil dispersion.	Section 8.2.1 of the Assessment has been amended with recommendations for application and application rates, this detail is provided in Section 8.2.1 of the Addendum.

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
30	Appendix J – Soils and Land Suitability Assessment 8.2.1 Soil amelioration and management	'*Reduce time bare soils are exposed by planting native grasses or other appropriate species and encouraging organic matter horizon, preferably during dry season*' An "organic matter horizon" may take many years to form, especially in newly placed soils. It is unclear how this is to be encouraged during the dry season when moisture is a key component to organic matter breakdown/deposition.	Update this section to provide guidance on how an "organic matter horizon" can be established and maintained.	Additional recommendations to provide guidance are provided in Section 8.2.1 of the Addendum.
31	Appendix J – Soils and Land Suitability Assessment 8.2.1 Soil amelioration and management	Land degradation in the form of soil erosion reduces the productive capacity of the land and can impact on water quality through sediment and nutrient addition. Given the erosion risk to water quality by proposed site activities, this section should also require an erosion and sediment control plan be developed.	An Erosion and Sediment Control Plan (ESCP) addressing Soil Erosion and Sediment Control should be prepared by a Certified Professional in Erosion and Sediment Control (CPESC) and developed in accordance with the International Erosion Control Association's 'Best Practice Erosion and Sediment Control' document (IECA, 2008). The Management Plan must achieve: • no worsening of the existing levels of soil loss from the land within or downslope of the subject land; • no increased risk of erosion, or other land degradation, on land or in waterways downslope of the subject land; and • no net increase in the sediment load leaving the development area and entering waterways and/or watercourses. The ESCP should be designed to accommodate any ongoing need for erosion and sediment control for all aspects of the proposed development.	An ESCP would be developed and implemented throughout construction and operation of the Project. A 'best practice' approach would be adopted that is consistent with the IECA recommendations. The ESCP would adopt the three cornerstones of erosion and sediment control: • Drainage control – prevention or reduction of soil erosion caused by concentrated flows and appropriate management and separation of the movement of diverted and surface water through the area of concern. • Erosion control – prevention or minimisation of soil erosion (from dispersive, nondispersive or competent material) caused by rain drop impact and exacerbated overland flow on disturbed surfaces. • Sediment control – trapping or retention of sediment either moving along the land surface, contained within runoff (i.e. from up-slope erosion) or from windborne particles. As per DoRs recommendation, reference to an ESCP is included within Section 8.2.1 of the Addendum.

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
32	Appendix J – Soils and Land Suitability Assessment 10 Conclusion	Implement any required changes based on comments above e.g. changes to gradational and texture contrast in Section 4 and comments regarding presence of SCAs.	Make changes as required.	Section 10 of the Addendum reflects the amendments made in response to DoR's comments.
33	Appendix J – Soils and Land Suitability Assessment Glossary	*Effective Soil Depth (ERD)* – Incorrect. ERD = Effective Rooting Depth.	Amend definition as described left.	Amended definition is provided in Section 12 of the Addendum.
34	Appendix J – Soils and Land Suitability Assessment Appendix A	Many soil surface photos contradict soil profile description information e.g. photos of surface crusting are described as cracking (Sites 14, 40, 45 & 57), self-mulching surface is described as soft (Site 34), hard setting surfaces described as soft (Site 58) and crusting or hard setting surface described as self-mulching (Site 63).	No action required.	Detailed sites were reviewed again based on the additional data required for Issue 15. Updated Detailed Site Descriptions have been included in Appendix A of the Addendum.
35	Appendix J – Soils and Land Suitability Assessment Appendix B	Majority of check site information is not accompanied by photographic evidence. For check sites to be of value to assessing agencies they should include photographs.	No action required.	Noted.

Issue No.	Section or Paragraph	DoR Issue	DoR Recommendation	GTE Response
36	Appendix J – Soils and Land Suitability Assessment Appendix D, Table D-6: Summary of Land Suitability classes for SMU C5	Table D-6: Summary of Land Suitability classes for SMU C5. SMU C5 has been assigned an overall suitability class of 4 based on a suitability subclass of 4 for Surface Condition (Ps). Review of C5 SMU sites shows described surface conditions include: • *Cracking with crust;* • *Cracking; and* • *Self-mulching.* The Inland Fitzroy and Southern Burdekin suitability framework surface condition limitation (Ps) table suggests these surface condition types would attract a suitability subclass of no higher than 3 (coarse self-mulching or hard setting) or 2 for fine self-mulching. Additionally, there is no mention of unfavourable surface characteristics in Section 4.1.6 *C5: Black–vertosol - Moderate to deep black clay soils on alluvial plains.*	Amend Ps limitation subclasses for SMU C5 to no greater than 3, in line with the Fitzroy and Southern Burdekin suitability framework. Then amend the overall SMU C5 suitability and agricultural land class accordingly.	SMU C5 representative site and detailed sites were reviewed with a re-assessment of the surface condition as coarse self-mulching. The land suitability has been reassessed as well as the corresponding Agricultural Land Class as A1. Refer to amended Table D-6 provided in Appendix D of the Addendum.
Additional Amendments by GTE				
In assessing the SMUs against the updated *Australian Soil Classification* (Isbell, 2021), GTE also reviewed the Department of Environment and Science (DES) and DoR (2021) *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment*. The Land Suitability and Agricultural Land Assessments presented in the Assessment were also re-assessed against the *Regional Land Suitability Frameworks for Queensland* (Regional Frameworks) (Department of Science, Information Technology and Innovation [DSITI] and the Department of Natural Resources and Mines [DNRM], 2013) and *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (DES & DoR, 2021), amended Section 3.2, Section 5 and Figures 4 and 6 are provided in this Addendum. Appendix D of the Assessment has also been amended where relevant and provided in this Addendum. Reference to the DES and DoR (2021) *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* has been added to Section 11 (References). Review of DoR (2021) *Queensland Soil and Land Resource Survey Information Guideline* was also considered in the amendment above. This document has also been added to Section 11 (References). A revised mine plan and reduced footprint spatial data has been provided. Figure 3 through 9 have been amended to include this latest information.			

1.2 Regulatory Requirements

This Addendum reviewed the following updated guidelines: *The Australian Soil Classification, Third Edition* (Isbell, 2021), *Queensland Soil and Land Resource Survey Information Guideline* (DoR, 2021) and *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (DES and DoR, 2021) where applicable.

In addition, GTE participated in recent discussions with DoR (formerly the Department of Natural Resource and Mines) regarding their requirements for soils surveys of linear features and SCAs.

All other report documents, guidelines and regulatory requirements referenced in the Assessment (GTE, 2021), apply to this Addendum.

3 METHODOLOGY

The methodology for this Addendum involved review of DoR's issues and recommendations against the updated regulatory requirements (refer Section 1.1).

3.1 Field Work

3.1.1 Laboratory analysis

Table 3-1: Analytical Program and Number of Samples

Test	Number of Samples Tested	Application	Justification
pH	90	Nutrient availability, nutrient fixation, toxicities (Al, Mn), liming, sodicity and correlation with other physical, chemical and biological properties.	The pH is a measure of soil acidity or alkalinity. Soil pH affects the amount of nutrients and chemicals that are soluble in soil water, and therefore the amount of nutrients available to plants.

3.2 Land Suitability and Agricultural Land Assessment

Land suitability is primarily based upon classifications provided within the Guidelines for Agricultural Land Evaluation in Queensland (GALE) (DSITI and DNRM, 2015) and Regional Frameworks (DSITI and DNRM, 2013), with reference to the *Land resource survey and evaluation of the Kilcummin area, Queensland* (Shields and Williams, 1991) for assessing suitability for beef cattle grazing.

ALC are based on a simple hierarchical scheme that is applicable across Queensland. The ALC assessment has been updated in *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and land resource assessment* (DES and DoR, 2021). As such, no further specific assessment for beef cattle grazing suitability is required, however remains for reference to post mine land use.

ALC assessment guidelines are presented in Section 5.2.

4 RESULTS

4.1 Soil Mapping Units

A total of 374 observation sites (82 detailed and 292 check sites), 15 SMUs and 67 Unique Mapping Areas (UMAs) were identified in the study area. The SMUs are presented on Figure 3. As discussed in Section 3.2.3, 17 detailed sites completed for the Olive Downs Project (ODP) were also identified in the vicinity of the Project, primarily to the north and east.

The SMUs have been grouped according to basic soil morphology, position in the landscape, and parent material. Individual SMUs have been classified in accordance with *The Australian Soil Classification, Third Edition* (Isbell, 2021). Comparable land systems, as described by Gunn et al. (1967), are also provided in Table 4-1.

Table 4-1: Summary of Identified Soil Mapping Units

SMU	Concept Summary	Land Systems (Gunn et al., 1967)	UMAs	Detailed Sites (*Laboratory Site)
Winchester South Project				
C1-BL	Black Vertosols on flat plains with melon hole microrelief. Soils are dominant black clays with minor interfingering sub-dominant brown clays. Microrelief is present with poor quality subsoils from increased salt, sodium and sodic attributes. Soils are suitable for grazing of native pastures.	Humboldt, Connors, Somerby	9	2*, 3, 4, 5, 15, 18, 32, 65
C1-BR	Brown Vertosols on flat plains with melon hole microrelief. Soils are dominant brown clays with minor interfingering sub-dominant black clays. Microrelief is present with poor quality subsoils from increased salt, sodium and sodic attributes. Soils are suitable for grazing of native pastures.	Monteagle, Humboldt, Girrah, Connors, Somerby	7	7, 8, 9*, 11, 12, 14, 17, 20, 21, 22, 24, 25, 40, 59, 66, 67
C3-BL	Black Vertosols on gently undulating plains. Soils are dominant black clays with minor interfingering sub-dominant brown clays. Soils have dispersive attributes in subsoils with minor salinity attributes increasing with depth. This SMU is suitable for a wide range of current and potential broadacre and horticultural crops.	Monteagle, Humboldt, Girrah, Somerby	11	28, 29, 44, 48, 51*, 53, 56, 57, 60, 74, 81
C3-BR	Brown Vertosols with sub-dominant Brown Dermosols on gently undulating plains. Soils are dominant brown clays with minor interfingering sub-dominant black clays. Soils have dispersive and salinity attributes in subsoils increasing with depth. This SMU is suitable for grazing native pastures.	Humboldt, Girrah, Somerby	8	16, 26, 27, 37*, 38, 39, 41, 45, 49, 50, 52, 61, 62, 63, 64
C4	Black Vertosols on gently undulating plains with linear microrelief. Soils feature uniform dark clays associated with linear gilgai, have dispersive and salinity attributes in subsoils increasing with depth. This SMU is suitable for a wide range of current and potential broadacre and horticultural crops.	Girrah	2	33, 34, 35*, 47, 77

SMU	Concept Summary	Land Systems (Gunn et al., 1967)	UMAs	Detailed Sites (*Laboratory Site)
C5	Deep Black Vertosols on alluvial plains. Soils feature cracking uniform black clays with calcium carbonate extending to 1.0 m below the surface. The SMU has limitations with dispersive attributes in subsoils at 0.90 metres below ground level (mbgl) and is suitable for a wide range of current and potential broadacre and horticultural crops.	Humboldt	2	70*, 76
K1	Very shallow Claustic Rudosol on wide crests. Soils are firm with coarse fragments and extend to approximately 0.10 mbgl. The major limitation is the very shallow soil profile and are suitable for grazing of native pastures.	Humboldt	1	55*
R3	Deep Red Kandosol on flat plains. Soils are firm, no coarse fragments and extend to 1.0 m below the surface. The soil has limited plant available water capacity (PAWC) and is suitable for grazing native pastures.	Humboldt	1	31*
S1	Deep Brown Sodosol on gently undulating plains. Soils are soft surfaced loamy sands on dispersive sandy clay loams extending 1.0 m below the surface. The soil has PAWC and erosive limitations and is suitable for grazing native pastures.	Monteagle, Humboldt, Connors	9	1*, 19, 30, 58, 79, 80
S3	Deep Brown Chromosol on flat to gently undulating plains. Soils have surface salt concentrations in the A1 horizon, however, is suitable for a narrow range of crops and sown pastures.	Humboldt, Somerby	7	10*, 13, 23, 71, 72
S4	Deep Brown Arenosols on flat plains. Soils are soft surfaced, low fertility free draining uniform sands. This SMU is suitable for grazing native pastures.	Monteagle, Connors	3	68*, 69
T1-B	Deep Brown Dermosol on gently undulating plains. Soils are deep clayey to light clay soils with soil water availability limitations allowing it to be suitable for a narrow range of crops, specifically cotton.	Humboldt	3	42*, 43
T1-R	Very deep Red Dermosols on wide crests. Soils are deep clayey to light clay soils with soil water availability limitations allowing it to be suitable for a narrow range of crops, specifically cotton.	Girrah	3	36*
T2	Deep Red Chromosol on gently undulating plains. Soils are deep texture contrast soils with favourable attributes and is suitable for a wide range of current and potential broadacre and horticultural crops.	Humboldt	2	46, 73, 75*, 82
T3	Deep Brown Dermosol associated with flat plains. Soils have sodic and salinity attributes in subsoils and are suitable for grazing native pastures.	Humboldt	4	6*, 54, 78

SMU	Concept Summary	Land Systems (Gunn et al., 1967)	UMAs	Detailed Sites (*Laboratory Site)
Olive Downs Project – SMUs adjacent to the northern, southern and eastern boundaries of the study area.				
B1	Black, to brown, grey duplex soils with loamy sands, silty clay loams to clayey sands, mottled silty clay loams and clay loams	Somerby, Monteagle, Humboldt	-	OD-28
B2	Brown silty loams to light clays with cracking surface on lower flat plains	Somerby, Connors, Humboldt, Blackwater	-	OD-187
S1	Brown shallow to deep duplex loamy sands to clay loam sandy earths	Somerby, Monteagle, Connors, Humboldt, Blackwater	-	OD-15, OD-170, OD-180, OD-181, OD-182, OD-189, OD-190
S2	Brown gradational sands, loamy to clayey sands	Somerby, Monteagle, Connors, Humboldt, Blackwater	-	OD-31, OD-184, OD-188
C2	Grey to brown light to medium clay with normal gilgai microrelief	Somerby, Monteagle, Connors, Humboldt, Blackwater	-	OD-26, OD-34, OD-94, OD-183

4.1.1 C1-BL: Black Vertosols on flat plains with melon hole microrelief

Table 4-2: Land Summary SMU C1-BL

Item	Description
Surface condition	Crust

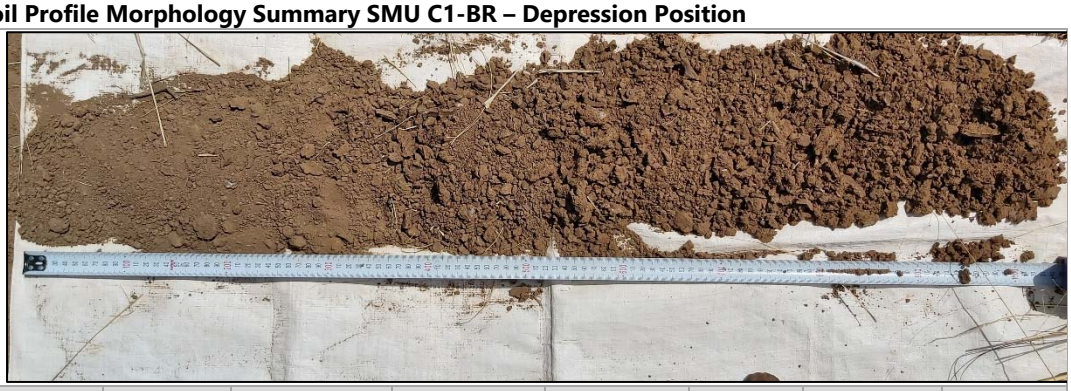
Table 4-4: Soil Profile Morphology Summary SMU C1-BL – Depression Position

Site 2-d	

Horizon Depth (m), Boundary	Field Texture	Structure Strength	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture Drainage	Roots	Depth (m) / Field pH	Samples (m)
A1 0.00-0.13 Abrupt	Medium clay	Weak, very firm, subangular <10 mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 5.5-6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
B21 0.13-0.61 Abrupt	Medium heavy clay	Moderate, very firm, subangular <20 mm Slickensides	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 5.5-6.0 0.60 / 5.5-6.0	
B22 0.61-1.00 EOBH	Medium heavy clay	Moderate, very firm, subangular 10-30 mm Slickensides	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.90 / 5.5	

4.1.2 C1-BR: Brown Vertosols on flat plains with melon hole microrelief

Table 4-9: Soil Profile Morphology Summary SMU C1-BR – Depression Position

Site 9-d								
Horizon Depth (m), Boundary	**Field Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH**	**Samples (m)**
A1 0.00-0.12 Abrupt	Light clay	Weak, weak, subangular <10 mm	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 4.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
B21 0.12-0.38 Abrupt	Light medium clay	Moderate, weak, subangular <10 mm	<1% manganese nodules	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 5.5	
B22 0.38-1.00 EOBH	Medium clay	Moderate, firm, subangular 10-20 mm Slickensides	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.60 / 5.5 0.90 / 5.5	

4.1.3 C3-BL: Black Vertosols on gently undulating plains

Table 4-12: Land Summary SMU C3-BL

Item	Description
Surface condition	Crust
Land suitability summary	**Land Suitability (Cropping) Class**: 3-4

4.1.4 C3-BR: Brown Vertosols with sub-dominant Brown Dermosols on gently undulating plains

Table 4-15: Land Summary SMU C3-BR

Item	Description
Surface condition	Crust

4.1.5 C4: Black Vertosols on gently undulating plains with linear microrelief

Table 4-18: Land Summary SMU C4

Item	Description
Surface condition	Self-mulching

Table 4-20: Soil Profile Morphology Summary SMU C4 - Depression Position

Site 35-d								
Horizon Depth (m), Boundary	**Field Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH**	**Samples (m)**
A1 0.00-0.10 Abrupt	Light clay	Weak, moderate, sub-rounded peds <20 mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 1.10-1.20 1.40-1.50
B21 0.10-0.50 Abrupt	Light medium clay	Moderate, firm, sub-angular peds <20 mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Common	0.30 / 6.0	
B22 0.50-0.65 Clear	Medium clay	Moderate, firm, sub-angular peds <20 mm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.50 / 6.5	
B23 0.65-1.30 Gradual	Medium clay	Moderate, firm, sub-angular peds <20 mm	<2% calcium carbonate	2.5YR3/2 Dusky red Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 6.5	
B24 1.30-1.50 EOBH	Medium clay	Moderate, firm, sub-angular peds <20 mm	<2% calcium carbonate	7.5YR4.3 Brown 20% light brown mottle Nil bleaching	Dry, imperfectly drained	Nil	1.30 / 6.5	

4.1.6 C5: Deep Black Vertosols on alluvial plains

Representative site

Site 70 was selected as a representative site of this SMU for chemical analysis.

Table 4-23: Land Summary SMU C5

Item	Description
Surface condition	Crust
Land suitability summary	**Land Suitability (Cropping) Class**: 3 **Agricultural Land Class:** A1

Table 4-24: Soil Profile Morphology Summary SMU C5

Site 70								
Horizon Depth (m), Boundary	**Field Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH**	**Samples (m)**
A1 0.00-0.12 Abrupt	Medium clay	Moderate, firm, subangular <20 mm	1% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00
B21 0.12-0.88 Abrupt	Medium clay	Moderate, firm, subangular 20-40 mm	2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.5 0.60 / 7.5	
B22 0.88-1.00 EOBH	Medium clay	Moderate, very firm, subangular 20-40 mm	2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate to imperfect	Nil	0.90 / 7.5	

4.1.7 K1: Very shallow Claustic Rudosols on wide crests

Table 4-26: Land Summary SMU K1

Item	Description
ASC order (s)	Claustic Rudosol

4.1.8 R3: Red Kandosols on flat plains

Soil characteristics and chemistry

The major characteristics from the laboratory data indicate that this SMU has:

- soils of loamy sands to sandy clay loams.

Table 4-29: Land Summary SMU R3

Item	Description
Land suitability summary	**Land Suitability (Cropping) Class**: 4-5

4.1.9 S1: Deep Brown Sodosols on gently undulating plains

Table 4-32: Land Summary SMU S1

Item	Description
Land suitability summary	**Land Suitability (Cropping) Class**: 4-5

4.1.10 S3: Deep Brown Chromosols on flat to gently undulating plains

Table 4-35: Land Summary SMU S3

Item	Description
Land suitability summary	**Land Suitability (Cropping) Class**: 3-4-5 **Agricultural Land Class**: B

4.1.11 S4: Deep Brown Arenosols on flat plains

Soil characteristics and chemistry

The major characteristics from the laboratory data indicate that this SMU has:

- ESP is non-sodic.

Table 4-38: Land Summary SMU S4

Item	Description
ASC order (s)	Brown Arenosol
Erosion potential	The assessment included reviewing the laboratory data and landform factors; • Sodicity/ESP: non-sodic.

4.1.12 T1-B: Deep Brown Dermosols on gently undulating plains

Soil characteristics and chemistry

The major characteristics from the laboratory data indicate that this SMU has:

- clay loams on clay soils.

Table 4-41: Land Summary SMU T1-B

Item	Description
Land suitability summary	**Land Suitability (Cropping) Class**: 3-4-5 **Agricultural Land Class**: B
Erosion potential	The assessment included reviewing the laboratory data and landform factors; • Texture: Clay loams on clay soils

4.1.13 T1-R: Very deep Red Dermosols on wide crests

Overview

The SMU is associated with clay soils on wide crests. This SMU is situated in the north-western portion of the study area and is minor variant associated with SMU T1-B.

Soil characteristics and chemistry

The major characteristics from the laboratory data indicate that this SMU has:

- clay loams on clay soils.

Table 4-44: Land Summary SMU T1-R

Item	Description
Land suitability summary	**Land Suitability (Cropping) Class**: 3-4-5 **Agricultural Land Class**: B
Erosion potential	The assessment included reviewing the laboratory data and landform factors; • Texture: Clay loams on clay soils

Table 4-45: Soil Profile Morphology Summary SMU T1-R

Site 36								
Horizon Depth (m), Boundary	**Field Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH**	**Samples (m)**
A11 0.00-0.08 Abrupt	Clay Loam	Massive, loose	Nil	10YR2/2 Very dark brown Nil mottles / bleaching	Dry, rapid	Common	0.05 / 6.5	0.00-0.08 0.10-0.20 0.20-0.30 0.50-0.60 0.90-1.00 1.40-1.50
A12 0.08-0.20 Abrupt	Clay loam	Weak, weak, sub-rounded 5-20 mm	<1% <2 mm coarse fragments	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well	Few	0.15 / 6.5	
B21 0.20-0.34 Abrupt	Light clay	Moderate, weak, sub-rounded 5-20 mm	<1% <2 mm coarse fragments	5YR3/4 Dark reddish brown Nil mottles / bleaching	Dry, well	Few	0.30 / 7.0	
B22 0.34-0.75 Abrupt	Silty clay loam	Weak, weak, sub-angular <20 mm	<5% <2 mm coarse fragments	5YR4/4 Reddish brown Nil mottles / bleaching	Dry, well to moderate	Nil	0.60 / 8.0	
B23 0.75-1.05 Abrupt	Silty clay loam	Weak, weak, sub-angular <20 mm	<2% <2 mm coarse fragments	7.5YR4/6 Strong brown Nil mottles / bleaching	Dry, well to moderate	Nil	0.90 / 8.0	
Horizon Depth (m), Boundary	**Field Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH**	
B3 1.05-1.60 EOBH	Loam	Massive, loose	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderate	Nil	1.20 / 8.5	

4.1.14 T2: Deep Red Chromosols on gently undulating plains

Overview

The SMU is associated with loam soils on clays with massive structure on gently undulating plains. This SMU is situated in the western and south-western portion of the study area.

