KATANNING GOLD
BASELINE SOIL ASSESSMENT

Ausgold Limited

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1 INTRODUCTION

Ausgold Limited (Ausgold) are planning to develop the Katanning Gold Project (the Project) and are preparing a Mining Proposal and Mining Closure Plan (MCP) for submission. Regulatory guidelines outline the requirement for a baseline assessment of the soils within the Project area prior to ground disturbance. Ausgold have engaged Landloch Pty Ltd (Landloch) to complete a baseline soil assessment for the Project area to inform management of the soil resources and to provide support in the submission of the Mining Proposal and MCP.

The Study area refers to the total area investigated, including the planned mine concept footprint and surrounding undisturbed land. The mine concept footprint includes potential areas associated with mining pits, waste rock landforms (WRL), tailings storage facility (TSF) and related infrastructure (e.g. processing facilities, workshops, roads).

This report presents the results of the baseline soil characterisation survey, and includes:

- Background information of the Project;
- Regulatory requirements that guided the soil assessment;
- Methodology for field-based survey;
- Classification and mapping of the soils in line with the relevant standards;
- Grouping of soils into soil mapping units and a summary of their soil and landform characteristics;
- Discussion outlining soil constraints and opportunities, and associated soil amelioration recommendations (where appropriate);
- Estimations of soil stripping depths and useable soil volumes; and
- Soil handling recommendations.

1.1 Background

The Project is located approximately 37km north-east of Katanning, and ~260km south-east of Perth, in the Katanning Greenstone Belt, Western Australia. Mining is proposed to be conducted via open pit methods across four main mining areas (Jinkas-White Dam and Jinkas South, Jackson, White Dam and Dingo).

The total size of the Study area is ~3,804ha and is comprised of two parts:

- Surrounding area; and
- Mine concept footprint.

The mine concept footprint is associated with the open pits, TSF, WRLs and general infrastructure. The final footprint will be determined during the Definitive Feasibility Study (DFS). A tentative footprint area of ~1,041ha was used to guide this study. The remaining Study area outside of the mine concept footprint is ~2,760ha in size.

The location of the Study area and mine concept footprints, within the regional setting, is presented in Figure 1.

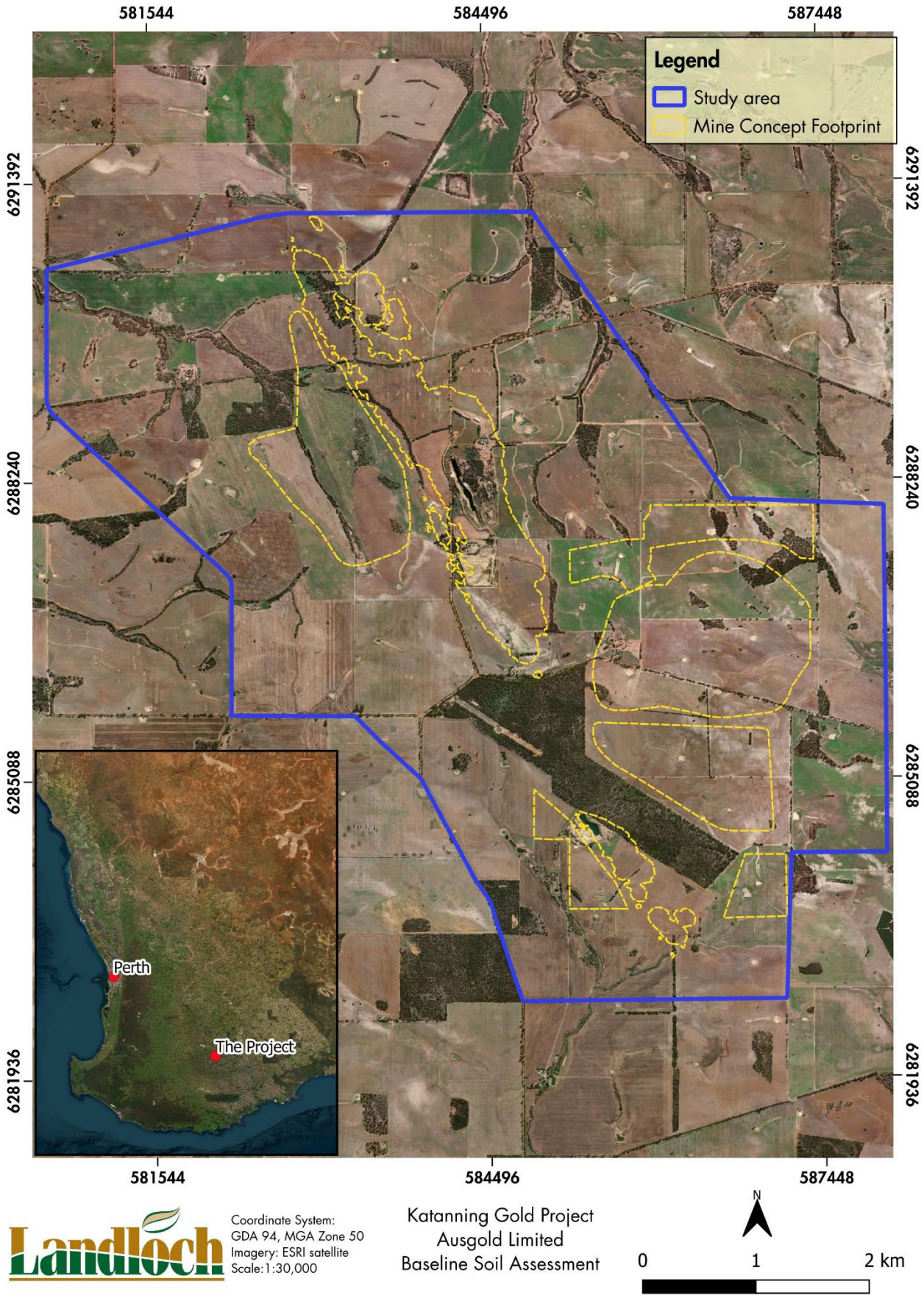

Figure 1: Location of the Katanning Gold Project within the regional setting and associated indicative development footprints within the Study area.

1.2 Regulatory requirements

This baseline soil assessment was undertaken in line with the following regulatory guidelines:

- *Statutory Guidelines for Mining Proposals* (DMIRS 2020a);
- *Mining Proposal Guidance* (DMIRS 2020b);
- *Statutory Guidelines for Mine Closure Plans* (DMIRS 2020d); and
- *Draft Guidance Materials Characterisation Baseline Data Requirements for Mining Proposals* (DMP 2016).

A summary of the regulatory requirements relating to soils, and how the methodology adopted for this soil survey address these requirements is summarised in Appendix A.

2 METHODOLOGY

Broadly, the approach taken to complete the soil assessment included:

- A desktop review and development of a Sampling and Analysis Plan;
- Adoption of a broad Study area to consider the soils and land associated with the mining proposal, as well as regional characteristics of surrounding lands;
- Field survey to ground-truth and sample the soils of the Study area;
- Classification of soils into soil types and mapping of their extents;
- Grouping of soil types based on similarities in characteristics; and
- Determination of potential topsoil and subsoil stripping depths and volumes.

2.1 Desktop review

A desktop review of existing soil and landscape data was undertaken to gain an appreciation of the type and variability of the soils and landscapes within the Study area. Soil inspection sites were selected to ground-truth the pre-existing soil and landscape data. A summary of the desktop review is provided in this section, with additional information found within the Sampling and Analysis Plan (Landloch 2024).

2.1.1 Land resource mapping

Land resources mapping has been conducted across Western Australia at varying assessment intensities. The collation of this information has resulted in the development of soil-landscape mapping for the whole of Western Australia. The scale of mapping varies across the state, with areas split into regions dependent on the amount of data available at the time of compilation. Mapping is compiled at differing intensities depending on the region.

The soil-landscape mapping is based on a nested hierarchy of mapping units comprised of six levels. Each unit in the mapping hierarchy is a subdivision of the preceding level. This hierarchy is outlined below:

1. Regions: broad subdivisions of the Australian Continent.
2. Provinces: broad overview of the whole state.
3. Zones: regions defined on geomorphic or geological criteria.
4. Systems: areas with reoccurring patterns of landforms, soils and vegetation.
5. Subsystems: areas of characteristic landforms containing definite suites of soils.
6. Phases: division of subsystems based on land use requirements.

The most detailed level of soil-landscape mapping available for the Study area is Soil Landscape Subsystems. Subsystems describe areas of characteristic landforms containing definite suites of soils. The soil landscape system mapping for the area exists at a scale of 1:100,000 (Percy *et al.* 2003).

The Study area is comprised of five subsystems associated with three land systems:

- Datatine system
    - Datatine 1 subsystem
    - Datatine 2 subsystem
- East Katanning system
    - East Katanning 1 subsystem
    - East Katanning 2 subsystem
- Coblinine system
    - Coblinine 2 subsystem

The dominant subsystem is the Datatine 2 subsystem (~47% of the Study area), encompassing many of the lower to upper slopes and crests within the landscape. This subsystem dominates the northern and central portion of the Study area. The soils of this subsystem are described as alkaline calcareous loamy earths and loamy or sandy duplexes, with soil structure and alkalinity increasing with depth.

The two East Katanning subsystems (1 and 2), cover ~50% of the Study area. The East Katanning 2 subsystem covers the lower to upper slopes and broad crests of the hills that dominate the southern portion of the Study area. Soils of the East Katanning 2 subsystem are expected to be shallow to deep sandy duplexes, potentially alkaline and gravelly. The East Katanning 1 subsystem comprises the gravelly crests and mid to upper slopes of the hills. Soils are predominately deep or shallow sandy gravels.

These three subsystems (Datatine 2, East Katanning 1 and 2) comprise ~97% of the Study area. The two remaining subsystems comprise only a minor proportion of the Study area (~3%).

The Coblinine 2 subsystem (~2% of the Study area) covers a single alluvial valley floor located at the very south of the survey area. This subsystem is comprised of saline wet soils with alkaline shallow or deep sandy duplexes. The Datatine 1 subsystem (~1% of the Study area) is the smallest of the subsystems present, located exclusively in the very west of the survey area.

Table 1 provides a summary of the soil landscape subsystems present within the Study area. The distribution of each subsystem within the Study area is shown in Figure 2.

Table 1: Summary of soil landscape subsystems present within the Study area.

Land system	Description	Percentage of Study Area (%)
Datatine 2 subsystem	Comprised of lower to upper slopes and crests of the landscape. Soils are typically alkaline calcareous loamy earths and loamy or sandy duplexes. Alkaline subsoils are common.	47
East Katanning 2 subsystem	Encompassing lower to upper slopes and the broad crests of the hills. Soils are typically grey shallow and deep sandy duplexes, alkaline shallow sandy duplexes, and duplex sandy gravels.	27
East Katanning 1 subsystem	The gravelly crests and mid – upper slopes. Predominately deep sandy gravels and shallow gravels. Minor areas of duplex sandy gravels, loamy gravels, and gravelly deep sands.	23
Coblinine 2 subsystem	The broad valley floors and alluvial plains of the landscape. Considerable areas of saline wet soils, with alkaline shallow sandy duplex soils and deep sandy duplexes.	2
Datatine 1 subsystem	Gravelly crests and mid – upper slopes atop undulating rises and low hills. Shallow loamy gravels, deep sandy gravels and duplex sandy gravels are expected.	1

2.1.2 Australian Soil Classification

The Australian Soil Resource Information System (ASRIS) contains broadscale interpolated soils data for the Study area. This includes classification of soils in line with the Australian Soil Classification (ASC). There is one soil order present within the survey area, Sodosols (Northcote, *et al.* 1967).

Sodosols include soils with a clear or abrupt texture contrast between the A and B horizons. The majority of the B horizon in a Sodosol is both sodic and not strongly acid. Soils with such a strong texture contrast are often referred to as duplexes in other classification schemes.

2.1.3 Landscape slope and relief

Differences in landscape elevation and gradient play an important role in soil formation and provide an indication of variability of soil types across a landscape. Digital elevation models (DEM) of the Study area were provided to Landloch by Ausgold, which is shown in Figure 3. The survey area is dominated by the crests and hilltops of the central landscape that slope down in alluvial channels to the north and south. The elevation ranges from 305m above sea level in the northwestern valley to ~390m at the crest of the central hills. This results in a maximum relief of 85m.

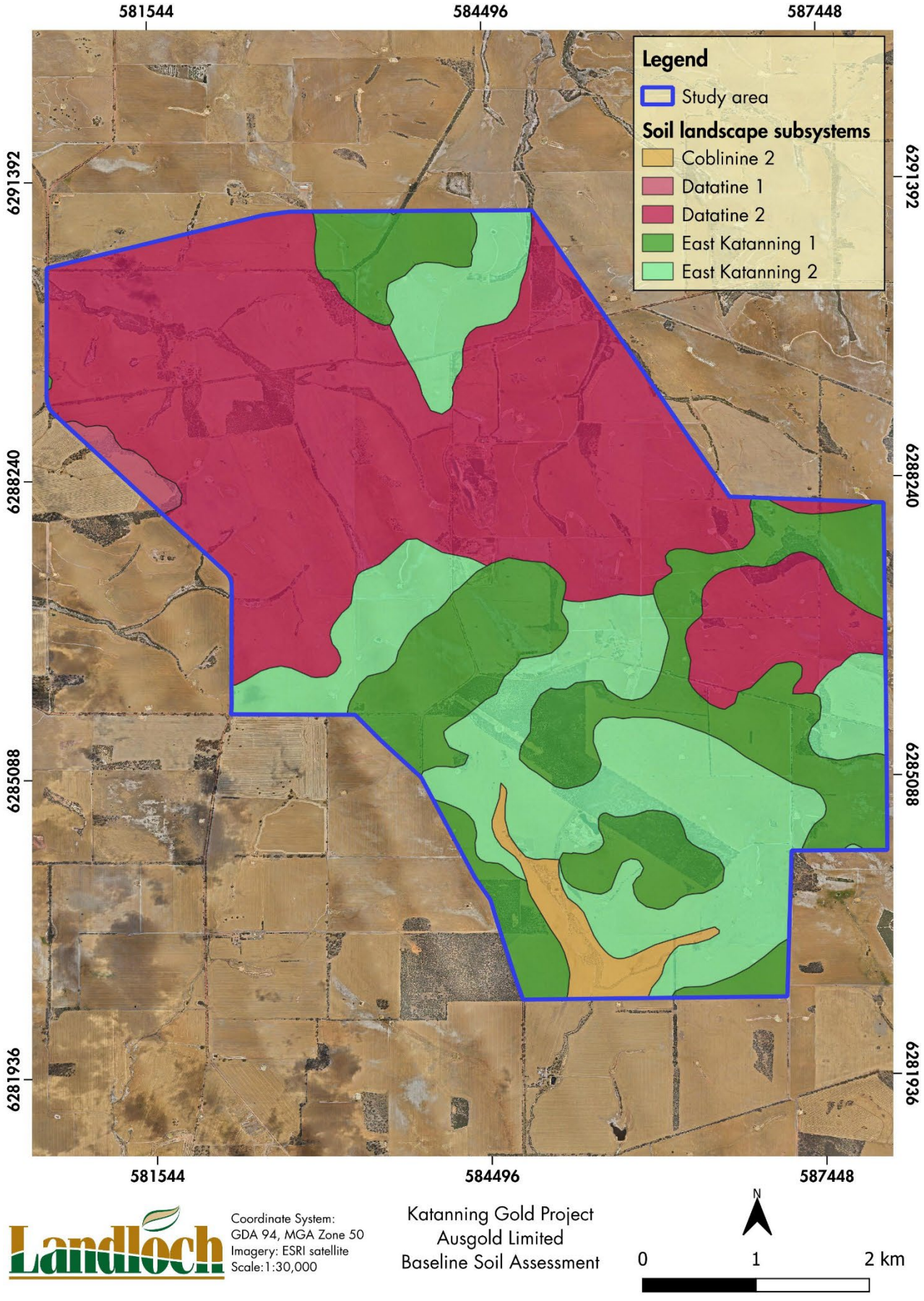

Figure 2: Soil landscape subsystem mapping of the Study area.

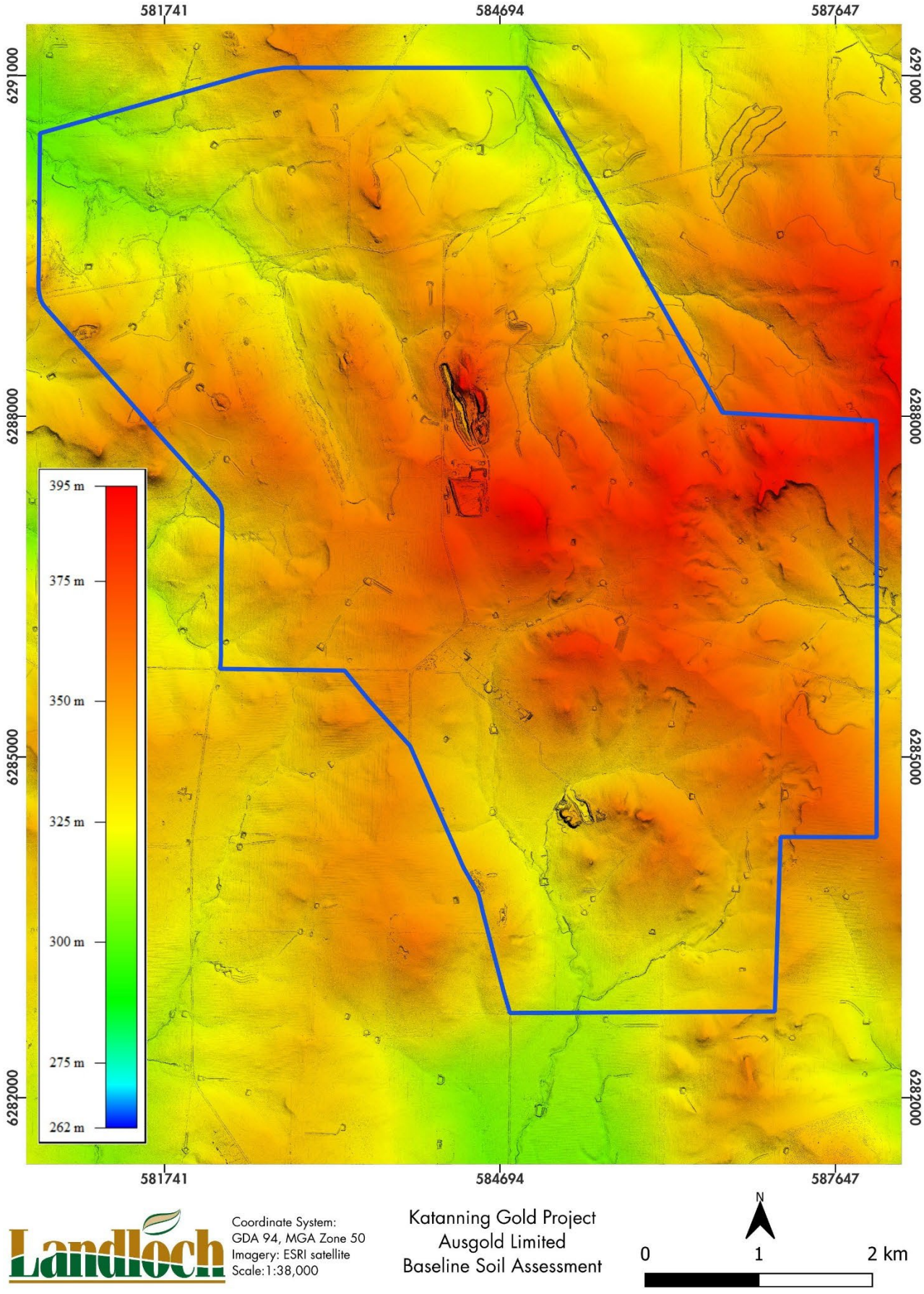

Figure 3: Digital elevation model of the Study area.

2.1.4 Summary

Based on the outcomes of the desktop review, the dominant soil types likely to be present over the Study area are a mix between loamy earth soils comprised of a consistent soil texture, through to a variety of duplex soils (sands over clays). This lines up with the ASC mapping indicating that Sodosols (duplex sodic soils) are the most common soil type present over the Study area.

Duplex soils are more likely to occur in the mid to lower landscape positions in the northern and southern sections of the Study area, and throughout the drainage lines that cut through the landscape. Loamy and gravelly soils are more likely to be present in the upper hillslopes that dominate the central section of the Study area.

2.2 Study area

Separate sampling scales and densities were applied for the mine concept footprints and the Study area outside of these footprints. The required soil inspection density for a range of assessment types is provided in the *Guidelines for Surveying Soil and Land Resources* (McKenzie *et al.* 2008), part of the Australian soil and land survey handbook series.

The total Study area is 3,804ha in size. At the time of the field-based survey, there were varied land access and sampling restrictions across much of the Study area. Ultimately, there were four (4) different levels of access that influenced the sampling density and methodology:

1. Unrestricted access: areas with no restrictions and complete soil profiles could be inspected via test pitting to depth (916ha);
2. Limited access: areas where sampling was limited to the use of a mechanised hand auger (357ha);
3. Public roads: publicly accessible roadside verges where mechanised hand auger sampling was permitted (45ha); and
4. Inaccessible: areas where land access was restricted at the time of sampling, and no sampling was conducted. Should mine design occur in such study areas, Ausgold will conduct future investigations to check specific soil characteristics.

The distribution of these four access levels and the location of the mine concept footprints is shown in Figure 4. A considerable portion of the main pit footprint and the entirety of the north-west WRL footprint are within inaccessible areas.

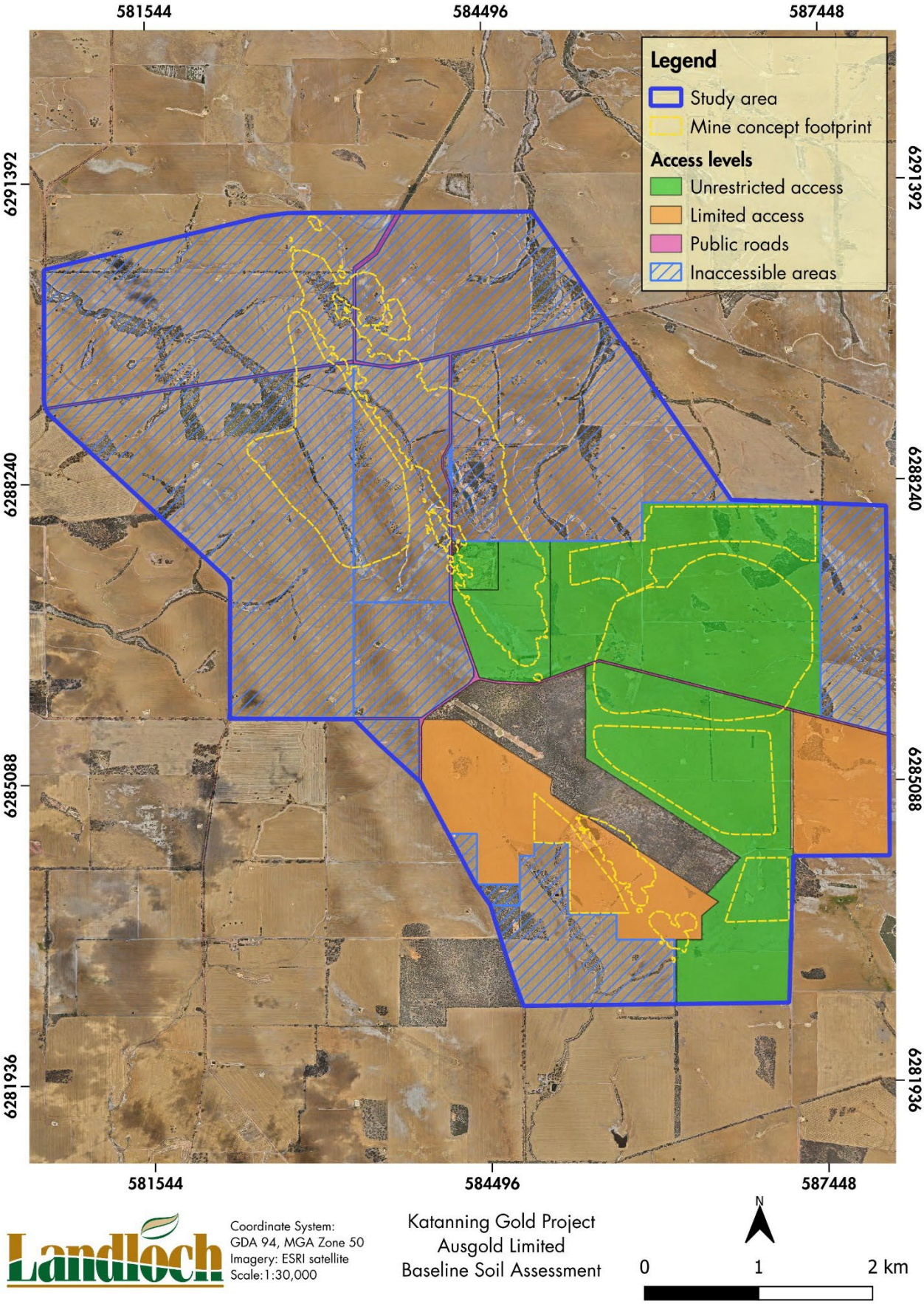

Figure 4: Locations of different access levels and proposed mine concept footprints within the Study area.

2.2.1 Mine concept footprint

The mine concept footprint has a total area of ~1,000ha. The mine concept footprint directs where land is likely to be developed and demarcates areas where there is a high potential to strip and stockpile soil resources beneficial for use in rehabilitation. These footprints were assessed using a 'medium (semi-detailed)' level of assessment. This level of assessment is suitable for assessing a project's feasibility or for semi-detailed project planning. It requires an inspection site every 20–100ha. It can produce mapping with a scale of 1:50,000 that will delineate areas of ~10ha and will detail groups of soils with similar properties. This sampling density was adopted for the mine concept footprints (~1,000ha). A total of 22 inspection sites were investigated as part of the field-based survey, equivalent to an inspection density of 1 site per ~47ha.

Of the 22 inspection sites, 15 were located within the unrestricted access areas of the mine concept footprints. 3 inspection sites were investigated within the limited access areas, with another 3 being located along public roads beside inaccessible areas.

2.2.2 Surrounding area

The remaining Study area outside of the mine concept footprint has a total area of ~2,800h. This area was assessed using a 'low (semi-detailed' level of assessment. This level of assessment is suitable for extensive land use, project feasibility, regional land inventory and district level planning. This can produce mapping with a scale of 1:100,000. This will delineate areas of ~40ha and will allow for the definition of soil units rather than individual soil types. This sampling density was adopted for the surrounding area (~2,700ha). Landloch assessed an additional 7 inspection sites within the broader surrounding area, outside the mine concept footprint.

Of these 7 inspection sites, 5 were located within the unrestricted access areas, 2 were within the limited access areas, and there were no additional inspection sites along the public road.

A total of 29 inspection points (including those within the mine concept footprints) were investigated within the surrounding area. This equates to approximately one inspection site every 131ha.

The percentage of the survey area located within each access type is summarised in Table 2 below.

Table 2: Percentage of access type associated with the mine concept footprint.

Access type	Mine concept footprint (%)
Unrestricted Access	55%
Limited Access	7%
Public Roads	1%
Inaccessible*	37%

*In areas that were inaccessible and away from public roads, further sampling and assessment may be undertaken if required following land access arrangements.

2.2.3 Inspection site selection

The locations of the soil inspection sites were determined prior to mobilisation into the field. Locations were selected based on the outcomes of the desktop review, with consideration of the following:

- Soil landscape systems mapping;
- Broadscale ASC mapping
- Aerial imagery;
- Land gradient and relief; and
- Land accessibility.

The field survey was conducted in February 2024. Each soil inspection site was located in field using hand-held GPS. The locations were adjusted where necessary to allow for a suitable inspection site to be constructed safely.

Coordinates for each soil inspection site are provided in Table 3, and their locations are shown in Figure 5. A total of 29 sites were investigated during the field-survey, 20 had soil profiles excavated via machinery and 9 were sampled by auger.

Table 3: Soil inspection site ID and coordinates (GDA94, Zone 50).

Soil Inspection Sites Constructed by Excavator					
Site ID	Easting (m)	Northing (m)	Site ID	Easting (m)	Northing (m)
TP01	584,697	6,287,607	TP11	587,295	6,287,109
TP02	584,855	6,287,168	TP12	587,042	6,286,590
TP03	584,660	6,286,750	TP13	587,173	6,286,217
TP04	584,336	6,286,785	TP14	586,164	6,286,075
TP05	585,452	6,287,433	TP15	586,891	6,285,524
TP06	585,415	6,286,758	TP16	585,944	6,285,200
TP07	585,875	6,287,398	TP17	586,913	6,284,900
TP08	586,196	6,287,394	TP18	586,781	6,283,973
TP09	586,339	6,287,868	TP19	587,092	6,283,810
TP10	587,092	6,287,671	TP20	586,680	6,283,079
Soil Inspection Sites Investigated by Auger					
Site ID	Easting (m)	Northing (m)	Site ID	Easting (m)	Northing (m)
HA01	584,588	6,284,574	HA06	584,197	6,288,147
HA02	585,099	6,284,527	HA07	583,752	6,289,455
HA03	585,747	6,284,397	HA08	583,002	6,289,445
HA04	585,868	6,283,505	HA09	583,366	6,290,200
HA05	586,223	6,283,617			

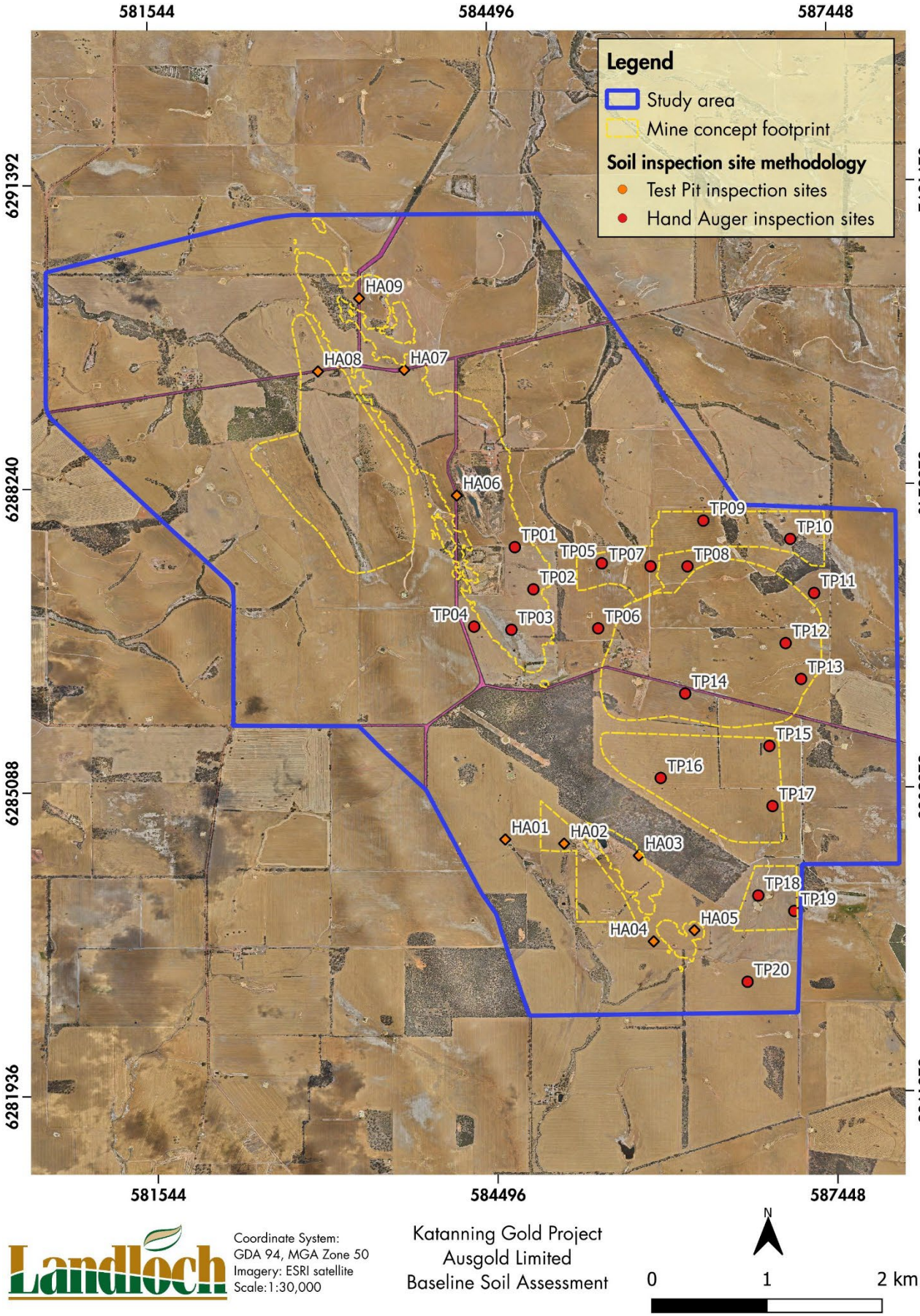

Figure 5: Location of soil inspection sites within the Study area.

2.2.4 Soil inspection site description

Site information, soil profile descriptions, and baseline soils data were recorded at each of the excavated soil pit inspection sites in line with the Australian Soil and Landscape Survey Field Handbook (NCST 2009). Soil profile descriptions were unable to be recorded for augured soil inspection sites.

At each of the excavated test pit inspection locations, a soil pit was dug using an excavator to a depth of ~1.5m or machinery refusal. Images of the landscape, vegetation, soil surface and soil profile were taken. Observation of the location, landform type, vegetation, land surface, and soil profile were recorded at each site.

At each of the hand auger inspection locations, a minimum of two holes were dug via varying depths of machinery refusal. Images of the landscape, vegetation, soil surface and excavated soil were taken. Observations of the location, landform type, vegetation, land surface, and soil profile were recorded at each site.

Location, landform, vegetation, and land surface observations included:

- Assessment date;
- GPS coordinates;
- Current land use;
- Dominant vegetation forms;
- Vegetation cover percentage;
- Land surface aspect and microrelief;
- Surface coarse fragments (abundance and size);
- Rock outcrop abundance; and
- Erosion state, type and extent.

The following information was recorded for each soil horizon observed within an assessed soil profile:

- Horizons (including depth and boundary type);
- Field texture;
- Colour (Munsell);
- Coarse fragment abundance and size;
- Soil structure type and grade;
- Soil consistency;
- Root abundance and size; and
- Presence of mottling and segregations (not possible at auger sites).

The information recorded for each soil inspection site is provided in the soil log data sheets (Appendix B).

2.2.5 Soil sampling

Soil samples from a range of depths were collected from all soil inspection sites. The number of samples taken at each site varied based on the depth of the soil pit/auger hole and/or the homogeneity of the soils within the soil profile. Generally, one sample

was taken from the topsoil (A) horizon and 1 - 4 samples from the diagnostic (B) horizons. A total of 105 soil samples were collected from the 29 soil inspection sites.

2.3 Soil characterisation

2.3.1 Soil testing

All soil samples collected were transported to Landloch's facility in Perth and assessed for the following parameters:

- pH_w (1:5 solids: deionised water solution);
- Salinity, $EC_{1:5}$ (1:5 solids: deionised water solution);
- Emerson dispersion test;
- Coarse fragment percentage (>2mm diameter); and
- Presence/absence of carbonates.

In addition to this, 40 samples from 11 sites were submitted for more detailed laboratory analysis (Table 4). The laboratory analyses were split into a topsoil and subsoil characterisation suite in line with DMP (2016). Of the 40 samples, 20 were tested for the topsoil suite, with the remaining 20 undergoing the subsoil characterisation suite.

Table 4: Detailed soil laboratory analysis (40 samples).

Test suite	Target samples	Analysis
Topsoil	Topsoil (A) horizon, generally the surface 100-200 mm. Analyses include chemical and physical properties of the soil, and soil fertility. This is the soil depth that contains the majority of fertility and is supporting existing vegetation.	• pH_w • Salinity, $EC_{1:5}$ • Soluble Cl • Exchangeable cations (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Al^{3+}) • Effective cation exchange capacity (ECEC) • Exchangeable sodium percentage (ESP) • Particle size distribution of the fine fraction (<2mm) • Organic C • Total N and Total P • Available P and K (Colwell) • Available S (KCl) • Trace Cu, Zn, Mn, Fe (DTPA)
Subsoil	Subsoil (B) and substrate (C) horizons, below the topsoil. Analyses include chemical and physical properties of the soil, excluding fertility.	• pH_w • Salinity, $EC_{1:5}$ • Soluble Cl • Exchangeable cations (Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Al^{3+}) • Effective cation exchange capacity (ECEC) • Exchangeable sodium percentage (ESP) • Particle size distribution of the fine fraction (<2mm)

2.3.2 Data interpretation scheme

As part of this project, a scheme was developed to assist with the interpretation of soils data to define the growth media suitability and structural stability of the soils. The scheme establishes a baseline of the existing properties of soils depending on whether they support vegetation (to varying degrees). Parameters considered include pH_w, $EC_{1:5}$, fertility, structural stability and coarse fraction percentage. The defined values are relevant to the Study area. This interpretation scheme can continue to be validated and further refined by future growth media/vegetation trial, particularly if waste materials sourced from depth are used as alternative growth media as part of rehabilitation.

2.3.2.1 Soil pH_w

A general classification of soil pH_w values is given in Table 5 (Hazelton and Murphy 2016). This classification allows for pH values to be expressed in qualitative terms but does not provide guidance on the suitability of a given pH value for vegetation establishment. A reasonable approach for assessing the suitability of soil pH is to consider the pH levels of the topsoils that currently support vegetation. This approach acknowledges vegetation presence but does not identify potential differences in vegetation type that may establish at varying pH values. In the case of the Study area, all soil inspection sites except for those located along public roads were located within agricultural cropping fields. No vegetation was present aside from the wheat stubble that remained following harvest.

It is assumed that following the completion of mining operations, the Project will be rehabilitated to allow for farming operations to again be undertaken where feasible. For this purpose, the soil pH_w of sites where farming is currently being undertaken (i.e. wheat stubble is present and topsoil root abundance is common or greater) was used to indicate a pH range that will provide a suitable land condition for the current land use.

The range of pH_w values of the topsoils that are currently supporting cropping ranged from 5.0 to 6.0. This is a range from strongly acid to slightly acid. Soils with pH_w values greater than 6.0 or less than 5.0 will be defined as soils that may not be suited to establishment and growth of the historically used cropping species.

Table 5: General soil pH_w classification (Hazelton and Murphy 2016).

pH_w (pH units)	Classification
<4.0	Very strongly acid
4.0–5.5	Strongly acid
5.5–6.0	Moderately acid
6.0–7.0	Slightly acid
7.0–8.0	Slightly alkaline
8.0–9.0	Moderately alkaline
9.0–10.0	Strongly alkaline
>10.0	Very strongly alkaline

2.3.2.2 Soil salinity ($EC_{1:5}$)

Salinity is often measured using the electrical conductivity (EC) of a solution containing 1 part solids to 5 parts deionised water ($EC_{1:5}$). Salinity ranges for soils based on their clay content are provided below in Table 6. These ranges provide salinity ratings and typical crop response based on $EC_{1:5}$ for a range of soil clay contents.

Salinity values that are rated as High or greater, for a given soil's clay content, were used to indicate materials that are likely to adversely impact salt tolerant and very salt tolerant cropping species. Typically topsoils of the Study area had clay content in the 10 – 20% range and subsoils were in the 40 – 60% range.

Table 6: Soil salinity ratings for a range of soil clay contents (Hazelton and Murphy 2016).

Soil salinity rating	$EC_{1:5}$ (dS/m) ratings for a range of soil clay contents				Plant salt tolerance group
	10 – 20% clay	20 – 40% clay	40 – 60% clay	60 – 80% clay	
Very low	<0.07	<0.09	<0.12	<0.15	No effect
Low	0.07 – 0.15	0.09 – 0.19	0.12 – 0.24	0.15 – 0.30	Moderately sensitive crops affected
Medium	0.15 – 0.34	0.19 – 0.45	0.24 – 0.56	0.30 – 0.70	Moderately tolerant crops affected
High	0.34 – 0.63	0.45 – 0.76	0.56 – 0.96	0.70 – 1.18	Tolerant crops affected
Very high	0.63 – 0.93	0.76 – 1.21	0.96 – 1.53	1.18 – 1.87	Very tolerant crops affected
Extreme	>0.93	>1.21	>1.53	>1.87	Too saline for crop growth

2.3.2.3 Fertility

Similar to pH values, the determination of generalised guidelines for suitable fertility values for a wide range of soils and sites is very difficult. A reasonable approach to defining suitable soil fertility is to consider the fertility values of the topsoils from sites that contained crop stubble and common to many roots (10 - >200 roots present). The resulting fertility parameter values are summarised in Table 7 and represent values that are not expected to limit crop growth or establishment.

It is noted that agricultural soils are typically and consistently treated with fertilisers to achieve a desired nutrient level for a given plant cover. Therefore, the provided fertility parameter values are not considered to be as stringent as fertility parameter values used in native re-vegetation. As such, desired end land use will guide nutrient suitability.

Table 7: Suitable nutrient values based on measured values from the topsoils.

Nutrient	Unit	Value
Total Nitrogen	mg/kg	>1200
Total Phosphorus	mg/kg	>130
Organic Carbon	%	>1.5
Available Phosphorus (Colwell)	mg/kg	>13
Available Potassium (Colwell)	mg/kg	>100

2.3.2.4 Structural stability

Structure is the arrangement of primary particles into secondary units or peds. The secondary units are characterised on the basis of size, shape, and grade. A structurally unstable soil is one that tends to have minor or reduced particle arrangement.

It is important to note that the structural stability of a material as used in this report is different to geotechnical stability (e.g. potential for mass movement).

Structurally unstable soils may be prone to:

- Tunnel erosion;
- Increased bulk density and hardsetting surfaces;
- Increased runoff and erosion potential;
- Reduced water holding capacity and infiltration capacity; and
- Reduced root penetrability.

A soil's potential to have an unstable structure is dependent on both its chemical and physical characteristics. These are considered in a number of ways.

The proportion of exchangeable Na held on the soil's exchange complex in relation to other exchangeable cations is important. This is referred to as the Exchangeable Sodium Percentage (ESP). McKenzie *et al.* (2004) considers the measurement of ESP as suitable for assessing the potential for clay dispersion when a soil's Effective Cation Exchange Capacity (ECEC) is >3meq/100g and exchangeable Na is >0.3 meq/100g. Further, clay dispersion risk is greatest in soils with loam or clay textures (clay fraction >10%). Sand dominated soils are not prone to structural instability even if they have high ESP.

Clay dispersion potential for a soil is also influenced by interactions between clay content, ESP, and $EC_{1:5}$. The Electrochemical Stability Index (ESI) is a way of considering the relationship between ESP and $EC_{1:5}$ for loam and clay textured soils (clay fraction >10%). A tentative critical ESI value is 0.05 (McKenzie *et al.* 2004), with ESI <0.05 and clay content >10% indicating a soil that is prone to structural instability due to clay dispersion.