Soil characteristics and chemistry

The major characteristics from the laboratory data indicate that this SMU has:

- silty loams on clay soils.

Table 4-47: Land Summary SMU T2

Item	Description
ASC order (s)	Red Chromosol
Land suitability summary	**Land Suitability (Cropping) Class**: 3-4 **Agricultural Land Class**: A1
Erosion potential	The assessment included reviewing the laboratory data and landform factors; • Texture: Silty loams on clay soils

4.1.15 T3: Deep Brown Dermosols associated with flat plains

Overview

The SMU is associated with silty loam on clay loam soils on flat plains. This SMU is situated in the south-west, central and south-east of the study area in four UMAs.

Soil characteristics and chemistry

The major characteristics from the laboratory data indicate that this SMU has:

- silty loams on clay soils.

Table 4-50: Land Summary SMU T3

Item	Description
Erosion potential	The assessment included reviewing the laboratory data and landform factors: • Texture: silty loams on clay soils.

Table 4-51: Soil Profile Morphology Summary SMU T3

Site 6								
Horizon Depth (m), Boundary	**Field / Lab Texture**	**Structure Strength**	**Inclusions Segregations**	**Colour, Mottle, Bleaching**	**Moisture Drainage**	**Roots**	**Depth (m) / Field pH**	**Samples (m)**
A1 0.00-0.20 Abrupt	Silty loam / Silty loam	Massive, firm	<1% <5 mm coarse fragments	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.57 0.65-0.75 0.90-1.00
B21 0.20-0.57 Abrupt	Silty clay loam / Silty clay loam to clay loam	Weak to moderate, firm, subangular <10 mm	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.0	
B22 0.57-0.76 Abrupt	Silty clay loam / Clay loam	Weak to moderate, firm, subangular <20 mm	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Nil	0.60 / 8.0	
B23 0.76-100 EOBH	Silty clay loam / Clay loam	Moderate, firm, subangular <10 mm	Nil	10YR5/4 Yellowish brown Nil mottles / bleaching	Dry, moderate	Nil	0.90 / 8.0	

5 LAND SUITABILITY AND AGRICULTURAL LAND ASSESSMENT

5.1 Land Suitability Classes

5.1.1 Background

Determination of the land suitability of the study area has been conducted based on GALE (DSITI and DNRM, 2015), Regional Frameworks (DSITI and DNRM, 2013) and the DES and DoR (2021) *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment*.

GALE (DSITI and DNRM, 2015) and the Regional Frameworks (DSITI and DNRM, 2013) give specific information for appropriate land uses and their associated limitations. The Regional Frameworks were reviewed in conjunction with GALE and *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* to assist with determining land suitability in the study area.

The Addendum acknowledges that assessing beef cattle grazing, as was undertaken by review of the *Land resource survey and evaluation of the Kilcummin area, Queensland* (Shields and Williams, 1991), is not required to assess Agricultural Land Classes, however remains for reference to post mine suitability.

The *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (DES and DoR, 2021) defines five land suitability classes for use in Queensland (Table 5-1). These land suitability classes decrease progressively from Class 1 to Class 5 and are used to describe an area of land in terms of suitability for a land use, allowing for optimal, sustainable production, while minimising degradation to the land resource in the short, medium or long-term.

Table 5-1: Land Suitability Classes

Class	Suitability	Limitations	Definition
1	Suitable	Negligible	Highly productive land requiring only simple management practices to maintain economic production.
2	Suitable	Minor	Land with limitations that either constrain production or require more than the simple management practices of class 1 land to maintain economic production.
3	Suitable	Moderate	Land with limitations that either further constrain production or require more than those management practices of class 2 land to maintain economic production.
4	Unsuitable	Severe	Currently unsuitable land. The limitations are so severe that the sustainable use of the land in the proposed manner is precluded. In some circumstances, the limitations may be surmountable with changes to knowledge, economics or technology.
5	Unsuitable	Extreme	Land with extreme limitations that preclude any possibility of successful sustained use of the land in the proposed manner.

Source: Definitions from *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (DES and DoR, 2021).

As detailed in Table 5-1, land determined as Class 1 to 3 is considered suitable for a land use, as the long-term benefits obtained from that land use typically outweigh the inputs required to initiate and maintain production. It should be noted that with the use of soil improvement techniques (for example, the application of fertiliser), Class 3 land can be as productive as Class 1 or 2 land.

Class 4 land is considered temporarily unsuitable for the specified land use due to the severity of one or several limitations. However, this land may be improved to a more suitable class with the implementation of considerable soil improvement measures.

Class 5 land is considered entirely unsuitable for the specified land use as the limitation(s) are so severe that the inputs required to initiate and maintain the specified land use are not sustainable.

5.1.2 Limitation Assessment Criteria

In reviewing the Regional Frameworks (DSITI and DNRM, 2013) suitability subclasses and attributes, the following assessments were undertaken:

- an assessment based on the cropping examples outlined in the suitability framework for the Inland Fitzroy and Southern Burdekin area for cropping based on thirteen subclasses (crops selected from the Regional Frameworks), refer to Section 5.1.3.

The following land attributes have been considered based on the suitability of the Inland Fitzroy and Southern Burdekin area, include:

- Water erosion (E);
- Erosion hazard, subsoil erodibility (Es);
- Soil water availability (M);
- Narrow moisture range (Pm);
- Surface Condition (Ps);
- Rockiness (R);
- Microrelief (Tm); and
- Wetness (W).

Field, laboratory and available public data collected was used as diagnostic attributes to assess the severity of these land attributes and the land suitability class of each soil unit.

5.1.3 Cropping Land Suitability Assessment

The land uses assessed included all thirteen crops nominated from the Regional Frameworks including barley (dryland), chickpea (dryland), cotton (furrow irrigated), maize (dryland), millet (dryland), mungbean (dryland), oat (dryland), safflower (dryland), sorghum (dryland), soybean (dryland), sunflower (dryland), triticale (dryland) and wheat (dryland).

The suitability assessment of for the amended SMUs (SMU C3-BL, C5 and T2) for the various land management options as outlined in the preceding sections, has been summarised in Tables D-3, D-6 and D-14 and presented in Appendix D. The land suitability assessment of the other SMUs is provided in Appendix D of the Assessment (GTE, 2021).

Table 5-3 summarises the assessed land suitability classes for each SMU. The overall class is assessed on reviewing the land suitability subclasses across all land uses, not the highest subclass number indicated. This assists in assessing the ALC class.

Table 5-3: Land Suitability Classes, Regional Frameworks Assessment Summary

SMU	Suitability subclasses for different land use summary												
	Barley	Chickpea	Cotton	Maize	Millet	Mungbean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
C1-BL	5	5	5	5	5	5	5	5	5	5	5	5	5
C1-BR	5	5	5	5	5	5	5	5	5	5	5	5	5
C3-BL	4	4	3	3	4	3	4	3	3	3	3	4	4
C3-BR	5	5	4	4	5	4	5	4	4	4	4	5	5
C4	3	3	3	3	3	3	3	3	3	3	3	3	3
C5	3	3	4	3	3	3	3	3	3	3	3	3	3
K1	5	5	5	5	5	5	5	5	5	5	5	5	5
R3	5	5	4	5	5	5	5	5	5	5	5	5	5
S1	5	5	4	5	5	5	5	5	5	5	5	5	5
S3	5	5	3	4	5	4	5	4	4	4	4	5	5
S4	5	5	5	5	5	5	5	5	5	5	5	5	5
T1-B	5	5	3	4	5	4	5	4	4	4	4	5	5
T1-R	5	5	3	4	5	4	5	4	4	4	4	5	5
T2	4	4	3	3	4	3	4	3	3	3	3	4	4
T3	5	5	5	5	5	5	5	5	5	5	5	5	5

SMUs C3-BL, C4, C5 and T2 present moderate limitations for some land uses.

The remaining SMUs (including all UMAs in the nominated SMUs) are unsuitable for the land uses proposed for the region with severe or extreme limitations, except for SMUs S3, T1-R and T1-B, which present moderate limitations for irrigated cotton.

5.2 Agricultural Land Classes

5.2.1 Background

ALC are based on a simple hierarchical scheme that is applicable across Queensland. It allows the interpreted land evaluation data to indicate the location and extent of agricultural land that can be used for a wide range of land uses with minimal land degradation.

This evaluation scheme has evolved through various guidelines and state planning policies and is currently referenced in regional shire council planning schemes. ALC assessment guidelines are presented below in Table 5-5.

Table 5-5: Agricultural Land Classes

Agricultural Land Class	Land Suitability (Cropping)[1]	Description	Number of Crops	Crop Suitability Class
Crop Land	A	Land that is suitable for a wide range[1] of current and potential crops with nil to moderate limitations to production.	>=4	1-3
	A1	Suitable for a wide range of current and potential broadacre and horticultural[2] crops.	>=4	1-3
	A2	Suitable for a wide range of current and potential horticultural crops only.	>=4	1-3
Limited Crop Land	**B**	Land that is suitable for a narrow range[3] of crops. The land is suitable for sown pastures and may be suitable for a wider range of crops with changes to knowledge, economics or technology.	<=3	1-3
Pasture Land	**C**	Land that is suitable only for improved or native pastures due to limitations that preclude continuous cultivation for crop production. Some areas may tolerate a short period of ground disturbance for pasture establishment.	n/a	4/5
	C1	Suitable for grazing sown pastures requiring ground disturbance for establishment; or native pastures on higher fertility soils.	n/a	4/5
	C2	Suitable for grazing native pastures, with or without the introduction of pasture species, and with lower fertility soils than C1.	n/a	4/5
	C3	Suitable for light grazing of native pastures in accessible areas and includes steep land more suited to forestry or catchment protection.	n/a	5
Non-Agricultural Land[4]	**D**	Land not suitable for agricultural use, including land alienated from agricultural use.	n/a	5
Complex Classes	**A/C** **A/D** **B/C** **C/D**	Land that is a complex of class A, B, C or D land where it is not possible to delineate the land class at the map scale. The dominant class is the first code in the sequence and is assumed to be >50% of the area, but <70%[5].	n/a	-

1. A wide range of crops is four or more crop types of local commercial significance.

2. Horticulture includes intensively grown small crops (e.g. vegetables) as well as tree crops (e.g. grown for nuts, seeds or fruit). Silviculture (plantation forestry) is not included.
3. A narrow range of crops is three or fewer crop types (broadacre or horticulture) of local commercial significance. Silviculture (plantation forestry) may be included. Crops with similar agronomic requirements e.g. maize and grain sorghum, peaches and nectarines are not generally regarded as different crop types. Different management regimes (including irrigation strategies) for the same crop do not increase the number of crops.
4. Non-agricultural land includes land that cannot be placed in any of the other land classes and includes land such as urban areas and stream channels.
5. In cases where two or more land classes are equally dominant and none are greater than 50%, judgement is used to identify the most appropriate agricultural land class/es for the unit.

5.2.2 Agricultural land class assessment

The land suitability class of each SMU has been determined using the Regional Frameworks (DSITI and DNRM, 2013) land suitability sub classes land uses (Table 5-3) and *Land resource survey and evaluation of the Kilcummin area, Queensland* (Shields and Williams, 1991) beef cattle grazing land suitability frameworks (Table 5-4) against the ALC assessment (Table 5-5). The results of this assessment are presented in Table 5-6.

Table 5-6: Land Suitability Classes, Regional Frameworks Assessment Summary

SMU	Land Suitability (Cropping)	Land Suitability (Grazing)	ALC
C1-BL	5	4	C2
C1-BR	5	4	C2
C3-BL	3 (7 Crops) – 4 (6 Crop) 3-4	3	A1
C3-BR	4 (7 Crops) - 5 (6 Crops) 4-5	3	C2
C4	3	3	A1
C5	3 (12 Crops) – 4 (1 Crop) 3-4	3	A1
K1	5	4	C2
R3	4 (1 Crop) – 5 (12 Crops) 4-5	4	C2
S1	4 (1 Crop) – 5 (12 Crops) 4-5	4	C2
S3	3 (1 Crop) - 4 (6 Crops) -5 (6 Crops) 3-4-5	3	B
S4	5	4	C2
T1-B	3 (1 Crop) - 4 (6 Crops) -5 (6 Crops) 3-4-5	3	B
T1-R	3 (1 Crop) - 4 (6 Crops) -5 (6 Crops) 3-4-5	3	B

SMU	Land Suitability (Cropping)	Land Suitability (Grazing)	ALC
T2	3 (7 Crops) – 4 (6 Crop) 3-4	3	A1
T3	5	4	C2

SMUs with extreme limitations for cropping and grazing were not classified as Class D. These SMUs are still considered to have some value for light grazing, and it is viewed by GTE that Class D land would be either have soils that are unable to support native or introduced plant or grass species or be located on landforms such as very steep to precipitous areas.

The regional frameworks, beef cattle grazing classes and ALC assessment are presented on Figures 4, 5 and 6. ALC summary with areas is presented in Table 5-7.

Table 5-7: Study Area Agricultural Land Class Areas

Agricultural Land Class Assessment		
Agricultural Land Class	**SMU**	**Area (ha)**
A1	C3-BL, C4, C5, T2	4,839
A2	-	-
B	S3, T1-B, T1-R	295
C1	-	-
C2	C1-BL, C1-BR, C3-BR, K1, R3, S1, S4, T3	8,442
C3	-	-
D	-	-
Disturbed Areas		25

6 REGIONAL PLANNING INTERESTS ASSESSMENT

6.1 Assessment of Strategic Cropping Areas

The RPI Act repealed the *Strategic Cropping Land Act 2011*. The repealed policies were migrated into the new legislation through the declaration of the Strategic Cropping Areas (SCA) as an area of regional interest. SCA consists of areas identified as Strategic Cropping Land (SCL).

Identification of SCL was undertaken for the study area. Desktop review of the study area was compared to the SCL Trigger Map. A small area of regionally mapped SCA intersects the mining lease boundary for the Project (within the Norwich Park Branch Railway corridor). However, this area of SCA is located outside the Project area (extent of disturbance), with a buffer of around 800 m at the closest point, and therefore will not be impacted. No further assessment was conducted.

8 SOIL MANAGEMENT MEASURES

8.2.1 Soil Amelioration and Management

The rehabilitation reuse of the soils may be assisted with the following treatments and amelioration recommendations:

- SMUs such as C3-BL with alkaline pH and SMUs C3-BR, C4, C5, T1-B and T1-R, with marginal alkaline levels may have reduced nitrogen availability for plant growth during revegetation. The use of nitrogen specific fertilisers during rehabilitation (as required during the targeted management of native vegetation or pasture development), will bolster nitrogen levels and would be suitable for alkaline soils.

  The application of nitrogen fertilisers to these SMUs shall be monitored with additional pH testing of the soil as an increase of pH above 9 may inhibit nitrogen being made available for topsoil. Fertilisers such as crushed sulphur and ammonia based nitrogen fertilsers may lower the pH while providing nitrogen. Any reduction of pH may risk the possibility of a loss of available nitrogen and therefore management of these soils in assessing pH and nitrogen levels is recommended.

  Typical rates of nitrogen rich fertilisers are 100-300 kilograms per hectare (kg/ha). It is recommended that site-specific trials be undertaken to assist in establishing the application rate of fertiliser prior to rehabilitation.

  The addition of any nutrient should be managed to ensure runoff or excessive use is minimised.

- Gypsum ameliorants may be used to reduce any dispersive attributes for subsoils. This may assist in minimising erosion (such as tunnelling) and unfavourable surface conditions (such as hard setting) during subsoil placement.

  Gypsum, although soluble is slow so incorporation is recommended, if possible, prior to stripping of the subsoils. This will allow time for the gypsum to dissolve and replace the sodium during its stockpile onsite. Application rates recommended are based on broadcast application with soil resource during the stockpiling process. This may also allow visual observations and additional analysis to be conducted prior to rehabilitation to assess the requirement for additional gypsum application.

  If gypsum is to be applied at the time of rehabilitation, contour deep ripping, or contour furrowing procedures are recommended for gypsum application. If application of subsoils is conducted by scrapers, gypsum should be applied between passes of the scraper.

  General application rates are 5 to 15 tonne per hectare (t/ha). A suggested rate of application prior to initial stripping may be 5 t/ha with further assessment before rehabilitation reuse, as discussed above.

Recommended application rates may include 5 t/ha for SMUs C4 and S1, 10 t/ha for SMU T3 and up to 15 t/ha for SMUs C3-BL and C3-BR which are currently not recommended for rehabilitation reuse due to their dispersive attributes. Management and visual observation of subsoils during stockpiling and placement will indicate if additional amelioration will be required, such as SMU S4 where subsoil indicates marginally sodic soils (>6.0 at 0.70 to 1.00 mbgl).

- Topsoil resources for SMUs R3, S1, S4, T1-B, T1-R, T2 and T3 have minimal limitations with the exception that the topsoil consists of massive structure and/or loamy sands which may be unfavourable in sloped areas of rehabilitation due to soil structure. These topsoils may be recommended to support other suitable SMU topsoil volumes.

  If additional rehabilitation volumes of topsoil are required, subsoil from SMUs R3, T1-R and T2 may be used to support topsoil volumes. Subsoil from C4, C5 and S3 may be used to support topsoil placement. SMUs S1 and S4 may be used separately, however, SMU S1 is recommended to be ameliorated with gypsum as above and both SMUs are recommended on level plains.

- Reduce time bare soils are exposed by planting native grasses or other appropriate species and encouraging organic matter horizon.

  Organic matter may be incorporated by the use of available site based organic matter, such as stripped vegetation. The use of elevated scrapers or blading with bulldozers is recommended to strip vegetation which should then be placed into stockpiles separate from the stripped soils.

  The establishment of a crop rotation such as cover crops perennial grasses and legumes may initially assist in providing organic matter and may form part of the long term rehabilitation plan of native species established after.

  Other alternative organic amendments may be considered, these include composted organic matter, biosolids and mulch and compost, if economically viable. Anecdotal practice recommended application rates include the application of composted organic matter at 2-30 t/ha, biosolids at 50 t/ha or hay mulch at 20 bales per ha.

  These recommendations would encourage the establishment of an organic matter horizon, which will reduce the exposure of bare soils during topsoil placement.

- Contour ripping of soils during the rehabilitation process will reduce erosion and hard setting of surfaces prior to vegetation establishment.

- An Erosion and Sediment Control Plan (ESCP) addressing Soil Erosion and Sediment Control should be prepared by a Certified Professional in Erosion and Sediment Control (CPESC) and developed in accordance with the International Erosion Control Association (IECA)'s 'Best Practice Erosion and Sediment Control' document (IECA, 2018). The ESCP should adopt the three cornerstones of erosion and sediment control:

- Drainage control – prevention or reduction of soil erosion caused by concentrated flows and appropriate management and separation of the movement of diverted and surface water through the area of concern.
- Erosion control – prevention or minimisation of soil erosion (from dispersive, nondispersive or competent material) caused by rain drop impact and exacerbated overland flow on disturbed surfaces.
- Sediment control – trapping or retention of sediment either moving along the land surface, contained within runoff (i.e. from up-slope erosion) or from windborne particles.

Table 8-2: Recommended Rehabilitation Stripping Depths and Approximate Volumes Available

SMU	Recommended Topsoil Stripping Depth in Soil Profile (mbgl)	Recommended Subsoil Stripping Depth in Soil Profile (mbgl)	Area of SMU Likely to be Disturbed (ha)	Approximate Topsoil Volume Available (cubic metres [m^3])	Approximate Subsoil Volume Available (m^3)
C1-BL (Mound)	0.00 – 0.10	0.00	132	66,000[1]	0
C1-BL (Depression)	0.00 – 0.30	0.00		198,000[1]	0
C1-BR (Mound)	0.00 – 0.10	0.00	1,476	738,000[1]	0
C1-BR (Depression)	0.00 – 0.30	0.00		2,214,000[1]	0
C3-BL	0.00 – 0.30	0.00	1,980	5,940,000	0
C3-BR	0.00 – 0.30	0.00	2,774	8,322,000	0
C4 (Mound & Depression)	0.00 – 0.30	0.30-1.10	99	297,000[2]	792,000[2]
C5	0.00 – 0.10	0.10 – 0.80	90	90,000	630,000
K1	0.00 – 0.10	0.00	16	16,000	0
R3	0.00 – 0.10	0.10 – 1.00	0	0	0
S1	0.00 – 0.30	0.30 – 1.00	115	345,000	805,000
S3	0.00 - 0.10	0.10 – 1.00	24	24,000	216,000
S4	0.00 - 0.60	0.60-1.00	87	522,000	348,000
T1-R	0.00 - 0.30	0.30 - 1.00	8	24,000	56,000
T1-B	0.00 - 0.30	0.30 - 1.00	0	0	0
T2	0.00 - 0.10	0.10 - 1.00	0	0	0
T3	0.00 - 0.10	0.00	149	149,000	0
TOTAL			**6,950**	**18,945,000**	**2,847,000**

1. Volumes are based on half of the SMU area, i.e. mound position. Note, these volumes represent the maximum volume of available topsoil, as loss of soil resource during stripping activities associated with microrelief areas may occur due to the undulating nature of the soils.

2. Linear gilgai microrelief areas were observed to be shallow with minimum difference between mound and depression. Therefore, the loss of soil resource during stripping activities will be minimal.

9 LAND USE IMPACTS AND FINAL LAND USE

9.1 Rehabilitation of the Project Area

Areas which would be disturbed by the Project (e.g. mining activities and associated infrastructure) would require rehabilitation. As the primary source of disturbance for the Project would be from the open cut operation, surface rehabilitation would form a significant portion of the study area. Current mine planning indicates that changes in pre-mining land use and suitability would involve approximately 7,130 ha of the study area.

Key activities that would require significant rehabilitation works because of direct surface disturbance include (Figure 2):

- open-cut mining and out-of-pit waste rock emplacement areas;
- mine infrastructure area, including a CHPP, ROM pads, workshops, offices, raw and product handling systems, coal processing plant, rail spur and loop and train load-out facility;
- mine access road and internal roads;
- water supply and management infrastructure, including a raw water supply pipeline, sediment dams and storage dams, pumps, pipelines and other water management equipment and structures (including up-catchment diversions, drainage channel realignments and levees); and
- ancillary infrastructure including electricity supply, consumable storage areas, explosives storage facilities, crib facilities, bathhouse, warehouse, workshop and re-fuelling facilities.

The remainder of the study area (approximately 6,471 ha) would either not be disturbed or would have altered local topography from local impacts such as access roads or other minor infrastructure.

9.2 Post-mining Land Use Suitability

Post-mining land use suitability is influenced by various factors including physical, biological and chemical changes of soil, depth of soil and slope gradient and length in the final landform design. Open cut mining activities are expected to change the nature of the final landform and suitability for land use activities.

Overall rehabilitation concepts envisaged specific to the Project components are summarised in Table 9-1.