Magnesic soils can also be prone to clay dispersion. This is assessed using a combination of the Exchangeable Magnesium Percentage (EMP), exchangeable Ca:Mg ratio, ESP, and clay content. Clay dispersion may occur if the following conditions are met:

- EMP >30%, Ca:Mg ratio <1 and ESP >4%. Clay dispersion has been recorded when (ESP + EMP/10) is >6%, assuming the soil also has >10% clay (Fenton and Conyers 2022).

Soils with a high combined proportion of fine sand, silt, and clay (particles ≤0.2mm) are prone to structural instability, even if their clay fractions are not chemically dispersive. This is because the smaller particles can mobilise within the coarse sand matrix. For this reason, soils with a combined fine sand, silt, and clay fraction >70% are considered to be at an increased risk of structural instability (Vacher *et al.* 2004).

It is noted that a soil can have a fine fraction that is prone to structural instability, but if the proportion of unstable fines is small, the soil as a whole may be structurally stable. Typically, a binary mixture with >30 – 40% fines and <60 – 70% coarse fraction could be considered a fines-dominated material with some coarse fraction; a binary mixture with <30 – 40% fines and >60 – 70% coarse fraction could be considered a coarse-dominated material with some fines. Based on this, a fines fraction cut-off of >40% seems reasonable, with soils that contain >40% fines being at risk of structural instability if the fine fraction meets one or more of the other criteria outlined above. A soil with <40% fines is classified as not being prone to instability, even if the fine fraction is prone to instability.

To capture interactions between physical and chemical properties and their effect on structural stability, the samples were assessed against these four criteria. If any of these criteria are met, that soil was classified as being prone to structural instability. The criteria are detailed in Table 8.

Table 8: Structural stability criteria.

ESP criteria	EMP criteria
• Clay content >10% of fines, and • Fines >40%, and • ECEC >3meq/100g, and • Ex. Na >0.3meq/100g, and • ESP >6%.	• Clay content >10% of fines, and • Fines >40%, and • ECEC >3meq/100g, and • EMP >30%, Ca:Mg <1, & ESP >4%, or • EMP >30%, Ca:Mg <1, & (ESP + (EMP/10) >6%
ESI criteria	**PSD criteria**
• Clay content >10% of fines, and • Fines >40%, and • ESI <0.05.	• Fines >40%, and • Fine sand + silt + clay >70% of fine fraction.

2.3.2.5 Coarse fraction

In addition to its influence on structural stability, the abundance and size of the coarse fraction also has a significant bearing on a soil's erosion potential. Surfaces with more abundant durable coarse fragments are more likely to be erosion resistant than surfaces with a lower abundance of durable coarse fragments.

For the purpose of this report, soils with a coarse fragment abundance >50% and coarse fragment sizes >20mm will be considered to potentially have a high resistance to erosion.

2.4 Soil classification schemes

The soils of the Study area were classified using the following soil classification systems:

- Australian Soil Classification; and
- Soil Groups of Western Australia.

Details on these systems are provided below.

2.4.1 Australian Soil Classification (ASC)

The Australia Soil Classification (ASC) (Isbell and NCST 2021) is the national system for soil classification. The scheme defines soil classes on real soil bodies using a key. The ASC uses a set of defined attributes, horizons, and materials to assign a soil profile to a class. Collectively, these concepts are called diagnostic features. Classes are allocated based on a vertical soil profile as seen in an exposed soil pit, and account for geographic attributes of the landform.

2.4.2 Soil Groups of Western Australia (SGWA)

The SGWA (Schoknecht and Pathan 2013) is a standardised scheme that provides common names for the main soil types specific to Western Australia. SGWA classes are allocated based on soil texture and depth, and is used to assist with communicating information collected from land and rangeland mapping programs. The soils are named and described at two levels:

1. Soil supergroups, using three criteria:
    a. Texture or permeability profile;
    b. Coarse fragments (presence and nature); and
    c. Water regime.
2. Soil groups, using one or more of the following:
    a. Calcareous layer (presence of carbonates);
    b. Colour;
    c. Depth of horizons/profile;
    d. pH (acidity/alkalinity); and
    e. Structure.

Similar to the ASC, the main method for classification is through description of an exposed soil profile. This provides the majority of the primary and secondary criteria required to classify the soils into a soil supergroup, and then the soil group.

2.5 Soil mapping units

In addition to the ASC and SGWA, the soils of the Study area were grouped into Soil Mapping Units (SMUs). SMUs are the basic geographic component of a soils map and ca be associated with a single or multiple soil types with definable characteristics. SMUs are developed based on recurring landscape and soil attributes, with minor variations in soil properties allowable within each SMU. The purpose of SMUs is to group soils by their management requirements, such as depth, salinity, sodicity, and coarse fragments. For the purpose of this project, SMUs were used as the basis for defining the viability and volume of the potential topsoil and subsoil resource.

3 SOIL CLASSIFICATION

3.1 Australian Soil Classification

The ASC uses a set of defined attributes, horizons, and materials to assign a soil profile to a class. Collectively, these concepts are called diagnostic features. These features are ranked based on their likely importance to the use of a soil; however, this ranking is subjective and arbitrary to a varying extent. In this way, the ASC provides an indication of a soil's potential for use, generally from an agricultural perspective. Classification of soils to the ASC relies on observations made of the soil profile, and interpretation of physical and chemical soils data.

Within the Study area, soil inspection sites were classified to the ASC, with four classes identified:

1. Sodosol;
2. Dermosol;
3. Kurosol; and
4. Rudosol.

A summary of each ASC Order and associated soil inspection sites is provided in Table 9. A spatial representation of each ASC Order is illustrated in Figure 6. Complete soil profiles could not be assessed for the hand auger inspection sites. The limited physical and chemical properties of these samples were used to assign each hand auger site to a given ASC Order.

The most common soil order found in the Study area are Sodosols (14 sites). Dermosols are also common throughout the Study area (12 sites). Both Rudosols and Kurosols were associated with a significantly reduce number of inspections sites (1 and 2 sites, respectively).

Sodosols are associated with 13 test pit inspection sites and 1 hand augured inspection site. Sodosols are classified as soils with a clear and abrupt textural contrast between the A and B horizons, where the majority of the B horizon is sodic (ESP >6%). As such, a key defining characteristic of Sodosols is their susceptibility to structural instability due to their sodic properties. The Sodosols encountered in the Study area have medium to medium heavy clay subsoils with sandy topsoils. Typically, the Sodosols are associated with the upper and mid slopes of the landscape.

Dermosols are soils with structured B2 horizons that lack a strong texture contrast between the A and B horizons. A key feature of these soils is the development of coherent soil structure. The Dermosols of the survey area are associated with a variety of landform types, including crests, upper and middle slopes. The Dermosols encountered have a variable abundance of coarse fragments (>2mm in size) and pH range from moderately acid to slightly acid.

Kurosols are soils with a clear and abrupt textural contrast between the A and B horizons where the B horizon is strongly acid. The Kurosols of the Study area are associated with 2 inspections sites. The Kurosols encountered have sandy topsoils and medium clay subsoils. They are associated with upper and mid slope landforms.

Rudosols that have little if any pedological organisation. These are typically sandy soils that lack coherent soil structure. Rudosols of the Study area are associated with a single inspection site (TP03). The Rudosols encountered are shallow sandy soils with low abundance of clay and coarse material laying atop a cemented layer.

Table 9: Australian Soil Classification of the soils within the Study area.

ASC	Description	Percentage of Study area (%)	Sites
Sodosol	Soils that have a clear and abrupt texture contrast between the A and B horizons. The majority of the soil profile is sodic.	60.4	TP01, TP05, TP07, TP08, TP09, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP19, HA01
Dermosol	Soils with structured B2 horizons and lacking a strong texture contrast between the A and B horizons. Although there is some diversity within the order, it brings together a range of soils with some important properties in common.	33.7	TP02, TP04, TP18, TP20, HA02, HA03, HA04, HA05, HA06, HA07, HA08, HA09
Kurosol	Soils that have a clear and abrupt texture contrast between the A and B horizons. The majority of the soil profile is acidic.	5.5	TP06, TP17
Rudosol	Soil with little to no pedological organisation.	0.4	TP03

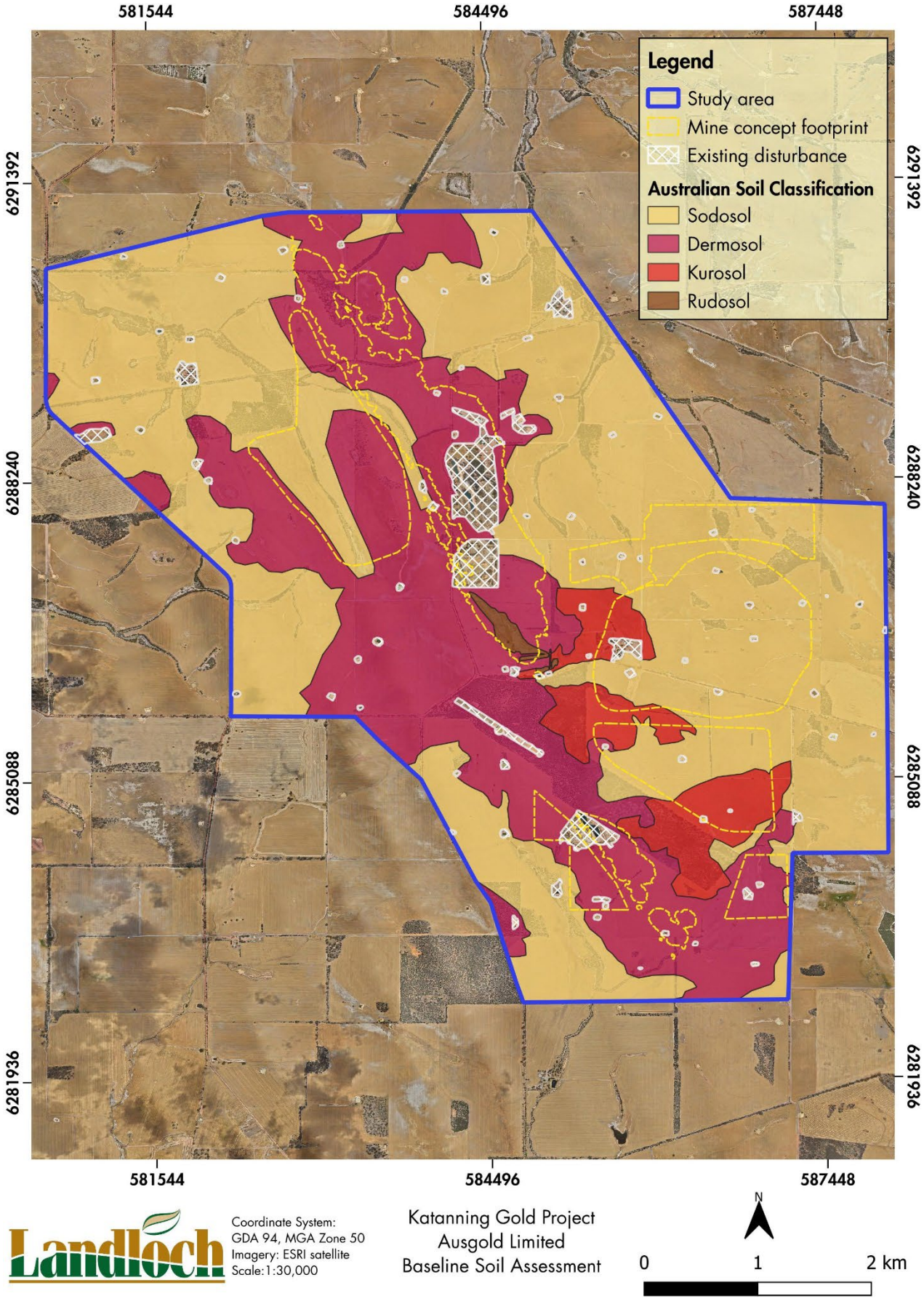

Figure 6: Australian Soil Classification order distribution within the Study area.

3.2 Soil Groups of Western Australia

The SGWA classification system was developed to assist with communication of information collected in land resource and rangeland mapping programs. It was designed to provide a standard way of giving common names to the main soils of the state, to provide a simple method for identification, and to assist with the communication of soils information at a general level.

Similar to the ASC, the main method for classification is through soil description of an exposed soil profile. This provides the majority of the primary and secondary criteria required to classify the soils in a soil supergroup, and then the soil group. Using the soil profile descriptions, all sites were classified to the SGWA, with resulting classification in Table 10 and mapping illustrated in Figure 7.

Table 10: Soil Groups of WA classification of the soils within the Study area.

Soil Group of WA	Description	Sites
Yellow/Brown Deep Sandy Duplex	Yellow or brown sandy surface with a texture contrast to sandy clay loam or clay within 30–80cm.	TP06, TP09, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP19
Grey Deep Sandy Duplex	Grey sandy surface with a texture contrast to sandy clay loam or clay within 30–80cm.	TP01, TP04, TP05, TP07, TP18, HA01
Brown Sandy Earth	Brown sandy surface grading to loam by a depth of 80cm.	TP20, HA02, HA03, HA06, HA07, HA08
Yellow Sandy Earth	Yellow sandy surface grading to loam by a depth of 80cm.	HA04, HA05, HA09
Red Shallow Sandy Duplex	Red soils with a sandy surface and a texture or permeability contrast at depths at or below 30cm.	TP02, TP17
Pale Shallow Sand	Sands less than 80cm in depth, overlaying rock, hardpan or a cemented layer.	TP03
Yellow/Brown Shallow Sandy Duplex	Soils with a sandy surface and a texture or permeability contrast at depths at or below 30cm.	TP08

The most common SGWA class is the Yellow/Brown Deep Sandy Duplex, making up approximately 34% of all the survey inspection sites. These are well structured soils that have a texture or permeability contrast at depths of 30–80cm. Typically these soils have sandy topsoils and medium clay subsoils. Coarse fragment abundance is variable.

Grey Deep Sandy Duplex soils make up ~20% of all surveyed inspection sites. These soils are similar to the Yellow/Brown Deep Sandy Duplexes but differ in soil colour. These soils typically have a low abundance of coarse fragments, and are sodic.

Combined, the Brown and Yellow Sandy Earths comprise 31% of the surveyed inspections sites. These are sandy soils that have an increased clay content at depths, without a clear textural or permeability contrast. The remaining soil classes are associated with only one or two inspection sites and contain Shallow Sandy Duplexes of varying colour and Pale Shall Sands. Shallow Sandy Duplexes contain a texture contrast at depths <30cm. Pale Shallow Sands, are sandy soils with a depths no greater than 80cm and overlay a rock cemented layer.

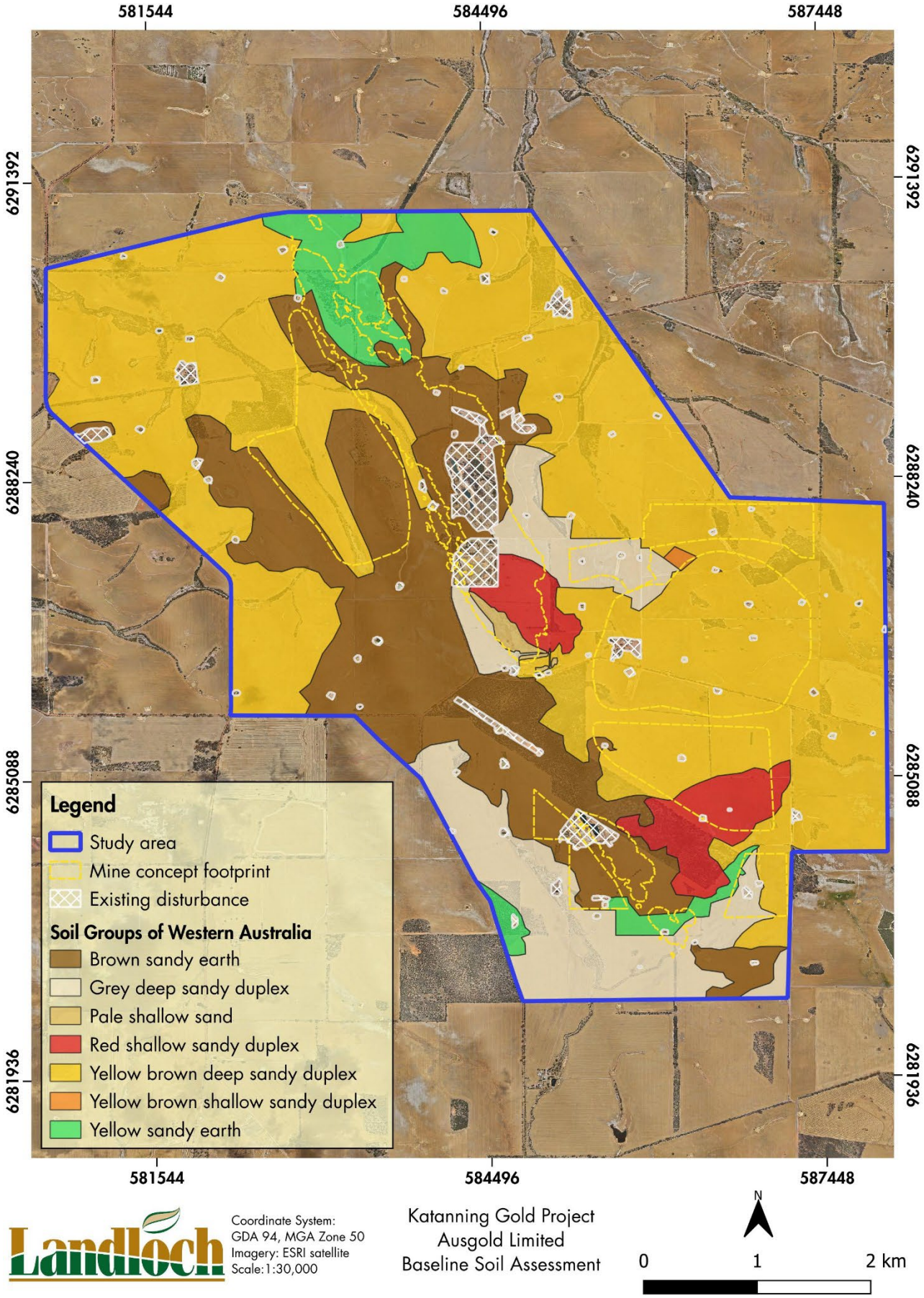

Figure 7: Soil Groups of Western Australia distribution within the Study area.

3.3 Soil Mapping Units

Both the ASC and SGWA classification systems provide a high-level understanding of the soils for a given area. However, these classification systems were developed to understand the *in situ* soils. These classification schemes do not consider land uses that actively strip, invert, and/or stockpile soils (i.e., mining). Development of SMUs allows for consideration of the soil-disturbing actions in light of the end use of the soils (that is, rehabilitation of the land disturbed by mining). As such, this report focuses on the development and mapping of SMUs for the determination of stripping depths, potential for re-use during rehabilitation, and management of the soil resources during the life of the mine.

Using both the ASC and SGWA classifications, the soil inspection sites were grouped into SMUs based on their management requirements, particularly their morphological properties, chemical data, particle size distributions, and coarse fragment abundance. Three SMUs were defined:

- Sodic Duplex: Soils characterised by the contrast between sandy topsoils and well-structured and highly sodic subsoils. Topsoils are typically dominated by loamy sands but does include loams. Clay content typically increases significantly and abruptly with depth. The subsoils are highly sodic and prone to structural instability. The Sodic Duplex Soils are located in various landscape positions, from crests and upper slopes to the lower slopes and drainage lines of the Study area.
- Acidic Soils: Soils where both the topsoils and subsoils are typically strongly acidic. Topsoils are sand dominated but can include loams. The subsoils have an increased clay content compared to the topsoils, ranging from loams to medium heavy clays. Coarse fragment abundance is variable within this SMU. The Acidic Soils are prone to structural instability.
- Shallow Sands: Sandy soils that are restricted to a single area within the Study area, with shallow structureless sands laying atop a cemented lateritic layer. Although these sands are considered to be sodic, they are not prone to structural instability.

A summary of the SMUs and the soil inspection sites associated with each is provided in Table 11.

Table 11: Soil Mapping Units within the Study area.

Soil Mapping Unit	Description	Test Pit Sites
Sodic Duplex	Deep soil profiles that have a clear contrast between sandy topsoils and clay subsoils. The subsoils are highly sodic and prone to structural instability.	TP01, TP05, TP07, TP08, TP09, TP10, TP11, TP12, TP13, TP14, TP15, TP16, TP19
Acidic Soils	Deep soil profiles with variable soil texture in both the topsoils and subsoils. Topsoils and subsoils are strongly acidic, and prone to structural instability.	TP02, TP04, TP06, TP17, TP18, TP20
Shallow Sands	Shallow structureless sandy soils overlaying a cemented lateritic layer at ~0.5m.	TP03

An overview of the key soil attributes that are common across all three SMUs, and those which differentiate the SMUs are given below.

3.3.1 Common attributes of the SMUs

Attributes of the soils that are consistent across the Study area and as such, are not a differentiating factor for the development of SMUs are outlined as follows:

- All SMUs are considered to have low to very low salinity. Median salinity values for all SMUs are below 0.07dS/m. A single outlying Acidic Soils site (TP20) was considered as saline, with increased salinity (>0.15dS/m) at all soil depths.
- Coarse fragment size and abundance was variable within each SMU. Typically gravel size was below 20mm and abundance was below 50% for individual soil horizons. As such, the gravel content of each SMU is unlikely to be sufficient to mitigate any structural instability.

3.3.2 Differentiating soil attributes of the SMUs

They key differentiation attributes of the three SMUs are:

- Soil texture;
- Soil pH_w;
- Profile depth;
- Ploughed or tilled topsoils;
- Structural instability; and
- Fertility

3.3.2.1 Soil texture

The soil textures of the Sodic Duplex topsoils vary from sands to loams, with subsoils comprising a clear increase in clay content (medium to medium heavy clays). While the Acidic Soils' topsoils are similarly loamy sands and sandy loams, the subsoils have a reduced clay content and typically range from clay loam to light clay. The Shallow Sandy soils have a single soil texture of sand and contain the lowest clay content of any SMU (<1%).

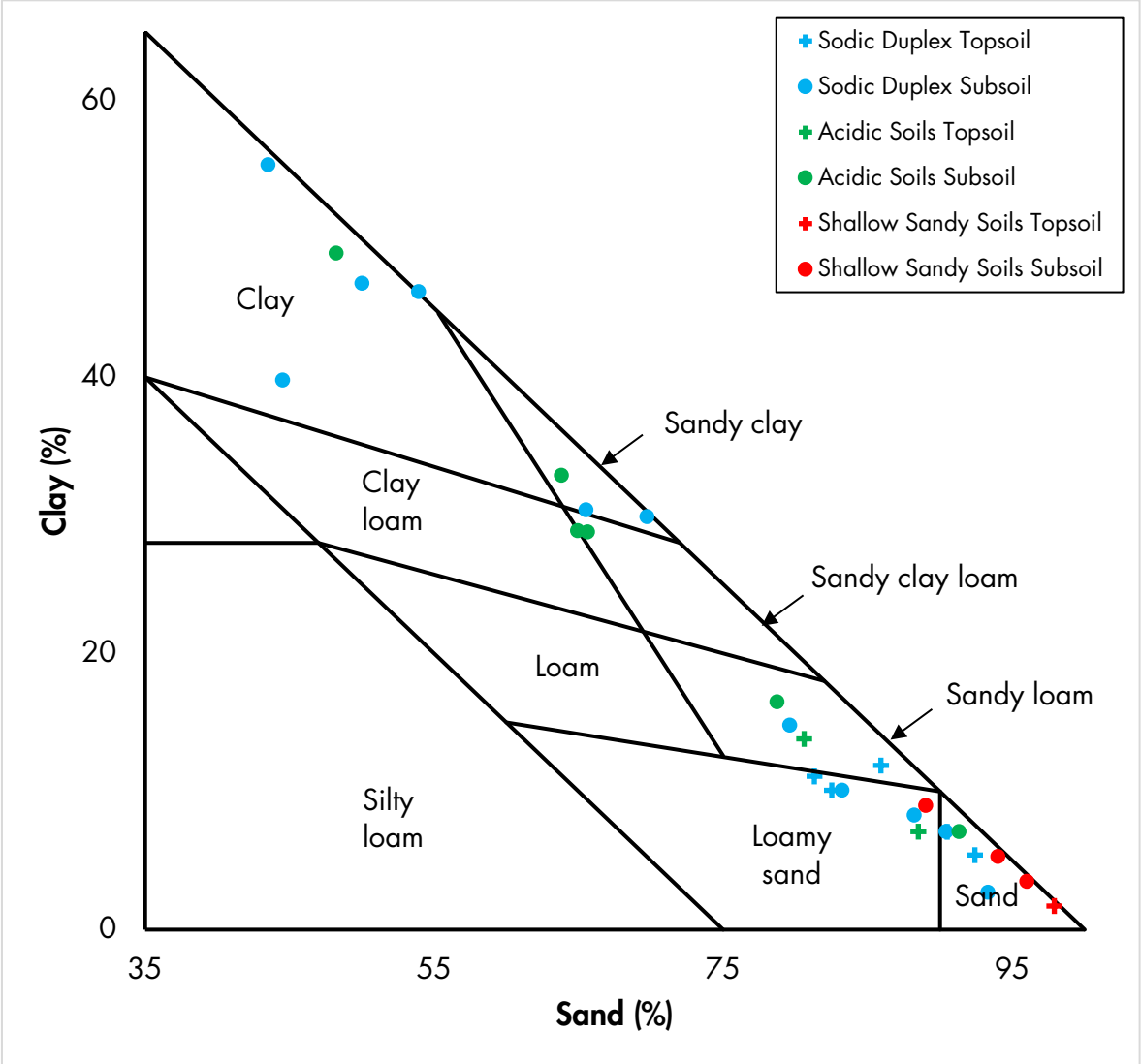

Figure 8: Soil texture classifications for samples subject to particle size distribution testing.

3.3.2.2 Soil pH_w

The soil pH_w values for both the Acidic Soils and Shallow Sandy soils are similarly classified as very acidic (<5.5). The topsoils of both SMUs have a median pH_w value of 5.5, with acidity typically increasing with depth for both SMUs (median subsoil pH_w 5.2). The Sodic Duplex are typically slightly acidic throughout the profile, with a median pH_w value of 6.0 for both topsoils and subsoils. Two Sodic Duplex sites, TP14 and TP16, had subsoil pH_w values within the moderately alkaline range with median values of 8.1 and 8.2, respectively.

Figure 9 below presents the median pH values throughout the observed soil profiles for each SMU.

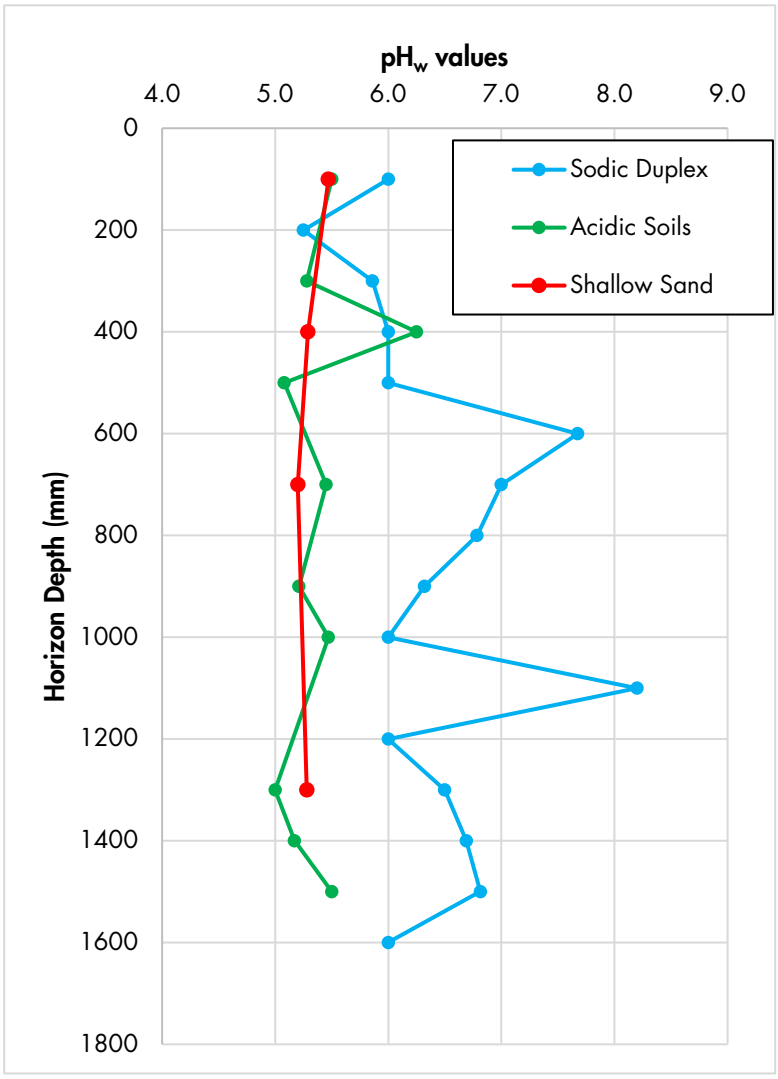

Figure 9: Median pH values throughout the observed soil profile for the SMUs.

3.3.2.3 Soil profile depth

Both the Sodic Duplex soils and the Acidic Soils consist of deep soil profiles. Typically, soil test pits for these SMUs were 1.5m deep with the deepest being recorded at 1.6m in depth. The Shallow Sands were 0.5m at their deepest point, with a concreted lateritic layer present from 0.5m, which extended to a depth of 1.3m and beyond.

3.3.2.4 Ploughed or tilled topsoils

Both the Sodic Duplex and Acidic Soil contained 'Ap' soil horizons. These are soil horizons where ploughing or tillage practices have occurred. As these are agricultural soils, periodic disturbance of the topsoils has been undertaken through ploughing and the application of fertilisers. Such soils horizons are not present in the Shallow Sands, where disturbance associated with agricultural activities has not occurred.

3.3.2.5 Structural instability

Both the Sodic Duplex and Acidic Soil topsoils and subsoils are prone to structural instability based on ESP, EMP and ESI. Additionally, the Sodic Duplex Soils also fail based on PSD. As such, both these soils can be considered as highly prone to erosion. The Shallow Sandy Soils are the only SMU that are not prone to structural instability.

3.3.2.6 Fertility

Similarly to the ploughed or tilled topsoils, the fertility values of the SMUs reflects the intensity of agricultural work undertaken on each SMU. Both the Sodic Duplex and Acidic Soils' topsoils have considerably higher nutrient values (total N, Total P, Organic C) than the Shallow Sands. This is consistent with the periodic application of fertilisers as part of agricultural works, which is evidently not undertaken at the location of the Shallow Sands. However, it must be noted that sands have a very low capacity to hold nutrients. Even if subjected to similar agricultural processes and inputs as the Sodic Duplex and Acidic Soil SMUs, the Shallow Sands would likely have significantly lower nutrient values due to a lack of clay.

3.3.3 Attributing SMUs to hand augured sites

The soils data obtained from the nine (9) hand auger sites is not comprehensive enough to be used in the development of SMUs. Many of the sites had a depth of refusal as shallow as 0.5m due to a sudden increase in either clay content or coarse material. The available soils data was assessed in line with the SMU definitions described above. Where soil properties matched those of a defined SMU, the hand auger site was mapped at that SMU. If the soil properties of a given hand auger site did not match any of the SMUs, it would be tentatively classified as a separate unit.

Hand auger sites that had elevated ESP and soil pH_w values classified as moderately to slightly acid (5.5–7.0) were classified as Sodic Duplex Soils. Seven (7) of the nine (9) Hand Auger sites were determined to have properties that are similar to Sodic Duplex Soils.

Where soil pH_w was classified as strongly acid (pH_w range 4.0 – 5.5) and ESP was low, a hand auger site would be classified as the Acidic Soil SMU. Two (2) of the nine (9) hand auger sites were determined to have properties that are similar to the Acidic Soils.

It is recommended that when land access has been granted, additional soil profile inspections be undertaken alongside the hand auger sites. This will allow for a more detailed assessment of the entire soil profile. Additionally, any soils with properties that differ from the defined SMUs can be identified and classified under a new SMU.

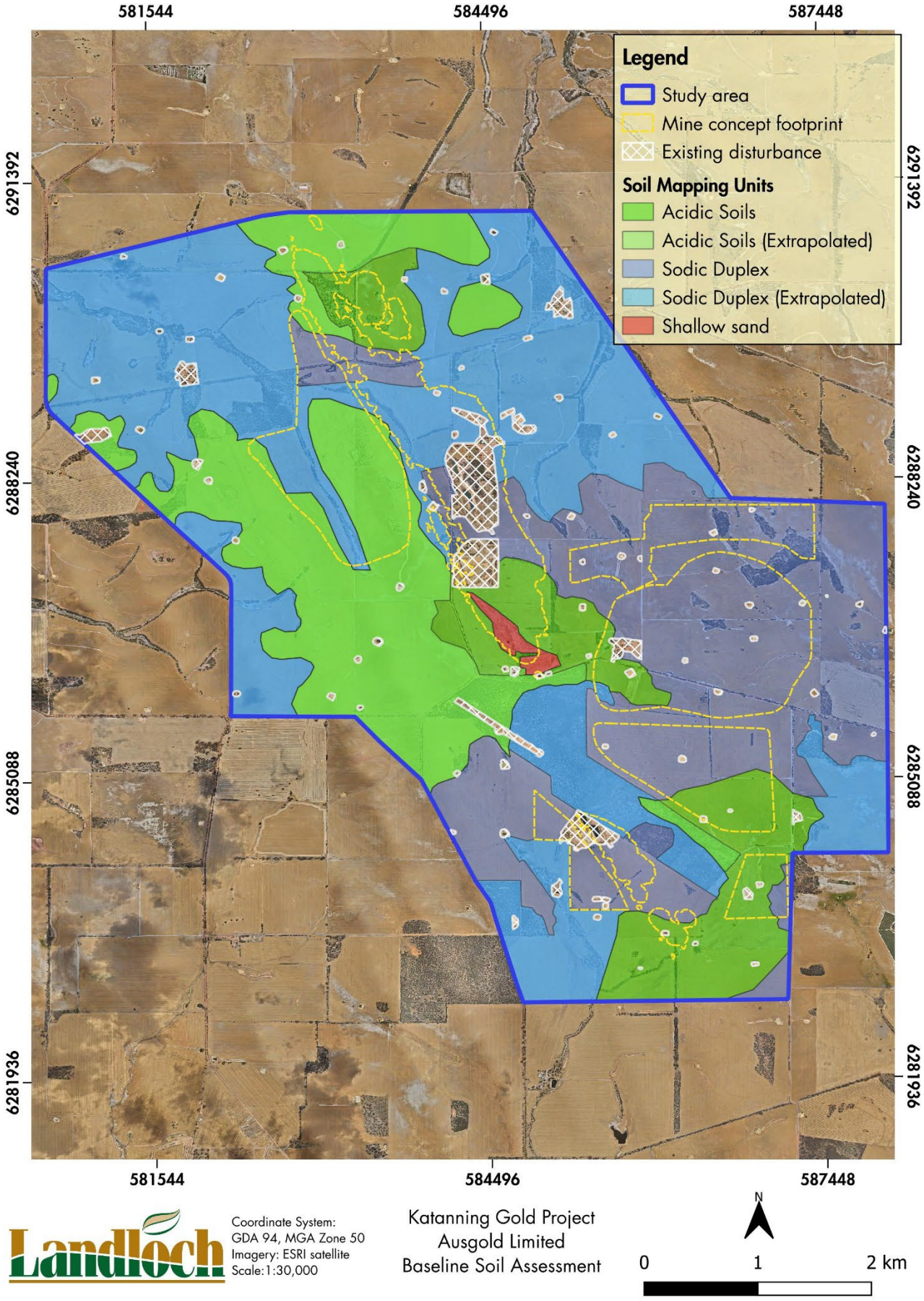

Figure 10: Soil Mapping Unit distribution within the Study area.

3.3.4 Sodic Duplex Soils

The Sodic Duplex soils are the most abundant SMU within the Study area. This SMU is associated with a variety of landscape positions including crests, upper and lower slopes, and drainage lines. The Sodic Duplex soils typically consist of a deep soil profile (>1.5m) with sandy topsoils atop sodic clay subsoils. All Sodic Duplex topsoils have been subject to a consistent regime of ploughing and fertiliser application via agricultural operations. This has resulted in a significantly darker topsoil colour compared to the subsoils, and high nutrient values.

The subsoils of this SMU range from non-sodic to strongly sodic (1 - 35%) and have a median ESP of 14% (strongly sodic). High sodicity has been linked to dispersive soils throughout Western Australia (Cochrane *et al.* 1994). Dispersive soils are at higher risk of soil compaction, surface hardsetting or crusting, and structural instability such as tunnel erosion and surface soil runoff.

The subsoils of this SMU are considered to be prone to structural instability. Twenty-six (26) Sodic Duplex samples were sent for detailed laboratory analysis, sixteen (16) were prone to structural instability due to one or more criteria. Three (3) of the sixteen (16) samples failed all four criteria.

Coarse fragment size and abundance is variable across the Sodic Duplex soils, and within individual soil horizons. Coarse fragment abundance is low, offering no resistance to erosion once these soils are stockpiled or placed on surfaces during rehabilitation.

Table 12 summarises the typical characterisation of the Sodic Duplex soils with median values shown in brackets. Table 13 summarises median properties of the Sodic Duplex soils against the baseline threshold values presented in the data interpretation scheme (section 2.3.2). Material characterisation data of the samples sent for detailed laboratory analysis is given in Table 14. The physical and morphological attributes of the soil horizons of a representation soil profile for the Sodic Duplex soils is given in Table 15.

Table 12: Typical material characteristics of the Sodic Duplex soils.

Characteristics	Topsoil	Subsoil	Subsoil
Horizon	A	B	B
Depth (mm)	0-150	150-1000	>1000
Texture (class)	Loamy sand – sandy loam	Lomay sand – medium clay	Sandy clay loam – medium heavy clay
Structure (grade)	Moderate	Weak – moderate	Moderate – strong
Consistency	Weak	Weak – firm	Firm – strong
Coarse fragments	13% 2 – 6mm^	16% 6 – 20mm^	10% 2 – 6mm
pH	5.5 – 6.2 (6.0)	5.0 – 8.7 (6.0)	5.5 – 8.2 (6.4)
Salinity (dS/m)	0.05 – 0.37 (0.08)	0.01 – 0.20 (0.04)	0.01 – 0.17 (0.09)
Sodicity, ESP (%)	1.3 – 15.7 (2.5)	4.3 – 32.6 (10.7)	14.0 – 34.8 (31.1)
ESI	0.01 – 0.07 (0.04)	0.021 – 0.061 (0.004)	0.002 – 0.007 (0.004)
Ca:Mg	<0.1 – 5.2 (2.1)	0.2 – 5.6 (2.6)	0.08 – 2.54 (0.21)
Emerson Class	2 – 6 (6)*	1 – 6 (3)*	2 – 6 (2)*
Fertility Class	High	Low	–

^ Values estimated from visual observations. * Signifies the mode value rather than the median value.

Table 13: Summary of Sodic Duplex properties (median values) against data interpretation scheme (Section 2.3.2).

Parameter	Unit	Optimal values	Topsoil	Subsoil
Soil chemical properties				
Soil pH	-	5.0 – 6.0	6.0	6.0
Soil salinity	dS/m	>0.15	0.08	0.06
Soil fertility				
Total nitrogen	mg/kg	>1200	1480	196
Total phosphorus	mg/kg	>130	223	64
Organic carbon	%	>1.5	2.4	0.5
Avail. phosphorus	mg/kg	>13	34	14
Avail. potassium	mg/kg	>100	130	93
Structural stability criteria				
Structural stability	-	ESI/EMP ESP/PSD	ESI	ESP, EMP, ESI, PSD
Soil physical properties				
Coarse fraction providing erosion resistance	%	50% >20mm	13% 2–6mm	10% 6–20mm

Table 14: Material characterisation data for the Sodic Duplex samples sent for more detailed laboratory analysis.

Analyses		Unit	TP01				TP10			
Depth		mm	0-100	300-400	750-850	1200-1300	0-100	200-300	800-900	1300-
pH (water)		pH units	6.02	6.13	6.32	6.21	5.54	5.63	6.94	5.70
Electrical Conductivity, $EC_{1:5}$		dS/m	0.09	0.02	0.12	0.12	0.08	0.02	0.08	0.10
Chloride		mg/kg	57.1	9.9	84.1	79.0	55.8	8.8	16.3	-
Total Nitrogen		mg/kg	1330	121	-	-	2420	212	-	-
Total Phosphorus		mg/kg	133	40	-	-	240	40	-	-
Organic Carbon		%	1.70	0.20	-	-	4.18	0.35	-	-
Plant Available Nutrients	Phosphorus - Colwell	mg/kg	13.5	5.0	-	-	34.7	13.5	-	-
	Potassium - Colwell	mg/kg	142	92	-	-	157	94	-	-
	Sulphur - KCl	mg/kg	10.0	3.8	-	-	5.5	4.0	-	-
	Copper – DTPA	mg/kg	0.23	<0.20	-	-	0.35	<0.20	-	-
	Iron – DTPA	mg/kg	31.4	24.3	-	-	38.9	16.5	-	-
	Manganese – DTPA	mg/kg	17.20	<1.00	-	-	7.96	<1.00	-	-
	Zinc – DTPA	mg/kg	2.94	0.26	-	-	2.10	0.30	-	-
Exchangeable Cations	Calcium	meq/100g	4.02	0.60	0.77	0.30	3.60	0.56	1.54	0.85
	Magnesium	meq/100g	0.98	0.16	2.85	3.88	0.84	0.11	3.03	3.16
	Potassium	meq/100g	0.27	0.17	0.22	0.18	0.28	0.18	0.18	0.18
	Sodium	meq/100g	0.13	0.04	1.03	2.04	0.09	0.04	0.51	0.69
	Aluminium	meq/100g	0.02	0.02	0.02	0.02	0.04	0.02	0.02	0.02
Effective Cation Exchange Capacity		meq/100g	5.4	1.0	4.9	6.4	4.8	0.9	5.3	4.9
Exchangeable Sodium Percentage		%	2.5	4.3	21.1	31.7	1.8	4.8	9.7	14.0
Electrochemical Stability Index		-	0.036	0.005	0.006	0.004	0.045	0.004	0.008	0.007
Calcium : Magnesium Ratio		-	4.1	3.7	0.3	0.1	4.3	4.9	0.5	0.3
Coarse Fragments > 2.0mm		%	4.3	5.7	14.8	14.1	33.3	46.7	20.0	1.5
Particle Size Distribution of Fine Fraction	Coarse Sand 0.2-2.0mm	%	0.2	0.2	0.9	0.7	6.5	6.3	1.4	13.0
	Fine Sand 0.02-0.2mm	%	63.6	55.9	40.9	31.1	60.6	58.0	14.4	8.1
	Silt 0.002-0.02mm	%	26.9	34.5	9.1	12.4	20.7	25.2	8.2	10.2
	Clay <0.002mm	%	2.2	2.2	2.3	0.4	1.0	0.4	4.2	68.2
Emerson class		Class	6	5	5	2	5	3	3	3
Carbonates Fizz Test		Class	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz

Table 14: Continued.