Table 9-1: Disturbance Types, Rehabilitation Recommendations and Post-mining Land Use

Potential Disturbance Type	Proposed Rehabilitation Strategy Recommendations	Proposed Post-mining Land Suitability Class
Open cut mining Out-of-pit waste rock emplacement areas Residual voids, Low walls	Final landform design would be developed in consideration of suitable soil attributes, depths and slopes. Open cut mining areas would be partially backfilled with suitable waste rock and capped with subsoil and topsoil rehabilitation reserves. Open cut mining areas would be backfilled up to the pre-mining surface level or higher with batters to be graded to 18%/10 degrees (°) slope on highwall and battered down. No areas would exceed 20% slope. The overall goal wherever possible is for landforms to be regraded where at least 70% of the land surface is <10% slope. Areas throughout the landform (e.g. ramp or pit batters), where the proportion of land with <10% slope will be less than 70%; would have reduced grazing land suitability potential. Implementation of practical drainage designs would ensure that any area affected by settling would be sufficiently drained to ensure that pre-existing productive uses can be returned. This may include targeted earthworks programs in areas of excessive cracking or to produce a desirable surface topography. Rehabilitated areas would be topsoiled and seeded with native grasses or other appropriate species. Monitoring would assess remediation success for an appropriate period. The Environmental Management Plan, or equivalent, would detail methods, success criteria and management of all rehabilitation areas. Coal rejects would be managed in accordance with the recommendations in the Geochemistry Assessment (Terrenus Earth Sciences, 2020). An ongoing, post-mining management plan would be documented. Low-wall slopes would be seeded with native grasses or other appropriate species.	**>70% of the land is <10% slope of land surface** Class 3 - Grazing Class 5 - Cropping **>30% of the land has slope in the range 10-15% with <10% of the land exceeding 15% slope** Class 4 - Grazing Class 5 - Cropping
Residual void, water body extent	Updated surface water modelling for the optimised mine plan indicates that the residual void water bodies would be of suitable quality for use as stock water. If deemed unsuitable for consumption by fauna, the area would be fully fenced off. A management plan for the residual voids would be developed and would include, but not limited to, the following: long term geotechnical stability and hydrogeology of the void stock water body, water quality assessment of the void, ongoing management and maintenance of drainage structures, fences, signs and pumping/moving of water as required.	**Residual void water body extent** N/A[1]
General infrastructure including potentially contaminated areas (e.g. coal preparation plant, workshops and vehicle servicing and wash down stations)	Infrastructure would be assessed on an individual basis for possible removal or whether it can be retained for future landowners. Infrastructure would be removed, and areas prepared and re-seeded if necessary. Location of all such areas would be recorded in a Progressive Rehabilitation and Closure Plan (PRC Plan). Potentially contaminated areas would undergo Stage 1 and 2 contaminated land assessments. A Remediation Plan for potentially contaminated areas would be prepared. Remediation works to remove contaminated material or rip, cap and topsoil inert areas. Areas would be seeded with native grasses or other appropriate species. Aim is to assess and remediate any residual contamination in a manner described for potentially low risk contaminated areas. Monitoring would assess remediation success for an appropriate period. The Environmental Management Plan, or equivalent, would detail methods, success criteria and management of all rehabilitation areas.	Same classes as pre-mining

Potential Disturbance Type	Proposed Rehabilitation Strategy Recommendations	Proposed Post-mining Land Suitability Class
Coal material (ROM pad and product coal stockpile) Laydown areas	Coal material and stockpile base would be removed. Areas would be capped and topsoiled, ripped and seeded with pasture grasses. It is anticipated that these areas would return to grazing lands consistent with pre-mining suitability.	Same classes as pre-mining
Water management structures	Water management structures would be individually assessed as they may provide future benefit to agricultural activities prior to being decommissioned. If no value in retaining the water management structures is assessed, the water management structures would be dewatered, capped and rehabilitated using topsoil and pasture grasses.	Same classes as pre-mining
Linear infrastructure (raw water pipeline, rail spur and loop, ETL and mine access road)	Infrastructure would be assessed, and either decommissioned and removed, and the area would be rehabilitated to previous landforms or retained for future use, as part of the post-mining land use.	Same classes as pre-mining

1. No agricultural use is proposed for the stock water bodies, low-walls adjacent to the highwalls of the residual voids (slopes >18%), the highwalls and stock water bodies of the residual voids, as such no post-mining land suitability class has been assigned to these areas.

Table 9-2 summarises the expected changes in agricultural land suitability area following mining if the recommendations in Table 9-1 are implemented. Figures 8 and 9 present the distribution of post-mining land suitability classes.

Table 9-2: Post-mining Land Suitability Changes

Land Suitability - Cropping			Land Suitability - Grazing		
Class[1]	**Pre-mining (ha)**	**Post-mining[2] (ha)**	**Class[3]**	**Pre-mining (ha)**	**Post-mining[1] (ha)**
3	430	430	**3**	8,353	4,613
3 / 4	4,409	3,405	**4**	5,223	3,912
3 / 4 / 5	295	280	**3 / 4[4]**	0	4,902
4 / 5	4,132	1,375	**-**	-	-
5	4,310	7,937	**-**	-	-
Disturbed Areas	25	25	Disturbed Areas	25	25
N/A – Residual water body extent	-	149	N/A – Residual water body extent	-	149
Total	**13,601**	**13,601**	**-**	**13,601**	**13,601**

1 Classes are based on suitability framework for the Inland Fitzroy and Southern Burdekin area. Assessment included thirteen subclasses of cropping.

2 Specific areas are subject to change as part of the PRC Plan process.

3 Classes are based on Land resource survey and evaluation of the Kilcummin area, Queensland (Shields and Williams, 1991) beef cattle grazing land suitability frameworks.

4 Open cut mining and out-of-pit waste rock emplacement areas, refer Table 9-1 for description.

10 CONCLUSION

The following conclusions have been made for the soils and land suitability assessment for the study area:

- Fifteen SMUs are present in the study area.
- The study area includes areas of flat to gently undulating plains dominated by Vertosols with microrelief (C1-BL, C1-BR and C4), and Vertosols with no microrelief (C3-BL, C3-BR and C5), Kandosols, Sodosols, Dermosols and Chromosol soils on gently undulating and flat plains (R3, S1, S3, T1-R, T1-B, T2 and T3), Arenosol on plains (S4) and very shallow Rudosol soils (K1).
- Land use suitability assessment of the fifteen SMUs was determined against the Regional Frameworks (DSITI and DNRM, 2013), GALE (DSITI and DNRM, 2015), *Land resource survey and evaluation of the Kilcummin area, Queensland* (Shields and Williams, 1991) and *Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment* (DES and DoR, 2021).
    - SMUs C3-BL, C4, C5, and T2 present moderate limitations for cropping land uses. Limitations include PAWC, water erosion, erosion hazards, surface conditions and moisture range. These were assessed as ALC rating A1 and suitable for a wide range of current and potential broadacre and horticultural crops.
    - SMUs S3, T1-B and T1-R were assessed as ALC rating B and are suitable for a narrow range of crops. The land is suitable for sown pastures and may be suitable for a wider range of crops.
    - The remaining SMUs were assessed as suitable for native pastures due to limitations that preclude continuous cultivation for crop production.

      SMUs C1-BL, C1-BR, C3-BR, K1, R3, S1, S4 and T3 were assessed as ALC rating C2 and are suitable for grazing native pastures, with or without the introduction of pasture species, and with lower fertility soils than C1.
    - Disturbed areas consist of 25 ha.
- Soil for rehabilitation use (e.g. able to support the establishment of native vegetation and grasses, or other appropriate species) is available from all SMUs, with S3 recommended to be analysed once stripping commences, prior to use for rehabilitation, due to the potential for high salinity in the topsoil. SMUs recommended for level plains or sloped backfill batters above 3% include C3-BL, C3-BR, C4, C5 and S3. SMUs recommended for level plains or slopes equal to or less than 3% include C1-BL, C1-BR, K1, R3, S1, S4, T1-B, T1-R, T2 and T3, with R3, S1, S4, T1-B, T1-R, T2 and T3 available for use on slopes above 3%.

Appropriate management such as the application of nitrogen fertilisers, gypsum ameliorants, surface preparation including ripping of topsoils, erosion and sediment controls and reduced exposure time of bare soils through vegetation establishment would assist in rehabilitation.

- Subsoil suitable for supporting the establishment of natural vegetation growth with additional soil fertility conditioning and the potential to increase topsoil reserves are limited due to dispersive and salinity attributes for most SMUs. SMUs C4, C5, R3, S1, S3, S4, T1-B, T1-R and T2 may provide suitable subsoils for rehabilitation use with SMUs S1 and S4 preferably used on level plains. All remaining SMUs are not suitable for rehabilitation use and more suited as potential capping of waste rock.
- A small area of regionally mapped SCA intersects the mining lease boundary for the Project (within the Norwich Park Branch Railway corridor) However, this area of SCA is located outside the Project area (extent of disturbance), with a buffer of around 800 m at the closest point, and therefore will not be impacted. No further assessment was conducted. No other areas of regional interest, including PAAs, are located within the mining lease boundary for the Project.
- Acid sulfate soils were not observed during the survey, and it is highly unlikely that the study area would include AASS and/or PASS. In the unlikely event conditions of the soil during the Project's life present attributes of PASS or AASS, an ASS environmental management plan should be prepared and implemented.
- The proposed post-mining final land use for most of the study area may include beef cattle grazing activities and cropping activities. The residual void water bodies in the Project final landform would be of suitable quality to be water storages for agricultural production (supply water to cattle). It is expected that undisturbed areas of the study area would remain the same land use identified pre-mine.

11 ADDENDUM REFERENCES

Department of Environment and Science and Department of Resources (2021), Queensland Land Resource Assessment Guidelines, Volume 1: Soil and Land Resource Assessment. Queensland Government, Brisbane, Queensland.

Department of Resources (2021), Queensland Soil and Land Resource Survey Information Guideline. Queensland Government, Brisbane, Queensland.,

GTE (2021), Soil and Land Suitability Assessment. Winchester South Project. Whitehaven WS Pty Ltd, Brisbane Queensland.

Isbell, R.F. (2021), The Australian Soil Classification, Third Edition. CSIRO Publishing. Collingwood VIC.

12 GLOSSARY OF TERMS

The following descriptions are of terms amended or added in the text of this Addendum.

Effective Rooting Depth (ERD): The depths of which vegetation roots may readily penetrate the soil profile, have access to water and nutrients and not be restricted by physical (e.g. hard pans) or chemical barriers (e.g. elevated chloride ≥800 Milligram per kilogram [mg/kg]).

Exchangeable Sodium Percentage (ESP): The amount of sodium as a proportion of all cations in a soil is termed the Exchangeable Sodium Percentage. It is calculated by dividing the exchangeable sodium by the CEC (cation exchange capacity), multiplied by 100. ESP values greater than 6% are considered sodic, with values greater than 15% considered very sodic. ESP = (Exchangeable sodium (meq/100 g)/Cation exchange capacity (meq/100 g)) x 100. It is noted, that it is not advisable to calculate ESP when the CEC is 3 mol (+) kg^{-1} or less and/or exchangeable sodium is 0.3 ml (+) kg^{-1} or less.

Vertic Properties: A soil that has a clay field texture or 35% or more clay throughout the solum except for this, surface crusty horizons 30 mm or less thick, and, unless too moist, have open cracks at some time in most years that are at least 5 mm wide and extend upward to the surface or to the base of any plough layer, peaty horizon, self-mulching horizon or thin surface crusty horizon, and at some depth in the solum, have slickenside and/or lenticular peds.

13 FIGURES - ADDENDUM

Figure 3 Soil Mapping Units

Figure 4 Pre-Mining Land Suitability (Cropping)

Figure 5 Pre-Mining Land Suitability (Grazing)

Figure 6 Agricultural Land Classes

Figure 7 Topsoil Stripping Depths

Figure 8 Post-Mining Land Suitability (Cropping)

Figure 9 Post-Mining Land Suitability (Grazing)

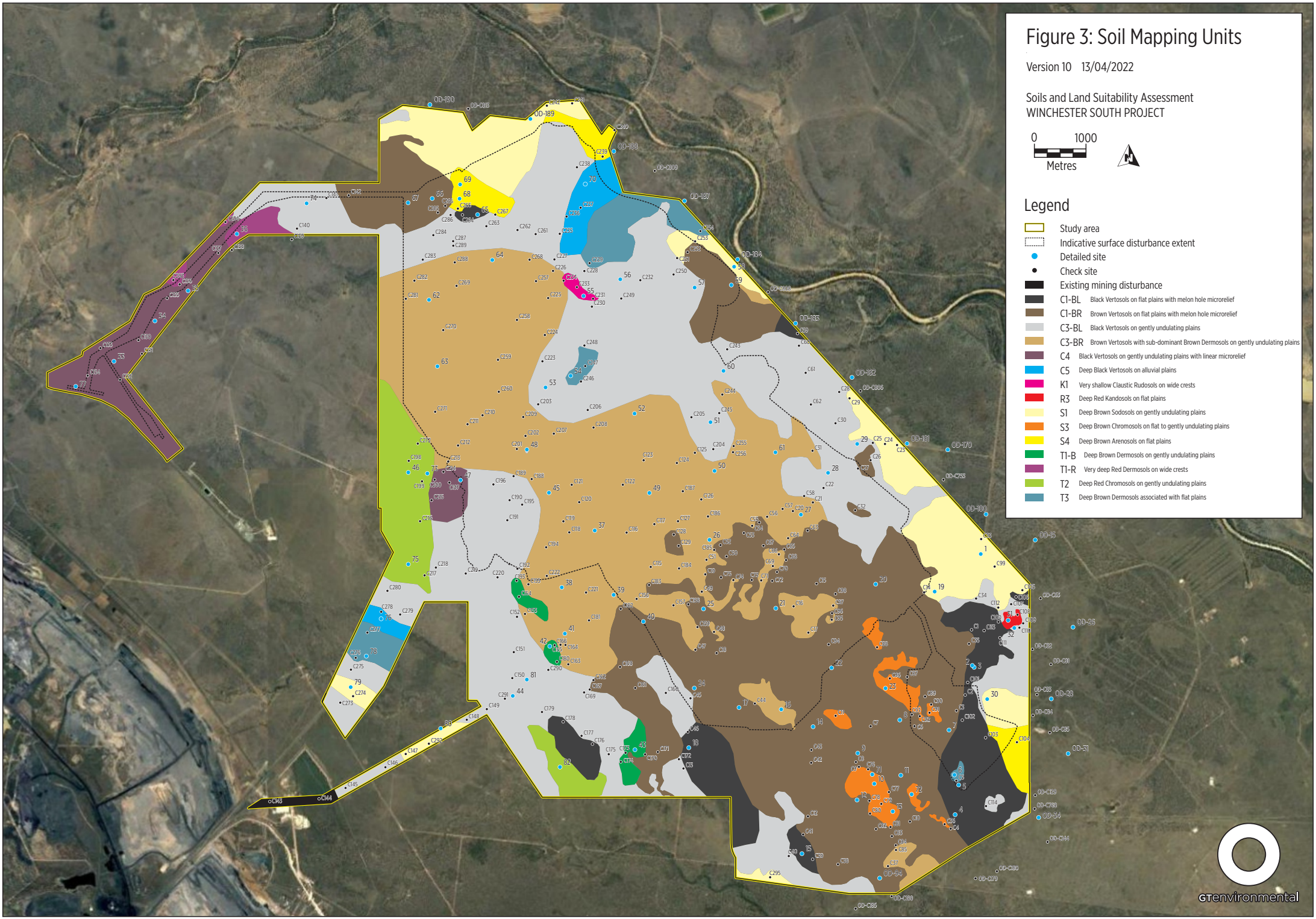


Figure 3: Soil Mapping Units
Version 10 13/04/2022
Soils and Land Suitability Assessment
WINCHESTER SOUTH PROJECT
0 1000
Metres
Legend
Study area
Indicative surface disturbance extent
Detailed site
Check site
Existing mining disturbance
C1-BL Black Vertosols on flat plains with melon hole microrelief
C1-BR Brown Vertosols on flat plains with melon hole microrelief
C3-BL Black Vertosols on gently undulating plains
C3-BR Brown Vertosols with sub-dominant Brown Dermosols on gently undulating plains
C4 Black Vertosols on gently undulating plains with linear microrelief
C5 Deep Black Vertosols on alluvial plains
K1 Very shallow Claustic Rudosols on wide crests
R3 Deep Red Kandosols on flat plains
S1 Deep Brown Sodosols on gently undulating plains
S3 Deep Brown Chromosols on flat to gently undulating plains
S4 Deep Brown Arenosols on flat plains
T1-B Deep Brown Dermosols on gently undulating plains
T1-R Very deep Red Dermosols on wide crests
T2 Deep Red Chromosols on gently undulating plains
T3 Deep Brown Dermosols associated with flat plains
GTenvironmental

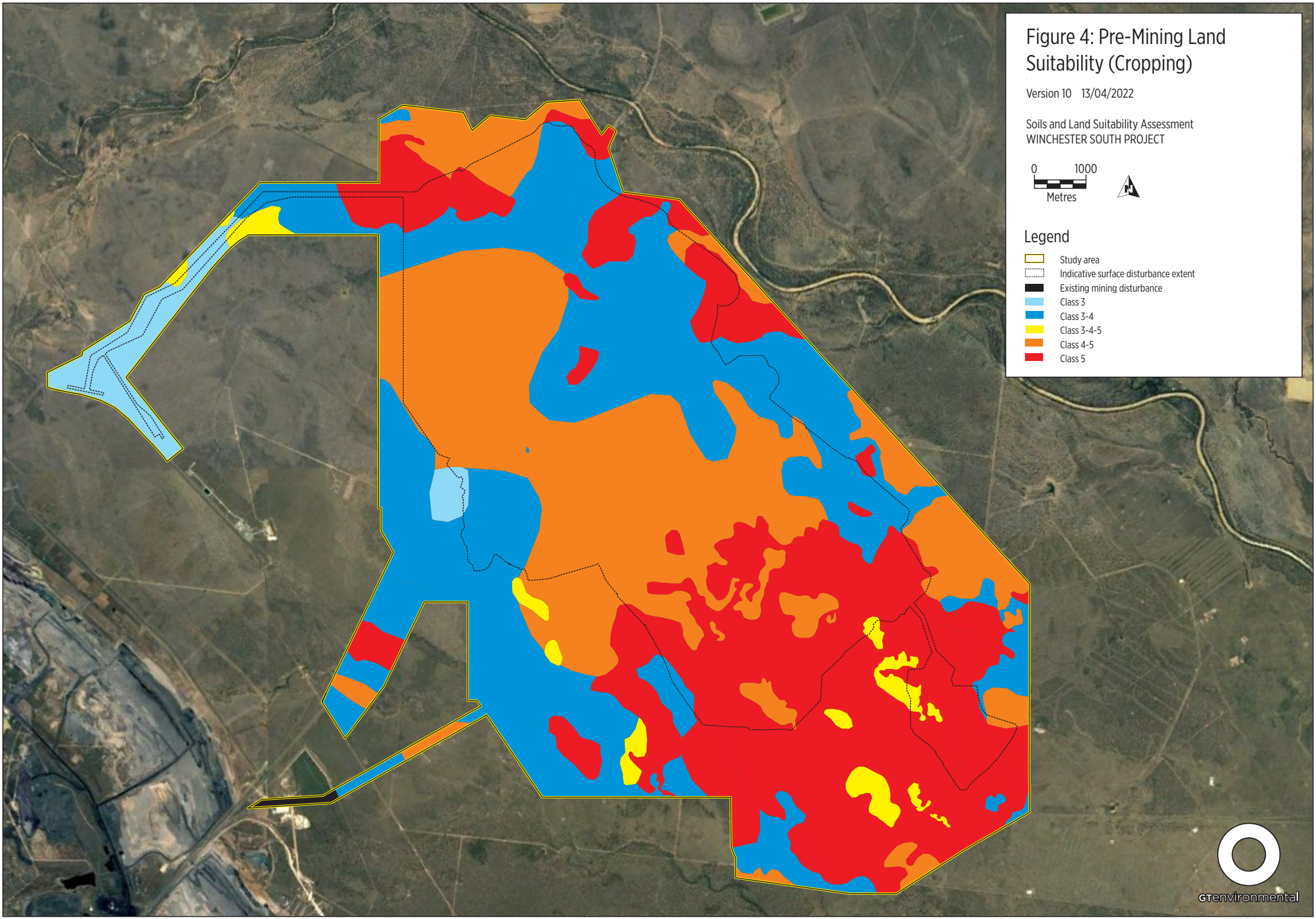


Figure 4: Pre-Mining Land Suitability (Cropping)
Version 10 13/04/2022
Soils and Land Suitability Assessment
WINCHESTER SOUTH PROJECT
0 1000
Metres
N
Legend
Study area
Indicative surface disturbance extent
Existing mining disturbance
Class 3
Class 3-4
Class 3-4-5
Class 4-5
Class 5
GTenvironmental

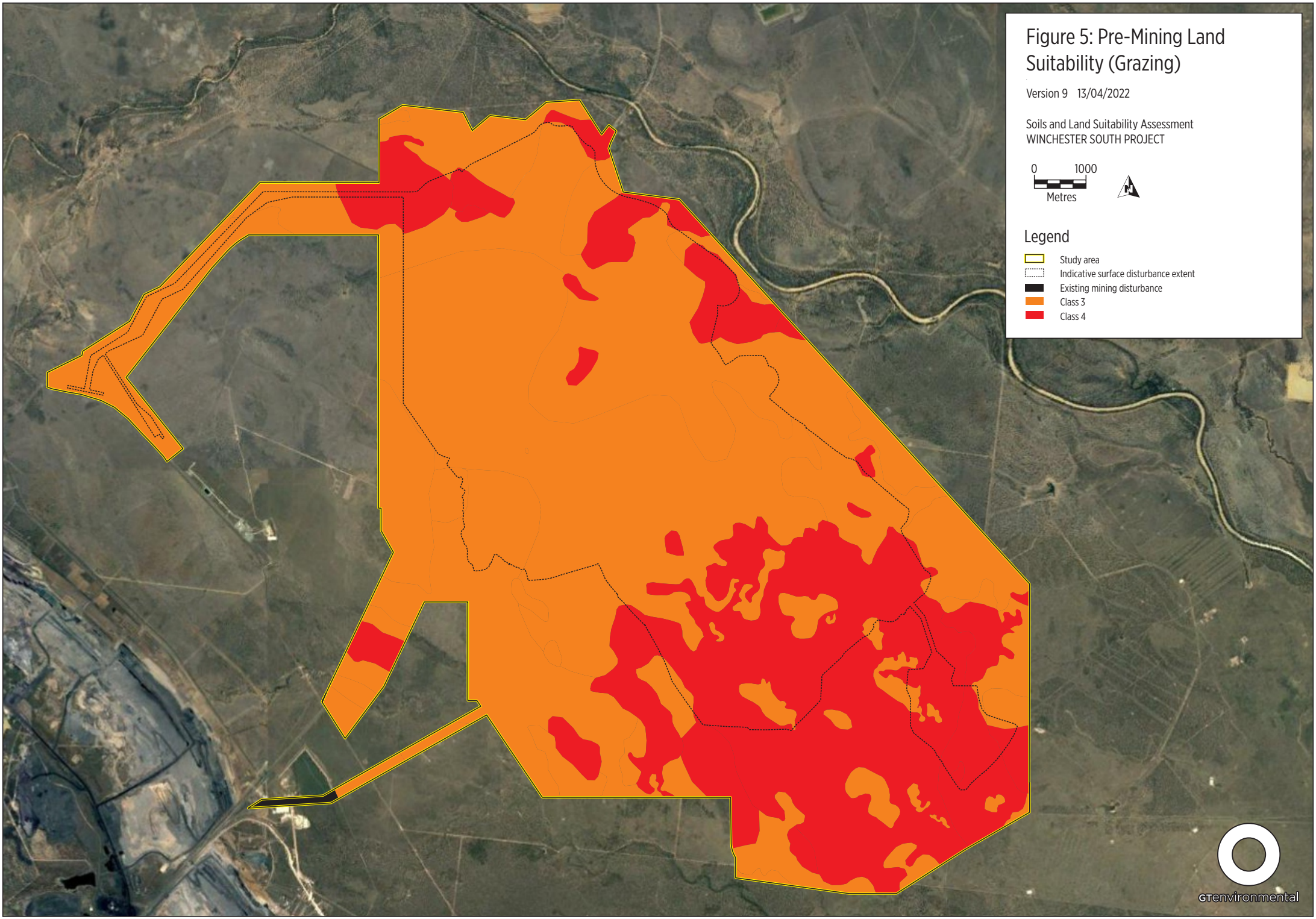


Figure 5: Pre-Mining Land Suitability (Grazing)
Version 9 13/04/2022
Soils and Land Suitability Assessment
WINCHESTER SOUTH PROJECT
0
1000
Metres
N
Legend
Study area
Indicative surface disturbance extent
Existing mining disturbance
Class 3
Class 4
GTenvironmental