Analyses		Unit	TP13				TP14			
Depth		mm	0-100	300-400	700-800	1300-1400	0-100	200-300	600-700	1400-
pH (water)		pH units	5.54	5.68	7.07	7.68	5.32	5.72	8.71	8.13
Electrical Conductivity, $EC_{1:5}$		dS/m	0.05	0.01	0.04	0.09	0.16	0.06	0.12	0.10
Chloride		mg/kg	34.2	<5.00	15.7	40.9	276	53.0	132	123
Total Nitrogen		mg/kg	1815	179	-	-	1330	385	-	-
Total Phosphorus		mg/kg	240	66.6	-	-	171	137	-	-
Organic Carbon		%	2.35	0.42	-	-	1.92	0.85	-	-
Plant Available Nutrients	Phosphorus - Colwell	mg/kg	33.9	13.5	-	-	30.9	64.6	-	-
	Potassium - Colwell	mg/kg	136	100	-	-	123	93	-	-
	Sulphur - KCl	mg/kg	6.5	3.5	-	-	11.6	8.4	-	-
	Copper – DTPA	mg/kg	0.33	<0.20	-	-	0.24	<0.20	-	-
	Iron – DTPA	mg/kg	31.1	14.5	-	-	28.7	29.6	-	-
	Manganese – DTPA	mg/kg	13.5	<1.00	-	-	2.43	<1.00	-	-
	Zinc – DTPA	mg/kg	1.10	0.24	-	-	1.46	0.30	-	-
Exchangeable Cations	Calcium	meq/100g	2.54	0.58	0.85	0.23	1.53	0.48	0.19	0.12
	Magnesium	meq/100g	0.52	0.12	1.72	1.49	0.70	0.47	1.14	0.93
	Potassium	meq/100g	0.25	0.19	0.20	0.21	0.21	0.17	0.18	0.17
	Sodium	meq/100g	0.04	0.04	0.40	0.97	0.46	0.31	0.74	0.55
	Aluminium	meq/100g	0.04	0.04	0.02	0.02	0.04	0.26	0.02	0.02
Effective Cation Exchange Capacity		meq/100g	3.4	1.0	3.2	2.9	2.9	1.7	2.3	1.8
Exchangeable Sodium Percentage		%	1.3	4.5	12.5	33.11	15.7	18.6	32.6	30.5
Electrochemical Stability Index		-	0.039	0.002	0.003	0.003	0.010	0.003	0.004	0.003
Calcium : Magnesium Ratio		-	4.9	5.0	0.5	0.2	2.2	1.0	0.2	0.1
Coarse Fragments > 2.0mm		%	23.6	60.4	37.5	0.2	14.5	19.7	0.9	1.2
Particle Size Distribution of Fine Fraction	Coarse Sand 0.2-2.0mm	%	57.0	57.9	48.9	38.3	63.1	53.8	24.7	32.8
	Fine Sand 0.02-0.2mm	%	35.4	35.4	20.8	15.6	22.8	11.7	5.5	11.7
	Silt 0.002-0.02mm	%	0.3	1.1	0.1	0.1	0.9	1.8	7.5	15.4
	Clay <0.002mm	%	5.4	2.7	29.9	46.2	11.9	30.4	62.0	39.8
Emerson class		Class	6	6	3	5	5	3	2	2
Carbonates Fizz Test		Class	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz

Table 14: Continued.

Analyses		Unit	TP16				HA01			
Depth		mm	0-100	250-350	500-600	1000-1100	0-100	300-400	600-700	1100-1200
pH (water)		pH units	5.31	6.88	8.35	8.2	6.2	6.24	6.61	7.06
Electrical Conductivity, $EC_{1:5}$		dS/m	0.08	0.02	0.09	0.06	0.26	0.12	0.08	0.09
Chloride		mg/kg	45.0	8.2	18.7	21.4	273	89.4	62.5	64.8
Total Nitrogen		mg/kg	1270	158	-	-	1480	681	-	-
Total Phosphorus		mg/kg	199	61.5	-	-	223	123	-	-
Organic Carbon		%	1.64	0.56	-	-	2.57	0.97	-	-
Plant Available Nutrients	Phosphorus - Colwell	mg/kg	21.4	6.32	-	-	35.1	17.7	-	-
	Potassium - Colwell	mg/kg	108	91	-	-	104	92	-	-
	Sulphur - KCl	mg/kg	9.5	3.9	-	-	37.0	24.8	-	-
	Copper – DTPA	mg/kg	0.61	0.39	-	-	0.27	0.27	-	-
	Iron – DTPA	mg/kg	66.8	6.14	-	-	86.7	54.1	-	-
	Manganese – DTPA	mg/kg	47.3	2.18	-	-	7.80	3.84	-	-
	Zinc – DTPA	mg/kg	0.66	0.22	-	-	0.56	0.34	-	-
Exchangeable Cations	Calcium	meq/100g	1.88	1.06	1.55	0.97	4.82	3.66	2.02	2.01
	Magnesium	meq/100g	0.40	0.36	2.72	2.19	0.93	0.66	0.41	0.79
	Potassium	meq/100g	0.20	0.22	0.24	0.24	0.20	0.18	0.17	0.17
	Sodium	meq/100g	0.22	0.12	1.52	1.82	0.92	0.53	0.32	0.49
	Aluminium	meq/100g	0.15	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Effective Cation Exchange Capacity		meq/100g	2.8	1.8	6.0	5.2	6.9	5.0	2.9	3.5
Exchangeable Sodium Percentage		%	7.7	6.8	25.12	34.76	13.4	10.5	10.9	14.0
Electrochemical Stability Index		-	0.010	0.003	0.004	0.002	0.019	0.011	0.007	0.006
Calcium : Magnesium Ratio		-	4.7	3.0	0.6	0.4	5.2	5.6	5.0	2.5
Coarse Fragments > 2.0mm		%	4.8	13.4	6.6	18.2	4.2	1.1	3.3	13.6
Particle Size Distribution of Fine Fraction	Coarse Sand 0.2-2.0mm	%	59.4	61.3	20.5	53.2	65.5	70.9	62.1	56.8
	Fine Sand 0.02-0.2mm	%	23.1	26.9	12.3	26.4	21.8	18.2	26.8	24.7
	Silt 0.002-0.02mm	%	5.9	2.3	4.5	3.3	4.2	4.2	1.5	1.5
	Clay <0.002mm	%	10.1	8.3	62.4	14.8	8.4	6.6	9.3	16.7
Emerson class		Class	6	3	2	2	6	3	2	2
Carbonates Fizz Test		Class	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz

Table 14: Continued.

Analyses		Unit	HA03	
Depth		mm	0-100	300-400
pH (water)		pH units	5.43	6.20
Electrical Conductivity, $EC_{1:5}$		dS/m	0.09	0.06
Chloride		mg/kg	44.6	20.9
Total Nitrogen		mg/kg	1974	-
Total Phosphorus		mg/kg	376	-
Organic Carbon		%	2.89	-
Plant Available Nutrients	Phosphorus - Colwell	mg/kg	47.9	-
	Potassium - Colwell	mg/kg	170	-
	Sulphur - KCl	mg/kg	11.8	-
	Copper – DTPA	mg/kg	0.59	-
	Iron – DTPA	mg/kg	26.9	-
	Manganese – DTPA	mg/kg	10.50	-
	Zinc – DTPA	mg/kg	0.44	-
Exchangeable Cations	Calcium	meq/100g	3.15	2.92
	Magnesium	meq/100g	0.64	1.13
	Potassium	meq/100g	0.35	0.32
	Sodium	meq/100g	0.06	0.04
	Aluminium	meq/100g	0.06	0.02
Effective Cation Exchange Capacity		meq/100g	4.3	4.4
Exchangeable Sodium Percentage		%	1.3	1.0
Electrochemical Stability Index		-	0.067	0.061
Calcium : Magnesium Ratio		-	4.9	2.6
Coarse Fragments > 2.0mm		%	43.5	15.6
Particle Size Distribution of Fine Fraction	Coarse Sand 0.2-2.0mm	%	49.8	37.3
	Fine Sand 0.02-0.2mm	%	24.8	18.1
	Silt 0.002-0.02mm	%	5.1	5.3
	Clay <0.002mm	%	16.5	38
Emerson class		Class	2	2
Carbonates Fizz Test		Class	No Fizz	No Fizz

Table 15: Representative inspection site of the Sodic Duplex SMU.

Representative Site No: TP07 **Landform:** Lower slope **Micro-relief:** N/A **Surface condition:** Soft	**Dominant Vegetation**: Woody **Surface cover:** Very sparse (0.2-10%) **Site Drainage:** Poorly drained	**Soil Group of Western Australia:** Grey deep sandy duplex **Australian Soil Classification:** Sodosol					**General comments:** Site beside a drainage area, 10% surface rock cover. Clay content decreases >1100mm.
Landscape Photos	**Profile Photo**	**Horizon (mm)**	**Moist Colour**	**Texture**	**Structure**	**Consistence**	**Roots**	**pH_w & $EC_{1:5}$**
		A 0-200	10yr 3/3 dark brown	Loamy Sand	Polyhedral	Weak (dry)	Many (25-200) Very fine (<1mm)	pH: 5.5 EC: 0.08 dS/m
		B1 200-500	10yr 6/2 light brownish grey	Sand	Polyhedral	Firm (dry)	No roots (0)	pH: 6.0 EC: 0.02 dS/m
		B21 500-1100	10yr 8/6 yellow	Medium Clay	Subangular blocky	Very firm (dry)	No roots (0)	pH: 6.0 EC: 0.09 dS/m
		B22 1100-1600	10yr 5/6 yellowish brown	Sandy Clay Loam	Subangular blocky	Very firm (dry)	No roots (0)	pH: 5.5 EC: 0.05 dS/m

3.3.5 Acidic Soils

The Acidic Soils are typically found on the mid and upper slopes of the landscape. These soils are characterised by their increased acidity (pH_w <5.5), particularly in the subsoils.

The Acidic Soils consists of deep soil profiles (>1.5m). Both topsoils and subsoils are strongly acidic, with median pH_w values of 5.5. Clay content increases with depth, from sandy and loamy topsoils to clay loam and medium clay subsoils. ESP is variable throughout the Acidic Soils, with one site being classified as non-sodic (ESP <6%) and another having highly sodic subsoils (ESP >14%). Similarly to the Sodic Duplex soils, coarse fragment size and abundance is variable within this SMU.

The Acidic Soils are prone to structural instability as they meet the ESI, EMP and ESP based criteria (as described in Section 2.3.2.4).

Tabel 16 summarises the typical characteristics of the Acidic Soils with median values shown in brackets. Table 17 summarises the median properties of this SMU against the threshold values. Material characterisation data from the samples of the Acidic Soil sent for detailed laboratory analysis are given in Table 18. Table 19 presents the physical and morphological attributes of the soil horizons of representative soil profiles for this SMU.

Table 16: Typical material characteristics of the Acidic Soils.

Characteristics	Topsoil	Subsoil	Subsoil
Horizon	A	B	B
Depth (mm)	0-150	150-1000	>1000
Texture (class)	Loamy sand – sandy clay loam	Clayey sand – medium clay	Sandy clay loam – medium heavy clay
Structure (grade)	Moderate – strong	Single grain – moderate	Moderate – strong
Consistency	Weak – moderate	Loose – strong	Firm – very firm
Coarse fragments	6% 6 – 20mm^	30% 6 – 20mm^	10% 6 – 20mm
pH	5.0 – 7.0 (5.5)	5.0 – 7.0 (5.5)	5.0 – 5.5 (5.2)
Salinity (dS/m)	0.03 – 0.17 (0.10)	0.01 – 0.73 (0.04)	0.05 – 0.88 (0.09)
Sodicity, ESP (%)	1.4 – 15.7 (1.8)	1.7 – 29.7 (6.7)	6.1
ESI	0.01 – 0.04 (0.02)	0.002 – 0.011 (0.004)	0.008
Ca:Mg	1.0 – 5.3 (3.1)	0.1 – 3.7 (0.5)	0.1
Emerson Class	2 – 6 (6)*	1 – 6 (5)*	2, 6 (2)*
Fertility Class	High	Low	–

^ Values estimated from visual observations. * Signifies the mode value rather than the median value.

Table 17: Summary of Acidic Soils properties (median values) against data interpretation scheme (Section 2.3.2).

Parameter	Unit	Optimal values	Topsoil	Subsoil
Soil chemical properties				
Soil pH	-	5.0 – 6.0	5.5	5.5
Soil salinity	dS/m	>0.15	0.10	0.05
Soil fertility				
Total nitrogen	mg/kg	>1200	1240	644
Total phosphorus	mg/kg	>130	176	128
Organic carbon	%	>1.5	2.0	1.0
Avail. phosphorus	mg/kg	>13	36	23
Avail. potassium	mg/kg	>100	128	97
Structural stability criteria				
Structural stability	-	ESI/EMP ESP/PSD	ESP, ESI	ESP, EMP, ESI
Soil physical properties				
Coarse fraction providing erosion resistance	%	50% >20mm	5% 6 – 20mm	17% 2 – 6mm

Table 18: Material characterisation data for the Acidic Soil samples sent for more detailed laboratory analysis.

Analyses		Unit	TP06				TP18		
Depth		mm	0-100	350-450	800-90	1300-1400	50-150	200-300	600-700
pH (water)		pH units	5.60	5.08	5.21	5.33	5.51	5.28	5.45
Electrical Conductivity, $EC_{1:5}$		dS/m	0.06	0.01	0.04	0.05	0.15	0.04	0.03
Chloride		mg/kg	21.4	<5.00	5.3	6.6	153.0	12.8	15.0
Total Nitrogen		mg/kg	1270	138	-	-	1240	1150	-
Total Phosphorus		mg/kg	176	41.0	-	-	253	214	-
Organic Carbon		%	1.70	0.38	-	-	2.27	2.24	-
Plant Available Nutrients	Phosphorus - Colwell	mg/kg	36.2	5.9	-	-	47.5	40.7	-
	Potassium - Colwell	mg/kg	128	104	-	-	124	91	-
	Sulphur - KCl	mg/kg	6.4	3.8	-	-	17.1	8.0	-
	Copper – DTPA	mg/kg	0.39	<0.20	-	-	0.47	0.45	-
	Iron – DTPA	mg/kg	32.1	20.0	-	-	72.7	89.8	-
	Manganese – DTPA	mg/kg	13.6	<1.00	-	-	10.2	4.06	-
	Zinc – DTPA	mg/kg	1.28	0.22	-	-	0.72	0.42	-
Exchangeable Cations	Calcium	meq/100g	2.26	0.29	0.72	0.31	2.18	1.72	0.43
	Magnesium	meq/100g	0.43	0.08	2.13	2.08	0.71	0.47	1.44
	Potassium	meq/100g	0.24	0.17	0.17	0.17	0.24	0.18	0.18
	Sodium	meq/100g	0.04	0.04	0.17	0.18	0.61	0.22	0.46
	Aluminium	meq/100g	0.04	0.13	0.11	0.26	0.17	0.46	0.02
Effective Cation Exchange Capacity		meq/100g	3.0	0.7	3.3	3.0	3.9	3.0	2.5
Exchangeable Sodium Percentage		%	1.4	6.1	5.1	6.1	15.7	7.4	18.0
Electrochemical Stability Index		-	0.042	0.002	0.008	0.008	0.010	0.005	0.002
Calcium : Magnesium Ratio		-	5.3	3.4	0.3	0.1	3.1	3.7	0.3
Coarse Fragments > 2.0mm		%	4.2	18.9	6.0	15.6	3.1	3.6	9.3
Particle Size Distribution of Fine Fraction	Coarse Sand 0.2-2.0mm	%	63.4	58.6	36.6	44.4	64.3	65.1	48
	Fine Sand 0.02-0.2mm	%	25.1	32.7	11.6	19.4	16.3	13.6	17.6
	Silt 0.002-0.02mm	%	4.0	0.4	2.3	2.2	4.2	3.3	4.2
	Clay <0.002mm	%	7.1	7.1	49.0	32.9	13.8	16.5	28.8
Emerson class		Class	6	5	6	6	5	5	2
Carbonates Fizz Test		Class	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz	No Fizz

Table 18: Continued.

Analyses		Unit	TP18	HA09	
Depth		mm	900-1000	0-100	300-400
pH (water)		pH units	5.47	5.18	5.89
Electrical Conductivity, $EC_{1:5}$		dS/m	0.06	0.03	0.02
Chloride		mg/kg	22.6	14.1	25.4
Total Nitrogen		mg/kg	-	829	-
Total Phosphorus		mg/kg	-	55.5	-
Organic Carbon		%	-	1.2	-
Plant Available Nutrients	Phosphorus - Colwell	mg/kg	-	7.83	-
	Potassium - Colwell	mg/kg	-	208	-
	Sulphur - KCl	mg/kg	-	6.4	-
	Copper – DTPA	mg/kg	-	<0.20	-
	Iron – DTPA	mg/kg	-	56.0	-
	Manganese – DTPA	mg/kg	-	1.26	-
	Zinc – DTPA	mg/kg	-	0.64	-
Exchangeable Cations	Calcium	meq/100g	0.16	0.88	0.83
	Magnesium	meq/100g	1.93	0.84	1.19
	Potassium	meq/100g	0.19	0.37	0.39
	Sodium	meq/100g	0.97	0.04	0.04
	Aluminium	meq/100g	0.02	0.23	0.04
Effective Cation Exchange Capacity		meq/100g	3.3	2.4	2.5
Exchangeable Sodium Percentage		%	29.7	1.8	1.7
Electrochemical Stability Index		-	0.002	0.016	0.011
Calcium : Magnesium Ratio		-	0.1	1.0	0.7
Coarse Fragments > 2.0mm		%	7.5	14.2	32.2
Particle Size Distribution of Fine Fraction	Coarse Sand 0.2-2.0mm	%	47	41.3	48
	Fine Sand 0.02-0.2mm	%	17.9	36.5	29
	Silt 0.002-0.02mm	%	4.3	6.9	3.3
	Clay <0.002mm	%	28.9	14.7	18.3
Emerson class		Class	2	3	3
Carbonates Fizz Test		Class	No Fizz	No Fizz	No Fizz

Table 19: Representative inspection site of the Acidic Soils SMU.

Representative Site No: TP04 **Landform:** Upper slope **Micro-relief:** N/A **Surface condition:** Firm	**Dominant Vegetation**: Woody **Surface cover:** Very sparse (0.2-10%) **Site Drainage:** Moderately well drained	**Soil Group of Western Australia:** Grey deep sandy duplex **Australian Soil Classification:** Dermosol					**General comments:** Abundant crop stubble, 30% surface rock cover. Similar properties to TP02.	
Landscape Photos	**Profile Photo**	**Horizon (mm)**	**Moist Colour**	**Texture**	**Structure**	**Consistence**	**Roots**	**pH_w & $EC_{1:5}$**
		A 0-100	5yr 4/1 dark grey	Loamy Sand	Polyhedral	Weak (dry)	Many (25-200) Very fine (<1mm)	pH: 5.5 EC: 0.12 dS/m
		B1 100-500	7.5yr 5/3 brown	Loamy sand	Apedal	Loose (dry)	Few (1 – 10)	pH: 6.0 EC: 0.02 dS/m
		B21 500-1100	7.5yr 6/8 reddish yellow	Sandy Clay Loam	Platy	Weak (dry)	No roots (0)	pH: 5.0 EC: 0.03 dS/m
		B22 1100-1600	7.5yr 6/8 reddish yellow	Light Clay	Subangular blocky	Very firm (dry)	No roots (0)	pH: 5.0 EC: 0.06 dS/m

3.3.6 Shallow Sand

The Shallow Sand SMU is associated with a single location within the Study area. This SMU is characterised by shallow sands atop a cemented hardpan or lateritic layer. No cropping has been undertaken within the area associated with this SMU.

The Shallow Sands consist of shallow sandy soils (<0.5m) that lay atop a hardened layer of lateritic material. The topsoil, subsoil and hardened materials are strongly acidic (pH_w <5.5) and non-saline (EC <0.02dS/m). The topsoil is non-sodic, with sodic subsoils (ESP 10%). Coarse fragment percentage of both the topsoil and subsoils is negligible (<1%). This SMU is not prone to structural instability.

Tabel 20 summarises the typical characteristics of the Shallow Sand with median values shown in brackets. Table 21 summarises the median properties of this SMU against the threshold values. Material characterisation data from the samples of the Shallow Sand sent for detailed laboratory analysis are given in Table 22. Table 23 presents the physical and morphological attributes of the soil horizons of representative soil profiles for this SMU.

Table 20: Typical material characteristics of the Shallow Sand.

Characteristics	Topsoil	Subsoil	Concreted layer
Horizon	A	B	C
Depth (mm)	0-150	150 – 500	>500
Texture (class)	Sand	Sand	Sand – Loamy sand
Structure (grade)	Single grain	Single grain	Massive
Consistency	Loose (dry)	Loose (dry)	Rigid (dry)
Coarse fragments	1% 2 – 6mm^	1% 2 – 6mm	70% 20 – 60mm
pH	5.5	5.3	5.2
Salinity (dS/m)	0.02	0.01	0.01
Sodicity, ESP (%)	4.1	9.5	2.6
ESI	0.005	0.001	0.004
Ca:Mg	3.2	1.4	1.1
Emerson Class	6	6	5
Fertility Class	Low	low	-

^ Values estimated from visual observations

Table 21: Summary of Shallow Sand properties (median values) against data interpretation scheme (Section 2.3.2).

Parameter	Unit	Optimal levels	Topsoil	Subsoil
Soil chemical properties				
Soil pH	-	5.0 – 6.0	5.5	5.3
Soil salinity	dS/m	>0.15	0.02	0.01
Soil fertility				
Total nitrogen	mg/kg	>1200	211	<50
Total phosphorus	mg/kg	>130	<40	<40
Organic carbon	%	>1.5	0.36	<0.20
Avail. phosphorus	mg/kg	>13	9.3	5.9
Avail. potassium	mg/kg	>100	98	90
Structural stability criteria				
Structural stability	-	ESI/EMP ESP/PSD	-	-
Soil physical properties				
Coarse fraction providing erosion resistance	%	50% >20mm	1% 2 – 6mm	1% 2 – 6mm

Table 22: Material characterisation data for the Shallow Sand samples sent for more detailed laboratory analysis.

Analyses		Unit	TP03			
Depth		mm	0-100	300-400	550-650	1200-1300
pH (water)		pH units	5.47	5.29	5.20	5.28
Electrical Conductivity, $EC_{1:5}$		dS/m	0.02	0.01	0.01	0.01
Chloride		mg/kg	7.7	<5.00	<5.00	5.3
Total Nitrogen		mg/kg	211	<50.0	-	-
Total Phosphorus		mg/kg	<40.0	<40.0	-	-
Organic Carbon		%	0.36	<0.20	-	-
Plant Available Nutrients	Phosphorus - Colwell	mg/kg	9.3	5.9	-	-
	Potassium - Colwell	mg/kg	98	90	-	-
	Sulphur - KCl	mg/kg	4.0	<3.00	-	-
	Copper – DTPA	mg/kg	<0.20	<0.20	-	-
	Iron – DTPA	mg/kg	9.80	5.54	-	-
	Manganese – DTPA	mg/kg	4.98	<1.00	-	-
	Zinc – DTPA	mg/kg	0.46	0.22	-	-
Exchangeable Cations	Calcium	meq/100g	0.62	0.12	0.15	0.66
	Magnesium	meq/100g	0.19	0.08	0.08	0.60
	Potassium	meq/100g	0.18	0.16	0.16	0.29
	Sodium	meq/100g	0.04	0.04	0.04	0.04
	Aluminium	meq/100g	0.02	0.05	0.03	0.07
Effective Cation Exchange Capacity		meq/100g	1.1	0.5	0.5	1.7
Exchangeable Sodium Percentage		%	4.1	9.5	9.2	2.6
Electrochemical Stability Index		-	0.005	0.001	0.001	0.004
Calcium : Magnesium Ratio		-	3.2	1.4	1.9	1.1
Coarse Fragments > 2.0mm		%	0.9	0.8	72.5	39.4
Particle Size Distribution of Fine Fraction	Coarse Sand 0.2-2.0mm	%	72.6	68.2	62.2	63.5
	Fine Sand 0.02-0.2mm	%	25.3	27.8	31.8	25.5
	Silt 0.002-0.02mm	%	0.4	0.4	0.4	0.4
	Clay <0.002mm	%	1.7	3.5	5.3	9.0
Emerson class		Class	6	6	6	5
Carbonates Fizz Test		Class	No Fizz	No Fizz	No Fizz	No Fizz

Table 23: Representative inspection site of the Shallow Sand SMU.

Representative Site No: TP03 **Landform:** Mid-slope **Micro-relief:** N/A **Surface condition:** Soft	**Dominant Vegetation**: Woody **Surface cover:** Very sparse (0.2-10%) **Site Drainage:** Moderately well drained	**Soil Group of Western Australia:** Pale Shallow Sand **Australian Soil Classification:** Rudosol					**General comments:** No crops established, very sparse woody native vegetation. Rock surface cover 10%.	
Landscape Photos	**Profile Photo**	**Horizon (mm)**	**Moist Colour**	**Texture**	**Structure**	**Consistence**	**Roots**	**pH_w & $EC_{1:5}$**
		A 0-150	10yr 6/2 light brownish grey	Sand	Apedal	Loose (dry)	Few (1-10) Very fine (<1mm)	pH: 5.5 EC: 0.02 dS/m
		B1 150-500	10yr 8/2 very pale brown	Sand	Apedal	Loose (dry)	No roots (0)	pH: 5.3 EC: 0.01 dS/m
		B1c 500-700	10yr 7/3 very pale brown	Sand	Apedal	Loose (dry)	No roots (0)	pH: 5.2 EC: 0.01 dS/m
		BC 700-1300	10yr 6/8 brownish yellow	Loamy Sand	Apedal	Rigid (dry)	No roots (0)	pH: 5.3 EC: 0.01 dS/m

4 SOIL MANAGEMENT

4.1 Soil suitability

The topsoils of both the Sodic Duplex and Acidic Soils within the Study area are identified as being suitable for use as growth media in rehabilitation. These topsoils have high fertility values due to the consistent application of fertilisers as part of agricultural practices. Additionally, the practice of tilling the topsoils has promoted the development of beneficial soil structure. Stripping and stockpiling the topsoils of both the Sodic Duplex and Acidic Soils is recommended. The increased acidity of the Acidic Soil topsoils, compared to the Sodic Duplex topsoils, is not of concern as evidenced by the abundance of crop stubble associated with both SMUs.

The majority of the subsoils of both the Sodic Duplex and Acidic Soil SMUs are associated with an increased risk of structural instability. The risks associated with any structural instability is likely to be heightened through disturbance of subsoils via physical stripping, stockpiling and respreading. This may result in potential hardsetting or compaction of the soils if placed at or near the surface during rehabilitation. Both subsoils have poor fertility values and are not considered to be a potential growth media. The subsoils can be considered for use as a subsurface material to reconstitute the soil profile during rehabilitation, with topsoil respread atop as a surface cover.

Placement of both topsoils and subsoils on steeper gradient slopes such as batter surface cover should only be considered following an erodibility assessment.

The topsoils and subsoils of the Shallow Sands are not prone to structural instability. These soils are limited to a single small area ~18ha in size. These soils have low fertility values and do not currently support any significant vegetation. The area associated with the Shallow Sands does not have any crops and shows no sign of being actively tilled or managed. Additionally, the coarse fragment percentage of both the topsoils and subsoils are very low (<1%), as such they do not offer any resistance to erosion. These soils are not considered to be a potential growth media. However, both the topsoils and subsoils could be placed on gentle slopes or flat surfaces in situations where sandy materials is required.

4.2 Soil stripping

The purpose of determining suitable soil stripping depths is to provide an estimate of the maximum available soils volumes that are potentially available for rehabilitation. To determine the maximum available soil volumes, both the suitable stripping depth and the area to be stripped must be known.

Suitable stripping depths are based on the attributes of the soils and are determined separately for each SMU. The key attribute determining the suitable stripping depth is soil depth and structural stability.

The area that is likely to be stripped (within the Study area) is limited to the mine concept footprints outlined in Section 1 (excluding ~74ha of pre-disturbed land) which is approximately 967ha in size.

Topsoils should be stripped and stockpiled separately from subsoils if stockpiled, as they contain higher levels of organic matter, soil biology, and have been actively managed as part of agricultural practices. Any vegetation debris should as be retained as it will likely be useful in maintaining the nutrient store.

4.2.1 Sodic Duplex

Topsoils of the Sodic Duplex SMU can be stripped for use as a rehabilitation resource and growth medium.

The Sodic Duplex topsoils are a potential rehabilitation resource for use on low gradient surfaces due to their high fertility values. There are no limitations to the stripping depth of the Sodic Duplex down to 0.15m. The subsoils become highly sodic at depths greater than 0.15m, increasing the potential for hardsetting and further risks of structural instability, and may inhibit vegetation establishment. For the purpose of stripping and stockpiling a potential rehabilitation resource, the Sodic Duplex topsoils could be stripped to a total depth of 0.15m, provided that they are managed appropriately when stockpiled and when used for rehabilitation.

For the purpose of stripping the maximum volume of soil, it is assumed that the topsoils of the Sodic Duplex SMU will be stripped to 0.15m and stockpiled.

The Sodic Duplex subsoils are not considered a primary rehabilitation resource due to their low fertility values and risk of structural instability. Although the stripping and stockpiling of these subsoils is not recommended, it is understood that they may potentially be stripped as part of mining operations. The subsoils may potentially be used as a secondary resource used to reconstitute the soil profile. Any stripped and stockpiled subsoils may be spread as a subsurface material that lays below respread growth media. In such a case, it is assumed that the Sodic Duplex subsoils will be stripped to a maximum depth of 1.5m.

4.2.2 Acidic Soils

Topsoils of the Acidic Soils can be stripped for use as a rehabilitation resource and growth medium.

The Acidic Soils topsoils are a potential rehabilitation resource for use on low gradient surfaces due to their high fertility values. There are no limitations to the stripping depth of the Acidic Soils down to 0.15m, The subsoils become strongly acidic with depths greater than 0.15m. Additionally, sodicity increases with depth, increasing the potential for hardsetting and further risks of structural instability. Both the increased sodicity and acidity of the subsoils may inhibit vegetation establishment. For the purpose of stripping and stockpiling the potential rehabilitation resource, the Acidic Soils could be stripped to a total depth of 0.15m, provided that they are managed appropriately when stockpiled and when used for rehabilitation.

For the purpose of stripping the maximum volume of soil, it is assumed that the topsoils of the Acidic Soils will be stripped to 0.15m and stockpiled.

The subsoils of the Acidic Soils are not considered a primary rehabilitation resource due to their low fertility values and risk of structural instability. Although the stripping and stockpiling of these subsoils is not recommended, it is understood that they may potentially be stripped as part of mining operations. The subsoils may potentially be used as a secondary resource used to reconstitute the soil profile. Any stripped and stockpiled subsoil may be spread as a subsurface material below respread topsoil or other growth media. In such a case, it is assumed that the Sodic Duplex subsoils will be stripped to a maximum depth of 1.5m.

4.2.3 Shallow Sands

The Shallow Sands are not considered for use as a rehabilitation resource due to their low fertility values and low volume. It is noted that stripping of the Shallow Sands may occur during mining operations. In such as case, it is assumed that the Shallow Sands will be stripped to a depth of 0.5m.

4.3 Soil volumes

Estimated total volumes of soils classified as potential rehabilitation resources are provided in Table 24.

Table 24: Volumes of soils to be recovered by SMU from the mine concept footprint considering only potential rehabilitation resources.

SMU	Soil Volume (m^3)		
	Topsoil	Subsoil	Total volume (m^3)
Sodic Duplex	989,595	-	**989,595**
Acidic Soils	442,290	-	**442,290**
Shallow Sands	-	-	
Total	**1,431,885**	**-**	**1,431,885**

If all soils, including subsoils were to be stripped to their maximum stripping depth (1.5m), an estimated 12,886,965m^3 of Sodic Duplex and Acidic Soil subsoils would be available from within the mine concept footprint. Additionally, an estimated 63,300m^3 of Shallow Sands topsoil and subsoil is available within the mine concept footprint.

To account for any potential topsoil deficit during rehabilitation, stripping of Sodic Duplex and Acidic Soil topsoils from outside the mine concept footprint can be considered to increase growth media volumes.

4.4 Soil stockpiling

The materials from the three SMUs have different physical and chemical properties. Importantly, the differences in sodicity, pH and structural instability. Each SMU should be stockpiled separately to facilitate the optimum use of the materials for rehabilitation and closure based on their inherent properties.

Further, topsoils have a considerably higher store of organic matter, soil biology, and nutrients than the subsoils. Any topsoils that are stripped should be stockpiled separately from any other sub-surface soils.

As both the Sodic Duplex and Acidic Soils are considered to be prone to structural instability, when stockpiling these soils, no stockpile should be greater than 2m in height.

4.5 Wind erosion

The susceptibility of a material to wind erosion is related to the material's aggregated PSD. Other factors such as coarse fraction abundance and size and soil moisture also strongly influence wind erosion potential (Hazelton and Murphy 2016). Sandy soils (>90% by weight), particularly those containing fine sand, tend to have high wind erosion potential while sandy loams to clay loams have moderate wind erosion potential, and clays have low wind erosion potential. Rocky or gravelly soils also have low wind erosion potential.

The Sodic Duplex and Acidic Soils topsoils, and the Shallows Sands topsoils and subsoils typically have sandy textures with clay contents <10%. Additionally, the coarse fragment abundance of these soils does not offer resistance to wind erosion (<50%). The topsoils from all three SMUs, in addition to the subsoils of the Shallow Sands, are susceptible to wind erosion. To mitigate this risk, when stockpiling and respreading these materials, the addition of large vegetation debris (i.e., trunks, branches) can offer protection to wind erosion.

4.6 Water erosion

The soils of both the Sodic Duplex and Acidic Soils are prone to low permeability, structural instability or soil detachment or a combination of these factors. The coarse fraction present in these soils is unlikely to reduce the risk of water erosion. Subsoils from these two units should not be used as surface covers. Topsoils are considered to be a primary rehabilitation resource and growth media, but it is noted that there are still potential risks due to their susceptibility to water erosion particularly if placed on steep sloped surfaces. The Shallow Sands are likely to be highly prone to water erosion. During rehabilitation, reconstitution of the soil profile, with subsoils placed as a subsurface material and topsoils respread atop as a growth medium, can reduce the impact of water erosion on the more erodible subsoils.

Prior to any materials being place on sloping surfaces, such as outer batter surfaces, further erosion testing and modelling is recommended. Such testing will inform design requirements in terms of slop lengths, gradients, depths and batter profiles and

landform shapes. This testing could also consider the benefits of the addition of tree debris or waste rock (if available) as an armouring element and the risks posed by berms and other engineered flow control structures (sizing of these structures such that the risk of dispersion is reduced would form part of this testing and assessment).

4.7 Soil amendments

Total N and P, available P and K, and organic C values for topsoils across the Study area are sufficient for vegetation growth (with the exception of the Shallow Sands). The subsoils of all SMUs have significantly reduced fertility values when compared to the topsoils.

If the Sodic Duplex subsoils are to be stripped and stockpiled, amelioration of the subsoil's high sodicity may be considered. Management of sodic soils typically involves tilling the top 30cm of the soil, following respreading, in conjunction with the addition of calcium via the application of gypsum. Rates of gypsum application should be assessed once the soils are stripped and stockpiled.

The addition of lime to any stripped subsoils of the Acidic Soils can be considered if the stockpiled subsoils are deemed too acidic for vegetation establishment. Rates of lime application should be assessed once the soils are stripped and stockpiled. Once collected, pH data for these Acidic Soils could be useful compared against the pH tolerance of the various crop varieties historically cultivated on these soils. This step may not be necessary if the post mining land use returns to cropping. Further planning will guide the seed mix used during rehabilitation, which may include native species associated with non-disturbed soils of the region.

4.8 Mapping resolution

Due to the differences in land access across the Study area at the time of the field investigation, the inspection detail was variable across the Study area. Areas where complete soil profiles were assessed via soil test pits (~915ha) had an inspection density of 1 site per 45ha. This has produced mapping with a scale of 1:50,000 for the Study area associated with the test pitting inspection sites.

The remaining Study area was sampled using hand augers and at a reduced sample density. This area had an inspection density of 1 site per 320ha, producing mapping with a scale of 1:100,000.

By combining data collected from both soil test pits and hand augers, the mine concept footprint (~1,041ha) had an inspection density of 1 site per 47ha. This has produced mapping with a scale of 1:50,000 for the mine concept footprint.

Once land access has been approved for the entirety of the Study area, it is recommended a supplementary soil survey be undertaken. This will allow for the description of soil profiles in areas that were previously investigated solely by hand auger. Once such an investigation is undertaken in the future, there is potential that the soils will be reclassified and soil boundaries re-mapped to better inform soil stripping and management practices.

4.9 Conclusion

The limitations, opportunities, growth media potential, erosion potential, and recommendations for use as rehabilitation materials for the soils found within each SMU are summarised in Table 25.

Table 25: Summary of the key limitations, opportunities, and suitability for rehabilitation of the soils within each SMU.

Material	Material	Limitation	Opportunities	Suitability for Rehabilitation
Sodic Duplex	Topsoil	• Potentially at risk of structural instability due to ESI. • Potentially susceptible to wind erosion.	• Non-saline. • Topsoil pH values that support agricultural cropping. • High fertility values that support agricultural crops. • Potentially well suited for placement on low gradient areas as a growth medium.	• Stripping of topsoils is recommended to a depth of 0.15m. • Topsoils are a potentially suitable growth media for. • The erodibility characteristics of this material should be tested if intended for use on batter slopes.
	Subsoil	• At risk of structural instability due to ESP, EMP, ESI and PSD. • May be prone to erosion if placed on sloping surface as a surface cover (e.g. batter slopes). • Highly sodic, prone to hardsetting. • Low fertility values.	• Non-saline. • pH values that support vegetation. • Not likely to be susceptible to wind erosion.	• Stripping of the Sodic Duplex subsoils is not recommended. • Not suitable for use as a growth media. • Potential sub-surface rehabilitation material below a growth media. • If the subsoils are to be stripped and stockpiled, an erodibility assessment is recommended.
Acidic Soils	Topsoil	• Potential at risk of structural instability due to ESI. • Potentially susceptible to wind erosion.	• Non-saline. • Topsoil pH values that support agricultural cropping. • High fertility values that support agricultural crops. • Potentially well suited for placement on low gradient areas as a growth medium.	• Stripping of the Acidic Soils topsoils is recommended to a depth of 0.15m. • Topsoils are a potentially suitable growth medium. • The erodibility characteristics of this material should be tested if intended for use on batter slopes.

Material	Material	Limitation	Opportunities	Suitability for Rehabilitation
Acidic Soils	Subsoil	• At risk of structural instability due to ESP, EMP and ESI. • May be prone to erosion if placed on sloping surfaces as a surface cover (e.g. batter slopes). • Potentially sodic, increased risk of hardsetting. • Low fertility values.	• Non-saline. • Not likely to be susceptible to wind erosion.	• Stripping of the Acidic Soils subsoils is not recommended. • Not suitable for use as a growth media. • Potential sub-surface rehabilitation material below a growth media. • If the subsoils are to be stripped and stockpiled, an erodibility assessment is recommended.
Shallow Sands	Topsoil	• At risk of wind erosion. • Low fertility values. • Low abundance of coarse material.	• Not prone to structural instability.	• Stripping of the Shallow Sands topsoils is not recommended. • Not suitable for use as a growth media.
	Subsoil	• At risk of wind erosion. • Low fertility values. • Low abundance of coarse material.	• Not prone to structural instability.	• Stripping of the Shallow Sands subsoils is not recommended. • Not suitable for use as a growth media.

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APPENDIX A: SUMMARY OF REGULATORY REQUIREMENTS

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Regulatory document	Requirement/Recommendation	Landloch's strategy
Statutory Guidelines for Mining Proposals	Baseline Environmental data: • Material characterisation including soils.	Completion of a soil survey that includes sampling of key soil types, laboratory analysis, and interpretation.
Mining Proposal Guidance	Regarding soils, it is recommended that the mining proposal addresses the following aspects: • A description of the major soils occurring in the Study area including the indicative volume and characterisation of topsoil and subsoil available for rehabilitation. • Where there are multiple soil types identified, a map showing the spatial extent of each identified soil type in the Study area shall be provided. The map should include a scale bar, latitude and longitude coordinates, date of field survey, and regional map location. Soils may be classified according to the WA Soil groups outlined in Schoknecht and Pathan (2013). • Adequate characterisation of the soils to ensure that the risk posed by adverse components can be determined. • Reference to the characterisation methodologies used. • Interpretation of baseline data & broad implications for risk assessment and treatments. • Relevant technical reports attached as appendices.	Revision of all existing soils data including land systems mapping, existing soil assessments, elevation data (slope and relief), vegetation mapping. These data guided selection of sampling locations to target variability in soil type across the Study area. Site information and soil morphology were recorded at each site according to the Australian Soil and Landscape Survey Field Handbook. Soils were classified to the Australian Soil Classification (ASC) and Soil Groups of WA (SGWA) and split into Soil Mapping Units (SMUs). Soil maps have been provided that illustrate the extent of the soil types as per these classifications. Soil samples were analysed to determine key risks and limitations, and management strategies and potential amelioration options have been provided.
Statutory Guidelines for Mine Closure Plans	Baseline and Closure Data and Analysis The mine closure plan must include baseline data that: • Informs successful rehabilitation and closure • Establishes baseline conditions for closure monitoring programs The mine closure plan must include: • Details of the methodology of analysing the baseline data.	Baseline soils and landform data were collected as part of the soil investigation. Interpretation of these data have provided baseline conditions prior to the commencement of mining. Data have been analysed based on available suitable classification schemes, including Landloch's experience with soils in the area.
Mine Closure Plan Guidance	Baseline and Closure Data and Analysis • Soil and waste materials characterisation – soil structure and stability (e.g. erodibility), growth media type. Other closure related data: • Availability and volumes of key materials required for rehabilitation such as competent waste rock, subsoil, topsoil and low-permeability clays (i.e. encapsulation	Soil structure was assessed in the field as part of soil morphology. The susceptibility of the soils to erode were assessed based on soil texture, particle size distribution, salinity, sodicity, ESI and the Ca:Mg ratio. Results outlined the materials susceptibility to structural decline but did not define erosion rates. More detailed erodibility test work

Regulatory document	Requirement/Recommendation	Landloch's strategy
	material). Closure Implementation: • Availability and management of closure material sources – including topsoil, competent waste rock and subsoil. Progressive rehabilitation: • Landform surface treatments (ripping, selective application of topsoil, placement of materials).	(e.g., simulated rainfall and overland flows capable of determining erosion rates) has not been conducted or reported as they are typically completed within landform design studies, once the soil and waste materials to be used within rehabilitation have been identified. The availability and volumes of topsoil and subsoil have been based on the mine concept footprint and the abundance of each soil type within that footprint. Stripping depths have been determined based on key characteristics of the topsoil and subsoil of each soil type within the mine concept footprint. Management strategies (e.g. strategic/preferential soil placement based on risk) have been discussed from a structural stability, erodibility, and growth media perspective.
Draft Guidance Material Characterisation Baseline Data Requirements for Mining Proposals	Soil characterisation should be undertaken for the purposes of: • Estimating the quantity and quality of the soil resources (topsoil and subsoil) including each major soil type. • Characterising the baseline growth medium attributes of each major soil type including water holding capacity and nutrients status. • Evaluating potential risk associated with salinity, wind erosion and water erosion. A comprehensive sampling program must consider the following: • The climate of the Study area • Optimal timing of sampling • Soil landscape mapping completed by the Department of Agriculture and Food (DAFWA). This delineates broad scale landscape patterns, landform and associated major soil groups and vegetation types. • Adequate spatial coverage and replication to identify and characterise major soil types. Soils can be classified in accordance with Soil Groups of Western Australia Resource Management Technical Report 380 Fourth Edition Schoknecht and Pathan (2013). Sampling should include surface and subsoil layers. Physical soil measurements will have long-term value if they have an associated site and profile description that conforms to standards defined in the Australian Soil and Land	Soil landscape mapping were reviewed as part of the desktop review, and informed sampling locations. The number of sampling locations was based on Guidelines for Survey Soil and Land Resources (McKenzie et al. 2008) as outlined in Section 2.3. Soils have been classified to the SGWA and ASC standards. Soil maps are provided that illustrate the extent of the soil types as per these standards. Soil profiles have been described as per the Australian Soil and Land Survey Field Handbook (NCST, 2009). Nutrient status has been captured as part of the proposed laboratory suite. Water holding capacity was estimated based on surrogate measures of soil texture and particle size. The laboratory analysis has been conducted in line with the recommended analysis within this guidance document. Soil characterisation included estimations of quantity and quality of the soil resource for each major soil type as identified by Soil Mapping Units (SMUs). The report

Regulatory document	Requirement/Recommendation	Landloch's strategy
	Survey Field Handbook (NCST, 2009). Collation and interpretation of soil analysis results should include: • WA Soil groups • Water holding capacity • Nutrient status • Salinity • Sodicity • Dispersion risk • Erodibility	included sections on soil limitations, soil handling and soil volumes. Included was an assessment of salinity and water and wind erosion.