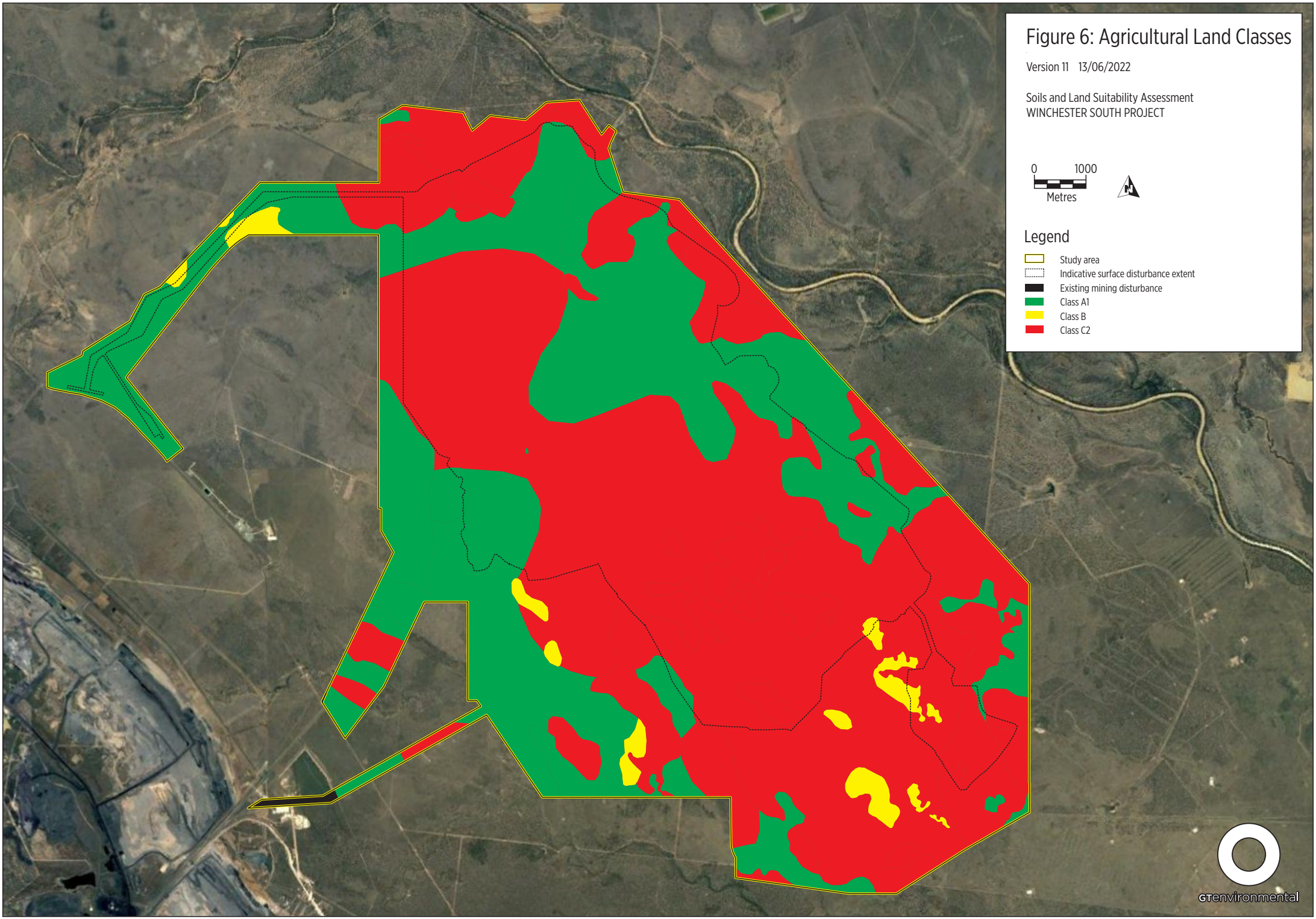


Figure 6: Agricultural Land Classes
Version 11 13/06/2022
Soils and Land Suitability Assessment
WINCHESTER SOUTH PROJECT
0
1000
Metres
N
Legend
Study area
Indicative surface disturbance extent
Existing mining disturbance
Class A1
Class B
Class C2
GTenvironmental

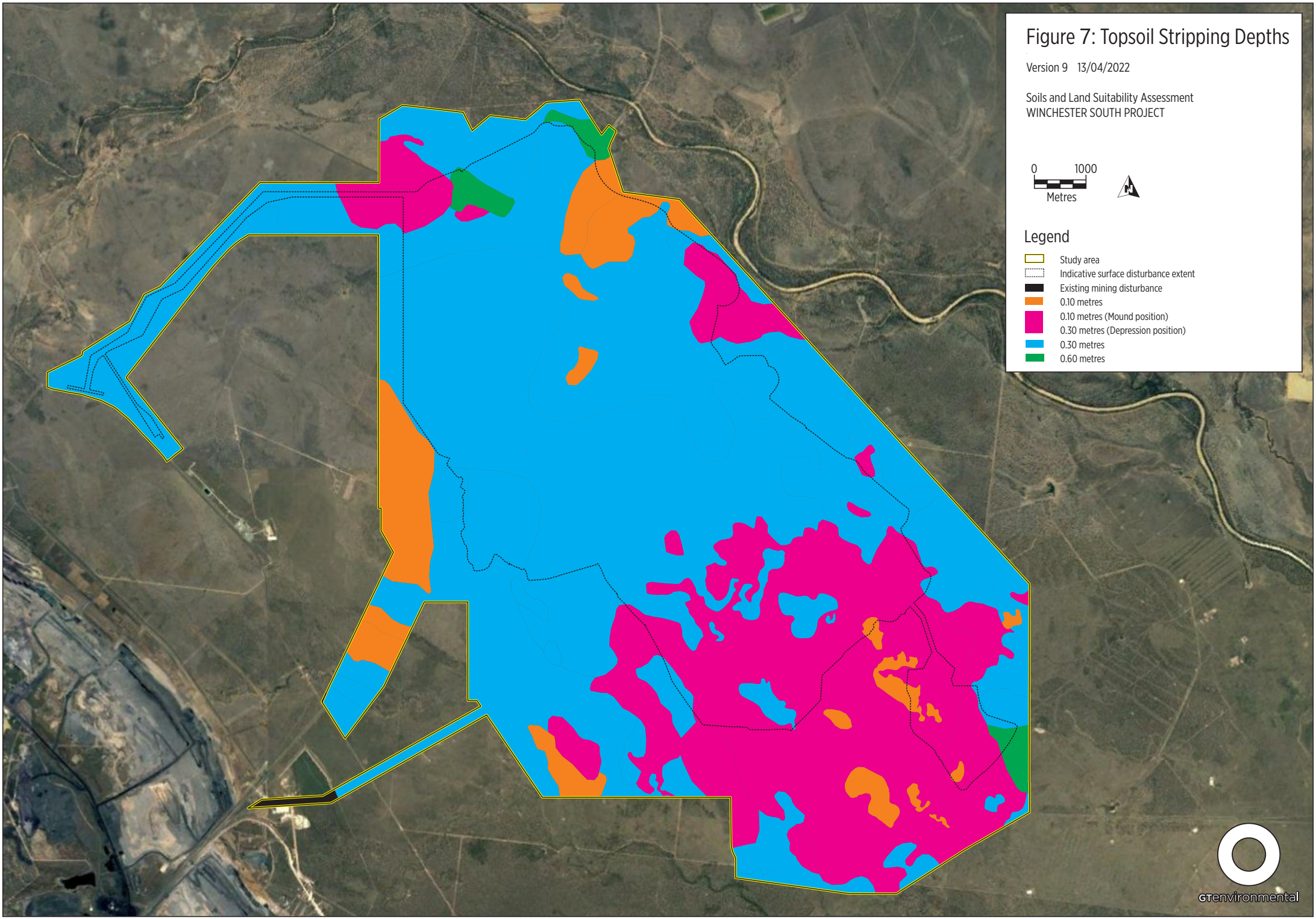


Figure 7: Topsoil Stripping Depths
Version 9 13/04/2022
Soils and Land Suitability Assessment
WINCHESTER SOUTH PROJECT
0
1000
Metres
N
Legend
Study area
Indicative surface disturbance extent
Existing mining disturbance
0.10 metres
0.10 metres (Mound position)
0.30 metres (Depression position)
0.30 metres
0.60 metres
GTenvironmental

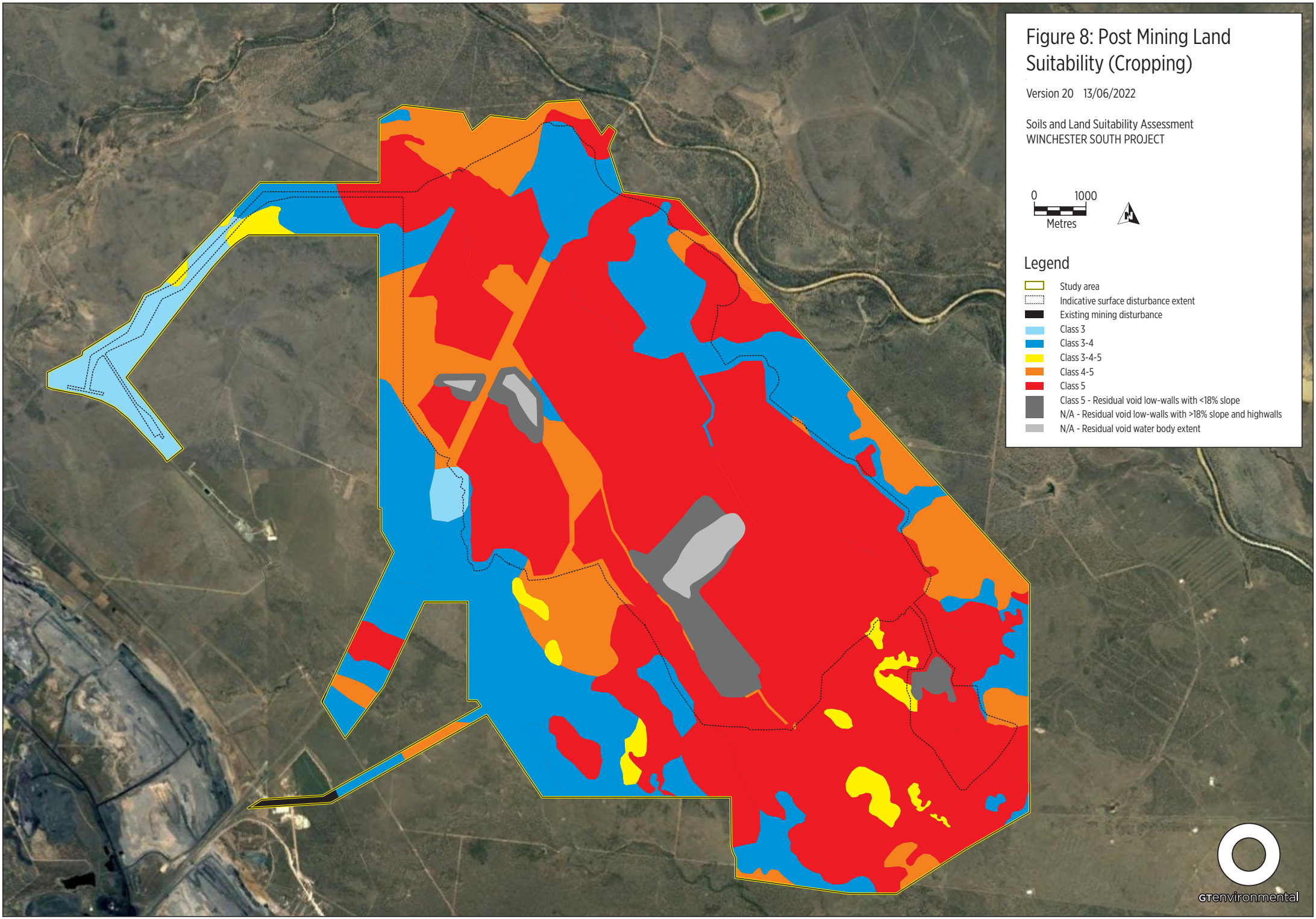


Figure 8: Post Mining Land Suitability (Cropping)
Version 20 13/06/2022
Soils and Land Suitability Assessment
WINCHESTER SOUTH PROJECT
0
1000
Metres
N
Legend
Study area
Indicative surface disturbance extent
Existing mining disturbance
Class 3
Class 3-4
Class 3-4-5
Class 4-5
Class 5
Class 5 - Residual void low-walls with <18% slope
N/A - Residual void low-walls with >18% slope and highwalls
N/A - Residual void water body extent
GTenvironmental

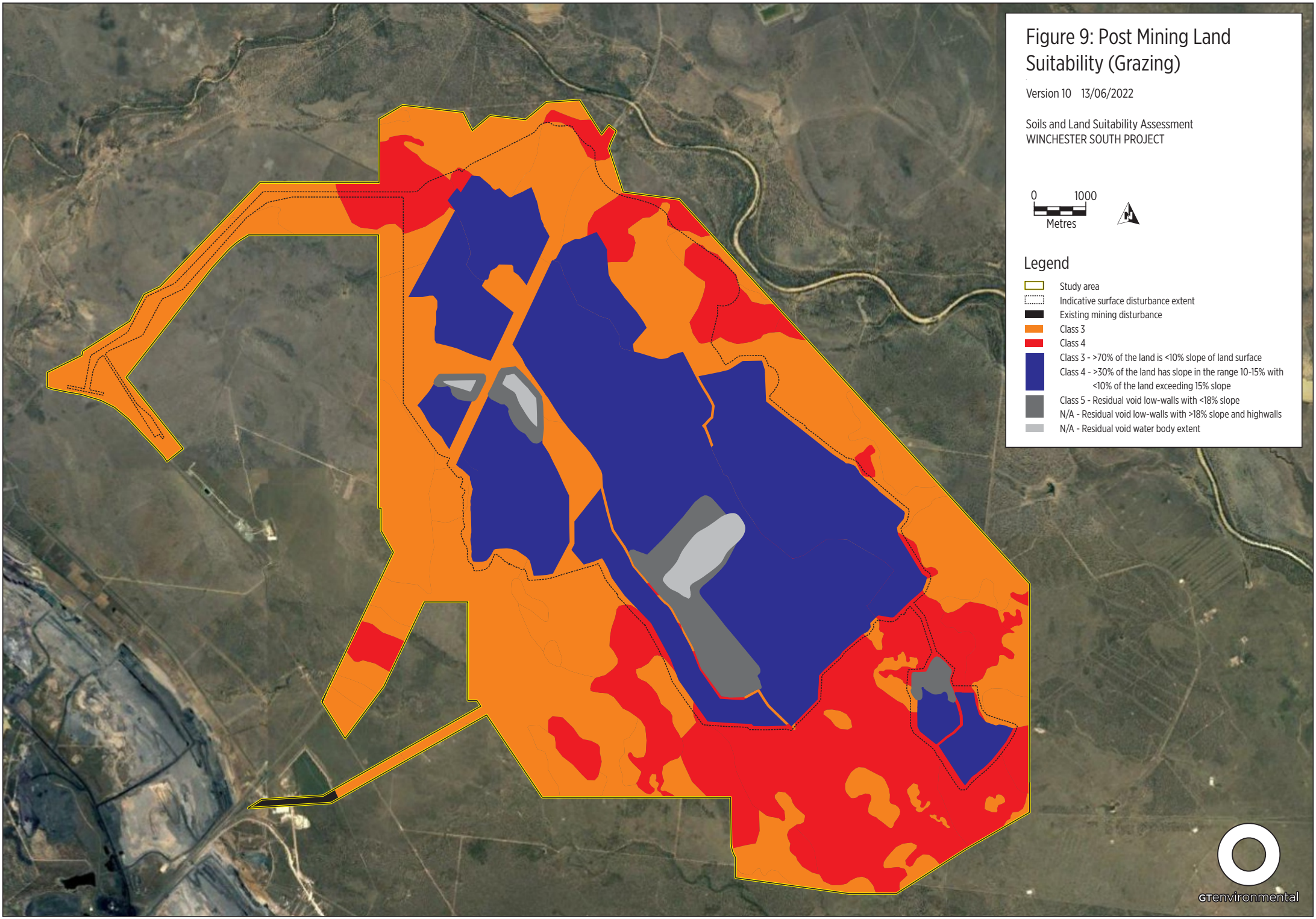


Figure 9: Post Mining Land Suitability (Grazing)
Version 10 13/06/2022
Soils and Land Suitability Assessment
WINCHESTER SOUTH PROJECT
0
1000
Metres
N
Legend
Study area
Indicative surface disturbance extent
Existing mining disturbance
Class 3
Class 4
Class 3 - >70% of the land is <10% slope of land surface
Class 4 - >30% of the land has slope in the range 10-15% with <10% of the land exceeding 15% slope
Class 5 - Residual void low-walls with <18% slope
N/A - Residual void low-walls with >18% slope and highwalls
N/A - Residual void water body extent
GTenvironmental

14 APPENDICES - ADDENDUM

Appendix A Detailed site descriptions

Appendix D Regional Frameworks Land Suitability Limitations Review

SITE 1

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S1	638334 7545005	Brown Sodosol	Detailed Hand Auger 50mm	20/9/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, Simple Slope 2%/2%	Poplar Box	Nil microrelief, Semi disturbance Nil erosion	Soft, <1% coarse fragments <5mm	A11 0.00-0.21 Abrupt	Loamy Sand	Loose, apedal	Nil	10YR4/3 Brown Nil mottles / bleaching	Dry, Rapid	Common	0.10 / 6.0	0.00-0.10 0.20-0.30 0.35-0.45 0.60-0.70 0.90-1.00	Nil
				A12 0.21-0.33 Abrupt	Loamy Sand	Loose, apedal	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, Rapid	Common	0.30 / 6.0		
				A13 0.33-0.54 Abrupt	Loamy Sand	Massive 30% <20mm peds	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, Well	Few	0.40 / 6.5		
				B2 0.54-1.00 End of borehole (EOBH)	Sandy clay loam	Weak to moderate, firm, angular <20mm peds	<2% manganese nodules	10YR5/6 Yellowish brown Mottle <10% 10YR6/8 Brownish yellow Nil bleaching	Dry, moderate to imperfect	Fine	0.60 / 7.0		

SITE 2 - Mound

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL	638156 7542869	Black Vertosol	Detailed Hand Auger 50mm	20/9/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Dawson Gum and Brigalow regrowth	Melon hole 40% coverage, 3-10m wide, 0.3-0.6m deep Semi disturbance	Crust Nil coarse fragments	A1 0.00-0.12 Abrupt	Medium clay	Moderate, very firm, subangular <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.05 / 5.5-6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Borehole conducted on the mound
				B21 0.12-0.50 Abrupt	Medium heavy clay	Moderate, very firm, subangular <20mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 5.5-6.0		
				B22 0.50-1.00 EOBH	Medium heavy clay	Moderate, very firm, subangular <40mm slickensides observed	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.60 / 5.5-6.0 0.90m / 5.5		

SITE 2 - Depression

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL	638156 7542869	Black Vertosol	Detailed Hand Auger 50mm	20/9/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Brigalow	Melon hole 40% coverage, 3-10m wide, 0.3-0.6m deep Semi disturbance Nil erosion	Crust Nil coarse fragments	A1 0.00-0.13 Abrupt	Medium clay	Weak, very firm, subangular <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 5.5-6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Borehole conducted in depression
				B21 0.13-0.61 Abrupt	Medium heavy clay	Moderate, very firm, subangular <20mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 5.5-6.0		
				B22 0.61-1.00 EOBH	Medium heavy clay	Moderate, very firm, subangular 10-30mm slickensides observed	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.60 / 5.5-6.0 0.90 / 5.5		

SITE 3

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL (Sub-dominant C1-BR)	638169 7542852	Black Vertosol	Detailed Hand Auger 50mm	20/9/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Brigalow	Gilgai (normal to melon hole) Semi disturbed Nil erosion	Crust Nil coarse fragments	A1 0.00-0.10 Abrupt	Light clay	Weak, strong, subangular <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.0	Nil	Nil
				B21 0.10-0.68 Abrupt	Medium clay	Weak to moderate, very firm, subangular 10-20mm	<1% <20mm coarse fragments (coarse fragments)	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5 0.60 / 6.0		
				B22 0.68-1.00 EOBH	Medium clay	Weak to moderate, very firm, subangular 10-20mm slickensides observed	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 5.5		

SITE 4

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL	637812 7540071	Black Vertosol	Detailed Hand Auger 50mm	20/9/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Brigalow	Melon hole 40% coverage, 3-10m wide, 0.3-0.6m deep Minor to semi disturbance Nil erosion	Crust Nil coarse fragments	A1 0.00-0.11 Abrupt	Medium clay	Moderate, very firm, subangular <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 5.5-6.0	Nil	Nil
				B21 0.11-0.48 Abrupt	Medium heavy clay	Moderate, very firm, subangular <20mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 5.5-6.0		
				B22 0.48-1.00 EOBH	Medium heavy clay	Moderate, very firm, subangular <40mm slickensides observed	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.60 / 5.5-6.0 0.90 / 5.5		

SITE 5

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL	637884 7540622	Black Vertosol	Detailed Hand Auger 50mm	20/9/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Brigalow	Melon hole 40% coverage, 3-10m wide, 0.3-0.6m deep Minor to semi disturbance Nil erosion	Firm, cracking Nil coarse fragments	A1 0.00-0.13 Abrupt	Medium clay	Weak, very firm, subangular <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 5.5-6.0	Nil	Nil
				B21 0.13-0.61 Abrupt	Medium heavy clay	Moderate, very firm, subangular <20mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 5.5-6.0		
				B22 0.61-1.00 EOBH	Medium heavy clay	Moderate, very firm, subangular 10-30mm slickensides observed	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.60 / 5.5-6.0 0.90 / 5.5		