APPENDIX B: SOIL LOG DATA SHEETS

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Site Information

Project 2530.23a	**Date** 23/2/2024	**Scribe** M.White	**Location** **TP01**	**Observation** Soil pit	**Easting/ Latitude** 584,697	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Non-woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,287,607	**Scale**	**ASC Ground Truth** Sodosol
Secondary Vegetation Form Woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Imperfectly drained	**Erosion Extent** None evident	
Landform Mid-slope			**Soil Surface Condition (dry)** Firm		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

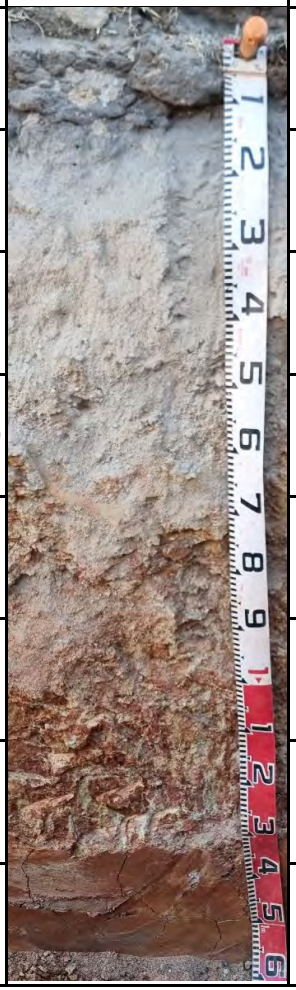
Other Information: Rock surface cover 10% 2-6mm. Crop stubble present.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-100		Clear	Loamy Sand	5yr 3/2	Not recorded	Not recorded	2-10 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	6.0	0.09	0-100
B1	100-500		Clear	Loamy Sand	7.5yr 7/2	Not recorded	Not recorded	20-50 % 6-20 mm	Polyhedral	Weak	Weak (dry)	Few (1-10) Very fine (<1 mm)	6.1	0.02	300-400
B21	500-950		Clear	Medium Clay	7.5yr 6/6	red 40%	Not recorded	2-10 % 2-6 mm	Angular blocky	Moderate	Very firm (dry)	No roots (0) Not recorded	6.3	0.12	750-850
B22	950-1600		Not recorded	Medium Heavy Clay	5yr 6/8	grey 30%	Not recorded	2-10 % 2-6 mm	Subangular blocky	Moderate	Very firm (dry)	No roots (0) Not recorded	6.2	0.12	1200-1300

Other information:

Soil Profile Description

Project 2530.23a	**Date** 23/2/2024	**Scribe** M.White	**Location** TP02	**Observation** Soil pit	**Easting/ Latitude** 584,855	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Non-woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,287,168	**Scale**	**ASC Ground Truth** Dermosol
Secondary Vegetation Form Woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Imperfectly drained	**Erosion Extent** None evident	
Landform Upper slope			**Soil Surface Condition (dry)** Firm		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Higher in the landscape. Crop stubble present. Rock cover 50% 20-60mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-100		Clear	Loamy Sand	10yr 3/2	Not recorded	Not recorded	2-10 % 6-20 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	5.5	0.09	0-100
B1	100-250		Clear	Sandy Clay Loam	10yr 5/4	Not recorded	Not recorded	50-90 % 20-60 mm	Apedal	Single grain	Loose (dry)	Few (1-10) Very fine (<1 mm)	5.0	0.03	150-250
B21	250-900		Gradual	Clay Loam	7.5yr 6/6	Red 40%	Not recorded	20-50 % 20-60 mm	Platy	Strong	Weak (dry)	No roots (0)	6.0	0.04	600-700
B22	900-1600		Not recorded	Light Clay	2.5yr 5/8	yellow 40%	Not recorded	2-10 % 6-20 mm	Subangular blocky	Moderate	Firm (dry)	No roots (0)	5.0	0.07	1200-1300

Other information:

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	23/2/2024	M.White	TP03	Soil pit	584,660		Sodosol
Dominant Vegetation Form	Woody	**Ground Cover %**	Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,286,750	**Scale**	**ASC Ground Truth** Rudosol
Secondary Vegetation Form	Non-woody	**Ground Cover %**	Very sparse (0.2-10%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type**	None evident
Vegetation (species)					**Drainage (site)** Moderately well-drained	**Erosion Extent**	None evident
Landform	Mid-slope	**Soil Surface Condition (dry)**			**Land Use** Cropping	**Erosion State**	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: White sand at surface. Crops not established. A few woody species established in sandy area. Rock surface cover 10% 20-60mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-150		Clear	Sand	10yr 6/2	Not recorded	Not recorded	2-10 % 2-6 mm	Apedal	Single grain	Loose (dry)	Few (1-10) Very fine (<1 mm)	5.5	0.02	0-100
B1	150-500		Clear	Sand	10yr 8/2	Not recorded	Not recorded	2-10 % 2-6 mm	Apedal	Single grain	Loose (dry)	No roots (0) Not recorded	5.3	0.01	300-400
B1c	500-700		Gradual	Sand	10yr 7/3	Not recorded	Not recorded	50-90 % 20-60 mm	Apedal	Single grain	Loose (dry)	No roots (0) Not recorded	5.2	0.01	550-650
BC	700-1300		Not recorded	Loamy Sand	7.5yr 6/8	Not recorded	Not recorded	50-90 % 20-60 mm	Apedal	Massive	Rigid (dry)	No roots (0) Not recorded	5.3	0.01	1200-1300

Other information: Cemented laterite with channels of sand. High levels of rock at transition from whiter sand to red loamy sand.

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	23/2/24	M.White	TP04	Soil pit	584,336		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Non-woody	Very sparse (0.2-10%)		6,286,785		Dermosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Woody	Isolated Plants (<0.2%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
Crop stubble	Imperfectly drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Upper slope	Firm		None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Ground cover is dense crop stubble. Rock cover 30% 20-60mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-100		Clear	Loamy Sand	5yr 4/1	Not recorded	Not recorded	10-20 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	5.5	0.12	0-100
B1	100-500		Clear	Loamy Sand	7.5yr 5/3	Not recorded	Not recorded	50-90 % 6-20 mm	Apedal	Single grain	Loose (dry)	Few (1-10) Very fine (<1 mm)	6.0	0.02	200-300
B21	500-1100		Gradual	Sandy Clay Loam	7.5yr 6/85yr 6/8	Red 30%	Not recorded	10-20 % 6-20 mm	Platy	Strong	Weak (dry)	No roots (0) Not recorded	5.0	0.03	600-700
B22	1100-1600		Not recorded	Light Clay	Not recorded	yellow 30%	Not recorded	2-10 % 2-6 mm	Subangular blocky	Moderate	Very firm (dry)	No roots (0)	5.0	0.06	1400-1500

Other information: Similar to TP2.

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	22/2/2024	M.White	TP05	Soil pit	585,452		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Woody	Very sparse (0.2-10%)		6,287,433		Sodosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Non-woody	Isolated Plants (<0.2%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
Crop stubble	Imperfectly drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Soft	Cropping	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

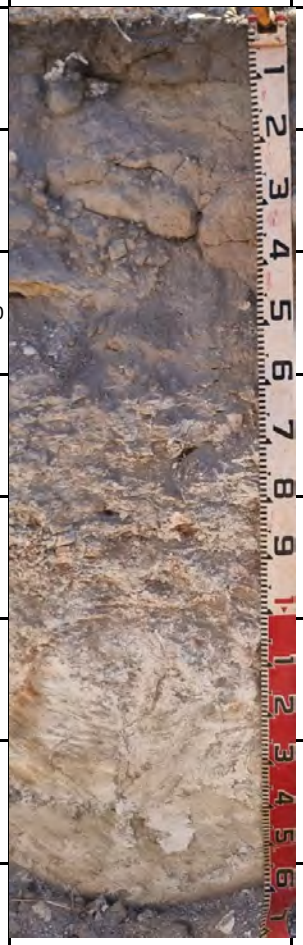
Other Information: Quartz fragment as surface cover 10% 20-60mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-100		Clear	Loamy Sand	10yr 2/2	Not recorded	Not recorded	2-10 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Common (10-25) Very fine (<1 mm)	6.0	0.11	0-100
B1	100-300		Clear	Loamy Sand	10yr 5/2	Not recorded	Not recorded	2-10 % 6-20 mm	Polyhedral	Moderate	Weak (dry)	No roots (0) Not recorded	6.0	0.04	200-300
B2	300-1500		Not recorded	Medium Heavy Clay	10yr 7#3	20% red	Not recorded	2-10 % 2-6 mm	Subangular blocky	Strong	Very firm (dry)	No roots (0) Not recorded	6.0	0.14	900-1000

Other information: Very hemogenous B2.

Soil Profile Description

Project 2530.23a	**Date** 22/2/24	**Scribe** M.White	**Location** TP06	**Observation** Soil pit	**Easting/ Latitude** 585,415	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,286,758	**Scale**	**ASC Ground Truth** Kurosol
Secondary Vegetation Form Non-woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Moderately well-drained	**Erosion Extent** None evident	
Landform Mid-slope			**Soil Surface Condition (dry)** Soft		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Other Information: No surface coarse fragments.

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-150		Clear	Loamy Sand	10yr 2/1	Not recorded	Not recorded	2-10 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Common (10-25) Very fine (<1 mm)	5.6	0.06	0-100
B1	150-500		Clear	Loamy Sand	10yr 7/4	Not recorded	Not recorded	10-20 % 6-20 mm	Angular blocky	Weak	Weak (dry)	Few (1-10) Very fine (<1 mm)	5.1	0.01	350-450
B2	500-1600		Not recorded	Medium Clay	7.5yr 6/8	yellow and red 50%	Not recorded	2-10 % 2-6 mm	Subangular blocky	Strong	Very firm (dry)	No roots (0) Not recorded	5.3	0.05	800-900 1300-1400

Other information: B2 is hemogenous.

Soil Profile Description

Project 2530.23a	**Date** 22/2/24	**Scribe** M.White	**Location** TP07	**Observation** Soil pit	**Easting/ Latitude** 585,875	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,287,398	**Scale**	**ASC Ground Truth** Sodosol
Secondary Vegetation Form Non-woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Poorly drained	**Erosion Extent** None evident	
Landform Lower slope			**Soil Surface Condition (dry)** Soft		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: 10% rock cover, 2-6mm. Adjacent to sump drain. Lower in landscape.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Clear	Loamy Sand	10ye 3/3	Not recorded	Not recorded	10-20 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	5.5	0.08	0-100
B1	200-500		Clear	Sand	10yr 6/2	Not recorded	Not recorded	20-50 % 6-20 mm	Polyhedral	Weak	Firm (dry)	No roots (0)	6.0	0.02	300-400
B21	500-1100		Gradual	Medium Clay	10yr 8/6	Red and yellow 50%	Not recorded	2-10 % 2-6 mm	Subangular blocky	Moderate	Very firm (dry)	No roots (0)	6.0	0.07	800-900
B22	1100-1600		Not recorded	Sandy Clay Loam	10yr 5/6	Yellow 60%	Not recorded	20-50 % 20-60 mm	Subangular blocky	Moderate	Very firm (dry)	No roots (0)	5.5	0.05	1400-1500

Other information: Quartz fragments present in B22.

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	22/2/24	M.White	TP08	Soil pit	586,196		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Woody	Very sparse (0.2-10%)		6,287,394		Sodosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Non-woody	Isolated Plants (<0.2%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
Crop stubble	Imperfectly drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Crest	Firm	Cropping	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Rock cover 10% 6-20mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-100		Clear	Loamy Sand	5yr 4/2	Not recorded	Not recorded	10-20 % 6-20 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	6.0	0.18	0-100
B1	100-200		Abrupt	Loamy Sand	7.5yr 6/4	Not recorded	Not recorded	50-90 % 20-60 mm	Subangular blocky	Weak	Weak (dry)	Common (10-25) Very fine (<1 mm)	5.0	0.02	150-200
B21	200-700		Gradual	Clay Loam, Sandy	7.5yr 3/3	red 30%	Not recorded	10-20 % 20-60 mm	Subangular blocky	Moderate	Firm (dry)	No roots (0) Not recorded	7.0	0.07	500-60)
B22	700-1600		Not recorded	Medium Heavy Clay	7.5yr 5/6	grry 30%	Not recorded	<2 % 6-20 mm	Platy	Moderate	Very firm (dry)	No roots (0) Not recorded	7.0	0.20	900-1000

Other information:

Soil Profile Description

Project 2530.23a	**Date** 22/2/24	**Scribe** M.White	**Location** TP09	**Observation** Soil pit	**Easting/ Latitude** 586,339	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,287,868	**Scale**	**ASC Ground Truth** Sodosol
Secondary Vegetation Form Non-woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Moderately well-drained	**Erosion Extent** None evident	
Landform Lower slope			**Soil Surface Condition (dry)** Soft		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Surface rock cover 5%. 6-20mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Clear	Loamy Sand	5yr 4/2	Not recorded	Not recorded	2-10 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Common (10-25) Very fine (<1 mm)	6.0	0.06	0-100
B1	200-500		Clear	Loamy Sand	5yr 5/4	Not recorded	Not recorded	10-20 % 2-6 mm	Angular blocky	Moderate	Firm (dry)	No roots (0)	6.0	0.02	300-400
B2	500-1000		Clear	Medium Heavy Clay	2.5yr 5/6	20% grey	Not recorded	<2 % 2-6 mm	Subangular blocky	Strong	Very firm (dry)	No roots (0)	6.0	0.12	600-700
B3	1000-1600		Not recorded	Loamy Sand	7.5yr 6/6	Not recorded	Not recorded	20-50 % 20-60 mm	Platy	Moderate	Weak (dry)	No roots (0)	6.0	0.06	1100-1200

Other information: Buried horizon of sand at 1000mm.

Soil Profile Description

Project 2530.23a	**Date** 22/4/24	**Scribe** M.White	**Location** TP10	**Observation** Soil pit	**Easting/ Latitude** 587,092	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,287,671	**Scale**	**ASC Ground Truth** Sodosol
Secondary Vegetation Form Non-woody			**Ground Cover %** Isolated Clumps (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Imperfectly drained	**Erosion Extent** None evident	
Landform Upper slope			**Soil Surface Condition (dry)** Loose		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Near to crest, in between two wooded areas. Surface cover quarts and laterite of differing sizes. 20% cover 20-100mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-150		Clear	Loamy Sand	10yr 4/2	Not recorded	Not recorded	10-20 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	5.5	0.08	0-100
B1	150-300		Abrupt	Loamy Sand (coarse)	10yr 6/3	Not recorded	Not recorded	20-50 % 6-20 mm	Angular blocky	Moderate	Weak (dry)	Common (10-25) Very fine (<1 mm)	5.6	0.02	200-300
B21	300-1100		Gradual	Medium Heavy Clay	2.5yr 5/8	Not recorded	Not recorded	10-20 % 6-20 mm	Platy	Strong	Very firm (dry)	No roots (0) Not recorded	6.9	0.08	800-900
B22	1100-1700		Not recorded	Medium Heavy Clay	2.5yr 6/6	white 30%	Not recorded	2-10 % 6-20 mm	Platy	Strong	Very firm (dry)	No roots (0) Not recorded	5.7	0.10	1300-1400

Other information: Burried quartz throughout the B2 horizon.

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	22/2/24	M.White	TP11	Soil pit	587,295		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Woody	Very sparse (0.2-10%)		6,287,109		Sodosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Non-woody	Isolated Plants (<0.2%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
Crop stubble	Imperfectly drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Firm	Cropping	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Crop stubble. 5% rock cover 6-20mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-100		Clear	Loamy Sand	10y 3/2	Not recorded	Not recorded	2-10 % 6-20 mm	Polyhedral	Moderate	Weak (dry)	Common (10-25) Very fine (<1 mm)	6.0	0.10	0-100
B1	100-350		Abrupt	Loamy Sand	10yr 5/2	Not recorded	Not recorded	2-10 % 6-20 mm	Subangular blocky	Strong	Firm (dry)	Few (1-10) Very fine (<1 mm)	6.0	0.03	200-300
B21	350-900		Gradual	Light Medium Clay	10yr 7/8	20% Red	Not recorded	2-10 % 2-6 mm	Angular blocky	Moderate	Firm (dry)	No roots (0)	7.0	0.06	600-700
B21	900-1600		Not recorded	Light Medium Clay	10yr 7/6	30% Red	Not recorded	<2 % 2-6 mm	Angular blocky	Moderate	Very firm (dry)	No roots (0)	7.0	0.11	1200-1300

Other information: Clay becomes lighter in colour with depth. Bleaching at B1 and B2 boundary.

Soil Profile Description

Project 2530.23a	**Date** 22/2/24	**Scribe** M.White	**Location** TP12	**Observation** Soil pit	**Easting/ Latitude** 587,042	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,286,590	**Scale**	**ASC Ground Truth** Sodosol
Secondary Vegetation Form Non-woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Imperfectly drained	**Erosion Extent** None evident	
Landform Simple slope			**Soil Surface Condition (dry)** Firm		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Down slope from a crest. 10% rock cover 2-6mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Clear	Loamy Sand	10yr 3/2	Not recorded	Not recorded	10-20 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	6.0	0.37	0-100
B1	200-300		Clear	Sand	10yr 4/4	Not recorded	Not recorded	10-20 % 2-6 mm	Subangular blocky	Strong	Firm (dry)	Common (10-25) Very fine (<1 mm)	6.0	0.03	200-300
B21	300-1000		Gradual	Medium Clay	10yr 7/4	10% Yellow	Not recorded	2-10 % 2-6 mm	Subangular blocky	Strong	Strong (dry)	No roots (0)	6.0	0.04	400-500
B22	1000-1600		Not recorded	Light Medium Clay	10yr 7/3	40% Yellow	Not recorded	<2 % 2-6 mm	Platy	Strong	Strong (dry)	No roots (0)	6.0	0.05	1100-1200

Other information:

Soil Profile Description

Project 2530.23a	**Date** 22/2/24	**Scribe** M.White	**Location** TP13	**Observation** Soil pit	**Easting/ Latitude** 587,173	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,286,217	**Scale**	**ASC Ground Truth** Sodosol
Secondary Vegetation Form Non-woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Imperfectly drained	**Erosion Extent** None evident	
Landform Mid-slope			**Soil Surface Condition (dry)** Loose		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Quartz and laterite like rocks on surface. Crop stubble. 10% rock cover 20-60mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Clear	Loamy Sand	10yr 3/2	Not recorded	Not recorded	2-10 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	5.5	0.05	0-100
B1	200-500		Clear	Loamy Sand	10yd 7/4	Not recorded	Not recorded	50-90 % 20-60 mm	Apedal	Single grain	Loose (dry)	Common (10-25) Very fine (<1 mm)	5.7	0.01	300-400
B21	500-1000		Gradual	Light Clay	10yr 7/6	Red 10%	Not recorded	10-20 % 20-60 mm	Subangular blocky	Moderate	Firm (dry)	No roots (0)	7.1	0.04	700-800
B22	1000-1700		Not recorded	Light Clay	7.5yr 7/6	Red 50%	Not recorded	2-10 % 6-20 mm	Polyhedral	Moderate	Firm (dry)	No roots (0)	7.7	0.09	1300-1400

Other information:

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	22/2/24	M.White	TP14	Soil pit	586,164		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Woody	Very sparse (0.2-10%)		6,286,075		Sodosol

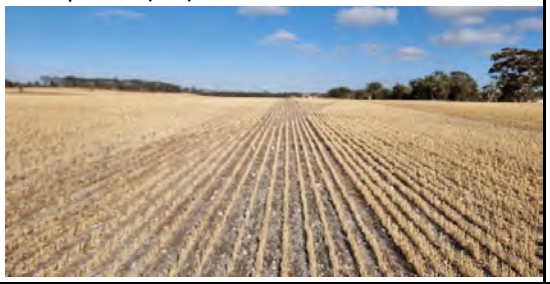
Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Non-woody	Isolated Plants (<0.2%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
Crop stubble	Moderately well-drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Firm	Cropping	None evident