SITE 6

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T3	637823 7540836	Brown Dermosol	Detailed Hand Auger 50mm	20/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, flat plain 1%/1%	Exotic grassland	Nil microrelief Completely disturbance Nil erosion	Firm, hard setting Nil coarse fragments	A1 0.00-0.21 Abrupt	Silty loam	Massive, firm	<1% <5mm coarse fragments	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.57 0.65-0.75 0.90-1.00	Nil
				B21 0.20-0.57 Abrupt	Silty clay loam	Weak to moderate, firm, subangular <10mm	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.0		
				B22 0.57-0.76 Abrupt	Silty clay loam	Weak to moderate, firm, subangular <20mm	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Nil	0.60 / 8.0		
				B23 0.76-1.00 EOBH	Silty clay loam	Moderate, firm, subangular <10mm	Nil	10YR5/4 Yellowish brown Nil mottles / bleaching	Dry, moderate	Nil	0.90 / 8.0		

SITE 7

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	637705 7541681	Brown Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Brigalow regrowth	Melon hole 30% coverage, 3-6m wide, 0.2-0.4m deep Minor to semi disturbance Nil erosion	Firm, hard setting Nil coarse fragments	A1 0.00-0.20 Abrupt	Light clay	Moderate, firm, subangular 10-30mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.20-0.65 Abrupt	Medium clay	Moderate, strong, subangular 20-40mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.0 0.60 / 8.0		
				B22 0.65-1.00 EOBH	Medium heavy clay	Moderate, strong, subangular 30-50mm slickensides observed	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 8.0		

SITE 8

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	636764 7541885	Brown Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/1%	Brigalow regrowth	Melon hole 30% coverage, 3-6m wide, 0.2-0.4m deep Minor to semi disturbance Nil erosion	Firm, hard setting Nil coarse fragments	A1 0.00-0.22 Abrupt	Light clay	Moderate, firm, subangular 10-30mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.22-0.62 Abrupt	Medium clay	Moderate, strong, subangular 20-40mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.0 0.60 / 8.0		
				B22 0.62-1.00 EOBH	Medium heavy clay	Moderate, strong, subangular 30-50mm slickensides observed	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 8.0		

SITE 9 - Mound

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	635942 7541225	Brown Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Midslope <2%/1%	Dawson Gum and Brigalow regrowth	Melon hole 50% coverage, 3-6m wide, 0.2-0.4m deep Semi disturbance Nil erosion	Cracking, Nil coarse fragments	A1 0.00-0.09 Abrupt	Light clay	Weak, firm, subangular <10mm	<2% manganese nodules	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	0.00-0.09 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
				B21 0.09-0.60 Abrupt	Light medium clay	Weak, firm, subangular <10mm	<1% manganese nodules	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.5 0.60 / 7.5		
				B22 0.60-1.00 EOBH	Light medium heavy clay	Weak, firm, subangular 10-20mm slickensides observed	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 6.5		

SITE 9 - Depression

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	635942 7541225	Brown Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Midslope <2%/1%	Brigalow regrowth	Melon hole 50% coverage, 3-6m wide, 0.2-0.4m deep Semi disturbance Nil erosion	Cracking Nil coarse fragments	A1 0.00-0.12 Abrupt	Light clay	Weak, weak, subangular <10mm	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 4.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
				B21 0.12-0.38 Abrupt	Light medium clay	Moderate, weak, subangular <10mm	<1% manganese nodules	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 5.5 0.60 / 5.5		
				B22 0.38-1.00 EOBH	Medium clay	Moderate, firm, subangular 10-20mm slickensides observed	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 5.5		

SITE 10

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S3	636268 7540681	Brown Chromosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Crest, flat plain 1%/1%	Narrow-leaved Ironbark	Nil microrelief Semi disturbance Nil erosion	Firm, <2% coarse fragments <5mm	A1 0.00-0.11 Abrupt	Sandy loam	Massive, apedal	Nil	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	0.00-0.10 0.20-0.30 0.48-0.58 0.70-0.80 0.90-1.00	Nil
				B21 0.11-0.58 Abrupt	Clay loam	Massive, apedal	<2% coarse fragments <5mm	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5		
				B22 0.58-0.85 Abrupt	Light clay	Massive, apedal	2% coarse fragments <5mm	7.5YR5/6 Strong brown Nil mottles / bleaching	Dry, moderate	Nil	0.60 / 7.0		
				B23 0.85-1.00 EOBH	Light clay	Massive, apedal	2% coarse fragments 10mm	7.5YR5/6 Strong brown Nil mottles / bleaching	Dry, moderate	Nil	0.90 / 7.0		

SITE 11

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	636792 7540808	Brown Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Brigalow regrowth	Melon hole 30% coverage, 3-6m wide, 0.2-0.4m deep Minor to semi disturbance Nil erosion	Firm, hard setting Nil coarse fragments	A1 0.00-0.20 Abrupt	Light clay	Moderate, firm, subangular 10-30mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.20-0.62 Abrupt	Medium clay	Moderate, strong, subangular 20-40mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.0 0.60 / 7.0		
				B22 0.62-1.00 EOBH	Medium heavy clay	Moderate, strong, subangular 30-50mm slickensides observed	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 8.0		

SITE 12

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	635884 7540395	Brown Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Midslope <2%/1%	Brigalow regrowth	Melon hole 50% coverage, 3-6m wide, 0.2-0.4m deep Semi disturbance Nil erosion	Cracking, Nil coarse fragments	A1 0.00-0.14 Abrupt	Light clay	Weak, weak, subangular <10mm	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 4.5	Nil	Nil
				B21 0.14-0.40 Abrupt	Light medium clay	Moderate, weak, subangular <10mm slickensides observed	<1% manganese nodules	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 5.5 0.60 / 5.5		
				B22 0.40-1.00 EOBH	Medium clay	Moderate, firm, subangular 10-20mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 6.0		

SITE 13

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S3	636629 7540160	Brown Chromosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat plain 1%/1%	Narrow Leaf Ironbark	Nil microrelief Semi disturbance Nil erosion	Firm, <2% coarse fragments <5mm	A1 0.00-0.11 Abrupt	Sandy loam	Massive, apedal	Nil	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.11-0.50 Abrupt	Clay loam	Massive, apedal	<2% coarse fragments <5mm	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5		
				B22 0.50-0.85 Abrupt	Light clay	Weak, apedal	2% coarse fragments <5mm	7.5YR5/6 Strong brown Nil mottles / bleaching	Dry, moderate	Nil	0.60 / 7.0		
				B22 0.85-1.00 EOBH	Light clay	Weak, apedal	2% coarse fragments 10mm	7.5YR5/6 Strong brown Nil mottles / bleaching	Dry, moderate	Nil	0.90 / 7.0		

SITE 14

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	635097 7541741	Brown Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Midslope <2%/1%	Brigalow regrowth	Melon hole 50% coverage, 3-6m wide, 0.2-0.4m deep Semi disturbance Nil erosion	Crust, Nil coarse fragments	A1 0.00-0.09 Abrupt	Light clay	Weak, firm, subangular <10mm	<2% manganese nodules	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.09-0.60 Abrupt	Light medium clay	Weak, firm, subangular <10mm	<1% manganese nodules	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.5 0.60 / 7.5		
				B22 0.60-1.00 EOBH	Light medium heavy clay	Weak, firm, subangular 10-20mm slickensides observed	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 6.5		

SITE 15

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL	634851 7539279	Black Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Brigalow	Melon hole 40% coverage, 3-10m wide, 0.3-0.6m deep	Crust with cracking Nil coarse fragments	A1 0.00-0.12 Abrupt	Medium clay	Moderate, very firm, subangular <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 5.5-6.0	Nil	Nil
				B21 0.12-0.55 Abrupt	Medium heavy clay	Moderate, very firm, subangular <20mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 5.5-6.0		
				B22 0.55-1.00 EOBH	Medium heavy clay	Moderate, very firm, subangular <40mm slickensides observed	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.60 / 5.5-6.0 0.90 / 5.5		

SITE 16

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	634514 7542109	Brown Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Midslope 1%	Mixed regrowth	Nil microrelief Semi disturbance Nil erosion	Crust with cracking Nil coarse fragments	A1 0.00-0.15 Abrupt	Light clay	Moderate, firm, subangular <10mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Site placed in small polygon with no microrelief, surrounding areas feature melon holes
				B21 0.15-0.80 Abrupt	Medium clay	Moderate, firm, subangular <10mm	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5 0.60 / 6.5		
				B22 0.80-1.00 EOBH	Medium clay	Moderate, firm, subangular 10-20mm slickensides observed	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 7.0		

SITE 17

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	633642 7542147	Brown Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Midslope <1%/1%	Brigalow regrowth	Melon hole 50% coverage, 3-6m wide, 0.2-0.4m deep Semi disturbance Nil erosion	Cracking, crust, Nil coarse fragments	A1 0.00-0.15 Abrupt	Light clay	Weak, weak, subangular <10mm	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.0	Nil	Nil
				B21 0.15-0.45 Abrupt	Medium clay	Moderate, weak, subangular <10mm	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.0 0.60 / 6.0		
				B22 0.45-1.00 EOBH	Medium clay	Moderate, firm, subangular 10-20mm slickensides observed	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 6.0		

SITE 18

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL	632695 7541423	Black Vertosol	Detailed Hand Auger 50mm	21/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Brigalow	Melon hole 40-50% coverage, 3-10m wide, 0.3-0.6m deep	Crust with crust Nil coarse fragments	A1 0.00-0.15 Abrupt	Medium clay	Moderate, very firm, subangular <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 5.5	Nil	Nil
				B21 0.15-0.55 Abrupt	Medium clay	Moderate, very firm, subangular <20mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.0		
				B22 0.55-1.00 EOBH	Medium heavy clay	Moderate, very firm, subangular <40mm slickensides observed	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.60 / 6.0 0.90 / 5.5		

SITE 19

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S1	637468 7544348	Brown Sodosol	Detailed Hand Auger 50mm	22/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain / flat plain 1%	Mixed vegetation with Poplar Box	Nil microrelief Semi disturbance Nil erosion	Hard setting, nil coarse fragments	A11 0.00-0.10 Abrupt	Loamy sand	Apedal, massive	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapidly drained	Common	0.10 / 6.0	Nil	Second attempt to reach 1m, first attempt no recovery at 0.70m
				A21 0.10-0.33 Abrupt	Clayey sand	Massive, weak, with parts firm subangular peds	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, rapidly drained	Common	0.25 / 7.0		
				A22 0.33-0.70 Abrupt	Clayey sand	Weak, firm, subangular peds	Nil	10YR3/6 Dark yellowish brown Nil mottles / bleaching	Dry, rapid/well drained	Few	0.60 / 7.0		
				B21 0.70-1.00 EOBH	Sandy clay loam	Moderate, very firm, subangular 10-20mm	<1% mg nodules <2mm	10YR4/6 Dark yellowish brown Nil mottles / bleaching	Dry, well drained	Few	0.90 / 7.5		

SITE 20

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	636315 7544448	Brown Vertosol	Detailed Hand Auger 50mm	22/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain 1%/<1%	Brigalow regrowth	Melon hole 30% coverage, 3-6m wide, 0.2-0.4m deep Minor to semi disturbance Nil erosion	Firm, cracking Nil coarse fragments	A1 0.00-0.15 Abrupt	Light clay	Moderate, firm, subangular 10-30mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.15-0.60 Abrupt	Medium clay	Moderate, strong, subangular 20-40mm slickensides observed	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5 0.55 / 6.5		
				B22 0.60-1.00 EOBH	Medium heavy clay	Moderate, strong, subangular 30-50mm slickensides observed	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 7.5		

SITE 21

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	634457 7544037	Brown Vertosol	Detailed Hand Auger 50mm	22/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Midslope 1%	Brigalow regrowth	Melon hole 40-50% coverage, 2-5m wide, 0.2-0.4m deep Semi disturbance Nil erosion	Cracking, Nil coarse fragments	A1 0.00-0.15 Abrupt	Light clay	Weak, weak, subangular <10mm	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 5.5	Nil	Nil
				B21 0.15-0.38 Abrupt	Light medium clay	Moderate, weak, subangular <10mm	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5 0.60 / 6.5		
				B22 0.38-1.00 EOBH	Medium clay	Moderate, firm, subangular 10-20mm slickensides observed	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 6.5		

SITE 22

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	635436 7542867	Brown Vertosol	Detailed Hand Auger 50mm	22/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Flat Plain 1%	Sparse Brigalow regrowth	Melon hole 40% coverage, 3-5 m wide, 0.2-0.4m deep Minor to semi disturbance Nil erosion	Firm, cracking, self-mulching Nil coarse fragments	A1 0.00-0.14 Abrupt	Light clay	Moderate, firm, subangular 10-30mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.0	Nil	Nil
				B21 0.14-0.62 Abrupt	Medium clay	Moderate, strong, subangular 20-40mm slickensides observed	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5 0.60 / 6.5		
				B22 0.62-1.00 EOBH	Medium heavy clay	Moderate, strong, subangular 30-50mm slickensides observed	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 7.0		

SITE 23

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S3	636484 7542483	Brown Chromosol	Detailed Hand Auger 50mm	22/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Flat plain <1%	Mixed regrowth with Poplar Box	Nil microrelief Semi disturbance Nil erosion	Firm to hard setting, <1% coarse fragments including Mg nodules	A1 0.00-0.10 Abrupt	Sandy loam	Weak, loose	2% coarse fragments 1-3mm	7.5YR2.5/3 Very dark brown Nil mottles / bleaching	Dry, rapidly drained	Common	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60	No auger recovery at 0.60m, three attempts
				B21 0.10-0.60+	Clay loam	Massive, weak	2% coarse fragments 1-3mm	7.5YR4/4 Brown Nil mottles / bleaching	Dry, rapidly drained	Nil	0.30 / 5.5 0.60 / 5.5		

SITE 24

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	632797 7542537	Brown Vertosol	Detailed Hand Auger 50mm	22/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Flat Plain 1%	Brigalow regrowth	Melon hole 40% coverage, 3-5 m wide, 0.2-0.4m deep Minor to semi disturbance Nil erosion	Firm, cracking self-mulching Nil coarse fragments	A1 0.00-0.18 Abrupt	Light clay	Moderate, firm, subangular 10-30mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.0	Nil	Nil
				B21 0.18-0.62 Abrupt	Medium clay	Moderate, strong, subangular 20-40mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5 0.60 / 6.5		
				B22 0.62-1.00 EOBH	Medium clay	Moderate, strong, subangular 30-50mm slickensides observed	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 6.5		

SITE 25

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	633001 7544031	Brown Vertosol	Detailed Hand Auger 50mm	22/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Midslope <2%/1%	Brigalow regrowth	Melon hole 50% coverage, 3-6m wide, 0.2-0.4m deep Semi disturbance Nil erosion	Crust Nil coarse fragments	A1 0.00-0.09 Abrupt	Light clay	Weak, firm, subangular <10mm	<2% manganese nodules	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.09-0.66 Abrupt	Light medium clay	Weak, firm, subangular <10mm	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5 0.60 / 6.5		
				B22 0.66-1.00 EOBH	Light medium clay	Weak, firm, subangular 10-20mm, slickensides observed	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 7.0		

SITE 26

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	633122 7545375	Brown Dermosol (Sub-dominant within SPC Map Unit)	Detailed Hand Auger 50mm	22/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, upper slope 1-2%	Grasses, nearby white/grey gums	Nil microrelief Semi disturbance Nil erosion	Crust with cracking nil coarse fragments	A1 0.00-0.18 Abrupt	Light clay	Weak, very firm peds <10mm	Nil	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.10 / 6.0	Nil	Nil
				B21 0.18-0.68 Gradual	Light clay	Weak to moderate, firm, peds <20mm	<1% <2mm manganese nodules	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.30 / 6.5 0.60 / 6.5		
				B22 0.68-1.00 EOBH	Light medium clay	Moderate, very firm, peds 10-20mm slickensides observed	<1% <2mm manganese nodules	10YR5/6 Yellowish brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 6.5		

SITE 27

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	634901 7545803	Brown Vertosol	Detailed Hand Auger 50mm	23/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid slope 2-3%	Grasses, nearby white/grey gums	1% normal gilgai in the area 0.2-0.3m deep Semi disturbance Nil erosion	Crust with cracking nil coarse fragments	A1 0.00-0.12 Abrupt	Light clay	Weak, firm	Nil	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.10 / 8.0	0.00-0.10 0.20-0.30 0.45-0.55 0.70-0.80 0.90-1.00	Nil
				B21 0.12-0.33 Abrupt	Medium clay	Weak, firm	<2% calcium carbonate	10YR4/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.25 / 7.0		
				B22 0.33-0.55 Clear	Medium clay	Moderate, strong, subangular blocky slickensides observed	<2% calcium carbonate	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.50 / 7.0		
				B23 0.66-1.00 EOBH	Medium clay	Moderate, firm, subangular blocky	<1% manganese nodules	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 7.5		

SITE 28

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	635396 7546618	Black Vertosol	Detailed Hand Auger 50mm	23/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, lower slope 1-2%	Grasses	Nil microrelief Extensive disturbance Nil erosion	Self mulching with cracking nil coarse fragments	A1 0.00-0.14 Abrupt	Light medium clay	Moderate, weak, sub-rounded	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well drained	Common	0.10 / 7.5	Nil	Nil
				B21 0.14-0.33 Abrupt	Light medium clay	Moderate, firm, subangular 10-20mm peds	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.25 / 8.0		
				B22 0.33-0.78 Clear	Medium clay	Moderate, firm, subangular 10-20mm peds	<1% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.55 / 8.0		
				B23 0.78-1.00 EOBH	Medium clay	Moderate, firm, subangular 20-40mm peds Slickensides observed	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 8.0		

SITE 29

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	635955 7547117	Black Vertosol	Detailed Hand Auger 50mm	23/09/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, lower slope 1-2%	Grasses	Nil microrelief Extensive disturbance Nil erosion	Crust nil coarse fragments	A1 0.00-0.15 Abrupt	Light medium clay	Moderate, weak, sub-rounded	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well drained	Common	0.10 / 7.5	Nil	Nil
				B21 0.15-0.45 Abrupt	Light medium clay	Moderate, firm, subangular 10-20mm peds	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.25 / 7.0		
				B22 0.45-1.00 EOBH	Medium clay	Moderate, firm, subangular 20-40mm peds slickensides observed	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.60 / 7.5 0.90 / 7.5		

SITE 30

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S1	638425 7542286	Brown Sodosol	Detailed Hand Auger 50mm	07/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid slope 1-2%	Poplar Box	Nil microrelief Nil disturbance Nil erosion	Hard setting, 1% coarse fragments <2mm	A11 0.00-0.12 Diffuse	Loamy sand	Massive, loose	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapidly drained	Common	0.10 / 6.0	Nil	Nil
				A12 0.12-0.40 Abrupt	Loamy sand	Massive, loose	Nil	10YR5/3 Brown Nil mottles / bleaching	Dry, rapidly drained	Few	0.30 / 6.5		
				A13 0.40-0.60 Abrupt	Loamy sand	Massive, loose	<5% coarse fragments <1mm	10YR5/3 Brown Nil mottles / bleaching	Dry, rapidly drained	Nil	0.55 / 6.5		
				B2 0.60-1.00 EOBH	Sandy clay loam	Weak to moderate, firm, subangular	Nil	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, well drained	Nil	0.90 / 7.0		

SITE 31

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
R3	638792 7543714	Red Kandosol	Detailed Hand Auger 50mm	07/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain <1% / 1%	Exotic grassland	Nil microrelief Semi disturbance Nil erosion	Firm, Nil coarse fragments	A11 0.00-0.12 Abrupt	Loamy sand	Massive, loose	Nil	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, Rapid	Common	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
				B21 0.12-0.45 Abrupt	Sandy loam	Massive, loose	Nil	5YR3/4 Dark reddish brown Nil mottles / bleaching	Dry, Well	Few	0.30 / 6.0		
				B22 0.45-1.00 EOBH	Sandy clay loam	Massive, minor weak structure, loose	Nil	2.5YR3/4 Dark reddish brown Nil mottles / bleaching	Dry, Well	Nil	0.60 / 6.0 0.90 / 6.0		

SITE 32 - Mound

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL	638966 7543632	Black Vertosol	Detailed Hand Auger 50mm	07/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, flat plain 1%	Brigalow	Gilgai 50% coverage depth 0.24-0.29m disturbance Nil erosion	Crust wit cracking, observed in area, nil coarse fragments	A1 0.00-0.12 Abrupt	Light medium clay	Weak, firm, angular <5mm peds	Nil	10YR4/1 Dark grey Nil mottles / bleaching	Dry, well drained	Common	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.75-0.85 0.90-1.00	Nil
				B21 0.12-0.75 Abrupt	Medium clay	Weak, firm, angular <10mm peds	Nil	10YR4/1 Dark grey Nil mottles / bleaching	Dry, well drained	Few	0.30 / 7.0 0.60 / 7.0		
				B22 0.75-1.00 EOBH	Medium clay	Weak, firm, angular <10mm peds slickensides observed	Nil	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well drained	Nil	0.90 / 7.5		

SITE 32 - Depression

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL	638966 7543632	Black Vertosol	Detailed Hand Auger 50mm	07/10/2019

Depression

Surface and depression depth

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, flat plain 1%	Brigalow	Gilgai 50% coverage depth 0.29m Average for area 0.42-0.29m disturbance Nil erosion	Crust, nil coarse fragments	A1 0.00-0.09 Abrupt	Light medium clay	Weak, firm, angular <5mm peds	Nil	10YR4/1 Dark grey Nil mottles / bleaching	Dry, well drained	Common	0.10 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.72-0.80 0.90-1.00	Nil
				B21 0.09-0.72 Abrupt	Medium clay	Moderate, firm, angular <10mm peds	Nil	10YR4/1 Dark grey Nil mottles / bleaching	Dry, well drained	Few	0.30 / 7.0 0.60 / 7.0		
				B22 0.72-1.00 EOBH	Medium clay	Moderate, firm, angular <10mm peds slickensides observed	Nil	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well drained	Nil	0.90 / 7.5		

SITE 33

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C4	621684 7548890	Black Vertosol	Detailed Hand Auger 50mm	09/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, upper slope, 3%/3%	Sparse mixed vegetation	Minor linear gilgai observed in surrounding areas Semi disturbance Nil erosion	Self-mulching, nil coarse fragments	A1 0.00-0.15 Abrupt	Light clay	Weak, weak, sub-rounded peds	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.10 / 8.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.95-1.05 1.22-1.32	Nil
				B21 0.15-0.43 Gradual	Light clay	Moderate, form, sub-rounded peds	Nil	10YR2/2 Very dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.30 / 8.5		
				B22 0.43-0.70 Abrupt	Light medium clay	Moderate, form, sub-angular peds slickensides observed	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.60 / 8.0		
				B23 0.70-0.95 Abrupt	Medium clay	Moderate, form, sub-angular peds slickensides observed	2-5% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately-imperfectly drained	Very few	0.90 / 8.0		

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
				BC 0.95-1.10 Clear	Silty loam	Massive, loose	10% rocks 5-20mm 10% coarse fragments 2-6mm	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, imperfectly drained	Nil	1.00 / 8.0		
				C 1.10-1.32	Silty loam	Massive, loose	50% coarse fragments 2-6mm	10YR5/3 Brown Nil mottles / bleaching	Dry, imperfectly drained	Nil	1.20 / 8.0		
				1.32 EOBH	No recovery	-	-	-	-	-	-		

SITE 34

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C4	622486 7549684	Black Vertosol	Detailed Hand Auger 50mm	09/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, midslope, simple slope, 2-3%	Buffel grass	Linear gilgai observed in surrounding areas, 0.15m deep Semi disturbance Nil erosion	Self-mulching nil coarse fragments	A1 0.00-0.11 Abrupt	Light clay	Weak, moderate, sub-rounded peds <20mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.0	0.00-0.10 0.20-0.30 0.60-0.70 0.90-1.00 1.10-1.20 1.30-1.40	Nil
				B21 0.11-0.46 Abrupt	Light medium clay	Moderate, firm, sub-angular peds <20mm	<1% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Common	0.30 / 6.0		
				B22 0.46-0.74 Abrupt	Light medium clay	Moderate, firm, sub-angular peds <20mm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.60 / 6.0		
				B23 0.74-1.05 Gradual	Light medium clay	Moderate, firm, sub-angular peds <20mm slickensides observed	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 6.0		
				BC 1.05-1.20 Abrupt	Silty loam	Massive, loose	<20% coarse fragments 5-20mm	10YR3/3 Dark brown	Dry, well drained	Nil	1.10 / 6.0		

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
							<10% coarse fragments <5mm	Nil mottles / bleaching					
				C 1.20-1.50 EOBH	Sandy loam	Massive, loose	20-30% coarse fragments <20mm <5% <5% black coarse fragments	10YR5/6 Yellowish brown Nil mottles / bleaching	Dry, rapidly drained	Nil	1.40 / 6.0		

SITE 35 - Mound

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C4	623121 7550243	Black Vertosol	Detailed Hand Auger 50mm	09/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid slope, simple slope, 2-3%	Native grassland	Linear gilgai 0.2m deep, 40% coverage Extensive disturbance Nil erosion	Self-mulching, cracking occasionally nil coarse fragments	A1 0.00-0.10 Abrupt	Light clay	Weak, moderate, sub-rounded peds <20mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 1.10-1.20 1.40-1.50	Nil
				B21 0.10-0.42 Abrupt	Light medium clay	Moderate, firm, sub-angular peds <20mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Common	0.30 / 6.5		
				B22 0.42-0.60 Clear	Medium clay	Moderate, firm, sub-angular peds <20mm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.50 / 6.5		
				B23 0.60-1.25 Gradual	Medium clay	Moderate, firm, sub-angular peds <20mm slickensides observed	<2% calcium carbonate	2.5YR3/2 Dusky red Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 6.5		
				B24 1.25-1.50 EOBH	Medium clay	Moderate, firm, sub-angular peds <20mm	Nil	7.5YR4.3 20% light brown mottle	Dry, imperfectly drained	Nil	1.30 / 6.5		

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
								Nil bleaching					

SITE 35 – Depression

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C4	623121 7550243	Black Vertosol	Detailed Hand Auger 50mm	09/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid slope, simple slope, 2-3%	Buffel grass	Linear gilgai 0.2m deep, 40% coverage Semi disturbance Nil erosion	Self mulching nil coarse fragments	A1 0.00-0.10 Abrupt	Light clay	Weak, moderate, sub-rounded peds <20mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90 1.10-1.20 1.40-1.50	Nil
				B21 0.10-0.50 Abrupt	Light medium clay	Moderate, firm, sub-angular peds <20mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Common	0.30 / 6.0		
				B22 0.50-0.65 Clear	Medium clay	Moderate, firm, sub-angular peds <20mm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.50 / 6.5		
				B23 0.65-1.30 Gradual	Medium clay	Moderate, firm, sub-angular peds <20mm slickensides observed	<2% calcium carbonate	2.5YR3/2 Dusky red Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 6.5		
				B24 1.30-1.50 EOBH	Medium clay	Moderate, firm, sub-angular peds <20mm	<2% calcium carbonate	7.5YR4.3 Brown 20% light brown mottle Nil bleaching	Dry, imperfectly drained	Nil	1.30 / 6.5		

SITE 36

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T1-R	624098 7551284	Red Dermosol	Detailed Hand Auger 50mm	10/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Wide crest <1%/<1%	Exotic grassland	Nil microrelief Semi disturbed Nil erosion	Firm, Nil coarse fragments	A11 0.00-0.08 Abrupt	Clay Loam	Massive, loose	Nil	10YR2/2 Very dark brown Nil mottles / bleaching	Dry, rapid	Common	0.05 / 6.5	0.00-0.08 0.10-0.20 0.20-0.30 0.50-0.60 0.90-1.00 1.40-1.50	Nil
				A12 0.08-0.20 Abrupt	Clay loam	Weak, weak, sub-rounded 5-20mm	<1% <2mm coarse fragments	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well	Few	0.15 / 6.5		
				B21 0.20-0.34 Abrupt	Light clay	Moderate, weak, sub-rounded 5-20mm	<1% <2mm coarse fragments	5YR3/4 Dark reddish brown Nil mottles / bleaching	Dry, well	Few	0.30 / 7.0		
				B22 0.34-0.75 Abrupt	Silty clay loam	Weak, weak, sub-angular <20mm	<5% <2mm coarse fragments	5YR4/4 Reddish brown Nil mottles / bleaching	Dry, well to moderate	Nil	0.60 / 8.0		
				B23 0.75-1.05 Abrupt	Silty clay loam	Weak, weak, sub-angular <20mm	<2% <2mm coarse fragments	7.5YR4/6 Strong brown Nil mottles / bleaching	Dry, well to moderate	Nil	0.90 / 8.0		

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
				B3 1.05-1.60 EOBH	Loam	Massive, loose	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderate	Nil	1.20 / 8.5		

SITE 37

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	630899 7545564	Brown Vertosol	Detailed Hand Auger 50mm	10/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, lower slope 2%	Exotic grassland	Nil microrelief Semi disturbed Nil erosion	Crust Nil coarse fragments	A1 0.00-0.10 Abrupt	Light clay	Weak, firm, subangular peds <20mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 8.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
				B21 0.10-0.63 Gradual	Light medium clay	Moderate, firm, angular peds 20-40mm, slickensides observed	<2% calcium carbonate <1% <2mm coarse fragments	10YR4/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.30 / 7.0 0.55 / 7.0		
				B22 0.63-1.00 EOBH	Light medium clay	Moderate, firm, angular peds 20-40mm, slickensides observed	Nil	10YR5/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Very few	0.90 / 7.0		

SITE 38

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	630256 7544461	Brown Vertosol	Detailed Hand Auger 50mm	10/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, lower slope 2%	Spare regrowth, Brigalow in area	Nil microrelief Semi disturbed Nil erosion	Crust Nil coarse fragments	A1 0.00-0.14 Abrupt	Light clay	Weak, firm, subangular peds <20mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 8.0	Nil	Nil
				B21 0.14-0.66 Gradual	Light medium clay	Moderate, firm, angular peds 20-40mm, slickensides observed	<2% calcium carbonate	10YR4/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.30 / 7.0 0.55 / 7.0		
				B22 0.66-1.00 EOBH	Light medium clay	Moderate, firm, angular peds 20-40mm, slickensides observed	Nil	10YR5/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Very few	0.90 / 7.0		

SITE 39

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	631277 7544334	Brown Dermosol	Detailed Hand Auger 50mm	10/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, upper slope <2%	Very sparse, Brigalow approx. 100m away	Nil microrelief Semi disturbed Nil erosion	Firm, observed in area	A1 0.00-0.12 Abrupt	Light clay	Weak, firm, subangular peds <20mm	Nil	7.5YR2.5/2 Very dark brown Nil mottles / bleaching	Dry, well drained	Common	0.10 / 7.0	Nil	Nil
				B21 0.12-0.25 Abrupt	Light medium clay	Moderate, firm, angular peds 20-40mm	Nil	7.5YR2.5/2 Very dark brown Nil mottles / bleaching	Dry, moderately well drained	Common	0.20 / 7.0		
				B22 0.25-0.63 Clear	Medium clay	Moderate, firm, angular peds 20-40mm slickensides observed	<1% calcium carbonate	7.5YR2.5/3 Very dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.50 / 8.0		
				B23 0.63-0.85 Abrupt	Medium clay	Moderate, firm, angular peds 20-40mm slickensides observed	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.80 / 8.0		
				B3 0.85-1.00 EOBH	Medium clay	Moderate, firm, angular peds <20mm	10% coarse fragments and weathered rock	10YR4/3 Brown Nil mottles / bleaching	Dry, imperfectly drained	Nil	0.95 / 8.0		

SITE 40

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	631851 7543813	Brown Vertosol	Detailed Hand Auger 50mm	10/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Mid slope <2%/1%	Brigalow regrowth	Melon hole 50% coverage, 3-6m wide, 0.2-0.4m deep Semi disturbance Nil erosion	Crust, Nil coarse fragments	A1 0.00-0.10 Abrupt	Light clay	Weak, firm, subangular <10mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.10-0.60 Abrupt	Light medium clay	Weak, firm, subangular <10mm	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.5 0.60 / 7.5		
				B22 0.60-1.00 EOBH	Light medium heavy clay	Weak, firm, subangular 10-20mm, slickensides observed	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 6.5		

SITE 41

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	630330 7543582	Brown Vertosol	Detailed Hand Auger 50mm	10/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid slope 1%	Brigalow regrowth	Nil microrelief Semi disturbed Nil erosion	Soft, cracking, crust observed in area	A1 0.00-0.12 Abrupt	Light clay	Weak, firm, subangular peds <20mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 7.0	Nil	Nil
				B21 0.12-0.62 Gradual	Light medium clay	Moderate, firm, angular peds 20-40mm, slickensides observed	<1% calcium carbonate	10YR4/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.30 / 7.0 0.55 / 7.0		
				B22 0.62-1.00 EOBH	Light medium clay	Moderate, firm, angular peds 20-40mm, slickensides observed	Nil	10YR5/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Very few	0.90 / 7.0		

SITE 42

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T1-B	630026 7543369	Brown Dermosol	Detailed Hand Auger 50mm	10/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, upper slope 1-2%	Brigalow regrowth	Nil microrelief Semi disturbed Nil erosion	Soft to firm, nil coarse fragments	A11 0.00-0.09 Abrupt	Clay loam	Massive to weak, loose	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 7.0	0.00-0.10 0.10-0.20 0.25-0.35 0.50-0.60 0.80-0.90	Nil
				A12 0.09-0.24 Gradual	Clay loam	Weak, firm, sub-angular peds <10mm	Nil	7.5YR3/4 Dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.20 / 8.0		
				B21 0.24-0.37 Abrupt	Light clay	Moderate, firm, sub-angular peds <10mm	<2% calcium carbonate	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.28 / 7.5		
				B31 0.37-0.70 Abrupt	Clay loam	Massive to weak, weak subangular peds <10mm <2%	<2% calcium carbonate	7.5YR4/6 Strong brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.50 / 8.0		
				B32 0.70-1.00 EOBH	Loam	Massive, loose	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 8.0		

SITE 43

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T1-B	631639 7541337	Brown Dermosol	Detailed Hand Auger 50mm	10/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid slope 1-2%	Mixed shrubs	Nil microrelief Semi disturbed Nil erosion	Hard setting, nil coarse fragments	A1 0.00-0.12 Abrupt	Sandy clay loam	Massive to weak, loose	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 7.0	0.00-0.10 0.20-0.30 0.50-0.60 0.68-0.78 0.90-1.00	Nil
				B21 0.12-0.38 Gradual	Light clay	Weak, firm, sub-angular peds <10mm	<2% calcium carbonate	7.5YR3/4 Dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.20 / 7.5		
				B22 0.38-0.60 Abrupt	Medium clay	Moderate, firm, sub-angular peds <10mm	Nil	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.28 / 7.5		
				B31 0.60-0.78 Abrupt	Clayey sand	Massive to weak, weak subangular peds <10mm <2%	5% weathered material	7.5YR4/6 Strong brown Nil mottles / bleaching	Dry, well drained	Nil	0.70 / 8.0		
				B32 0.78-1.00 EOBH	Clayey sand (increased sand content)	Massive, loose	5% weathered material	7.5YR4/4 Brown Nil mottles / bleaching	Dry, well drained	Nil	0.90 / 8.0		

SITE 44

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	629299 7542395	Black Vertosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, lower slope 1-2%	Grass, sparse mixed vegetation	Nil microrelief extensively disturbed Nil erosion	Self-mulching, <2% coarse fragments <5mm	A1 0.00-0.09 Abrupt	Light clay	Weak, firm, subangular peds 10-20mm	<2% coarse fragments <5mm	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Coming	0.05 / 7.5	0.00-0.09 0.20-0.30 0.50-0.60 0.72-0.82 0.90-1.00 1.40-1.50	Nil
				B21 0.09-0.46 Abrupt	Light medium clay	Moderate, firm, subangular peds 10-20mm Slickensides observed	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Few	0.30 / 7.5		
				B22 0.46-0.72 Abrupt	Light medium clay	Moderate, firm, subangular peds 5-20mm	<2% coarse fragments <5mm	10YR4/1 Dark grey Nil mottles / bleaching	Dry, moderately well drained	Nil	0.60 / 8.0		
				BC 0.72-1.00 EOBH	Loamy sand	Massive, weak, <5% loose	<2% coarse fragments <5mm	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, rapidly drained	Nil	0.90 / 7.5		

SITE 45

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	630026 7546291	Brown Vertosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, lower slope <2%	Sparse Brigalow regrowth	Nil microrelief Semi disturbed Nil erosion	Crust, nil coarse fragments	A1 0.00-0.10 Abrupt	Light clay	Weak, firm, subangular peds <20mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 7.0	Nil	Nil
				B21 0.10-0.65 Gradual	Light medium clay	Moderate, firm, angular peds 20-40mm	<1% <2mm coarse fragments	10YR4/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.30 / 7.0 0.55 / 7.0		
				B22 0.65-1.00 EOBH	Light medium clay	Moderate, firm, angular peds 20-40mm slickensides observed	<1% calcium carbonate	10YR5/3 Brown Nil mottles / bleaching	Dry, moderately well drained	Very few	0.90 / 7.5		

SITE 46

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T2	627368 7546702	Red Chromosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid slope 1-2%	Sparse vegetation, gums	Nil microrelief Semi disturbed Nil erosion	Firm nil coarse fragments	A1 0.00-0.11 Abrupt	Sandy clay loam	Massive to weak, form, peds <5mm	<1% coarse fragments 5mm	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	Nil	No recovery at 0.91 m
				B21 0.11-0.31 Abrupt	Clay loam	Massive to weak, form, peds <5mm	<1% coarse fragments 5mm	5YR4/3 Reddish brown Nil mottles / bleaching	Dry, well drained	Few	0.25 / 6.0		
				B22 0.31-0.80 Clear	Medium clay	Massive to weak, form, peds <2% <20mm	Nil	2.5YR4/4 Reddish brown Nil mottles / bleaching	Dry, well drained	Few	0.60 / 6.0		
				B23 0.80-0.91	Medium clay	Massive to weak, form, peds <5mm	Nil	5YR4/4 Reddish brown Nil mottles / bleaching	Dry, well drained	Nil	0.85 / 6.0		

SITE 47

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C4	628379 7546548	Black Vertosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Gently undulating plain, lower slope 1-2%,	Sparse mixed vegetation	Linear gilgai, <0.1m deep, 50% coverage Semi disturbed Nil erosion	Self-mulching, nil coarse fragments	A1 0.00-0.08 Abrupt	Light clay	Moderate, weak, peds 5-20mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	0.00-0.08 0.20-0.30 0.50-0.60	Auger refusal at 0.80m
				B21 0.08-0.80	Medium clay	Moderate, strong, subangular peds 20-50mm slickensides observed	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well drained	Few	0.30 / 6.5 0.75 / 6.5		

SITE 48

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	629619 7547139	Black Vertosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid slope 1-2%	Mixed	Nil microrelief Extensive disturbed Nil erosion	Soft, self-mulching occasionally, nil coarse fragments	A1 0.00-0.10 Abrupt	Light clay	Weak, firm Sub-rounded peds <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	Nil	Isolated area of C3-BL, surrounded by C3-BR
				B21 0.10-0.49 Abrupt	Light medium clay	Moderate, firm, subangular peds 20-40mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.30 / 6.5		
				B22 0.49-0.88 Abrupt	Light medium clay	Moderate, firm, subangular peds 20-40mm	<10% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.60 / 6.5		
				B23 0.88-1.00 EOBH	Light medium clay	Moderate, firm, subangular peds <10mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderately well drained	Nil	0.95 / 6.5		

SITE 49

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	631969 7546284	Brown Vertosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid slope 2/2%	Sparse mixed regrowth	Nil microrelief Semi disturbed Nil erosion	Cracking, nil coarse fragments	A1 0.00-0.10 Abrupt	Light clay	Moderate, weak, peds 5-10mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 7.0	Nil	Nil
				B21 0.10-0.35 Abrupt	Light clay	Moderate, firm, peds 10-20mm	Nil	7.5YR2.5/3 Very dark brown Nil mottles / bleaching	Dry, well drained	Common	0.25 / 7.5		
				B22 0.35-0.77 Abrupt	Medium clay	Moderate, very firm, subangular peds 10-40mm	<1% calcium carbonate	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.60 / 7.5		
				B23 0.77-1.00 EOBH	Medium clay	Moderate, weak, peds 10-20mm slickensides observed	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 7.5		

SITE 50

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	633207 7546644	Brown Vertosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid slope 2%	Sparse mixed regrowth	Nil microrelief Semi disturbed Nil erosion	Cracking nil coarse fragments	A1 0.00-0.12 Abrupt	Light clay	Moderate, weak, peds 5-10mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 7.0	Nil	Nil
				B21 0.12-0.340 Abrupt	Light clay	Moderate, firm, peds 10-20mm	Nil	7.5YR2.5/3 Very dark brown Nil mottles / bleaching	Dry, well drained	Common	0.25 / 7.0		
				B22 0.40-0.75 Abrupt	Medium clay	Moderate, very firm, subangular peds 10-40mm	Nil	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.60 / 7.5		
				B23 0.75-1.00 EOBH	Medium clay	Moderate, weak, peds 10-20mm slickensides observed	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 7.5		

SITE 51

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	633162 7547605	Black Vertosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, simple mid slope 1-2%	Native vegetation	Nil microrelief Semi / Extensive disturbed Nil erosion	Crust, white nodules <1%	A1 0.00-0.12 Abrupt	Light clay	Weak, very firm, sub-rounded peds <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
				B21 0.12-0.80 Abrupt	Light medium clay	Moderate, very firm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well to moderately drained	Few	0.30 / 7.0 0.60 / 7.0		
				B22 0.80-1.00 EOBH	Light medium clay	Moderate, very firm slickensides observed	Nil	10YR4/1 Dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.90 / 7.0		

SITE 52

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	631697 7547799	Brown Vertosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid slope 1-2%	Sparse mixed regrowth	Nil microrelief Semi disturbed Nil erosion	Cracking nil coarse fragments	A1 0.00-0.08 Abrupt	Light clay	Moderate, weak, peds 5-10mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	Nil	Nil
				B21 0.08-0.37 Abrupt	Light clay	Moderate, firm, peds 10-20mm	<1% calcium carbonate	7.5YR2.5/3 Very dark brown Nil mottles / bleaching	Dry, well drained	Common	0.25 / 6.5		
				B22 0.37-0.70 Abrupt	Medium clay	Moderate, very firm, subangular peds 10-40mm slickensides observed	<1% calcium carbonate	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.60 / 7.0		
				B23 0.70-1.00 EOBH	Medium clay	Moderate, weak, peds 10-20mm	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 7.0		

SITE 53

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	629989 7548288	Black Vertosol	Detailed Hand Auger 50mm	11/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, simple mid slope 1-2%	Grass	Nil microrelief Extensively disturbed Nil erosion	Cracking with crust occasionally nil coarse fragments	A1 0.00-0.12 Abrupt	Light clay	Weak, very firm, sub-rounded peds <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	Nil	Nil
				B21 0.12-0.78 Abrupt	Light medium clay	Moderate, very firm slickensides observed	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well drained	Few	0.30 / 7.0 0.60 / 7.0		
				B22 0.78-1.00 EOBH	Light medium clay	Moderate, very firm	Nil	10YR4/1 Dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.90 / 7.0		

SITE 54

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T3	630478 7548527	Brown Dermosol	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, upper slope 2%	Mixed woodlands, Poplar Box	Nil microrelief Semi disturbed Nil erosion	Firm,nil coarse fragments	A1 0.00-0.12 Abrupt	Loam	Massive, loose	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
				B21 0.12-0.30 Gradual	Silty loam	Weak, weak	Nil	7.5YR3/4 Dark brown Nil mottles / bleaching	Dry, well drained	Few	0.25 / 6.5		
				B22 0.30-0.70 Gradual	Silty clay loam	Weak to moderate, weak, peds 5-30mm	<1% black nodules <1mm	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Few	0.60 / 6.5		
				B23 0.70-1.00 EOBH	Silty clay loam	Weak, weak, peds 5-30mm	Nil	7.5YR3/4 Dark brown Nil mottles / bleaching	Dry, well drained	Nil	0.90 / 7.0		

SITE 55

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
K1	630779 7550077	Claustic Rudusol, Very shallow	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface

Soil Profile

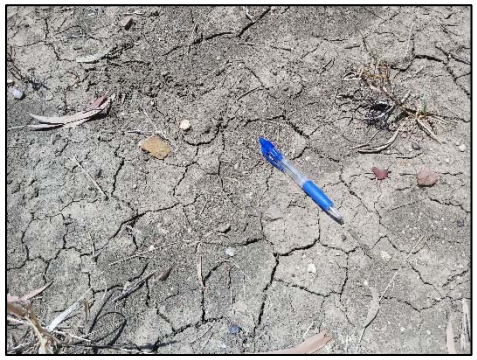
Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, wide crest upper slope, 1-2%	Exotic grassland	Nil microrelief Semi disturbed Nil erosion	Firm, 2% coarse fragments <10mm	A1 0.00-0.11 EOBH	Sandy loam	Massive, loose	40% <10mm coarse fragments 10% 10-20mm coarse fragments	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, rapidly drained	Common	0.05 / 6.5	0.00-0.10	Auger refusal at 0.11m, 5 attempts in the area

SITE 56

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	631455 7550363	Black Vertosol	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface



Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, lower slope, open flat plain	Brigalow	Very minor gilgai <1% coverage Semi disturbed Nil erosion	Crust with cracking observed 5% coarse fragments <20mm	A1 0.00-0.12 Abrupt	Light clay	Weak, firm, subangular peds <10mm	<1% coarse fragments <5mm	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
				B21 0.12-0.70 Abrupt	Light medium clay	Moderate, firm, subangular peds <20mm slickensides observed	<1% coarse fragments <5mm <2% coarse fragments <2mm	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well drained	Few	0.30 / 6.0 0.60 / 6.0		
				B22 0.70-1.00 EOBH	Light medium clay	Moderate, firm, subangular peds <20mm	<2% coarse fragments 2-5mm	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Nil	0.90 / 6.0		

SITE 57

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	632877 7550194	Black Vertosol	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, simple mid slope 1-2%	Softwood scrub mixed vegetation	Nil microrelief Semi disturbed Nil erosion	Crust white nodules <1%	A1 0.00-0.10 Abrupt	Light clay	Weak, very firm, sub-rounded peds <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	Nil	Nil
				B21 0.10-0.68 Abrupt	Light medium clay	Moderate, very firm slickensides observed	<1% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well drained	Few	0.30 / 7.0 0.60 / 7.0		
				B22 0.68-1.00 EOBH	Light medium clay	Moderate, very firm slickensides observed	<2% calcium carbonate	10YR4/1 Dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.90 / 7.0		

SITE 58

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S1	633675 7550629	Brown Sodosol	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid slope 1-2%	Sparse mixed regrowth	Nil microrelief Semi disturbed Nil erosion	Hard, nil coarse fragments	A11 0.00-0.16 Abrupt	Loamy Sand	Massive, loose	Nil	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, Rapid	Common	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	
				A12 0.16-0.50 Abrupt	Clayey Sand	Massive, loose	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, Rapid	Few	0.30 / 6.0		
				B2 0.50-1.00 EOBH	Sandy clay Sand	Massive, loose, <10% <20mm weak peds	Nil	7.5YR3/4 Dark brown Nil mottles / bleaching	Dry, Well	Few	0.60 / 6.5 0.90 / 6.5		

SITE 59

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	633592 7550246	Brown Vertosol	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat plain	Very sparse Brigalow Grasses	Melon hole gilgai microrelief Extensive disturbance Nil erosion	Curst with cracking observed, <2% Coarse fragment	A1 0.00-0.09 Abrupt	Light clay	Weak, firm, subangular <10mm	<2% manganese nodules	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.09-0.59 Abrupt	Light medium clay	Weak, firm, subangular <10mm	<1% manganese nodules	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.5 0.60 / 7.5		
				B22 0.59-1.00 EOBH	Light medium heavy clay	Weak, firm, subangular 10-20mm, slickensides observed	Nil	7.5YR4/3 Brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 6.5		

SITE 60

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	633443 7548576	Black Vertosol	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid-slope 2-3 %	Mixed vegetation including Brigalow and shrubs	Nil microrelief Semi disturbed Nil erosion	Cracking with crust nil coarse fragments	A1 0.00-0.11 Abrupt	Light clay	Weak, very firm, sub-rounded peds <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	Nil	Nil
				B21 0.11-0.76 Abrupt	Light medium clay	Moderate, very firm slickensides observed	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well drained	Few	0.30 / 7.0 0.60 / 7.0		
				B22 0.76-1.00 EOBH	Light medium clay	Moderate, very firm	Nil	10YR4/1 Dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.90 / 7.0		

SITE 61

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	634364 7546987	Brown Vertosol	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid-slope 2 / 2%	Sparse mixed regrowth	Nil microrelief Semi disturbed Nil erosion	Crust with cracking nil coarse fragments	A1 0.00-0.09 Abrupt	Light clay	Moderate, weak, peds 5-10mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 7.0	Nil	Nil
				B21 0.09-0.27 Abrupt	Light clay	Moderate, firm, peds 10-20mm	Nil	7.5YR2.5/3 Very dark brown Nil mottles / bleaching	Dry, well drained	Common	0.25 / 7.5		
				B22 0.27-0.77 Abrupt	Medium clay	Moderate, very firm, subangular peds 10-40mm slickensides observed	<1% calcium carbonate	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.60 / 7.5		
				B23 0.77-1.00 EOBH	Medium clay	Moderate, weak, peds 10-20mm slickensides observed	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 7.5		

SITE 62

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	627773 7550039	Brown Vertosol	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid-slope 2 / 2%	Grasses	Nil microrelief Semi disturbed Nil erosion	Cracking self-mulching, nil coarse fragments	A1 0.00-0.12 Abrupt	Light clay	Moderate, weak, peds 5-10mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 7.0	Nil	Nil
				B21 0.12-0.25 Abrupt	Light clay	Moderate, firm, peds 10-20mm slickensides observed	<1% calcium carbonate	7.5YR2.5/3 Very dark brown Nil mottles / bleaching	Dry, well drained	Common	0.25 / 7.5		
				B22 0.25-0.71 Abrupt	Medium clay	Moderate, very firm, subangular peds 10-40mm slickensides observed	<1% calcium carbonate	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, moderately well drained	Few	0.60 / 7.5		
				B23 0.71-1.00 EOBH	Medium clay	Moderate, weak, peds 10-20mm	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderately well drained	Nil	0.90 / 7.5		

SITE 63

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	627918 7548726	Brown Vertosol	Detailed Hand Auger 50mm	12/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Midslope <2%/1%	Brigalow regrowth	Nil microrelief Semi disturbed Nil erosion	Crusting Nil coarse fragments	A1 0.00-0.11 Abrupt	Light clay	Weak, weak, subangular <10mm	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10m / 4.5	Nil	Nil
				B21 0.11-0.38 Abrupt	Light medium clay	Moderate, weak, subangular <10mm	<1% manganese nodules	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Common	0.30m / 5.5 0.60m / 5.5		
				B22 0.53-1.00 EOBH	Medium clay	Moderate, firm, subangular 10-20mm slickensides observed	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90m / 5.5		

SITE 64

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BR	628992 7550731	Brown Vertosol	Detailed Hand Auger 50mm	13/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, flat plain 1%/1%	Sparse Brigalow	Nil microrelief Semi disturbed Nil erosion	Crust Nil coarse fragments	A1 0.00-0.11 Abrupt	Light clay	Weak, weak, subangular <10mm	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10m / 4.5		
				B21 0.11-0.58 Abrupt	Light medium clay	Moderate, weak, subangular <10mm slickensides observed	<1% manganese nodules	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Common	0.30m / 5.5 0.60m / 5.5		
				B22 0.58-1.00 EOBH	Medium clay	Moderate, firm, subangular 10-20mm slickensides observed	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.90m / 5.5		

SITE 65

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BL	628719 7551638	**Black Vertosol**	Detailed Hand Auger 50mm	13/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat Plain	Sparse Brigalow, grasses	Melon hole 50% coverage, 3-6m wide, 0.2-0.4m deep Semi disturbance Nil erosion	Crust with cracking Nil coarse fragments	A1 0.00-0.15 Abrupt	Medium clay	Weak, very firm, subangular <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 5.5-6.0	Nil	Nil
				B21 0.15-0.66 Abrupt	Medium heavy clay	Moderate, very firm, subangular <20mm	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Common	0.30 / 5.5-6.0		
				B22 0.66-1.00 EOBH	Medium heavy clay	Moderate, very firm, subangular 10-30mm slickensides observed	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.60 / 5.5-6.0 0.90 / 5.5		

SITE 66 - Mound

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	627840 7551946	Brown Vertosol	Detailed Hand Auger 50mm	13/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Mid-slope <1-1 %	Brigalow regrowth, sparse grasses	Melon hole 40% coverage, 3-6m wide, 0.2-0.4m deep extensive disturbance Nil erosion	Crust Nil coarse fragments	A1 0.00-0.17 Abrupt	Light medium clay	Weak, very firm, subangular <10mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 7.0	Backup samples	Nil
				B21 0.17-0.50 Abrupt	Light medium clay	Moderate, very firm, subangular <20mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Common	0.30 / 7.5		
				B22 0.50-0.66 Abrupt	Medium clay	Moderate, very firm, subangular <40mm slickensides observed	1% calcium carbonate	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.60 / 7.5		
				B23 0.66-1.00 EOBH	Medium clay	Moderate, very firm, subangular <40mm slickensides observed	1% calcium carbonate / manganese nodules	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.90 / 7.5		

SITE 66 - Depression

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	627840 7551946	Brown Vertosol	Detailed Hand Auger 50mm	13/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Mid-slope <1-1 %	Brigalow regrowth, sparse grasses	Melon hole 40% coverage, 3-6m wide, 0.2-0.4m deep extensive disturbance Nil erosion	Crust Nil coarse fragments	A1 0.00-0.11 Abrupt	Light medium clay	Weak, very firm, subangular <10mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 7.0	Backup samples	Nil
				B21 0.11-0.43 Abrupt	Medium clay	Moderate, very firm, subangular <20mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.5		
				B22 0.43-1.00 EOBH	Medium clay	Moderate, very firm, subangular <40mm Slickensides observed	1% calcium carbonate	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.60 / 7.5 0.90 / 7.5		

SITE 67

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C1-BR	627369 7551873	Brown Vertosol	Detailed Hand Auger 50mm	13/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Mid-slope <1-1 %	Brigalow regrowth, sparse grasses	Melon hole 40% coverage, 3-6m wide, 0.2-0.4m deep extensive disturbance Nil erosion	Crust Nil coarse fragments	A1 0.00-0.13 Abrupt	Light medium clay	Weak, very firm, subangular <10mm	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 7.0	Nil	Nil
				B21 0.13-0.45 Abrupt	Medium clay	Moderate, very firm, subangular <20mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.5		
				B22 0.43-1.22 Abrupt	Medium clay	Moderate, very firm, subangular <40mm Slickensides observed	1% calcium carbonate	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Very few	0.60 / 7.5 0.90 / 7.5		
				B22 1.22-1.50 EOBH	Medium clay	Moderate, very firm, subangular <40mm Slickensides observed	2% calcium carbonate	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Nil	1.20 / 7.5		

SITE 68

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S4	628352 7551956	Brown Arenosol	Detailed Hand Auger 50mm	13/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat plain <1% / <1%	Poplar Box	Nil microrelief Nil disturbance Nil erosion	Soft, nil coarse fragments	A11 0.00-0.15 Abrupt	Loamy sand	Massive, loose	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapid	Common	0.10 / 6.0	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
				A12 0.15-0.70 Abrupt	Loamy sand	Massive, loose	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, rapid	Few	0.30 / 6.0 0.60 / 7.0		
				A13 0.70-1.00 EOBH	Loamy sand	Massive, loose	Nil	10YR4/6 Dark yellowish brown Nil mottles / bleaching	Dry, rapid	Nil	0.90 / 8.0		

SITE 69

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S4	628387 7552222	Brown Arenosol	Detailed Hand Auger 50mm	13/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat plain	Poplar box	Nil microrelief Nil disturbance Nil erosion	Soft, sandy	A11 0.00-0.10 Abrupt	Loamy sand	Apedal, loose	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapid	Nil	0.10 / 6.5	Nil	No recovery at 0.50 metres below ground level (mbgl) . Not counted as refusal, unable to recover soil beneath this depth.
				A12 0.10-0.50 EOBH	Loamy sand	Apedal, loose	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapid	Nil	0.30 / 6.5		

SITE 70

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C5	630784 7552235	Black Vertosol	Detailed Hand Auger 50mm	13/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Alluvial plain, flat wide depression	Exotic grassland	Nil microrelief Extensive disturbance Nil erosion	Crust Nil coarse fragments	A1 0.00-0.12 Abrupt	Medium clay	Moderate, firm, subangular <20mm	1% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00	Nil
				B21 0.12-0.88 Abrupt	Medium clay	Moderate, firm, subangular 20-40mm slickensides observed	2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.5 0.60 / 7.5		
				B22 0.88-1.00 EOBH	Medium clay	Moderate, very firm, subangular 20-40mm	2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate to imperfect	Nil	0.90 / 7.5		

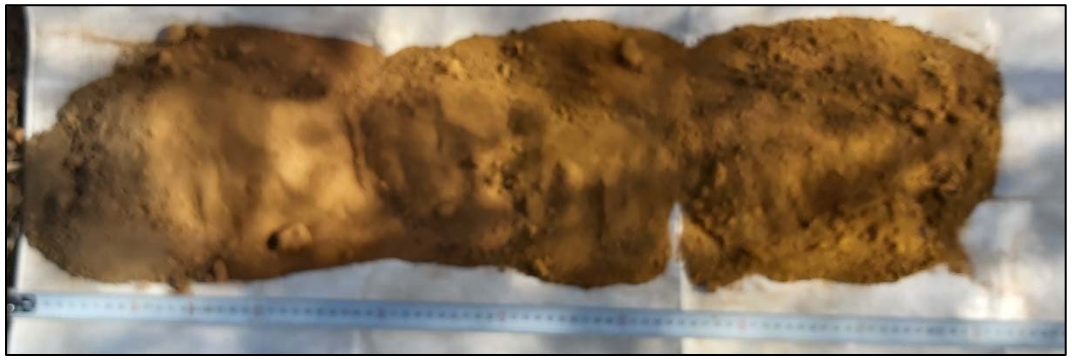
SITE 71

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S3	636235 7540822	Brown Chromosol	Detailed Hand Auger 50mm	14/10/2019

Landscape

Surface

Soil Profile



Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat plain 1%/1%	Narrow Leaf Ironbark	Nil microrelief Semi disturbance Nil erosion	Firm, <2% coarse fragments <5mm	A1 0.00-0.11 Abrupt	Sandy loam	Massive, apedal	Nil	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 6.5	Nil	Nil
				B21 0.11-0.50 Abrupt	Clay loam	Massive, apedal	<2% coarse fragments <5mm	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, moderate	Few	0.30 / 6.5		
				B22 0.50-0.85 Abrupt	Light clay	Massive, apedal	2% coarse fragments <5mm	7.5YR5/6 Strong brown Nil mottles / bleaching	Dry, moderate	Nil	0.60 / 7.0		
				B22 0.85-1.00 EOBH	Light clay	Massive, apedal	2% coarse fragments 10mm	7.5YR5/6 Strong brown Nil mottles / bleaching	Dry, moderate	Nil	0.90 / 7.0		

SITE 72

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S3	636966 7540450	Brown Chromosol	Detailed Hand Auger 50mm	14/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid-slope <2%	Grasses	Nil microrelief Extensive disturbance Nil erosion	Hard Nil coarse fragments	A1 0.00-0.09 Abrupt	Clay loam	Massive, firm	Nil	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, Well	Common	0.10 / 6.0	Nil	No recovery at 0.8 mbgl
				B21 0.09-0.28 Abrupt	Silty loam	Massive, firm	<1% <5mm coarse fragments	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderate	Few	0.20 / 6.0		
				B22 0.28-0.80 Abrupt	Silty clay loam	Massive, firm	1% manganese nodules	7.5YR4/6 Strong brown Nil mottles / bleaching	Dry, moderate	Nil	0.60 / 6.0		

SITE 73

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T2	627705 7546720	Red Chromosol	Detailed Hand Auger 50mm	14/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid slope 1-2%	Sparse vegetation, gums	Nil microrelief Semi disturbed Nil erosion	Firm	A1 0.00-0.10 Abrupt	Sandy clay loam	Massive to weak, form, peds <5mm	<1% coarse fragments 5mm	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	Nil	Nil
				B21 0.10-0.33 Abrupt	Clay loam	Massive to weak, form, peds <5mm	<1% coarse fragments 5mm	5YR4/3 Reddish brown Nil mottles / bleaching	Dry, well drained	Few	0.25 / 6.0		
				B22 0.33-0.80 Clear	Medium clay	Massive to weak, form, peds <2% <20mm	Nil	2.5YR4/4 Reddish brown Nil mottles / bleaching	Dry, well drained	Few	0.60 / 6.0		
				B23 0.80-1.00 EOBH	Medium clay	Massive to weak, form, peds <5mm	Nil	5YR4/4 Reddish brown Nil mottles / bleaching	Dry, well drained	Nil	0.85 / 6.0		

SITE 74

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	625433 7551868	Black Vertosol	Detailed Hand Auger 50mm	14/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, mid-slope 2%	Grasses	Nil microrelief Extensive disturbance Nil erosion	Crust Nil coarse fragments	A11 0.00-0.12 Abrupt	Light clay	Weak to moderate, sub-angular <20mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well	Common	-	Nil	Nil
				B21 0.12-0.80 Abrupt	Light medium clay	Weak to moderate, sub-angular <20mm slickensides observed	Nil	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, well to moderate	Common	-		
				B22 0.80-1.10 Abrupt	Light medium clay	Moderate, sub-angular <20mm	Nil	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, well to moderate	Nil	-		
				B23 1.10-1.50 EOBH	Medium clay	Moderate, sub-angular <20mm	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, moderate	Nil	-		

SITE 75

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T2	627314 7544935	Red Chromosol	Detailed Hand Auger 50mm	14/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP mid-slope 2 / 2%	Mixed vegetation	Nil microrelief Semi disturbance Nil erosion	Firm, Nil coarse fragments	A1 0.00-0.10 Abrupt	Sandy clay loam	Massive to weak, form, peds <5mm	<1% coarse fragments 5mm	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	0.00-0.10 0.20-0.30 0.50-0.60 0.70-0.80 0.90-1.00 1.40-1.50	Nil
				A2 0.10-0.30 Abrupt	Clay loam	Massive to weak, form, peds <5mm	<1% coarse fragments 5mm	5YR4/3 Reddish brown Nil mottles / bleaching	Dry, well – moderate	Few	0.25 / 6.0		
				B21 0.30-0.88 Abrupt	Medium clay	Massive to weak, form, peds <2% <20mm	Nil	2.5YR4/6 Red Nil mottles / bleaching	Dry, moderate	Few	0.60 / 6.5		
				B22 0.88-1.10 Abrupt	Medium clay	Massive to weak, form, peds <10mm	<1% coarse fragments <5mm	2.5YR4/6 Red Nil mottles / bleaching	Dry, moderate	Nil	0.90 / 6.5		
				B23 1.10-1.50 EOBH	Clay loam	Massive to weak, form, peds <5mm	<1% coarse fragments <5mm	2.5YR4/6 Red Nil mottles / bleaching	Dry, moderate	Nil	1.20 / 7.0		

SITE 76

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C5	626770 7543936	Black Vertosol	Detailed Hand Auger 50mm	14/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Alluvial plain, flat wide depression	Sparse woodland	Nil microrelief Extensive disturbance Nil erosion	Self mulching, Nil coarse fragments	A1 0.00-0.10 Abrupt	Medium clay	Moderate, firm, subangular <20mm	1% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well to moderate	Common	0.10 / 7.5	0.00-0.10 0.20-0.30 0.50-0.60 0.80-0.90	Nil
				B21 0.10-0.85 Abrupt	Medium clay	Moderate, firm, subangular 20-40mm slickensides observed	2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate	Few	0.30 / 7.5 0.60 / 7.5		
				B22 0.85-0.94 EOBH	Medium clay	Moderate, very firm, subangular 20-40mm slickensides observed	2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, moderate to imperfect	Nil	0.90 / 7.5		

SITE 77

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C4	620919 7548417	Black Vertosol	Detailed Hand Auger 50mm	15/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP Mid-slope 3%	Grasses	Nil microrelief Extensive disturbance Nil erosion	Self-mulching, cracking Nil coarse fragments	A11 0.00-0.10 Abrupt	Light clay	Moderate, firm, sub-angular 5-15mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well	Common	-	Nil	Refusal encountered at 1.20 mbgl
				B21 0.10-0.33 Abrupt	Light medium clay	Moderate, firm, sub-angular 10-20mm	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, moderate	Common	-		
				B22 0.33-1.05 Abrupt	Medium clay	Moderate, firm, sub-angular 10-40mm slickensides observed	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, moderate	Few	-		
				B23 1.05-1.20 EOBH	Medium clay	Moderate, firm, sub-angular 10-20mm	<2% coarse fragments	10YR3/2 Very dark greyish brown Mottles <2% 10YR4/2 Dark greyish brown Nil bleaching	Dry, moderate to imperfect	Nil	-		

SITE 78

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T3	626510 7543191	Brown Dermosol	Detailed Hand Auger 50mm	15/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP mid-slope 2%	Poplar box with minor Brigalow	Nil microrelief Semi disturbance Nil erosion	Firm to hard setting <1% coarse fragments < 5mm	A11 0.00-0.09 Abrupt	Silty clay	Weak, firm, sub-angular <10mm	Nil	10YR4/3 Brown Nil mottles / bleaching	Dry, Well	Common	0.05 / 7.5	Nil	Nil
				A12 0.09-0.23 Abrupt	Silty clay	Weak, firm, sub-angular <15mm	Nil	10YR4/3 Brown Nil mottles / bleaching	Dry, Well	Common	0.15 / 7.5		
				B21 0.23-0.41 Abrupt	Silty clay loam	Moderate, firm, sub-angular 10-20mm	Nil	10YR4/3 Brown Nil mottles / bleaching	Dry, Well to moderate	Common	0.30 / 7.5		
				B22 0.41-0.53 Abrupt	Silty clay loam	Moderate, firm, sub-angular 10-20mm	<1% calcium carbonate	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, Well to moderate	Few	0.45 / 8.0		
				B23 0.53-1.05 Abrupt	Light clay	Moderate, firm, sub-angular 10-20mm	<2% calcium carbonate	10YR4/3 Brown Nil mottles / bleaching	Dry, Moderate	Few	0.60 / 8.0		
				B3 1.05-1.50 EOBH	Silty loam	Massive, weak	Nil	5YR3/3 Dark reddish brown Nil mottles / bleaching	Dry, Moderate	Nil	1.20 / 7.0		

SITE 79

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S1	626206 7542633	Brown Sodosol	Detailed exposed soil profile	15/10/2019

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing GUP, lower slope near drainage line	Mixed Eucalyptus	Nil microrelief Semi disturbed Gully erosion	Hard Nil coarse fragments	A11 0.00-0.22 Abrupt	Clayey Sand	Weak	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, Well	Common	-	Nil	Exposed cutting profile
				A12 0.22-0.70 Abrupt	Clayey Sand	Weak	<1% coarse fragments <5mm	10YR3/3 Dark brown Nil mottles / bleaching	Dry, Well to moderate	Common	-		
				B2 0.70-1.00 EOBH	Sandy clay loam	Firm	<1% coarse fragments <5mm	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, Well to moderate	Few	-		

SITE 80

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
S1	627902 7541799	Brown Sodosol	Detailed Hand Auger 50mm	15/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing Flat plain	Tall woodlands including poplar box	Nil microrelief Nil disturbance Nil erosion	Hard setting Nil coarse fragments	A11 0.00-0.10 Abrupt	Clayey Sand	Massive, weak	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, Well	Common	0.10 / 6.0	Nil	Nil
				A12 0.10-0.45 Abrupt	Clayey Sand	Massive, weak	Nil	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, Well to moderate	Few	0.30 / 6.0		
				B21 0.45-0.90 Abrupt	Sandy clay loam	Moderate, firm 5-20mm	<1% coarse fragments <5mm	10YR4/6 Dark yellowish brown Nil mottles / bleaching	Dry, Well to moderate	Nil	0.60 / 7.5		
				B22 0.90-1.50 EOBH	Sandy clay loam	Weak, weak	Nil	10YR4/6 Dark yellowish brown Nil mottles / bleaching	Dry, Moderate	Nil	1.20 / 7.5		

SITE 81

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
C3-BL	629586 7542707	Black Vertosol	Detailed Hand Auger 50mm	15/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, simple mid slope 1-2%	Softwood scrub mixed vegetation	Nil microrelief Semi disturbed Nil erosion	Crust, white nodules <1%	A1 0.00-0.11 Abrupt	Light clay	Weak, very firm, sub-rounded peds <10mm	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Common	0.05 / 6.5	Nil	Nil
				B21 0.11-0.70 Abrupt	Light medium clay	Moderate, very firm	<2% calcium carbonate	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well drained	Few	0.30 / 7.0 0.60 / 7.0		
				B22 0.70-1.00 EOBH	Light medium clay	Moderate, very firm slickensides observed	Nil	10YR4/1 Dark grey Nil mottles / bleaching	Dry, moderately well drained	Few	0.90 / 7.0		

SITE 82

Soil Mapping Unit:	Location (GDA94 ZONE 55):	Australian Soil Class:	Site Survey Type:	Survey Date:
T2	630200 7541015	Red Chromosol	Detailed Hand Auger 50mm	15/10/2019

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Field Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle, Bleaching	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, upper slope 1-2%	Tall woodlands	Nil microrelief Semi disturbance Nil erosion	Firm, Nil coarse fragments	A1 0.00-0.10 Abrupt	Clayey sand	Massive, loose	<2% coarse fragments <1mm	7.5YR3/2 Dark brown Nil mottles / bleaching	Dry, rapid	Common	-	Nil	Nil
				B21 0.10-0.38 Abrupt	Sandy clay loam	Weak, weak, sub-angular <20mm	Nil	7.5YR3/4 Dark brown Nil mottles / bleaching	Dry, well	Common	-		
				B22 0.38-0.68 Abrupt	Medium clay	Weak, weak, sub-angular <20mm	Nil	7.5YR3/3 Dark brown Nil mottles / bleaching	Dry, well	Few	-		
				B22 0.68-1.00 EOBH	Medium clay	Weak, weak, sub-angular <20mm	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, well	Nil	-		

SITE OD-15

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
S1	Somerby, Monteagle, Connors, Humboldt, Blackwater	639357 mE 7545231 mN	Brown Sodosol	Detailed - 50mm hand auger	20/6/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, very gently undulating plains, 1%	Very Sparse, Moreton Bay Ash, Blackbutt	Semi cleared	Firm, nil coarse fragments	A11 0.0 – 0.22 Abrupt	Loamy sand	Massive, loose	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, rapid	Few, very fine	0.1 / 6.5	No samples taken	No additional observations
				A12 0.22 – 0.7 Abrupt	Clayey sand	Weak subangular peds 20mm, weak	Nil	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Humid, well drained	Few, very fine	0.3 / 7.0 0.6 / 7.0		
				B2 0.7 – 1.0	Sandy clay loam	Weak subangular peds 40mm, weak	2% coarse fragments, 2-10mm	7.5YR4/4 Brown Brown Mottle: 2.5YR4/6 Red Red Nil bleaching	Dry, imperfectly drained	Nil	0.9 / 7.0		

SITE OD-26a

Soil Mapping Unit:	**CSIRO Land Systems (Gunn et al 1967):**	**Location (GDA ZONE 55):**	**Aust. Soil Class.** :	**Site Survey Type**:	**Survey Date:**
C2 - C1-BR interfingering with C1-BL	Somerby, Monteagle, Connors, Humboldt, Blackwater, Junee	640146 mE 7543555 mN	Brown Vertosol	Detailed - 50mm hand auger	22/6/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	**Natural Vegetation**	**Microrelief Disturbance Erosion**	**Surface condition, surface rock**	**Soil Profile Description**									
				Horizon Depth (m), Boundary	**Texture**	**Structure, Strength, Cutans**	**Inclusions Segregations**	**Colour, Mottle**	**Moisture, Drainage**	**Roots**	**Depth (m) / Field pH**	**Sample (m)**	**Observations**
Grazing, very gently undulating plain, <1% slope	Tall Brigalow and Brigalow regrowth, semi sparse, limited clearing 20-30% coverage	Normal gilgai, 30% coverage, <0.3m deep	Cracking, crust 5% coarse fragments <5mm	A1 0.00 – 0.19 Abrupt	Light medium clay	Weak, <10mm peds, subangular, strength-firm	2% coarse fragments	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well drained	Nil	0.00 / 6.5	0.00 – 0.10 0.30 – 0.40 0.60 – 0.70 0.90 – 1.00	Site located in gilgai depression
				B2 0.19 – 1.00	Medium clay	Strong structure <20mm, very firm strength slickensides observed	<2% black nodules <5mm <1% calcium carbonate	10YR4/3 Brown Nil mottles / bleaching	Dry, well drained	Nil	0.30 / 6.5 0.60 / 7.0 09.0 / 7.0		

SITE OD-26b

Soil Mapping Unit:	**CSIRO Land Systems (Gunn et al 1967):**	**Location (GDA ZONE 55):**	**Aust. Soil Class.** :	**Site Survey Type**:	**Survey Date:**
C2 - C1-BR interfingering with C1-BL	Somerby, Monteagle, Connors, Humboldt, Blackwater, Junee	640146 mE 7543555 mN	Brown Vertosol	Detailed - 50mm hand auger	22/6/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	**Natural Vegetation**	**Microrelief Disturbance Erosion**	**Surface condition, surface rock**	**Soil Profile Description**									
				Horizon Depth (m), Boundary	**Texture**	**Structure, Strength, Cutans**	**Inclusions Segregations**	**Colour, Mottle**	**Moisture, Drainage**	**Roots**	**Depth (m) / Field pH**	**Sample (m)**	**Observations**
Grazing, very gently undulating plain, <1% slope	Tall Brigalow and Brigalow regrowth, semi sparse, limited clearing 20-30% coverage	Normal gilgai, 30% coverage, <0.3m deep	Crust, 5% coarse fragments <5mm	A1 0.00 – 0.25 Abrupt	Light medium clay	Moderate, <10mm peds, subangular, strength-firm	2% coarse fragments	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well drained	Nil	0.00 / 6.5	0.00 – 0.10	Site located on gilgai mound
				B2 0.25 – 1.00	Medium clay	Strong structure <20mm, very firm strength slickensides observed	<2% black nodules <5mm <1% calcium carbonate	10YR4/3 Brown Nil mottles / bleaching	Dry, well drained	Nil	0.30 / 7.0 0.60 / 7.0 09.0 / 7.0	0.30 – 0.40 0.60 – 0.70 0.90 – 1.00	

SITE OD-28

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
B1 interfingering / grading with S1	Somerby, Monteagle, Humboldt	639637 mE 7542190 mN	Subnatric Brown Sodosol	Detailed - 50mm hand auger	22/6/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, very gently undulating plain, mid slope 1-2%	Ironbark, Poplar Box, Moreton Bay Ash	Nil	Hard setting, <5% coarse fragments <10mm	A11 0.00 – 0.30 Diffuse	Loamy sand	Massive, loose	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, rapid	Few, very fine	0.10 / 6.5	No samples taken	No additional observations
				A12 0.30 – 0.55 Clear	Loamy sand	Weak 0-10mm peds subangular, Weak	<2% black/white nodules	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, well drained	Nil	0.30 / 6.5		
				B21 0.55 – 1.00	Silty clay loam	Weak subangular, Moderate 6-10mm peds	<2% manganese nodules	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, well drained	Nil	0.60 / 7.0 0.90 / 7.0		

SITE OD-31

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
S2 grading into S4	Somerby, Monteagle, Connors, Humboldt, Blackwater	639834 mE 7541276 mN	Haplic Brown Dermosol	Detailed - 50mm hand auger	22/6/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plain, upper slope 1.5%	Very sparse Blackbutt and Ironbark	Extensive clearing	Firm, nil coarse fragments	A1 0.00 – 0.13 Abrupt	Clayey sand	Weak, peds 2-10mm, weak	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapid	Few, very fine	0.00 / 7.0	No samples taken	No additional observations
				B21 0.13 – 0.37 Clear	Loamy sand	Weak subangular peds 5-20mm, weak	Nil	10YR4/3 Brown Nil mottles / bleaching	Dry, rapid	Nil	0.30 / 7.0		
				B22 0.37 – 1.00	Loamy sand	Weak subangular peds 10-30mm, weak	<2% Coarse fragments 2-5mm and red nodules	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Moderately moist, rapid	Nil	0.60 / 7.0 0.90 / 7.0		

SITE OD-34

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
C2, grading into C3-BL	Somerby, Monteagle, Connors, Humboldt, Blackwater, Junee	639343 mE 7540015 mN	Brown Vertosol	Detailed - 50mm hand auger	23/6/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, mid slope, very gently undulating plain, 1.5%	Brigalow regrowth	Extensive clearing, previously blade ploughed	Hard setting, cracking – fine to moderate cracks, <5% coarse fragments 2-4mm	A1 0.00 – 0.18 Clear	Light clay	Weak angular peds <10mm, firm	<2% coarse fragments 2-6mm	10YR3/1 Very dark grey Nil mottles / bleaching	Humid – moderately moist, well drained	Very fine, few	0.00 / 6.5	0.00 – 0.10 0.30 – 0.40 0.60 – 0.70 0.90 – 1.00	No additional observations
				B21 0.18 – 0.70 Diffuse	Medium clay	Moderate angular peds <20mm, firm	<5% coarse fragments 2-6mm and black nodules	10YR3/1 Very dark grey Nil mottles / bleaching	Moderately moist, well drained	Very fine, few	0.30 / 6.5		
				B22 0.70 – 0.81 Abrupt	Medium clay	Moderate angular peds <20mm, firm slickensides observed	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Moderately moist, well to moderately drained	Nil	0.60 / 7.0		

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
				B23 0.81 – 1.05	Silty clay loam	Weak angular peds <10mm, firm	-	10YR4/2 Dark greyish brown Nil mottles / bleaching	Dry, moderately moist	-	0.90 / 7.0		

SITE OD-94

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
C2, grading into C3-BL	Somerby, Monteagle, Connors, Humboldt, Blackwater, Junee	636346 mE 7538814 mN	Brown Vertosol	Detailed - 50mm hand auger	12/7/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, gently undulating plains, upper slope, 1.0%	Regrowth, shrubs	Shallow gilgai, Extensive clearing	Cracking, Nil coarse fragments	A1 0.00-0.10 Abrupt	Light clay	Weak, firm, <10mm sub-angular	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Few, very fine	0.10 / 6.5	No samples taken	No additional observations
				B2 0.10-1.00	Light clay	Moderate, firm, <20mm sub-angular slickensides observed	Nil	10YR3/1 Very dark grey Nil mottles / bleaching	Dry, well drained	Very few, very fine	0.30 / 6.5 0.60 / 6.0 0.90 / 6.0		

SITE OD-170

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
S1	Somerby, Monteagle, Connors, Humboldt, Blackwater	637680 mE 7547045 mN	Brown Sodosol	Detailed - 50mm hand auger	4/8/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Gently undulating plain, mid-slope 1.0%	Poplar box, minor Ironbark	Nil	Soft to firm, nil coarse fragments	A1 0.00-0.38 Diffuse	Loamy sand	Massive, weak	Nil	10YR3/3 Dark Nil mottles / bleaching	Dry, rapid	Very fine, very few	0.10 / 6.5 0.30 / 6.5	No samples taken	No additional observations
				B2 0.38-1.00	Clay loam sand	Moderate, angular, 5-20 weak	<2% coarse fragments 2mm	10YR4/3 Brown Brown Mottle 5% 10YR5/8 Yellowish brown	Dry, well drained	Nil	0.60 / 7.5 0.90 / 7.5		

SITE OD-180

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
S1	Somerby, Monteagle, Connors, Humboldt, Blackwater	638448 mE 7545811 mN	Brown Sodosol	Detailed - 50mm hand auger	25/11/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Gently undulating plain, lower slope <2.0%	Poplar box, minor Eucalypts	Nil	Soft, loose, nil coarse fragments	A11 0.00-0.12 Abrupt	Loamy sand	Massive, weak	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, rapid	Few, fine	0.10 / 6.5	No samples taken	No additional observations
				A12 0.12-0.32 Abrupt	Loamy sand	Massive, weak	Nil	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, rapid	Few, fine	0.30 / 6.5		
				A13 0.32-0.70 Abrupt	Loamy sand	Massive, weak	Nil	10YR4/6 Dark yellowish brown Nil mottles / bleaching	Dry, rapid	Very few, very fine	0.60 / 6.5		
				B2 0.70-0.85	Clay loam sandy	Weak, weak, <5mm sub-angular	Nil	10YR4/3 Brown Nil mottles / bleaching	Dry, Well drained	Nil	0.90 / 7.0		

SITE OD-181

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
S1	Somerby, Monteagle, Connors, Humboldt, Blackwater	636937 mE 7547191 mN	Brown Sodosol	Detailed - 50mm hand auger	25/11/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Gently undulating plain, mid-slope <2.0%	Sparse Poplar box	Nil	Firm, nil coarse fragments	A1 0.00-0.10 Abrupt	Loamy sand	Massive, weak	Nil	10YR2/2 Very dark brown Nil mottles / bleaching	Dry, rapid	Very few, very fine	0.10 / 6.0	No samples taken	No recovery from 0.80m
				A2 0.10-0.44 Abrupt	Clayey sands	Massive, weak	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapid	Nil	0.30 / 6.5		
				A2 0.47-0.70 Abrupt	Clayey sand	Massive, weak	Nil	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, well drained	Nil	0.60 / 6.5		
				B2 0.70-0.80	Clay loam sand	Weak, weak, <5mm sub-angular	Nil	10YR4/3 Brown Nil mottles / bleaching	Dry, rapid	Nil	0.90 / 7.0		

SITE OD-182

Soil Mapping Unit:	**CSIRO Land Systems (Gunn et al 1967):**	**Location (GDA ZONE 55):**	**Aust. Soil Class.** :	**Site Survey Type**:	**Survey Date:**
S1	Somerby, Monteagle, Connors, Humboldt, Blackwater	635944 mE 7548438 mN	Brown Sodosol	Detailed - 50mm hand auger	25/11/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	**Natural Vegetation**	**Microrelief Disturbance Erosion**	**Surface condition, surface rock**	**Soil Profile Description**									
				Horizon Depth (m), Boundary	**Texture**	**Structure, Strength, Cutans**	**Inclusions Segregations**	**Colour, Mottle**	**Moisture, Drainage**	**Roots**	**Depth (m) / Field pH**	**Sample (m)**	**Observations**
Grazing, Gently undulating plain, lower slope <1.5%	Poplar box, Ironbark	Semi cleared, No microrelief No Erosion	Soft to firm, nil coarse fragments	A1 0.00-0.27 Abrupt	Loamy sand	Massive, weak	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapid	Few, fine	0.10 / 6.0	No samples taken	No additional observations
				B21 0.27-0.86 Abrupt	Clay loam sandy	Moderate, weak <10mm sub-angular	Nil	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, rapid	Nil	0.30 / 6.0 0.60 / 6.5		
				B22 0.86-1.00	Clay loam sandy	Moderate, weak, <10mm sub-angular	<2% calcium carbonate	10YR4/4 Dark yellowish brown Nil mottles / bleaching	Dry, well drained	Nil	0.90 / 7.0		

SITE OD-183

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
C2 grading into C1-BL	Somerby, Monteagle, Connors, Humboldt, Blackwater	634838 mE 7549412 mN	Brown Vertosol	Detailed - 50mm hand auger	25/11/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Flat plain <0.5%	Brigalow regrowth	Extensive clearing, Minor normal gilgai <20% coverage 3-5m wide and <0.30m in depth	Cracking with crust, firm	A1 0.00-0.11 Abrupt	Light clay	Weak, firm, 3-10mm sub-angular	Nil	10YR3/2 Very dark greyish brown Nil mottles / bleaching	Dry, well drained	Very few, very fine	0.10 / 7.0	No samples taken	No additional observations
				B2 0.11-1.00	Light clay	Moderate, firm, 20-50mm sub-angular slickensides observed	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, well drained	Nil	0.30 / 7.0 0.60 / 7.0 0.90 / 7.0		

SITE OD-184

Soil Mapping Unit:	**CSIRO Land Systems (Gunn et al 1967):**	**Location (GDA ZONE 55):**	**Aust. Soil Class.** :	**Site Survey Type**:	**Survey Date:**
S2	Somerby, Monteagle, Connors, Humboldt, Blackwater	633712 mE 7550670 mN	Haplic Brown Dermosol	Detailed - 50mm hand auger	25/11/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	**Natural Vegetation**	**Microrelief Disturbance Erosion**	**Surface condition, surface rock**	**Soil Profile Description**									
				Horizon Depth (m), Boundary	**Texture**	**Structure, Strength, Cutans**	**Inclusions Segregations**	**Colour, Mottle**	**Moisture, Drainage**	**Roots**	**Depth (m) / Field pH**	**Sample (m)**	**Observations**
Grazing, Gently undulating plain, lower slope 2.0%	Eucalypts Poplar box, minor Moreton Bay Ash	Nil	Firm, nil coarse fragments	A11 0.00-0.15 Abrupt	Loamy sand	Massive, weak	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapid	Very few, very fine	0.10 / 6.0	No samples taken	No additional observations
				A12 0.15-0.50 Abrupt	Loamy sand	Massive, weak	Nil	10YR3/4 Dark yellowish brown Nil mottles / bleaching	Dry, rapid	Very few, very fine	0.30 / 6.0		
				A13 0.50-1.00	Loamy sand	Massive, weak	Nil	10YR3/6 Dark yellowish brown Nil mottles / bleaching	Dry, rapid	Nil	0.60 / 6.0 0.90 / 6.0		

SITE OD-187

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
B2 grading into T3	Somerby, Monteagle, Connors, Humboldt, Blackwater	632756 mE 7551848 mN	Mesonatric Grey Sodosol	Detailed - 50mm hand auger	26/11/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Very gently undulating plain, lower slope <1.0%	Mixed vegetation, Brigalow regrowth and Poplar Box	Nil	Firm to hard setting Nil coarse fragments	A11 0.00-0.10 Abrupt	Silty loam	Weak, weak	Nil	10YR2/2 Very dark brown Nil mottles / bleaching	Dry, rapid	Very few, very fine	0.05 / 6.5	No samples taken	No additional observations
				A12 0.10-0.60 Abrupt	Silty loam	Moderate, weak, 5-20mm	Nil	10YR2/2 Very dark brown Nil mottles / bleaching	Dry, rapid	Very few, very fine	0.30 / 6.5		
				B2 0.60-1.00	Light clay	Firm, sub-angular 10-30mm	<2% calcium carbonate nodules	10YR2/2 Very dark brown Mottle 10YR3/6 Dark yellowish brown Dark yellowish brown 10-20% Nil bleaching	Dry, Imperfect	Nil	0.60 / 7.0 0.90 / 7.5		

SITE OD-188

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
S2 grading to S4	Somerby, Monteagle, Connors, Humboldt, Blackwater	631308 mE 7552792 mN	Haplic Brown Dermosol	Detailed - 50mm hand auger	26/11/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Open Depression	Eucalypts, minor Brigalow	Gully erosion, No microrelief No disturbance	Loose, <5% <5mm coarse fragments	A11 0.00-0.40 Abrupt	Loamy sand	Massive, weak	Nil	10YR2/2 Very dark brown Nil mottles / bleaching	Dry, rapid	Few, fine	0.05 / 6.0	No samples taken	No additional observations
				A12 0.30-1.00 Abrupt	Loamy sand	Massive, weak	<10% coarse fragments <5mm	10YR6/3 Dark brown Nil mottles / bleaching	Dry, rapid	Few, fine	0.30 / 6.0		

SITE OD-189

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
S1	Somerby, Monteagle, Connors, Humboldt, Blackwater	629781 mE 7553506 mN	Brown Sodosol	Detailed - 50mm hand auger	26/11/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Very gently undulating plain, lower slope <1.0%	Poplar box	Nil	Firm, Nil coarse fragments	A11 0.00-0.28 Abrupt	Loamy sand	Massive, weak	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapid	Few, fine	0.10 / 6.0	No samples taken	No additional observations
				A12 0.28-0.54 Abrupt	Loamy sand	Massive, weak	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, rapid	Very few, fine	0.30 / 6.5		
				B2 0.54-1.00	Clay loam sandy	Moderate, weak, <10mm sub-angular	Nil	7.5YR4/4 Brown Mottle <2% 10YR5/8 Dark yellowish brown Nil bleaching	Dry, Imperfect	Nil	0.60 / 6.5 0.90 / 6.5		

SITE OD-190

Soil Mapping Unit:	CSIRO Land Systems (Gunn et al 1967):	Location (GDA ZONE 55):	Aust. Soil Class. :	Site Survey Type:	Survey Date:
S1	Somerby, Monteagle, Connors, Humboldt, Blackwater	627807 mE 7553767 mN	Brown Sodosol	Detailed - 50mm hand auger	26/11/2017

Landscape

Surface

Soil Profile

Land use Landform Pattern, Element, Slope	Natural Vegetation	Microrelief Disturbance Erosion	Surface condition, surface rock	Soil Profile Description									
				Horizon Depth (m), Boundary	Texture	Structure, Strength, Cutans	Inclusions Segregations	Colour, Mottle	Moisture, Drainage	Roots	Depth (m) / Field pH	Sample (m)	Observations
Grazing, Flat plain <0.5%	Poplar box	Nil	Firm, Nil coarse fragments	A11 0.00-0.28 Abrupt	Loamy sand	Massive, weak	Nil	10YR3/3 Dark brown Nil mottles / bleaching	Dry, rapid	Few, fine	0.10 / 6.0	No samples taken	No additional observations
				A12 0.28-0.54 Abrupt	Loamy sand	Massive, weak	Nil	7.5YR4/4 Brown Nil mottles / bleaching	Dry, rapid	Very few, fine	0.30 / 6.5		
				B2 0.54-1.00	Clay loam sandy	Moderate, weak, <10mm sub-angular	Nil	7.5YR4/4 Brown Mottle <2% 10YR5/8 Dark yellowish brown Nil bleaching	Dry, Imperfect	Nil	0.60 / 6.5 0.90 / 6.5		

Appendix D - Regional Frameworks Land Suitability Limitations Amended

Table D-3: Summary of Land Suitability Classes for SMU C3-BL

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	31	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es)	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Soil Water Availability (M)	3	4	4	3	3	4	3	4	3	3	3	3	4	4
Narrow Moisture Range (Pm)	5	3	3	3	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	6	3	3	3	3	3	3	3	3	3	3	3	3	3
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4M	1	1	2	1	1	1	1	1	1	1	1	1	1
Overall Suitability Class		4	4	3	3	4	3	4	3	3	3	3	4	4

1. *Water erosion assessed on k-factor of 0.025, moderate (Foster et al., 1981), ESP of 0.4 and R1 dispersion of 0.27.*

Table D-6: Summary of Land Suitability Classes for SMU C5

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	31	2	2	2	2	2	2	2	2	2	2	2	2	2
Erosion Hazard (Es)	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Soil Water Availability (M)[2]	2	3	3	2	2	3	2	3	2	2	2	2	3	3
Narrow Moisture Range (Pm)	5	3	3	4	3	3	3	3	3	3	3	3	3	3
Surface Condition (Ps)	5	3	3	3	3	3	3	3	3	3	3	3	3	3
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4M	1	1	2	1	1	1	1	1	1	1	1	1	1
Overall Suitability Class		3	3	4	3	3	3	3	3	3	3	3	3	3

1. *Water erosion assessed on k-factor: 0.015, low (Rosewell.1993) and ESP of 1.4.*
2. *PAWC for the profile is 120 mm/100 cm, however assessed at 125-150 mm due to the high clay content.*

Table D-14: Summary of Land Suitability Classes for SMU T2

Limitation Categories	Limitation Value	Suitability subclasses for different land uses												
		Barley	Chickpea	Cotton	Maize	Millet	Mung bean	Oat	Safflower	Sorghum	Soybean	Sunflower	Triticale	Wheat
Water Erosion (E)[1]	32	3	3	3	3	3	3	3	3	3	3	3	3	3
Erosion Hazard (Es)	31	1	1	1	1	1	1	1	1	1	1	1	1	1
Soil Water Availability (M)	3	4	4	3	3	4	3	4	3	3	3	3	4	4
Narrow Moisture Range (Pm)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Surface Condition (Ps)	3	2	2	2	2	2	2	2	2	2	2	2	2	2
Rockiness (R)	G2	1	1	1	1	1	1	1	1	1	1	1	1	1
Microrelief (Tm)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Wetness (W)	4S	2	2	2	2	2	2	2	2	2	2	2	2	2
Overall Suitability Class		4	4	3	3	4	3	4	3	3	3	3	4	4

1. *Water erosion assessed on k-factor of 0.024, moderate (Foster et al., 1981), ESP of 0.5 and R1 dispersion of 0.49.*

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