Landscape Photo (North)

Landscape Photo (East)



Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Loose quartz rocks on surface. Rock surface cover 10%, 20-100mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-100		Clear	Loamy Sand	10yr 3/2	Not recorded	Not recorded	2-10 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	5.3	0.16	0-100
B1	100-300		Abrupt	Sandy Clay Loam (coarse)	10yr 5/1	Not recorded	Not recorded	2-10 % 2-6 mm	Subangular blocky	Strong	Firm (dry)	No roots (0) Not recorded	5.7	0.06	200-300
B21	300-1000		Gradual	Medium Heavy Clay	7.5yr 7/2	Red 15%	Not recorded	2-10 % 2-6 mm	Subangular blocky	Strong	Firm (dry)	No roots (0) Not recorded	8.7	0.12	600-700
B22	1000-1700		Not recorded	Medium Heavy Clay	2.5y 8/1	Not recorded	Not recorded	<2 % 2-6 mm	Lenticular	Moderate	Firm (dry)	No roots (0) Not recorded	8.1	0.10	1400-1500

Other information:

Soil Profile Description

Project 2530.23a	**Date** 22/2/24	**Scribe** M.White	**Location** TP15	**Observation** Soil pit	**Easting/ Latitude** 253,891	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,285,524	**Scale**	**ASC Ground Truth** Sodosol
Secondary Vegetation Form Non-woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Moderately well-drained	**Erosion Extent** None evident	
Landform Mid-slope			**Soil Surface Condition (dry)** Loose		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

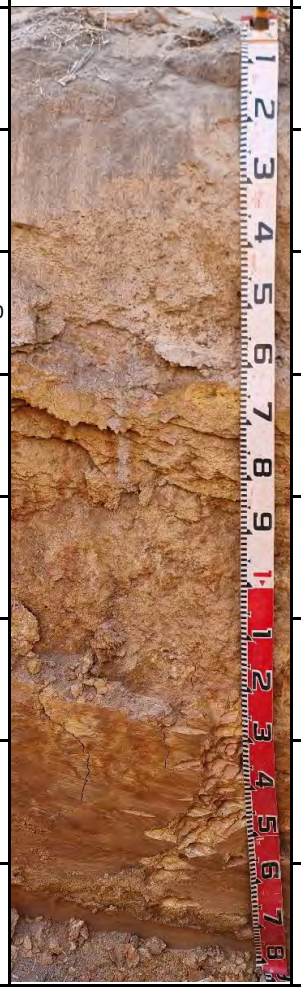
Other Information: Crop stubble remains. Rock surface cover 10% 2-6mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A1	0-150		Clear	Loamy Sand	10yr 4/2	Not recorded	Not recorded	<2 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	6.0	0.05	0-100
B1	150-550		Abrupt	Loamy Sand	10yr 6/4	Not recorded	Not recorded	10-20 % 6-20 mm	Polyhedral	Weak	Weak (dry)	Few (1-10) Very fine (<1 mm)	6.0	0.02	400-500
B21	550-1250		Gradual	Medium Heavy Clay	7.5yr 7/8	Red 30% grey 15%	Not recorded	<2 % 2-6 mm	Subangular blocky	Strong	Strong (dry)	No roots (0) Not recorded	6.0	0.11	900-1000
B22	1250-1800		Not recorded	Medium Clay	7.5yr 6/8	Red 20% grey10%	Not recorded	<2 % 2-6 mm	Apedal	Massive	Very strong (dry)	No roots (0) Not recorded	6.0	0.17	1500-1600

Other information: Coarse fragments are in higher abundance above clay horizon change.

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	21/2/24	M.White	TP16	Soil pit	585,944		Sodosol

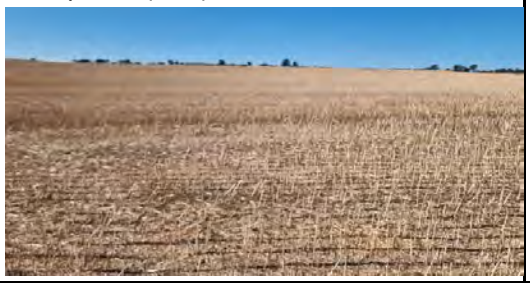
Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Woody	Very sparse (0.2-10%)		6,285,200		Sodosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Non-woody	Isolated Plants (<0.2%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
Crop stubble	Moderately well-drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Soft	Cropping	None evident

Landscape Photo (North)



Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: No rock cover
Cleared rocks and trees piled nearby.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A1	0-150		Clear	Sandy Loam	7.5yr 4/2	Not recorded	Not recorded	2-10 % 2-6 mm	Polyhedral	Moderate	Firm (dry)	Common (10-25) Very fine (<1 mm)	5.3	0.08	0-100
B1	150-350		Abrupt	Clayey Sand	Not recorded	Not recorded	Not recorded	<2 % 2-6 mm	Angular blocky	Strong	Very firm (dry)	No roots (0) Not recorded	6.9	0.02	250-350
B2	350-900		Gradual	Light Medium Clay	10yr 6/6	red mottles 40%	Not recorded	2-10 % 6-20 mm	Subangular blocky	Strong	Firm (dry)	No roots (0) Not recorded	8.3	0.09	500-600
B22	900-1500		Not recorded	Clay Loam, Sandy	10yr 5/8	red 20%	Not recorded	10-20 % 20-60 mm	Subangular blocky	Weak	Very firm (dry)	No roots (0) Not recorded	8.2	0.06	1000-1100

Other information: Bleaching at 400mm. Compressed sand above bleached layer.

Soil Profile Description

Project 2530.23a	**Date** 21/2/24	**Scribe** M.White	**Location** TP17	**Observation** Soil pit	**Easting/ Latitude** 586,913	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,284,900	**Scale**	**ASC Ground Truth** Kurosol
Secondary Vegetation Form Non-woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Moderately well-drained	**Erosion Extent** None evident	
Landform Crest			**Soil Surface Condition (dry)** Soft		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Atop the hill on the crest of the landscape. Rock surface cover 20% 20-60mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Abrupt	Sandy Loam	2.5yr 3/2	Not recorded	Not recorded	2-10 % 6-20 mm	Subangular blocky	Moderate	Weak (dry)	Common (10-25) Very fine (<1 mm)	5.5	0.11	0-100
B2	200-600		Clear	Medium Clay	2.5yr 5/8	20% Grey	Not recorded	2-10 % 2-6 mm	Polyhedral	Strong	Strong (dry)	No roots (0) Not recorded	5.5	0.05	300-400
B22	600-1200		Clear	Sandy Clay Loam	2.2yr 6/8	10% White	Not recorded	10-20 % 20-60 mm	Subangular blocky	Moderate	Firm (dry)	No roots (0) Not recorded	5.5	0.11	800-900
B23	1200-1700		Clear	Light Clay	2.5yr 6/6	Not recorded	2-10 % Carbonates	2-10 % 6-20 mm	Subangular blocky	Moderate	Very firm (dry)	No roots (0) Not recorded	5.5	0.18	1400-1500
BC	1700+		Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded

Other information: Sudden increase in clay content at 200mm. Decreases at 800mm. Burried horizons. BC not sampled

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	21/2/24	M.White	TP18	Soil pit	586,781		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Woody	Very sparse (0.2-10%)		6,283,973		Dermosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Non-woody	Isolated Plants (<0.2%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
Crop stubble	Moderately well-drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Firm	Cropping	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Close to a dam. Surface cover desnse crop stubble. 10% rock cover <2mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A11	0-200		Clear	Loamy Sand	10yr2/1	Not recorded	Not recorded	<2 % 2-6 mm	Subangular blocky	Strong	Firm (dry)	Many (25-200) Very fine (<1 mm)	5.5	0.15	50-150
A11	200-400-		Clear	Loamy Sand	10yr3/3	Not recorded	Not recorded	<2 % 2-6 mm	Subangular blocky	Strong	Firm (dry)	No roots (0) Not recorded	5.3	0.04	200-300
B1	400-800		Clear	Clayey Sand	10yr 5/3	10% grey	Not recorded	2-10 % 2-6 mm	Subangular blocky	Weak	Strong (dry)	No roots (0) Not recorded	5.5	0.03	600-700
B21	800-1150		Clear	Sandy Clay Loam	10yr 5/6	10% grey	Not recorded	<2 % 2-6 mm	Angular blocky	Moderate	Very firm (dry)	No roots (0) Not recorded	5.5	0.06	900-1000
B22	1150-1500		Abrupt	Medium Heavy Clay	10yr 6/6	50%yellow grey	Not recorded	<2 % 2-6 mm	Apedal	Massive	Very strong (dry)	No roots (0) Not recorded	5.5	0.10	1400-1500
C	1500+		Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded	Not recorded

Other information:

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	21/2/24	M.White	TP19	Soil pit	587,092		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Woody	Very sparse (0.2-10%)		6,283,810		Sodosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Non-woody	Isolated Clumps (<0.2%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
Crop stubble	Moderately well-drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Loose	Cropping	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Mid to upper slope. Isolated weeds present. Surface cover crop stubble, 70% 20mm rocks.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A11	0-100		Abrupt	Loamy Sand	10yr 3@2	Not recorded	Not recorded	20-50 % 2-6 mm	Polyhedral	Moderate	Weak (dry)	Many (25-200) Very fine (<1 mm)	5.0	0.07	0-50
A12	100-200		Clear	Loamy Sand	10yr 4/3	Not recorded	Not recorded	50-90 % 20-60 mm	Polyhedral	Weak	Weak (dry)	Few (1-10) Very fine (<1 mm)	5.5	0.03	150-200
B	200400		Clear	Clayey Sand (coarse)	10yr 5/4	Not recorded	Not recorded	50-90 % 20-60 mm	Subangular blocky	Moderate	Firm (dry)	No roots (0) Not recorded	6.0	0.02	300-400
B1	400-950		Clear	Sandy Clay Loam	10yr 6/4	5% Red	Not recorded	50-90 % 20-60 mm	Subangular blocky	Moderate	Firm (dry)	No roots (0) Not recorded	6.5	0.03	700-800
B21	950-1500		Diffuse	Medium Heavy Clay	10yr 7/8	10% Grey 10% Red	Not recorded	2-10 % 6-20 mm	Platy	Moderate	Strong (dry)	No roots (0) Not recorded	6.5	0.01	1200-1300
B22	1500-1900		Not recorded	Medium Heavy Clay	7.5yr 6/8	20% Red 20% Grey	Not recorded	2-10 % 6-20 mm	Platy	Moderate	Strong (dry)	Not recorded	Not recorded	Not recorded	Not recorded

Other information: B22 mottle colour change. No other change outside of colour. Not sampled.

Soil Profile Description

Project 2530.23a	**Date** 21/2/24	**Scribe** M.White	**Location** TP20	**Observation** Soil pit	**Easting/ Latitude** 586,680	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,283,079	**Scale**	**ASC Ground Truth** Dermosol
Secondary Vegetation Form Non-woody			**Ground Cover %** Isolated Clumps (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Moderately well-drained	**Erosion Extent** None evident	
Landform Mid-slope			**Soil Surface Condition (dry)** Hard setting		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Crop stubble. Less than 5%, 2mm rock cover.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-100		Clear	Clay Loam	10yr 4/2	Not recorded	Not recorded	<2 % 2-6 mm	Subangular blocky	Strong	Firm (dry)	Few (1-10) Very fine (<1 mm)	7.0	0.17	0-100
B1	100-400		Clear	Sandy Clay Loam	10yr 5/2	Not recorded	Not recorded	<2 % 2-6 mm	Polyhedral	Moderate	Very firm (dry)	No roots (0) Not recorded	7.0	0.39	300-400
B21	400-1100		Gradual	Light Clay	10yr 6/4	30% red	Not recorded	20-50 % 20-60 mm	Subangular blocky	Strong	Very strong (dry)	No roots (0) Not recorded	5.0	0.73	800-900
B22	1100-1600		Not recorded	Light Clay	2.5yr 4/6	10% grey	Not recorded	2-10 % 6-20 mm	Subangular blocky	Strong	Very strong (dry)	No roots (0) Not recorded	5.0	0.88	1300-1400

Other information:

Soil Profile Description

Project 2530.23a	**Date** 26/2/24	**Scribe** M.White	**Location** HA01	**Observation** Manual auger	**Easting/ Latitude** 584,588	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Non-woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,284,574	**Scale**	**ASC Ground Truth** Sodosol
Secondary Vegetation Form Woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** Water	
Vegetation (species) Crop stubble					**Drainage (site)** Imperfectly drained	**Erosion Extent** Minor or present	
Landform Lower slope			**Soil Surface Condition (dry)** Soft		**Land Use** Cropping	**Erosion State** Partially stabilised	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Site is immediately to the north of a dam. Water etosion evident from water running into dam. Same crop stubble. Rock cover 10% 6-20mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Not recorded	Sandy Loam	10yr 2/2	Not recorded	Not recorded	<2 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.2	0.26	0-100
B1	200-500		Not recorded	Sandy Loam	10yr 2/2	Not recorded	Not recorded	<2 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.2	0.12	300-400
B21	500-800		Not recorded	Loamy Sand	10yr 3/2	Not recorded	Not recorded	<2 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.6	0.08	600-700
B22	800-1200		Not recorded	Clayey Sand	10yr 3/2	Not recorded	Not recorded	10-20 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	7.1	0.09	1100-1200

Other information:

Soil Profile Description

Project 2530.23a	**Date** **26**	**Scribe** M.White	**Location** **HA02**	**Observation** Manual auger		**Easting/ Latitude** 585,099	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Non-woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**		**Northing/ Longitude** 6,284,517	**Scale**	**ASC Ground Truth** Dermosol
Secondary Vegetation Form Woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**		**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble						**Drainage (site)** Moderately well-drained	**Erosion Extent** None evident	
Landform Mid-slope			**Soil Surface Condition (dry)** Firm			**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Crop stubble. 200m away from abondoned mining pit. Rock cover 10% 6-20mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Not recorded	Loamy Sand	10yr 3/4	Not recorded	Not recorded	2-10 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.0	0.13	0-100
B21	200-300		Not recorded	Clayey Sand	10yr 3/6	Not recorded	Not recorded	10-20 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.0	0.16	200-300
B22	400-600		Not recorded	Clayey Sand	10yr 3/6	Not recorded	Not recorded	20-50 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.0	0.04	400-500

Other information:

Soil Profile Description

Project 2530.23a	**Date** 26/2/24	**Scribe** M.White	**Location** **HA03**	**Observation** Manual auger	**Easting/ Latitude** 585,747	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Non-woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,284,397	**Scale**	**ASC Ground Truth** Dermosol
Secondary Vegetation Form Woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Moderately well-drained	**Erosion Extent** None evident	
Landform Upper slope			**Soil Surface Condition (dry)** Soft		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Site is pasture directly beside a nature reserve. Crop stubble. Rock cover 2% 20mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Not recorded	Clayey Sand	5yr 3/4	Not recorded	Not recorded	10-20 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.4	0.09	0-100
B1	200-500		Not recorded	Light Clay	2.5yr 2/4	Not recorded	Not recorded	10-20 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.2	0.06	300-400

Other information:

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	26/2/24	M.White	HA04	Manual auger	585,868		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Non-woody	Very sparse (0.2-10%)		6,283,505		Dermosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Non-woody	Isolated Plants (<0.2%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
Crop stubble	Moderately well-drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Soft	Cropping	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Pasture. Crop stubble. Rock cover less than 10% 20-60mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Not recorded	Clayey Sand	5yr 3/4	Not recorded	Not recorded	2-10 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.0	0.09	0-100
B1	200-400		Not recorded	Sandy Clay Loam	7.5yr 4/3	Not recorded	Not recorded	20-50 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.5	0.05	300-400
B2	400-700		Not recorded	Clayey Sand	7.5yr 4/6	Not recorded	Not recorded	50-90 % 20-60 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.5	0.04	600-700

Other information: Depth of refusal at 300mm and 800mm. 1m apart. Most likely encountering clay layer.

Soil Profile Description

Project 2530.23a	**Date** 26/2/24	**Scribe** M.White	**Location** HA05	**Observation** Manual auger	**Easting/ Latitude** 586,223	**Zone**	**ASC Mapped** Sodosol
Dominant Vegetation Form Non-woody			**Ground Cover %** Very sparse (0.2-10%)	**Aspect**	**Northing/ Longitude** 6,283,617	**Scale**	**ASC Ground Truth** Dermosol
Secondary Vegetation Form Woody			**Ground Cover %** Isolated Plants (<0.2%)	**Slope %**	**Rock Outcrop** No rock outcrop	**Erosion Type** None evident	
Vegetation (species) Crop stubble					**Drainage (site)** Moderately well-drained	**Erosion Extent** None evident	
Landform Mid-slope			**Soil Surface Condition (dry)** Soft		**Land Use** Cropping	**Erosion State** None evident	

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Similar to HA04. rock cover 30% 20-60mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Not recorded	Sandy Clay Loam	10yr 3/6	Not recorded	Not recorded	20-50 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.5	0.05	0-100
B	200-500		Not recorded	Sandy Clay Loam	7.5yr 4/4	Not recorded	Not recorded	50-90 % 20-60 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.5	0.05	400-500

Other information:

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	23/2/24	M.White	HA06	Manual auger	584,184		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Non-woody	Mid-dense (30-70%)		6,288,144		Dermosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
	Mid-dense (30-70%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
	Moderately well-drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Firm		None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Road side nature strip. Groundcover leaf litter. No rock cover.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Not recorded	Clayey Sand	7.5yr 2.5/2	Not recorded	Not recorded	2-10 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.5	0.08	0-100
B	200-500		Not recorded	Sandy Clay Loam	7.5yr 33/3	Not recorded	Not recorded	<2 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.0	0.14	400-500

Other information:

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	23/2/24	M.White	HA07	Manual auger	583,752		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Non-woody	Dense (>70%)		6,289,455		Dermosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Woody	Sparse (10-30%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
	Imperfectly drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Firm	Cleared	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Roadside auger site. rock cover 20% 20mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-200		Not recorded	Loamy Sand	5yr 3/4	Not recorded	Not recorded	10-20 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.0	0.03	0-100
B	200-600		Not recorded	Clayey Sand	7.5yr 2.5/3	Not recorded	Not recorded	10-20 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.5	0.03	500-600
B2	600-900		Not recorded	Clayey Sand	2.5yr 2.5/3	Not recorded	Not recorded	2-10 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.5	0.07	800-900

Other information:

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	23/2/24	M.White	HA08	Manual auger	583,002		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Non-woody	Mid-dense (30-70%)		6,289,445		Dermosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Woody	Sparse (10-30%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
	Moderately well-drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Mid-slope	Firm	Cleared	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Other Information: Auger site off the side of the road. 100% veg cover. 10% rock cover 20mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
A	0-300		Not recorded	Loamy Sand	7.5yr 2.5/2	Not recorded	Not recorded	2-10 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.0	0.05	0-100
B	300-600		Not recorded	Clayey Sand	5yr 3/4	Not recorded	Not recorded	10-20 % 2-6 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.0	0.03	400-500
B2	600-900		Not recorded	Clayey Sand	5yr 3/4	Not recorded	Not recorded	20-50 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	6.0	0.03	800-900

Other information:

Soil Profile Description

Project	Date	Scribe	Location	Observation	Easting/ Latitude	Zone	ASC Mapped
2530.23a	23/2/24	M.White	HA09	Manual auger	583,366		Sodosol

Dominant Vegetation Form	Ground Cover %	Aspect	Northing/ Longitude	Scale	ASC Ground Truth
Non-woody	Dense (>70%)		6,290,200		Dermosol

Secondary Vegetation Form	Ground Cover %	Slope %	Rock Outcrop	Erosion Type
Woody	Sparse (10-30%)		No rock outcrop	None evident

Vegetation (species)	Drainage (site)	Erosion Extent
	Moderately well-drained	None evident

Landform	Soil Surface Condition (dry)	Land Use	Erosion State
Upper slope	Firm	Pastures	None evident

Landscape Photo (North)

Landscape Photo (East)

Soil Surface Condition Photo

Site Type

Detailed + Sampled for Lab

Landscape Photo (South)

Landscape Photo (West)

Other Photo

Microrelief

Type

Vertical (m)

Horizontal (m)

Sampled

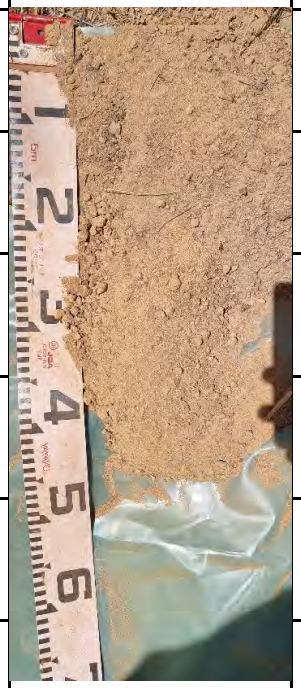
Other Information: Nature strip between paddock and dirt road. 10% rock cover 20mm.

Dominant Vegetation Photo 1

Dominant Vegetation Photo 2

Other Vegetation Photo

Soil Profile Description

Horizon	Depth (mm)	Profile Photo	Boundary	Texture	Moist Colour	Mottle (colour, abundance)	Segregations (abundance, nature)	Coarse fragments (abundance, size)	Structure (type)	Structure (grade)	Consistence (soil water status)	Roots (abundance, size)	pH	EC (dS/m)	Depth of Sample for Lab (mm)
P	0-200		Not recorded	Sandy Clay Loam	Not recorded	10yr 4/6	Not recorded	10-20 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.2	0.03	0-100
B	200-500		Not recorded	Sandy Clay Loam	Not recorded	10yr 4/6	Not recorded	10-20 % 6-20 mm	Not recorded	Not recorded	Not recorded	Not recorded	5.9	0.02	300-400

Other information: