



Appendix M

Aboriginal cultural heritage assessment





Balranald Mineral Sands Project Modification 1

Aboriginal cultural heritage assessment

Prepared for Iluka Resources Pty Ltd
April 2022





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Balranald Mineral Sands Project Modification 1

Aboriginal cultural heritage assessment

Report Number

Balranald MOD1_ACHA

Client

Iluka Resources Pty Ltd

Date

29 April 2022

Version

v4

Prepared by



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1 Introduction

EMM Consulting Pty Limited (EMM) was commissioned by Iluka Resources Limited (Iluka) to prepare an Aboriginal Cultural Heritage Assessment (ACHA) for the proposed modification (MOD1) to the approved Balranald Mineral Sands Project in south-western New South Wales (NSW).

This ACHA comprises the following two key components:

- a review of the Aboriginal heritage impacts and management requirements related to the proposed modification footprint within the approved project boundary (as set out in the ACHMP 2016); and
- further Aboriginal cultural heritage assessment, archaeological investigation, impact assessment and management recommendations for the proposed modification footprint outside of the approved project boundary.

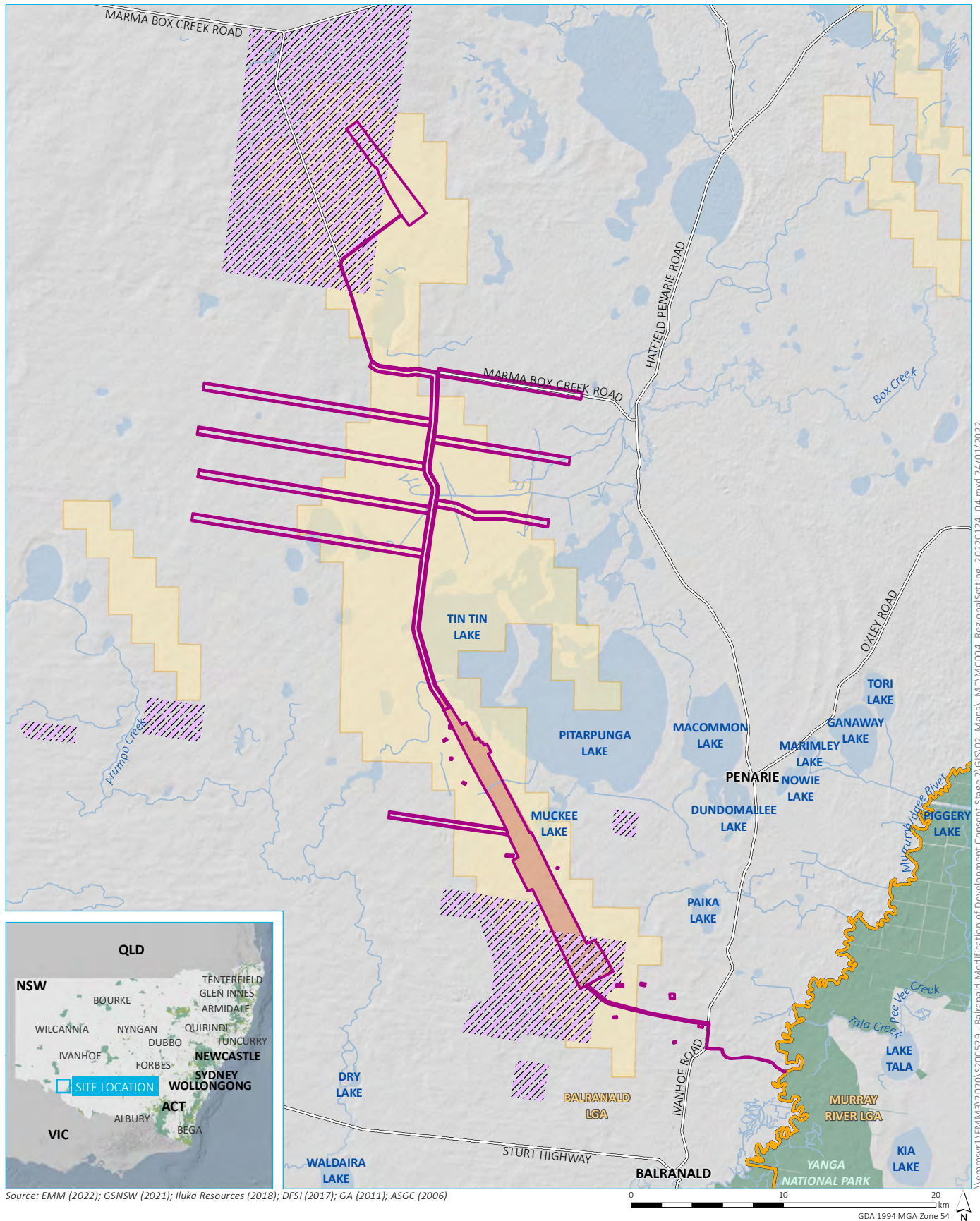
1.1 Project background

Iluka have approval to develop a mineral sands mine in south-western (NSW), known as the Balranald Mineral Sands Project (the project). It includes construction, mining, primary processing and rehabilitation of two linear mineral sand deposits, known as the West Balranald and Nepean deposits, located approximately 12 kilometres (km) and 66 km north-west of the town of Balranald (Balranald town), respectively (Figure 1.1).

An environmental impact statement (EIS) was prepared and submitted in 2015 to accompany a State significant development (SSD-5285) application under Part 4 of the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) for an open cut, truck and shovel mining method (EIS 2014). Development consent was granted by the NSW Department of Planning, Infrastructure and Environment (DPIE) under Part 4 of the EP&A Act on 5 April 2016. The Balranald Project also included undertaking a bulk sampling activity at the West Balranald mine to test the removal of up to 100,000 tonnes (t) of ore using underground mining methods.

The project EIS was supported by an ACHA prepared by Niche Environment and Heritage Pty Ltd in 2015 (Niche 2015) which identified and assessed the Aboriginal cultural heritage values across the project area in consultation with Registered Aboriginal Parties (RAPs). In 2016, an Aboriginal Cultural Heritage Management Plan (ACHMP, Niche 2016) was developed in consultation with project RAPs and approved in accordance with Condition #20 of the development consent. The ACHMP broadly sets out management for individual Aboriginal sites, but also includes mapped 'archaeological risk layers' (classed as low, moderate and high) that guide the future identification, assessment and management of Aboriginal cultural values within the approved project boundary.

Since development consent was granted in April 2016, Iluka has undertaken the approved bulk sampling activity, validated key elements of the mining unit design and have been used to help guide the proposed modification to inform the potential suitability (ie commerciality and reduced environmental impacts) of underground mining as an alternative method for resource extraction for the Balranald Project.



KEY

- EIS Approved Balranald Project Area (SSD-5285)
- Exploration Licence (EL7450)
- Mining Lease (ML1736)
- Southern Mallee Conservation Area (2015)
- Major road
- Watercourse/drainage line
- Waterbody
- NPWS reserve

INSET KEY

- NPWS reserve
- State forest

Regional setting

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 1.1

1.2 Description of modification

The proposed modification would involve:

- continuing underground mining within a portion of the approved disturbance footprint of the West Balranald deposit pursuant to the consent (ie mining area); and
- development of approved mineral processing infrastructure within a proposed new area of disturbance (ie surface infrastructure).

The proposed modification will ensure minimal or no changes are proposed to a number of key aspects of the existing Balranald Project; in particular, ore production and processing at a rate no greater than approved under the development consent. Potential environmental impacts from the proposed modification, including Aboriginal cultural heritage, will be reduced compared to the approved Balranald Project.

The construction of infrastructure approved under the development consent would be undertaken to support the construction and operation for the proposed underground mining trial, including mineral processing infrastructure, haul road, transmission line, access roads, upgrade of external roads and intersections, gravel extraction, monitoring infrastructure and accommodation facility.

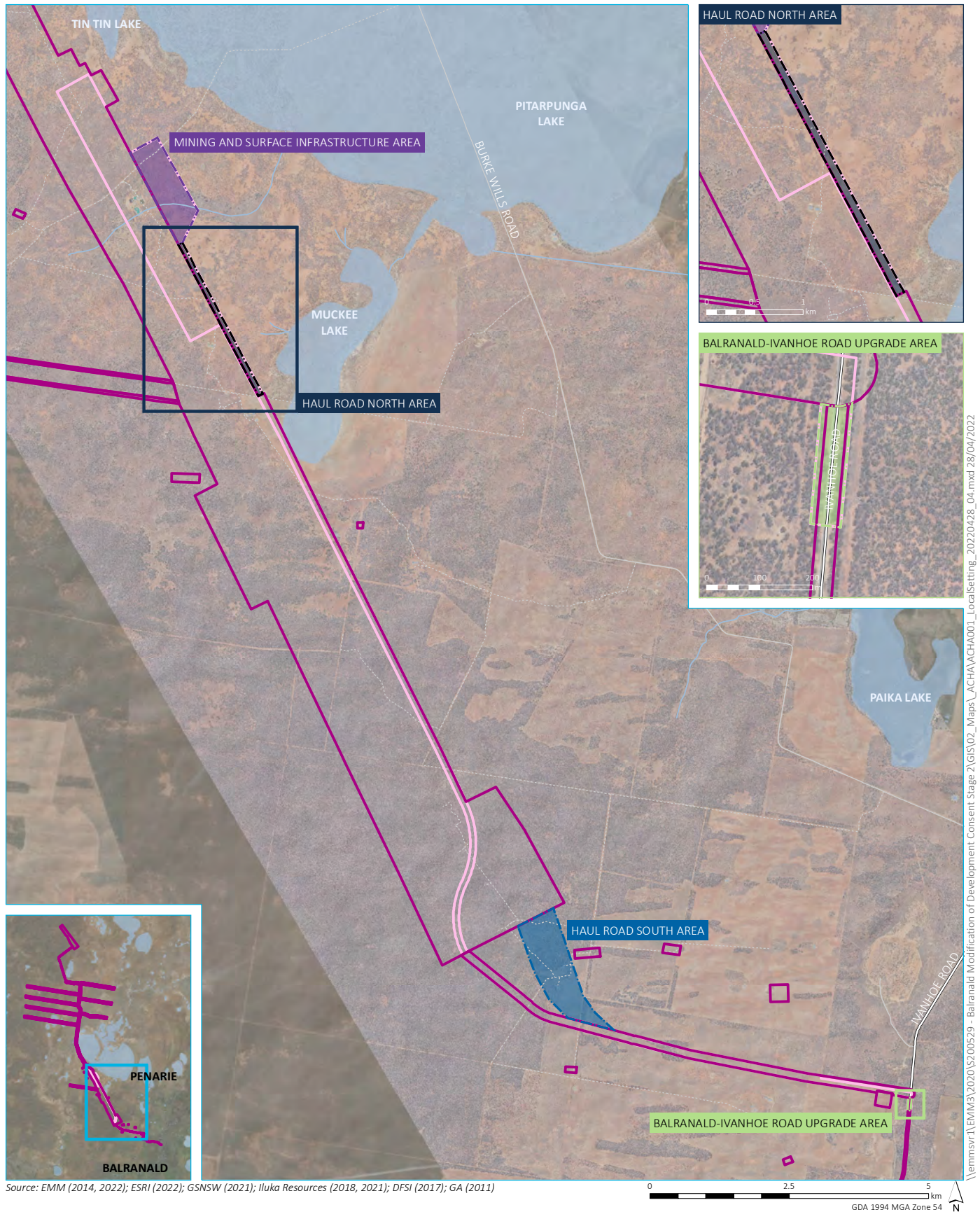
The majority of this infrastructure would be required regardless of the mining method (ie open cut as approved under the development consent, or underground). For all other land located outside of the proposed modification area, ie other areas of the West Balranald mine and the Nepean mine, Iluka proposes no change to the currently approved open cut mining method at this stage.

The underground mining process would involve:

- clearing the footprint directly above the mining area – the area will be stripped of topsoil, subsoil and non-saline overburden to a nominal depth of 2 metres (m);
- surface placement of treated sand tails and overburden/subsoil ahead of mining into the space created by the above stripping;
- sequential underground mining of the ore;
- processing of the mined ore to separate the heavy mineral concentrate (HMC) from sand tails, sand fines and oversize;
- stockpiling of the HMC;
- backfilling of sand fines underground;
- replacement of subsoil and topsoil for rehabilitation and final landform; and
- environmental monitoring activities.

Ore is expected to be produced and processed at a rate no greater than approved under the development consent. The processing plant on site will produce a Heavy Mineral Concentrate (HMC) to generate two primary product streams; magnetic HMC and non-magnetic HMC.

The product would be stockpiled and transported off-site for downstream processing with underground mining operations to be undertaken for a period of six years. The MOD1 disturbance footprint (study area) is shown in Figure 1.2.



KEY

 EIS Approved Balranald Project Area (SSD-5285) (project area)

 Proposed modification (study area)

Major road

Minor road

Existing track

Watercourse/drainage line

Waterbody

Investigation area

Mining and surface infrastructure area

Haul road north area

Haul road south area*

Balranald-Ivanhoe Road upgrade area

* Excluded from MOD1 development

Local setting

Balranald Mineral Sands Project
 Aboriginal cultural heritage assessment
 Figure 1.2

1.3 Purpose of the ACHA and scope

The objectives of the ACHA are to:

- identify Aboriginal cultural heritage values relevant to the proposed MOD1 investigation area which include:
 - Aboriginal objects and sites;
 - Aboriginal socio-cultural or historic values which might not be related to Aboriginal objects; and
 - areas of archaeological sensitivity.
- assess the significance of Aboriginal objects, sites and locations identified in the course of the archaeological investigations and through Aboriginal community consultation;
- assess the impact of the project on identified Aboriginal cultural heritage values; and
- propose appropriate management measures for potentially impacted Aboriginal cultural heritage values in response to their assessed significance.

1.3.1 Project, study and investigation area definitions

The **project area** refers to the Balranald Mineral Sands Project boundary approved under SSD-5285.

The **study area** is the entire proposed modification area that extends within and outside of the approved project area.

The archaeological **investigation area** refers to the portions of the MOD1 investigation area that extend outside the project area. The investigation area represents where additional archaeological investigation was undertaken as part of this ACHA, as it was not previously assessed under EIS 2014 ACHA (Niche 2015).

The MOD1 investigation area was divided into the following four areas to assist the archaeological survey and assessment (Figure 1.2):

- mining and surface infrastructure area;
- haul road north area;
- haul road south area¹; and
- Balranald-Ivanhoe Road and mine site access upgrade area.

¹ Note: this area has been removed from the MOD disturbance footprint after completion of archaeological survey and assessment. The area included a previous iteration of the MOD1 haul road design which has since been excluded. The area has been included in this ACHA to acknowledge that it has been assessed for its archaeological potential, should any future development be proposed.

1.3.2 Regulator consultation and assessment approach

This ACHA has aimed to generally align with the assessment methods, commitments and management measures set out in the EIS 2014 ACHA (Niche 2015) and the approved project ACHMP (Niche 2016). The following best practice NSW heritage guidelines were followed where they did not conflict with requirements set out in the ACHMP and other guideline aspects not relevant to SSD applications:

- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011);
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a; and
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010b).

Iluka and EMM have consulted Heritage NSW (Department of Premier and Cabinet) throughout the MOD1 ACHA. Table 1.1 provides a summary of the outcomes of consultation with Heritage NSW. Documentation of consultation with Heritage NSW is provided in Appendix F.

Table 1.1 Consultation with Heritage NSW

Date and details	Key topics discussed	Outcomes
Date: 15 December 2021 Type: MS Teams meeting Attendees: Heritage NSW, Iluka and EMM. Materials: project information and methods letter provided 13 December 2021 prior to meeting. Meeting delivered to MS Powerpoint presentation.	Presentation of: • MOD1 project information and ACHA assessment background and methods. • Summary of archaeological survey results in MOD1 investigation area and proposed test excavation scope and methods. • Schedule and timing of ACHA, noting that test excavation results would be provided after the MOD1 EIS and development application is submitted. Commitment to provide an addendum to the ACHA detailing the outcomes of test excavation as part of the MOD1 response to submissions report.	Heritage NSW generally supported proposed ACHA assessment methods. Heritage NSW suggested that the proposed test excavation include provisions for mechanical excavation methods if required, and to ensure that areas of low archaeological potential are established from the excavation. EMM adopted these methods into the test excavation methodology which is as Appendix E. Heritage NSW supported the proposed timing of ACHA and provision of an addendum report during the MOD1 EIS response to submissions phase.
Dates: 7–18 March 2022 Type: emails to Heritage NSW and follow up call. Materials: notice of test excavation letter and draft ACHA (version provided to RAPs).	Notice of intent to undertake test excavation in MOD1 investigation area. Provision of test excavation methodology for Heritage NSW review. Provision of draft ACHA included to provide context for proposed test excavation.	Heritage NSW responded on 15 March 2022 supporting excavation and provision to use mechanical testing if required for geomorphic study and if soils encountered were too difficult for manual excavation. EMM contacted Heritage NSW on 18 March via phone to advise that they would no longer pursue mechanical excavation during the test excavation program due to WHS and logistical issues, but that the geomorphologist would be consulted during the excavation to determine if it was necessary as part of the MOD1 ACHA. Heritage NSW supported this updated approach.

1.4 Legislative context

There are several Commonwealth and state Acts (and associated regulations) that manage and protect Aboriginal cultural heritage (Table 1.2).

Table 1.2 Commonwealth and State legislation relevant to the project/proposed MOD1 for Aboriginal heritage

Legislation	Description	Relevant to the project/MOD1	Details
Commonwealth			
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Recognises sites with universal value on the World Heritage List (WHL). Protects Indigenous heritage places with outstanding heritage value to the nation on the National Heritage List (NHL), and significant heritage value on the Commonwealth Heritage List (CHL).	No	There are no Indigenous heritage places within the project area that are listed on the WHL, NHL, or the CHL.
<i>Native Title Act 1993</i>	Administers rights and interests over lands and waters by Aboriginal people. Provides for negotiation and registration of Indigenous Land Use Agreements (ILUAs). Often used in NSW to identify relevant stakeholders for consultation.	No	No native title claim applications or determinations or Indigenous Land Use Agreements exist over the MOD1 area.
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>	Preserves and protects areas and objects of particular significance to Aboriginal people that are under threat from injury or desecration.	No	There are no areas or objects within the MOD1 investigation area subject to a Declaration under the Act.
State			
<i>Environmental Planning and Assessment Act 1979</i>	Requires environmental impacts, including to Aboriginal heritage, to be considered in land use planning. Provides for the development of environmental planning instruments, including State Environmental Planning Policies and Local Environmental Plans.	Yes	The project was assessed a State Significant Development under Part 4, Division 4.7 of the Act. Development consent was issued under Section 4.36 of the Act. The proposed modification will be assessed by a modification application under section 4.55(1A) of the Act.
<i>National Parks and Wildlife Act 1974</i>	Provides blanket protection for all Aboriginal objects and declared Aboriginal places. Includes processes and mechanisms for development where Aboriginal objects are present, or where Aboriginal Places are proposed for harm.	Yes	The NPW Act generally remains in force for the project in relation to the discovery, impact notification and care of Aboriginal objects in NSW. However, as the project is classed as SSD, an Aboriginal heritage impact permit (AHIP) is therefore not required to permit harm to Aboriginal objects associated with the project or associated modifications. Instead, an approved ACHMP serves as an approval to manage impacts to Aboriginal objects (current ACHMP in force for the project area was approved in 2016).
<i>Aboriginal Land Rights Act 1983</i>	Establishes Local Aboriginal Land Councils (LALCs). Allows transfer of ownership of vacant crown land to a Local Aboriginal Land Council. The Office of the Registrar, <i>Aboriginal Land Rights Act 1983</i> (ORALRA), registers Aboriginal land claims and maintains the Register of Aboriginal Owners. Often used in NSW to identify relevant stakeholders for consultation.	No	A request to search the Register of Aboriginal Owners was made to the ORALRA on 19 December 2021. The study area does not appear to have Registered Aboriginal Owners pursuant to Division 3 of the Act.

2 Aboriginal consultation

2.1 Registered Aboriginal parties

There are five RAPs registered as the primary stakeholders for the project and ACHMP:

- the Balranald Local Aboriginal Land Council;
- the descendants of Alice Kelly, the Muthi Muthi people, represented by Mr. Daniel Kelly through the Balranald Aboriginal Health Service;
- Paul Charles Kullila Site Consultants;
- National Koori Site Management; and
- Kay Dowdy.

Iluka is committed to maintaining ongoing consultation with all RAPs throughout the life of the Balranald Project.

2.2 Summary of 2015 ACHA consultation

The following is a summary of the Aboriginal consultation process followed for the EIS 2014 ACHA, which is based on the more extensive account given in that report (Niche 2015).

The *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010b) were used for the EIS 2014 ACHA. RAPs were invited to provide cultural information about the project study area, were provided with draft assessment and fieldwork methods for review and kept consulted about project updates and management via consultation meetings, letters and emails and provided with assessment documentation for review and comment.

Subsequent to project approval, Niche and Iluka consulted with RAPs for the development of an ACHMP in accordance with Condition of approval (CoA) 20 under development consent for SSD-5285. The ACHMP was approved in April 2016 (Niche 2016) and consultation with RAPs has been ongoing since the approval to undertake the management measures set out in the plan.

A summary of the main consultation components during EIS 2014 ACHA phase and ACHMP is provided in Table 2.1. An overview of the entire consultation process to date is provided in Section 5 of the EIS 2014 ACHA (Niche 2015).

Table 2.1 Summary of the consultation prior to the proposed modification

Component	Key features
ACHA Phase	
December 2011 – May 2015 (Niche 2015) EIS 2014 ACHA consultation component	This phase included: - the identification, notification and registration of RAPs; - presentation of project information and assessment methodologies (including on-site meeting on 14 June 2012 in Balranald); - gathering cultural information; - archaeological survey with RAP involvement (which occurred over July – August 2012, September – October 2013, October and December 2014 due to changes in project boundaries); - provision of draft ACHA for RAP review, including a consultation meeting in Balranald on 26 February 2015; and - provision of final ACHA to RAPs as part of EIS lodgement.
ACHMP Phase	
February 2015 – April 2016 (Niche 2016) Preparation and approval of ACHMP	This phase included: - notification of intent to prepare ACHMP (February 2015); - provision of draft ACHMP for 28-day review period (November 2015), including on-site meeting to discuss ACHMP on 3 December 2015; - finalisation of ACHMP, issue to DPIE and OEH (now Heritage NSW), and approval of document (December 2015 – April 2016).
2016 to present	RAP representative fieldwork positions have been provided to RAPs for surface artefact collection activities within the project area and due diligence level assessments related to geotechnical exploration activities within and outside of the project area.

2.3 Consultation for the proposed modification

The Aboriginal consultation documentation for the proposed modification is summarised in this section and provided in Appendix B.

The project RAPs were notified about the proposed modification on 25 November 2021 via email with a letter that provided an overview of the proposed modification, the proposed assessment approach, and requested any cultural information about the MOD1 areas.

A draft version of this report, which included background information, results, draft significance assessments and draft management recommendations, was issued to RAPs on 28 February 2022 accompanied by a cover email with guiding notes and proposing a 28-day timeframe for review. The draft report included highlighted text indicating sections where RAP input was sought regarding Aboriginal heritage values, significance assessment and management measures. No responses were received during this review period.

3 Existing environment

Understanding environmental context assists with predictions of archaeological potential, such as the likelihood of archaeological material being present in the landscape, its spatial distribution and its preservation. Landscape features were an important factor for the choice of camping and transitory and ceremonial areas used by Aboriginal people. Similarly, these landscape features and historical land use plays a role in the level of preservation and the integrity of archaeological sites.

A landscape consisting of suitable topography, hydrology, geology and soils has strong links with natural resources that would have been available to, and sought after, by Aboriginal people. Flora and fauna would have provided food, tools, shelter and ceremony (culturally modified trees); proximity to fresh water was necessary for life and provided food. Stone artefacts were manufactured from raw stone material that was collected from quarry sites.

The following summarises the key findings of the EIS 2014 ACHA which provides a comprehensive investigation into the local and regional environmental context (Niche 2015). Further detail on landscape, geomorphology, hydrology, soil, geology, vegetation and disturbance context is provided in Appendix D.1:

- The study area is situated within the Murray Darling Depression Bioregion. Topography is generally flat with little relief (Figure 3.1). The landscape is characterised by dune fields and sand plains with windblown and eroded shallow depressions, vegetated by mallee communities, and undulating plains vegetated with saltbush, bluebush, belah and rosewood communities. Within and surrounding the study area are swamp depressions and ephemeral small lakes, and a system of large relict lakes with fringing lunette formations.
- Locally, the main surface water feature within the Balranald project area is Box Creek, which is an ephemeral watercourse and a tributary of the Murray River, approximately 2.5 km to the north-east of the study area (Figure 3.1). Box Creek was not an active channel in terms of floodplain deposition for the majority of the Holocene, but prior to this would have actively meandered across the plains. In more recent times, the creek only flows during and immediately following heavy local rainfall or large flooding events. Permanent surface water flows therefore, are confined to the major rivers and their associated backwaters outside of the Balranald Project area.
- Pleistocene relict landforms are found in the vicinity of the study area near Muckee Lake (0.5 kilometres (km) to the east), Tin Tin Lake (3 km to the north) and Pitarpunga Lake (3 km to the east). As the climate became increasingly arid into the mid Holocene, groundwater declined, and the lakes dried up (illustrated on Plate D.1).
- Previous geomorphological study (Mitchell 2012) indicates that the study area is primarily situated on the sandplain away from the lakes and rivers, may have depended on sufficiently heavy rain to flood the gilgai. Occupation of the study area is therefore likely to date to the late Holocene, after the large lakes dried permanently. Mitchell describes this period as “dispersed occupation of the sand plain country based on ephemeral water supplies and wetlands provided by flooded gilgai.” During the Holocene, after the large lakes dried permanently, human occupation within the study area which is situated on the sandplain away from the lakes and rivers, may have depended on sufficiently heavy rain to flood the gilgai.
- The geomorphological study identified lunettes as key features of archaeological potential which build up as crescent shaped dunes on the eastern edges of lakes in the local area (Appendix D.1.3). Therefore, while part of the proposed haul road is situated on the shore of Muckee Lake, as it is on the western edge of the lake, deeper Palaeolithic archaeological remains, including burials and middens, are less likely to be present than in the deeper sands of lunettes on eastern shore of Muckee Lake, where WB66 was identified (see Section 3.1.2 and Figure 3.1).

- Land systems are areas with recurring patterns in topography, soils and vegetation. The study area is situated within the Rata, Marma, Hatfield and Condoulpe Western NSW land systems. These land systems are broadly comprised of Riverine plains with saltbush and bluebush (Rata and Hatfield), scalded plains (Marma), and sandplains and dune fields with mallee (Condoulpe) (Figure 3.1). These land systems have broad implications for archaeological potential which is detailed in Table 4.1.
- Disturbance within the study area reflects historical use of the landscape by Europeans from the nineteenth century. The land has been used for stock which has impacted the nature and abundance of vegetation as well as the quality of the soil. Land clearance has largely resulted in the removal of trees across the study area and sheet erosion of the sandplain has stripped topsoil creating large hard surfaced scalds with remnant vegetation mounds with original soils on the margins of the scalds (Plate 3.1 and Plate 3.3).



Plate 3.1 Scald area with surface artefacts, WB 45. View north-west.



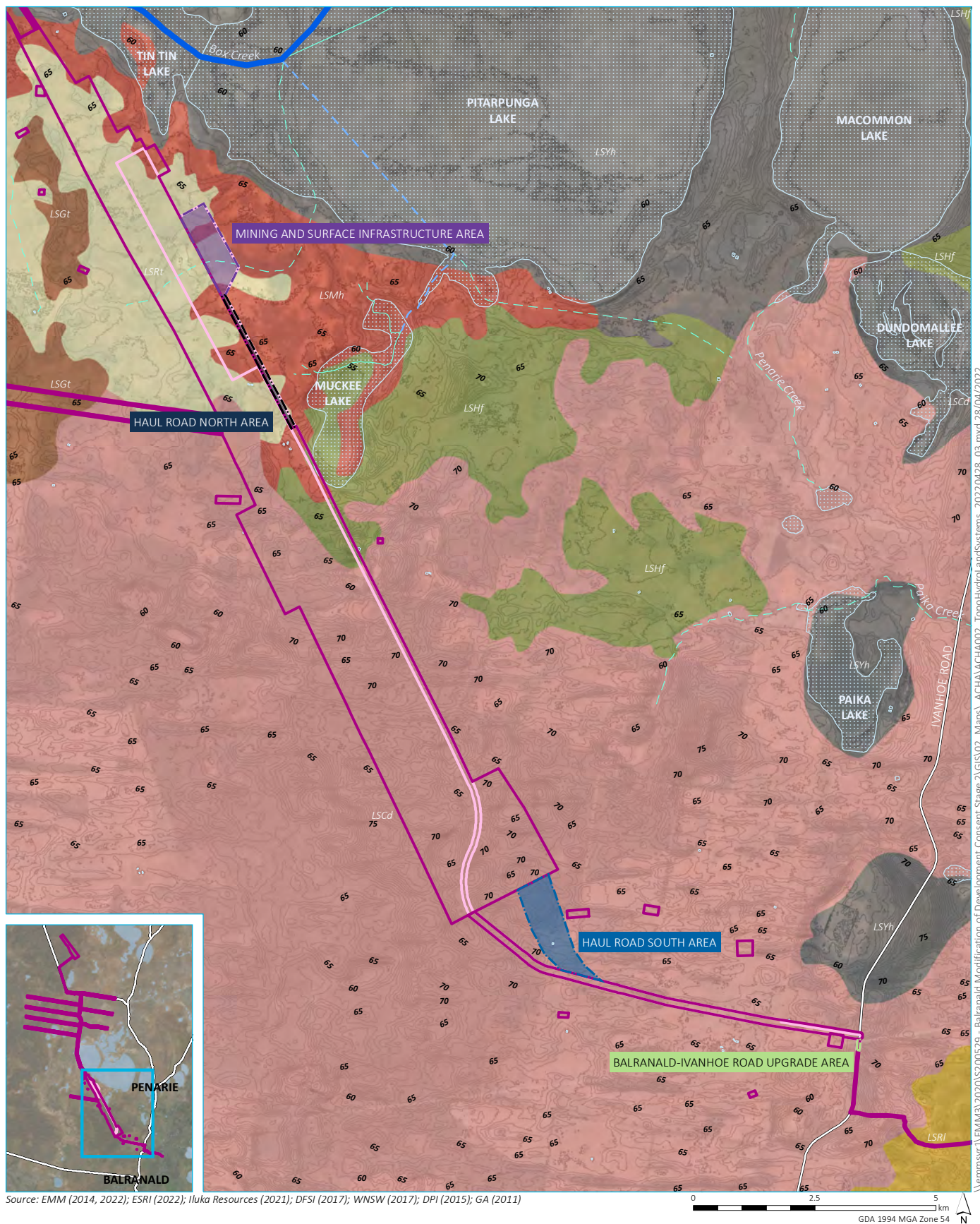
Aeolian vegetation mound

Remnant A horizon

Wash slope

Remnant B horizon

Plate 3.2 Example of vegetation mound within Aboriginal site WB41.



KEY

 EIS Approved Balranald Project Area (SSD-5285) (project area)

 Proposed modification (study area)

Major road

Topographic contour (1 m interval)

Investigation area

Mining and surface infrastructure area

Haul road north area

Haul road south area*

Balranald-Ivanhoe Road upgrade area

Waterbody

Strahler stream order

1st order

2nd order

3rd order

8th order

Land systems of Western NSW

LSCd | Condoupe

LSGt | Gulthul

LSHf | Hatfield

LSMh | Marma

LSRT | Rata

LSRI | Riverland

LSYh | Youhl

* Excluded from MOD1 development

Topography, hydrology and land systems

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 3.1

3.1 Aboriginal heritage context

3.1.1 Overview

The following provides an overview of the Aboriginal heritage context relevant to the study area. Further detail regarding etho-historical background, regional archaeological studies, local studies and previously recorded Aboriginal heritage sites is provided in Appendix D.2:

- The study area is on Muthi country (Plate 3.3).
- In NSW, the earliest evidence of Aboriginal people, dating to 50,000 – 45,000 years ago, has been found in the Willandra Lakes Region World Heritage Area (WLRWHA) approximately 45 km north-east of the study area where archaeological evidence has been identified along the eastern lunette of Lake Mungo. Sites include burials, shell middens, hearths, stone artefact and quarries.
- The landscape of the study area is surrounded by ancient lakes similar to WLRWHA. However, the archaeologically significant eastern lunettes of these lakes are outside the study area and archaeological evidence on the landforms within the study area is predicted (Mitchell 2012) to date to the late Holocene.
- An ACHA was completed for the Balranald Project EIS (Niche 2015). The 2014 EIS ACHA identified a total of 548 sites, 43 of which were within the study area). Since the Project ACHA was finalised in 2015, an additional 52 sites within the study area have been identified, making a total of 95 Aboriginal cultural sites within the study area (including the 12 that were identified during the MOD1 survey, see Section 3.1.2). Previously recorded sites in the local area are shown on Figure 3.2a to Figure 3.2c.
- Following the results of survey for the EIS 2014 ACHA and informed by land system data, the Balranald Project area and its surrounds were classified into areas of high, moderate and low archaeological risk which have guided the ACHMP (Niche 2016) and subsequent the approach of the MOD1 ACHA.
- The north of the study area is predominantly situated on areas of high and moderate archaeological risk while most of the haul road in the south of the study area is classified as low archaeological risk (Figure 3.2). According to the 2014 EIS ACHA modelling, within the investigation area, areas of high and moderate archaeological risk are situated on Marma and Rata land systems (Figure 3.1) whereas Hatfield and Condoulpe land systems are considered low archaeological risk areas.
- The most common site characteristics in the MOD1 investigation area are:
 - Artefacts, predominantly silcrete, which are widespread across the investigation area.
 - Hearths which have been found on all land systems except Condoulpe but are most commonly identified on the scalded red contrast soils of the plains, visible on the surface by heat retainers of burnt clay, burnt termite mounds, calcrete and stone, in association with burnt sediment, charcoal, animal bones and stone artefacts.
 - Areas of potential archaeological deposit (PAD) were identified in areas predicted to have retained a suitable soil profile warranting test excavation. However, no subsurface investigations have yet been undertaken to verify these areas of potential.

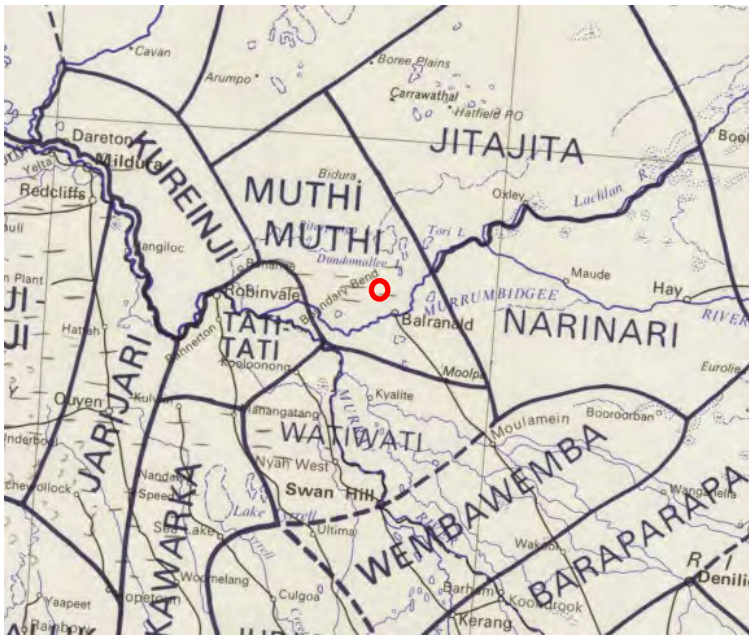


Plate 3.3 The study area is located in Muthi country (Tindale 1974). Red circle shows the indicative location of the MOD1 investigation area.

3.1.2 Previous studies of the project area

Archaeological investigations for the Balranald Project have been ongoing since 2011.

In summary, investigations have involved:

- Aboriginal heritage due diligence assessments completed for exploration activities, initially as part of the review of environmental factors (REF) (Cupper 2011; Niche 2012, 2013a, 2013b, 2013c, 2014; Stone 2011). These targeted investigations have been limited in scope and their results are provided in more detail in the EIS 2014 ACHA (Niche 2015, Section 8.2).
- The EIS 2014 ACHA undertaken by Niche, which included an extensive archaeological survey program and geomorphic investigations. These archaeological surveys identified 548 Aboriginal sites during field programs undertaken between 2012 and 2014 (Niche 2015) and classified archaeological risk layers into areas of high, moderate and low according to the predicted likelihood of Aboriginal objects being present (Figure 3.2a to Figure 3.2c). Appendix D.2.3 provides a detailed summary of the EIS 2014 ACHA.
- Subsequent Aboriginal heritage due diligence assessments and archaeological mitigation programs (surface collection only) completed for various geotechnical investigations following approval of the EIS and ACHMP (Niche 2016). This includes assessments completed both within and outside of the MOD1 investigation area (EMM 2018, 2019, 2021a, 2021b).

3.1.3 Aboriginal site database searches

EMM conducted two searches of the Aboriginal Heritage Information Management System (AHIMS) on 6 October 2021, encompassing the entire study area. A search of the BAHD was conducted to cross-check for records of previously recorded Aboriginal sites within the study area. The AHIMS search results indicate that 49 sites have been recorded within the approved portion of the MOD 1 study area, four of which are partially within the approved boundary but extend beyond it into the unapproved MOD 1 investigation area. There are only two previously registered sites that are wholly within the unapproved MOD 1 investigation area (WB 102 and WB 47).

In addition to AHIMS results, the BAHD indicates that there are an additional 33 previously recorded sites within the MOD 1 study area, all of which are within the approved portion of the MOD 1 study area. These sites were not registered on AHIMS but are accounted for the project ACHMP site inventory and mapping (Niche 2016). Iluka are in the process of resolving this discrepancy between the BAHD and AHIMS to ensure AHIMS is appropriately updated. An additional site, WB 161, was located during geotechnical surface collection works conducted by EMM in November 2021 and lies partially within the approved portion of the MOD 1 study area (EMM 2021b). This site has not yet been submitted to the BAHD or the AHIMS database at the time of writing this report.

The previously recorded Aboriginal sites are shown on Figure 4.1a and their site types are listed in Table 3.1. The AHIMS searches are included in Appendix A.

A breakdown of the 83 Aboriginal sites recorded within the MOD1 investigation area indicates that the dominant site types are stone artefact sites comprising artefact scatters (n=26), isolated finds (n=36), and artefacts with PAD (n=4), representing 80% of the total previously documented sites. The second most frequent site types are hearth sites which are relatively common in the study area, representing 21% of the total previously documented sites. Hearth sites include hearths with stone artefacts, PADs, and in one case, a scarred tree.

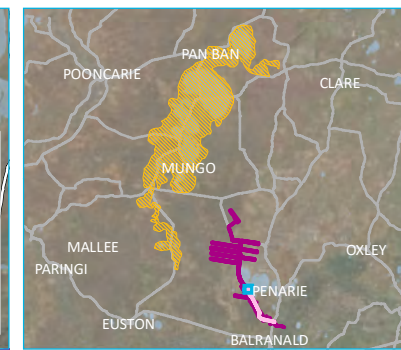
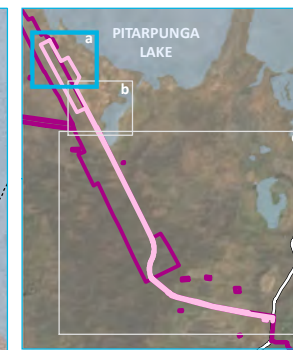
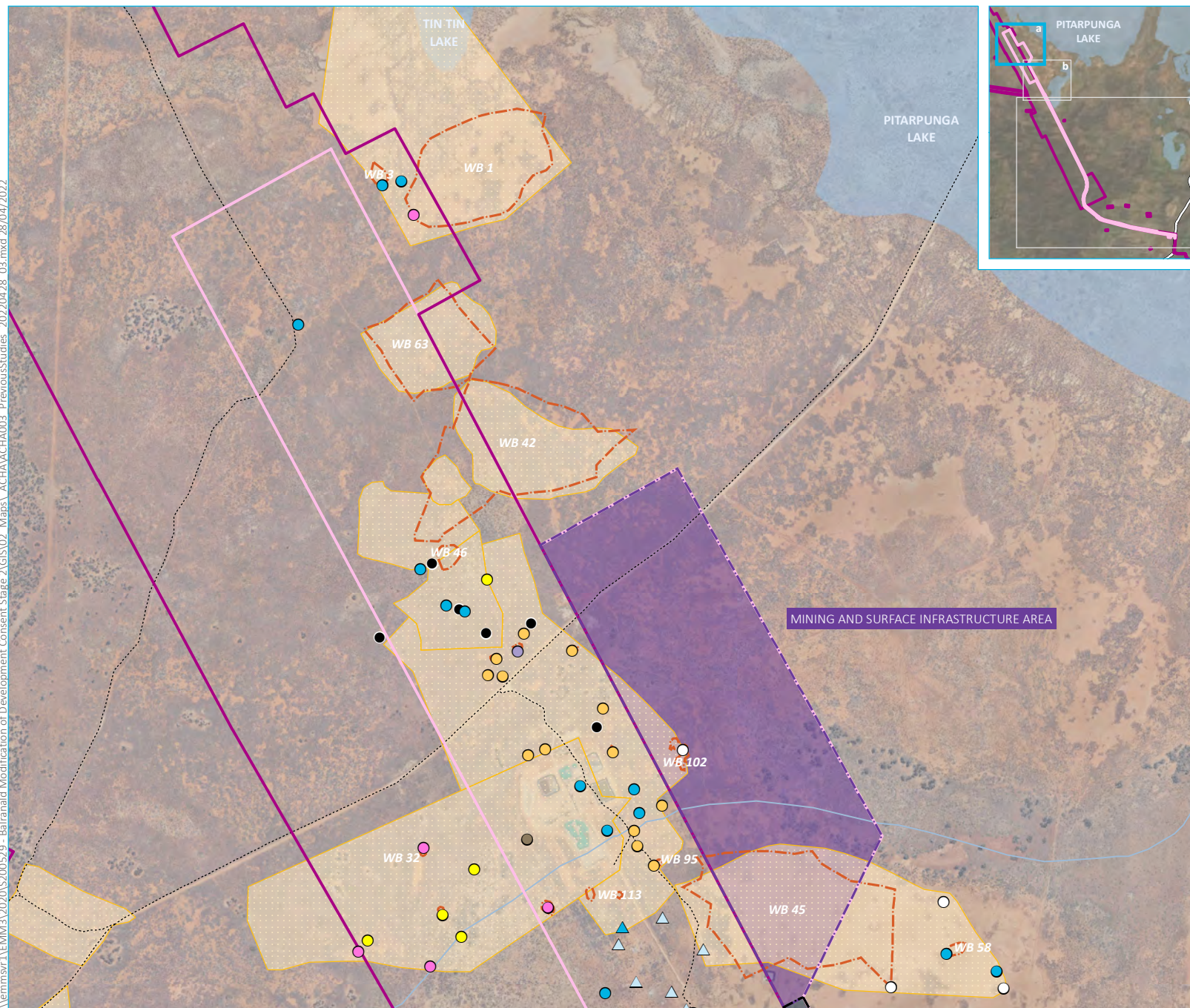
Of the 83 sites, seven are listed as 'destroyed' on the AHIMS database (BSE34, BSE39 – 42, WB29, and WB30), having been salvaged under the existing approval (SSD-5285). An additional site South2 OS2 (#47-2-0658) was salvaged in November 2021 (EMM 2021b) but is yet to be lodged on AHIMS as 'destroyed'². Furthermore, an additional site WB31 (#47-2-0252) is clearly within a developed part of the project area but is not updated on AHIMS.

² Site South2 OS2 (#47-2-0658) was initially recorded to feature PAD due to the perceived depth of soil in the local area. This site was assessed for its significance in accordance with the ACHMP (Niche 2016, Section 7.4). Using the ACHMP significance criteria, the site did not meet any significance thresholds that would require further investigation or additional mitigation measures as it was assessed to be of low archaeological significance.

Table 3.1 **Previously documented Aboriginal sites within the study area**

Site type	Count	Representation
Artefact sites	66	79.5
Artefact scatters	26	31.3
Isolated finds	36	43.4
Artefacts, PAD	4	4.8
Hearth sites	17	20.5
Hearth, artefacts, PAD	6	7.2
Hearth	5	6.0
Hearth, artefacts	2	2.4
Hearth, artefacts, PAD, scarred tree	1	1.2
Hearth, isolated find	1	1.2
Hearth, isolated find, PAD	1	1.2
Hearth, PAD	1	1.2
Total	83	100

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- KEY**
- EIS Approved Balranald Project Area (SSD-5285) (project area)
 - Proposed modification (study area)
 - UNESCO Willandra Lakes World Heritage Area (refer to regional inset)
 - Existing track
 - Watercourse/drainage line
 - Waterbody
 - Previous survey areas (Niche 2015)

Investigation area

- Mining and surface infrastructure area
- Haul road north area

Previously recorded sites

BAHD sites (not on AHIMS)

- ▲ Artefacts
- △ Isolated artefact
- Art site
- Artefact site
- Artefact site: isolated find
- Artefact site; hearth
- Artefact site; hearth; PAD
- Artefact site; PAD
- Hearth
- Hearth; PAD

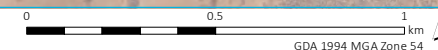
- Heritage site boundary (Niche 2015)

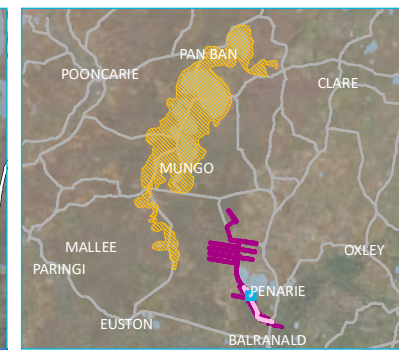
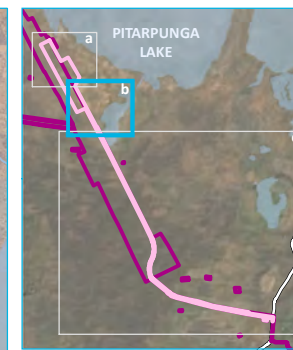
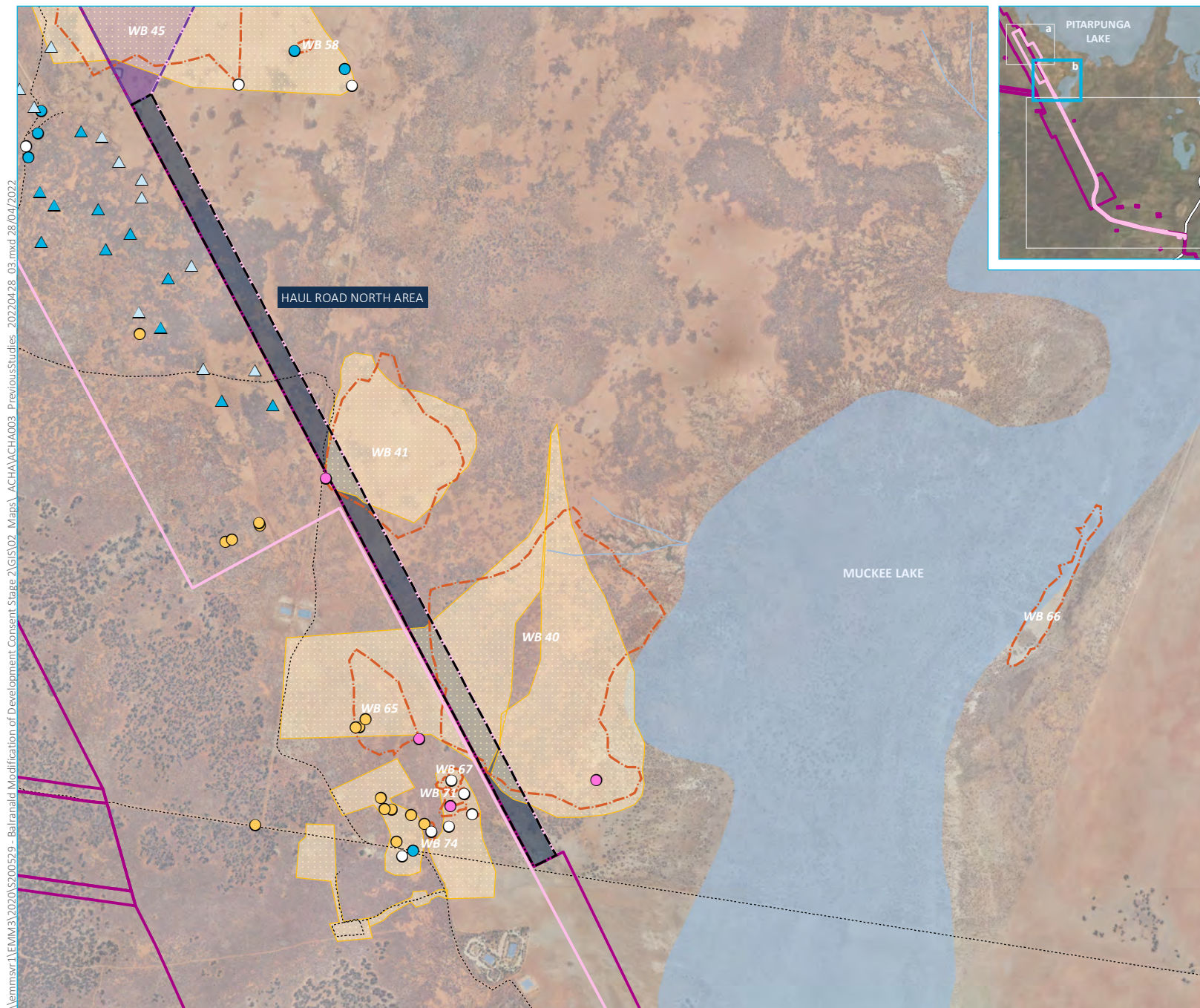
Previous Aboriginal investigations in the study area

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 3.2a



Source: EMM (2014, 2022); ESRI (2022); Iluka Resources (2018, 2021); DFSI (2017); IUCN (2016); DPI (2015); Niche (2014); GA (2011)





KEY

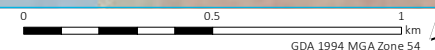
- EIS Approved Balranald Project Area (SSD-5285) (project area)
- Proposed modification (study area)
- UNESCO Willandra Lakes World Heritage Area (refer to regional inset)
- Existing track
- Watercourse/drainage line
- Waterbody
- Previous survey areas (Niche 2015)
- Investigation area**
 - Mining and surface infrastructure area
 - Haul road north area
- Previously recorded sites**
 - BAHD sites (not on AHIMS)
 - Artefacts
 - Isolated artefact
 - AHIMS (13/10/2021)
 - Artefact site
 - Artefact site: isolated find
 - Artefact site; hearth; PAD
 - Artefact site; PAD
 - Heritage site boundary (Niche 2015)

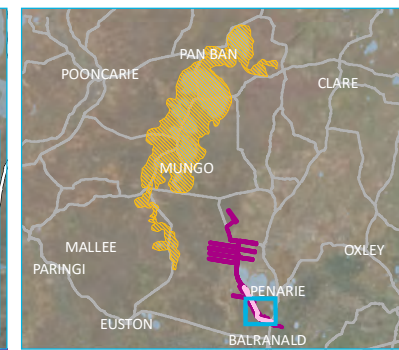
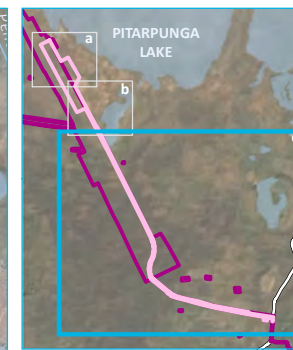
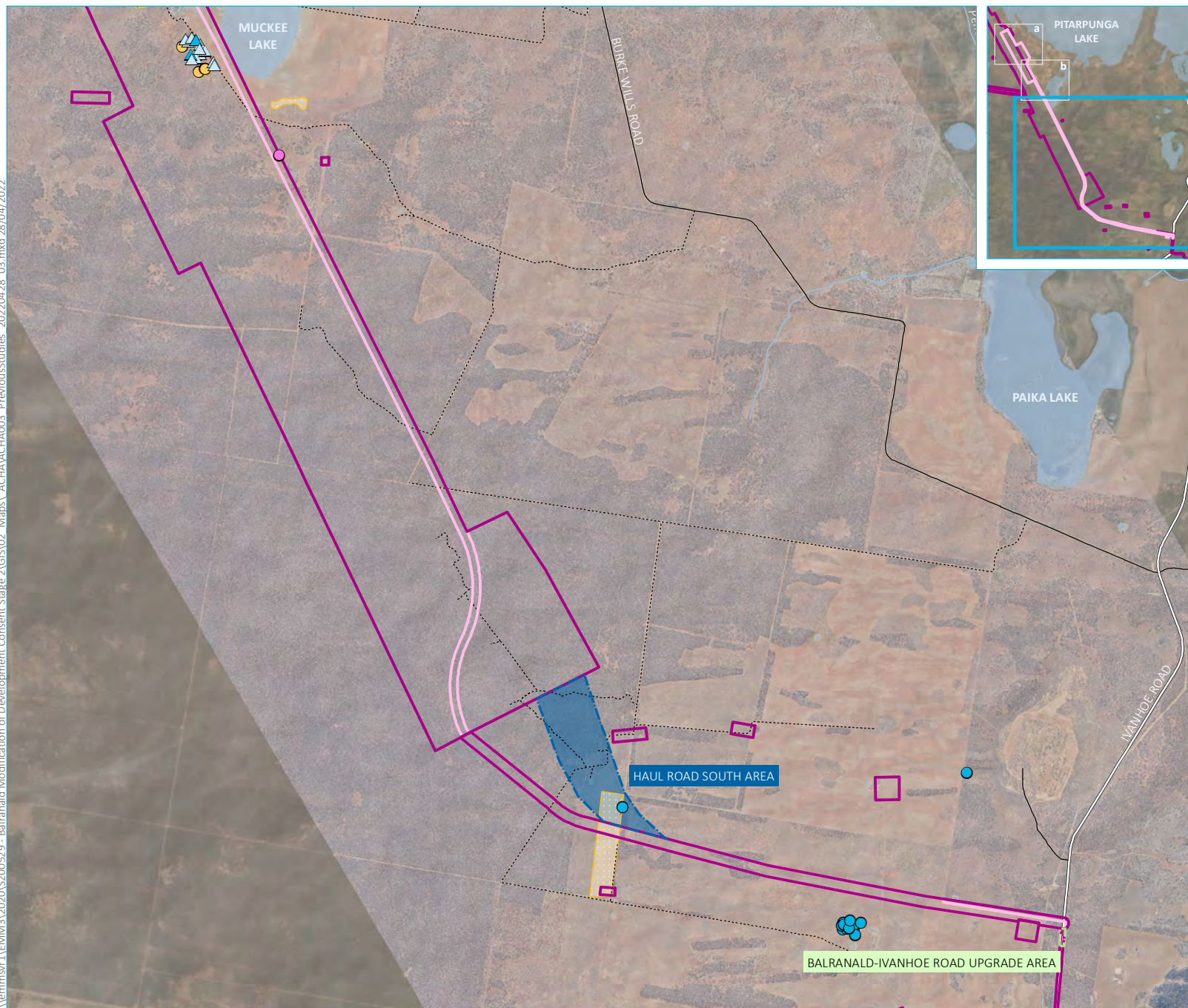
Previous Aboriginal investigations in the study area

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 3.2b



Source: EMM (2014, 2022); ESRI (2022); Iluka Resources (2018, 2021); DFSI (2017); IUCN (2016); DPI (2015); Niche (2014); GA (2011)





KEY

- EIS Approved Balranald Project Area (SSD-5285) (project area)
- Proposed modification (study area)
- UNESCO Willandra Lakes World Heritage Area (refer to regional inset)
- Major road
- Minor road
- Existing track
- Watercourse/drainage line
- Waterbody
- Previous survey areas (Niche 2015)

Investigation area

- Haul road south area*
- Balranald-Ivanhoe Road upgrade area

Previously recorded sites

BAHD sites (not on AHIMS)

- ▲ Artefacts
- ▲ Isolated artefact

AHIMS (13/10/2021)

- Artefact site
- Artefact site: isolated find
- Artefact site; hearth; PAD
- Heritage site boundary (Niche 2015)

* Excluded from MOD1 development

Previous Aboriginal investigations in the study area

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 3.2c



3.1.5 Predictive model

The EIS 2014 ACHA developed a predictive model for the presence and density of Aboriginal cultural sites in the project area (Niche 2015).

The model assumed that Box Creek has not been an active channel in terms of floodplain deposition for the majority of the Holocene, but prior to this would have actively meandered across the plains. Aboriginal cultural and archaeological sites are therefore assumed to be Holocene in age, associated with the ephemeral watercourse of Box Creek and the episodic lakes and depressions which fill during local rain events, or major flood events.

The extent of erosion and likely disturbance within the West Balranald and surrounding landforms observed during the preliminary results of the Balranald Project during 2012 and 2013 suggests that most open sites recorded are probably not more than 500–3,000 years old. (Niche 2015, p.62). The report also noted that the majority of soils in the project area have been subject to reworking and disturbance from windblown sediments and the impacts of grazing. Many of the sites within these soils will have deflated from their original context, making it difficult to establish the antiquity of these sites.

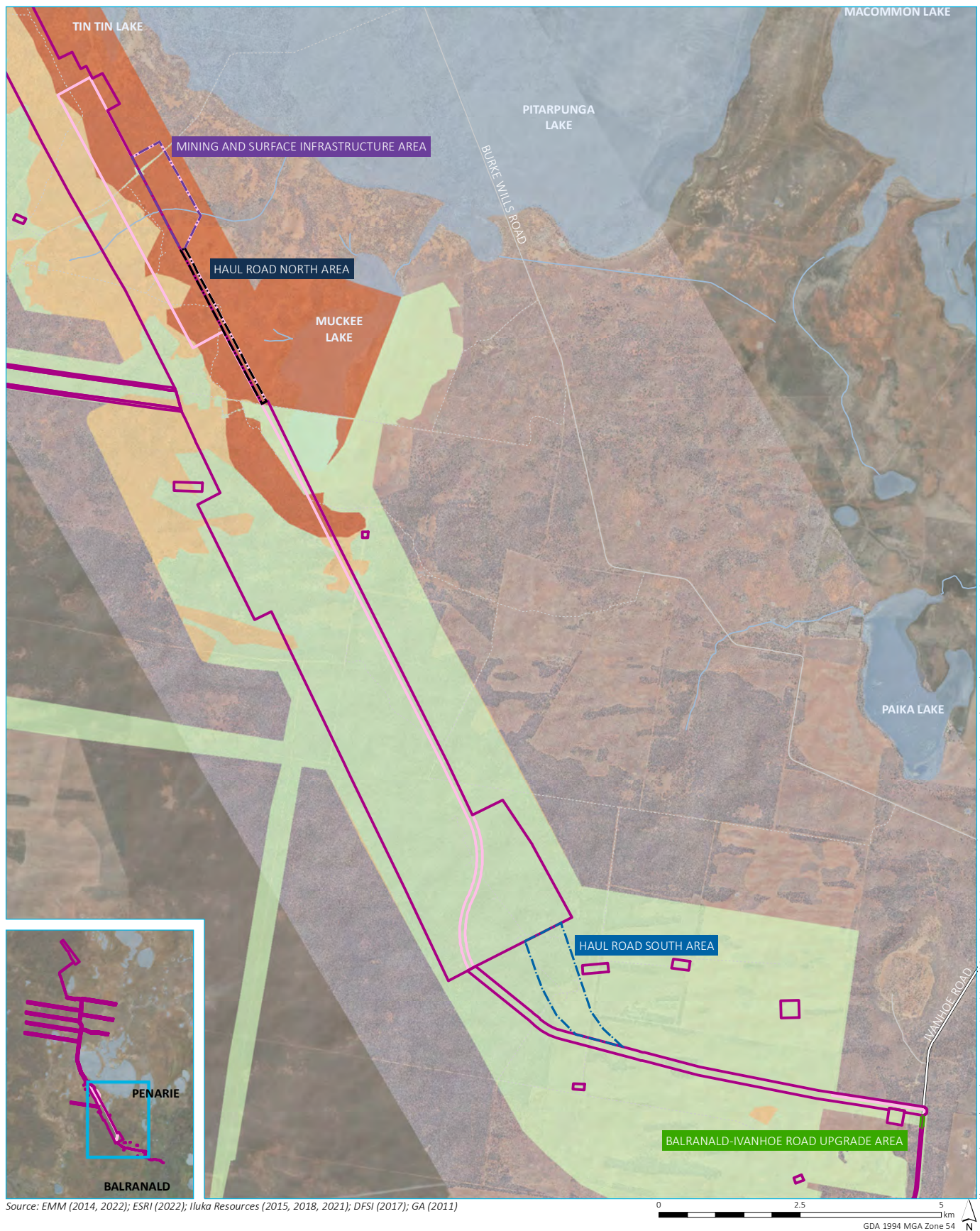
Following the results of survey, the predictive model was refined, and the project area and its nearby surrounds classified into areas of high, moderate, and low archaeological risk which serve as a predictive model for future archaeological investigation (Table 3.2).

The northern sections of the MOD1 investigation area, including the proposed surface infrastructure and the haul road north, are situated on areas of high archaeological risk, while the haul road south³ and Balranald-Ivanhoe Road and mine site access upgrade area are on landscapes considered to have low archaeological risk (Figure 3.2b).

Table 3.2 Balranald Mineral Sands Project Aboriginal archaeological risk layers

Risk layer rating	Character of risk layer rating
High	Landscape features associated with sites of moderate to high significance and frequent low-density sites of low significance. These landscape features may be lunettes, dunes, scalds and pans associated with depressions, relict lakes, relict creeks and vegetation suggesting shallow water tables. Land systems such as Marma, Hatfield, Youhl, Rata and Peretkin frequently contain these features.
Moderate	Landscape features associated with frequent isolated and low-density sites, often of low significance. The landscape features may be dunes, scalds or pans and differ from the high-risk rating due to their increasing distance from water or resource and/or the limited nature of that resource. Land systems such as Marma, Hatfield, Youhl, Rata and Peretkin frequently contain these features.
Low	Landscape features associated with low archaeological potential or infrequent, isolated Aboriginal objects of low significance. These landscape features are typically characterised by disturbed land or limited temporary or permanent water sources, mallee dunefields, calcareous rises or saltbush plains with few pans, scalds, soaks and depressions. Land systems such as Arumpo, Bulgamarra, Condoulpe and Gulthul often contain these landscape features.

³ Note: this area has been removed from the MOD disturbance footprint after completion of archaeological survey and assessment. The area has been included in this ACHA to acknowledge that it has been assessed for its archaeological potential, should any future development be proposed.



KEY

 EIS Approved Balranald Project Area (SSD-5285) (project area)

 Proposed modification (study area)

Major road

Minor road

Existing track

Watercourse/drainage line

Waterbody

Investigation area

 Mining and surface infrastructure area

 Haul road north area

 Haul road south area

 Balranald-Ivanhoe Road upgrade area

* Excluded from MOD1 development

Archaeological risk level

High

Moderate

Low

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 3.3

This archaeological risk layer model has informed the predictive model of Aboriginal site location along with the background review completed as part of this ACHA. The model enables predictions to be made about the location of Aboriginal sites for the MOD1 investigation area where further archaeological fieldwork was undertaken as part of this ACHA. This information guided the archaeological survey effort undertaken in the investigation area as part of this ACHA. The results from the predictive model are summarised in Table 3.3.

Table 3.3 Archaeological predictive model for the MOD1 investigation area

Site type	Predictions for study area
Open artefact sites and isolated finds	Artefacts are likely to occur anywhere in the landscape, with higher densities concentrated on the scalded red contrast soils of the plains (Marma land system) and, to a lesser extent on the Hatfield land system. The margins of the western lunette and dune deposit of Muckee Lake associated with WB40 and WB67 – WB81 have been identified as a sensitive landform for the presence of Aboriginal cultural material. On Rata land systems, artefacts occur less frequently but where sites are present, tend to contain a reasonably high number of artefacts. Very occasional artefacts are identified on the Condoulpe land system in the south half of the investigation area. Fine grained silcrete is the most commonly used raw material.
Culturally modified trees	Trees were scarred when bark was removed for shelters, canoes, shields and coolamons, for grub or possum hunting and for burial huts. Typically, box trees, this species is groundwater sensitive. While a culturally modified tree is recorded at WB40, generally, widespread land clearance makes it less likely that trees of sufficient age will have survived within the investigation area.
Grinding grooves and grind stones	Axe grinding grooves are unlikely to occur in the local area due to the lack of suitable outcropping material. Grinding plates for processing grain have been identified at nearby WLRWHA and may occur in the investigation area.
Hearths	Hearths are a common site type in the local area (of the 383 recorded sites in the project area in 2015, 63 included hearths) and have been found on all land systems except Condoulpe. They are most commonly identified on scalded red contrast soils of the plains (Marma). Of particular importance, the margins of the western lunette and dune deposit of Muckee Lake associated with WB40 and WB67 – WB81 have been identified as a sensitive landform for the presence of Aboriginal cultural material. Hearth may be visible on the surface by heat retainers of burnt clay, burnt termite mounds, calcrete and stone, in association with burnt sediment, charcoal, animal bones and stone artefacts.
Burials	Burials occur in the local landscape in lunettes, source bordering dunes, levees and lakes, but can occur anywhere in the landscape. Numerous burials have been identified in the Willandra lakes area, mostly within sand dunes created from paleo-channels, and located on high points in the landscape near permanent and ephemeral water sources. Within the investigation area, evidence for burials may include raised earth mounds, raised ridges of earth, grave cut depressions, ashy or burnt sediment, calcified bone and bone.
Stone arrangements	This site type is unlikely to occur in the investigative area, both because it is a rare site type locally (no stone arrangements are recorded on AHIMS within the search area) and due to extensive ground disturbance from pastoral use.
Quarries (stone or ochre)	There are no known quarries of stone suitable for artefact manufacture located within the investigation area or the greater project area. Silcrete is the most common raw lithic material found in the study area and was likely obtained from near Lake Mungo.
Rock art, shelters and engravings	Rock outcropping is rare in the project area and the flat plain landscape does not contain cliffs and scarps with rock overhangs. This site type is highly unlikely in the investigation area.
Middens	Middens may be found on lunettes and source bordering dunes particularly near current or previous sources of water.

4 Proposed modification archaeological survey

EMM archaeologists Pamela Chauvel and Taylar Reid conducted an archaeological field survey of the MOD1 investigation area with the assistance of RAP site officers Tara Bruton, Ryan Kelly and Chloe Griffiths, over five days between 29 November 2021 – 3 December 2021. An overview of the survey tracks and Aboriginal site results are provided on figures completed for the survey is shown on Figures 4.1a to Figure 4.1c.

The primary aims of the survey were to:

- identify Aboriginal archaeological sites and/or Aboriginal places with the assistance of Aboriginal knowledge holders;
- characterise the landscape to aid predictions of archaeological potential;
- identify sites or areas that would require further investigation if planned for development as part of the proposed modification;
- identify sites or areas to be avoided by development, where possible; and
- identify areas with minor or negligible Aboriginal cultural heritage values that are most suitable for development.

Additional archaeological survey was not undertaken within the portions of the study area within the approved project area. Such areas have previously been assessed and have approved management and mitigation measures as described in the project ACHMP (Niche 2016).

Further information about Aboriginal site definitions and recording criteria used in this assessment are provided in Appendix D.1.

4.1 Sampling strategy

The sampling strategy for the survey has been developed in line with the survey methodology for the EIS 2014 ACHA (Niche 2015) that divided the investigation area into Western NSW land systems (refer to Section D.1.5). Broadly, the survey strategy was developed on the basis of the predictive model for Aboriginal site location (refer to Section 3.3.2). The overarching aims of the survey strategy were to focus on the land systems most likely to feature Aboriginal sites (areas of high archaeological sensitivity) while also gathering a representative sample of land systems less likely to feature Aboriginal sites to confirm predictions of low archaeological sensitivity.

The investigation area was categorised into classes of land systems for sampling during the survey (refer Table 4.1). The extent of sampling within each landform class was proportionate to its level of archaeological sensitivity as presented in the predictive model. The boundary of the survey transects was defined by the investigation area and divided into four areas: mining and surface infrastructure survey area, haul road north survey area, haul road south survey area and Balranald-Ivanhoe Road and mine site access upgrade survey area (refer Figure 4.1a to Figure 4.1c). Note that the haul road south survey area was included in the survey effort as it featured a previous iteration the MOD1 haul road design which has since been excluded.

Within these areas, greater survey effort was made within more archaeologically sensitive Rata and Marma land systems which comprise alluvial plains and playas and basins. The Condoulpe land system, a featureless sandplain

with mallee scrub, was sampled albeit to a lesser extent to confirm its predicted low risk for archaeological materials being present.

Table 4.1 Land systems and their corresponding landscape elements

Land system	Landscape elements
Rata	Extensive saltbush plains with isolated rises of coarse-textured aeolian material.
Marma	Ill-defined scalded drainage tract. Associated floodplain of fine-textured Quaternary alluvium and aeolian sandplains.
Condoulpe	Sandplain between dune fields and the Riverine plain near Balranald.

4.2 Survey methods

The archaeological survey and data collection methods followed Section 2.2 of the Code (DECCW 2010a) with all survey transects completed on foot.

The survey team comprised five to six people per day spaced approximately 10 m apart within an approximate 50 metre (m) corridor. This method was considered to be suitable for a landscape characterised by alluvial plains with frequent scalds (Marma and Rata land systems) whereby suitable ground exposures were easy to identify and target at this spacing. This method was also employed within the Condoulpe land system, which featured predominantly mallee scrub with low visibility and exposure. Although the survey team was spread across a 50 m corridor, the assessment calculations assume that each participant could only observe approximately 5 m of the ground surface in front of them (eg five field members covered 25 m of ground within the 50 m corridor).

The survey team targeted ground exposures such as scalds and eroded surfaces within areas deemed as of high archaeological risk (refer Table 3.2). The survey participants flagged cultural material and Aboriginal objects with high visibility stake flags. Site locations and their details were then recorded using GPS and site recording forms created by EMM on the Survey123 application for ArcGIS (Esri© software) on iPhones. iPhones have a location accuracy of up to ± 3 m which is similar to hand-held non-differential GPS units. The Survey123 forms allowed for a site's location, details and representative photographs to be linked together, which avoided potential post-fieldwork issues around data integrity.

Survey transects were recorded on a separate Survey123 form created by EMM. The Survey123 form allowed for survey transects details and representative photographs to be recorded. The course of survey transects were recorded as tracks on hand-held non-differential GPS units which were linked to the Survey123 forms.

4.3 Survey coverage and results

The survey comprised nine walking transects across the investigation area. GPS track log data indicates that each survey participant walked approximately 37 km, which represents the total length of the survey transects.

Figure 4.1a to Figure 4.1c present the survey transects logged by GPS, but represent only where the archaeologists walked during survey (two people's movements). It does not accurately represent the transect width covered by the survey team, which sometimes involved people separating beyond the 50 m corridor to inspect key landscape features and exposures.

Landform coverage data is summarised in Table 4.2 and data for individual transects are provided in Appendix C. Examples of different landforms, ground surface visibility conditions and disturbance levels are shown in Plate 4.1 to Plate 4.12.

Table 4.2 **Survey effective coverage summary**

Land system	Total length (m)	Proportion of survey (%)	Area (m ²)	Effective coverage area (m ²)	Effective coverage %	Number of Aboriginal sites ⁴
Rata	19,260	52	878,261	263,478	30	8 (3 partial)
Marma	11,240	31	419,088	176,017	42	5 (3 partial)
Condoulpe	6,420	17	1,329,744	199,461	15	1
Total	36,920 m	100	2,627,093 m²	638,956 m²	-	17

i **Rata**

The survey team walked 19.26 km of survey transects within the Rata land system. Visibility ranged from moderate (40%) in the scalded plains in the northern section of the mining and surface infrastructure area, to very high (100%) in the claypans in the southern portion of the survey area.

Exposure was also varied, ranging from low (30%) in the northern portion of the mining and surface infrastructure survey area and haul road north survey area, to very high (100%) in the claypans. The average across the land system as whole was estimated to be 60% visibility and 50% exposure.

The survey coverage was adequate for this land system by focusing the survey efforts on open scalds and claypans, which are conducive for locating artefact scatters and isolated finds, the most common site type in this region. The coverage was also suitable for identifying areas of PAD amongst the scalds where vegetation mounds has retained more of the soil profile.

Several mature trees were located in a low-lying swampy area in the eastern portion of the mining and surface infrastructure area. Here the vegetation transitioned from scrub to mature box trees with large shrubs and deep, dark grey soils with sink holes and small gilgai (refer Plate 4.2). A sample of the trees were inspected, though no cultural scars were identified. The survey team assessed the area as unlikely to be suitable for occupation and focused the survey efforts in the more open plains with scalds and claypans.

Areas of PAD were identified during the survey efforts in association with previously registered sites WB 102, WB 45, and WB 40 (refer Section 4.6, Figure 4.1b) where isolated clumps of vegetation limited the natural erosion of the soils, retaining a deeper soil profile than the surrounding scalds. The areas of PAD identified within the mining and infrastructure survey area, in association with WB 102 and WB 45, were identified where a dense scattering of artefacts was found eroding out of the upper soil profile of the surrounding scald.

PAD was also identified within the haul road north survey area, in association with WB 40. WB 40 extends from the top of a rise, representing the western dunes of Muckee which gently slope southwards and terminates at the shores of a relict lake. The dunes retain a deeper soil profile, and PAD was identified in areas where artefacts were found eroding out of the topsoils onto surrounding erosion scars. Several sinkholes were identified on the hillslope showing this deeper soil profile (Plate 4.3).

Plate 4.1 to Plate 4.4 shows the varying levels of visibility and exposure within the Rata land system.

⁴ Three Aboriginal sites traverse both the Rata and Marma land systems (refer Figure 4.1a to Figure 4.1c). They have not been included in the total number of Aboriginal sites per land system but have been included in the overall total.



Plate 4.1 Rata land system showing varying levels of visibility and exposure, view north.



Plate 4.2 Rata land system showing low-lying swampy terrain with low visibility and exposure, view east.



Plate 4.3 Rata land system showing deep soil profile associated with previously registered site WB40, view north.



Plate 4.4 Rata land system showing high levels of exposure and visibility, view south.

ii Marma

The survey team walked 11.24 km of transects within the Marma land system. The visibility and exposure were high across the Marma land system resulting from the large erosion scalds and expansive claypans. The visibility varied from moderate (50%) in the northern portion of the mining and surface infrastructure survey area, to high (100%) in the claypans along the haul road north survey area. The exposure varied as well, ranging from moderate (50%) to high (100%) in the claypans. Overall, the Marma land system was assessed as having an average of 70% visibility and 60% exposure across the investigation area.

The survey coverage was adequate for this land system as the expansive claypans and erosion scalds enabled the identification of surface artefact scatters. Artefact scatters are the most common Aboriginal site type identified within this largely scalded landscape, which limits the potential for PAD and the establishment of mature trees suitable for cultural scarring. As such, no areas suitable for test excavation were identified within the investigation areas of the Marma land system.

Plate 4.5 to Plate 4.8 shows varying levels of visibility and exposure within the Marma land system.



Plate 4.5 Marma land system showing gilgai after rain event, view west.



Plate 4.6 Marma land system showing varying levels of visibility and exposure, view north.



Plate 4.7 Marma land system showing extensive claypan and high visibility and exposure, view east.



Plate 4.8 Marma land system showing variation in vegetation and low visibility, view north.

iii Condoulpe

The survey team walked 6.42 km of transects within the Condoulpe land system. The Condoulpe land system encompassed the Haul Road South area and Balranald-Ivanhoe Road and mine site access upgrade survey areas. This land system is comprised of a featureless sandplain with mallee scrub. Evidence of disturbance within the investigation areas include the historical land clearing practices to remove the mallee scrub for agricultural purposes in the haul road south survey area, and the construction of the Balranald-Ivanhoe Road within the Balranald-Ivanhoe Road and mine site access upgrade survey area. Other evidence of disturbance includes the installation of fences, access tracks and ploughed fields within the Haul Road South survey area.

The visibility was broadly consistent across the two surveyed portions of this land system, which varied from 40%–60%. Ground exposure was considerably lower within this land system, averaging ~30% across the two surveyed portions. The effective coverage (15%), though lower than the other two land systems, was suitable for this landscape with lower visibility, limited landscape features suitable for occupation (ie watercourses, hillcrests) and areas of disturbance that were easy to target and inspect. Discussions with the RAPs on-site suggests that the mallee scrub was an undesirable place to camp due to the limited resources and ability to move through the landscape. Occupation sites were primarily found in the open plains where the claypans and scalds provided temporary water sources following rain events.

No new Aboriginal sites were identified in this land system. One previously registered site, WB47 located on an access track that traverses a gentle rise, was inspected during the survey. No artefacts were identified at the site, however closer inspection supported Niche’s assessment of the site as having PAD, noting the access track dissects a gentle rise in the landscape, revealing a sandy soil profile with potential depth (refer Plate 4.10). Plate 4.9 to Plate 4.12 shows varying levels of exposure, visibility, and disturbance within the Condoulpe land system.



Plate 4.9 Condoulpe land system showing disturbance and visibility of the Ivanhoe Road investigation area, view south.



Plate 4.10 Condoulpe land system showing PAD associated with WB47, view south.

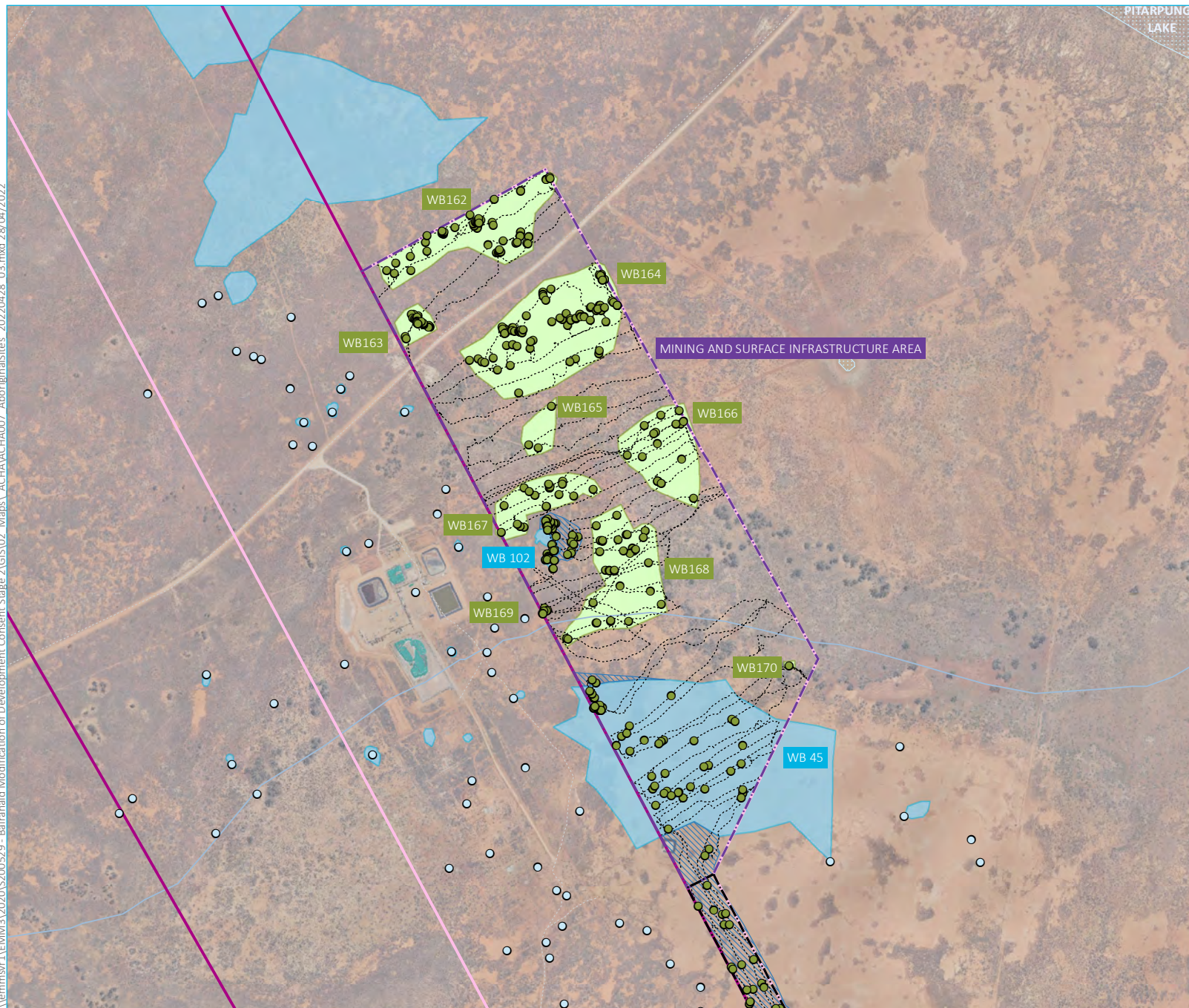


Plate 4.11 Condoulpe land system showing low visibility, exposure and recent land clearing of the mallee scrub, view north.

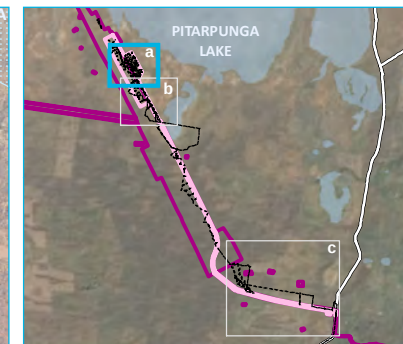


Plate 4.12 Condoulpe land system showing low visibility and exposure in the mallee scrub, view south.

\\lemmsvr1\EMM3\2020\5200529 - Balranald Modification of Development Consent Stage 2\GIS\02 Maps\ACHA\ACHA007 Aboriginal Sites 20220428 03.mxd 28/04/2022



Source: EMM (2014, 2021, 2022); ESRI (2022); Iluka Resources (2018, 2021); DFSI (2017); Niche (2015); GA (2011)



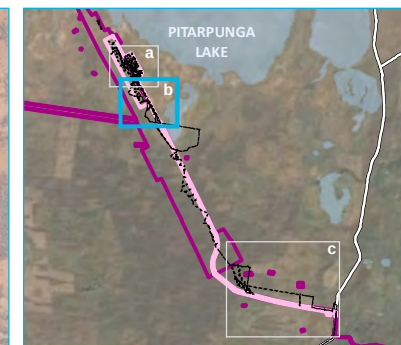
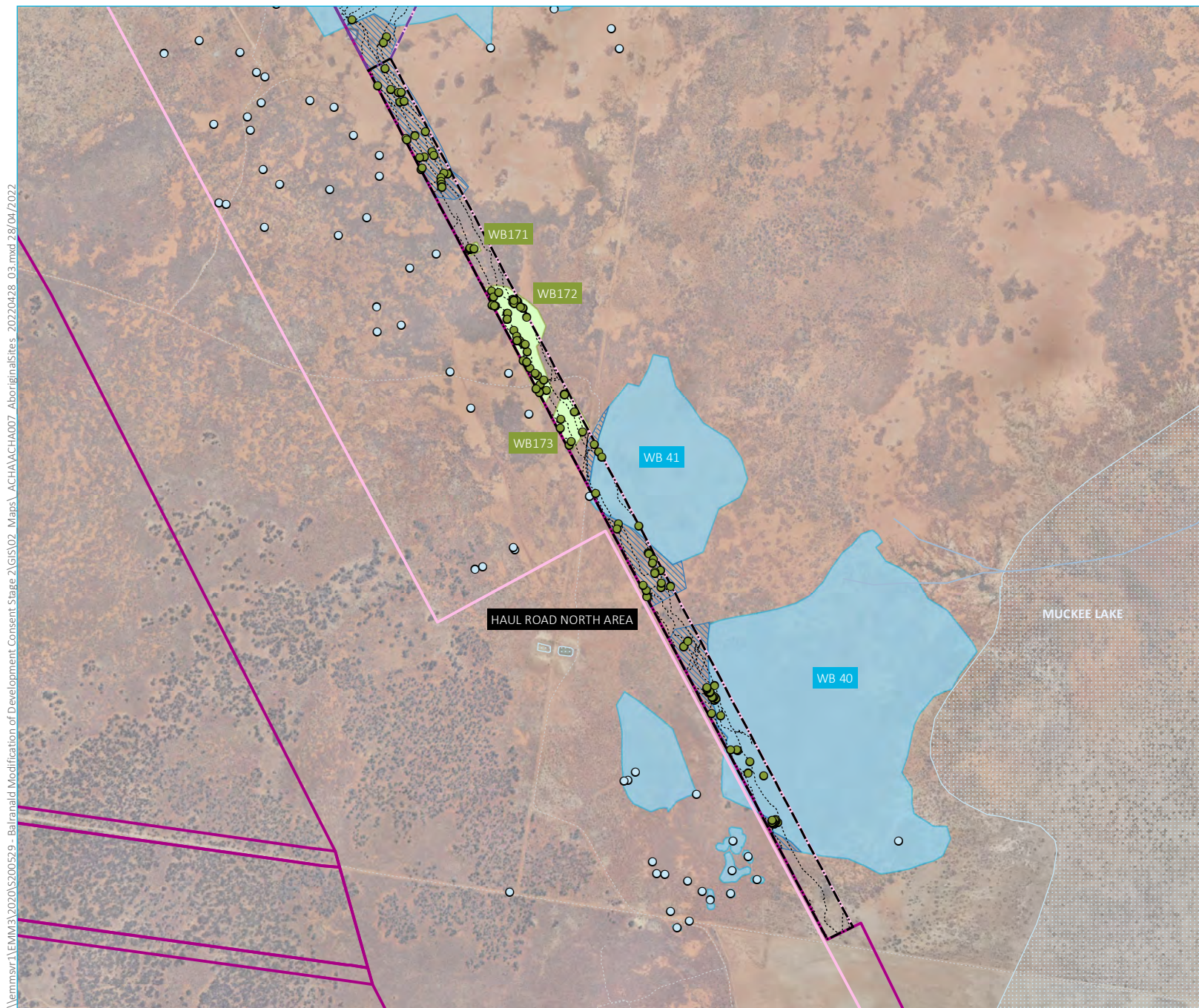
- KEY**
- EIS Approved Balranald Project Area (SSD-5285) (project area)
 - Proposed modification (study area)
 - Existing track
 - Survey track
 - Watercourse/drainage line
 - Waterbody
 - Previously identified Aboriginal site
 - Heritage site boundary (Niche 2015)
 - Extended site boundary (EMM 2021)
 - Identified artefact
 - Newly identified Aboriginal site (EMM 2021)
- Investigation area**
- Mining and surface infrastructure area
 - Haul road north area

Archaeological survey results

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 4.1a



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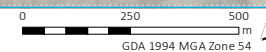
- KEY**
- EIS Approved Balranald Project Area (SSD-5285) (project area)
 - Proposed modification (study area)
 - Existing track
 - ... Survey track
 - Watercourse/drainage line
 - Waterbody
 - Previously identified Aboriginal site
 - Heritage site boundary (Niche 2015)
 - Extended site boundary (EMM 2021)
 - Identified artefact
 - Newly identified Aboriginal site (EMM 2021)
- Investigation area**
- Mining and surface infrastructure area
 - Haul road north area

Archaeological survey results

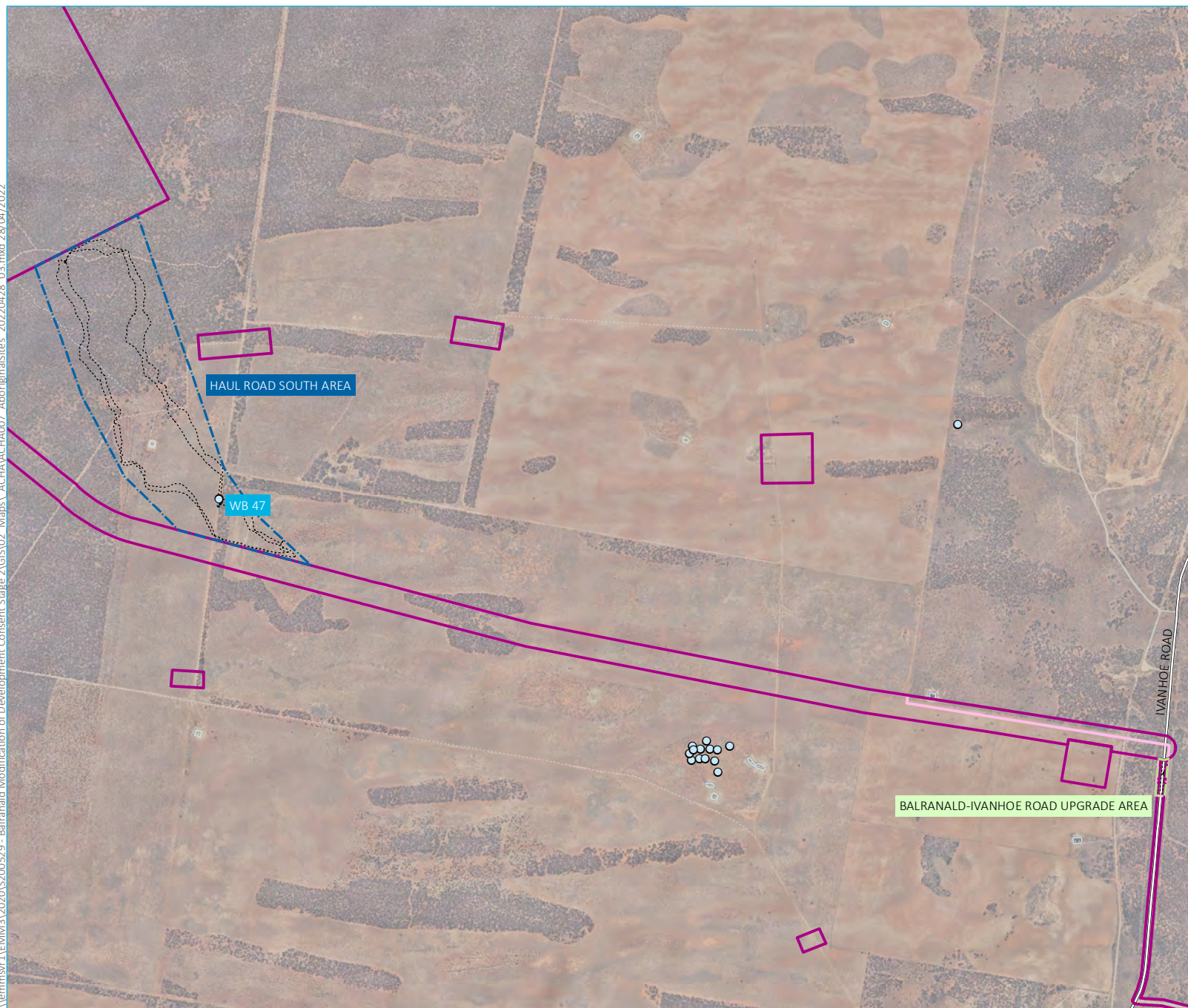
Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 4.1b



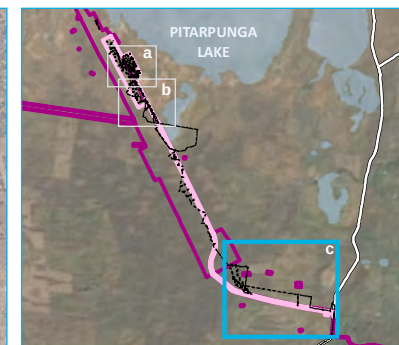
Source: EMM (2014, 2021, 2022); ESRI (2022); Iluka Resources (2018, 2021); DFSI (2017); Niche (2015); GA (2011)



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Source: EMM (2014, 2021, 2022); ESRI (2022); Iluka Resources (2018, 2021); DFSI (2017); Niche (2015); GA (2011)



KEY

- EIS Approved Balranald Project Area (SSD-5285) (project area)
- Proposed modification (study area)
- Major road
- Minor road
- Existing track
- Survey track
- Waterbody
- Previously identified Aboriginal site
- Heritage site boundary (Niche 2015)

Investigation area

- Haul road south area*
- Balranald-Ivanhoe Road upgrade area

* Excluded from MOD1 development

Archaeological survey results

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 4.1c



4.4 Aboriginal sites

4.4.1 Reinspected sites within the investigation area

There are two previously recorded sites wholly within the MOD1 investigation area (WB 47 and WB 102) and three previously recorded sites that partially extend across the MOD1 investigation area and outside its boundaries (WB 40, WB 41 and WB 45).

These five sites were inspected during the survey where they intersected with the MOD1 investigation area. Additional cultural materials were found associated with WB 40, WB 41, WB 45 and WB 102. As a result of these findings, the site boundaries of these four sites have been extended as shown on Figure 4.1a. In the EIS 2014 ACHA, site boundaries were defined using an arbitrary distance of 40 m between visible Aboriginal object or, in some cases, landform features were used to define site boundaries (Niche 2015, p.65). Rationale around extending the site boundaries during survey was undertaken in accordance with Niche's previous method.

The survey team revisited WB 47 within the Haul Road north survey area and verified the PAD attributed to the site but did not relocate any surface artefacts.

Updated information regarding these previously documented sites (Niche 2015) is provided in Table 4.4.3 and representative photos are shown in Plate 4.13 – Plate 4.20. Further information regarding the archaeological potential of these sites is provided in Table E.1 in Appendix E.

Table 4.4.3 Outcomes of inspection of previously recorded Aboriginal sites within the investigation area

Site name	AHIMS #	Land system	Site type	Easting	Northing	Description
WB 40	47-2-0262	Rata/Marma	Artefact scatter, hearth, hearth scatter, scarred tree, PAD	725703	6186587	WB 40 was originally recorded as a high-density archaeological complex with a high volume and range of stone artefacts, hearths, a culturally modified tree and PAD. The site represents the most intense and diverse assemblage in the project area. The 2021 survey identified artefacts dispersed across the scald, with no discernible patterning. In total, an additional 25 silcrete flakes, a flaked river pebble and a few pieces of shell recorded. The area of PAD appears to extend slightly further north within the investigation area than previously mapped. The site extent of WB 40 is now 1000 m x 815 m. No evidence of hearths was identified within the investigation area. There were very few trees within the survey area. Trees were inspected but no cultural scars were identified within the investigation area.
WB 41	47-2-0263	Marma	Artefact, hearth scatter, PAD	724739	6187662	WB 41 was initially recorded as a low to moderate artefact density, hearth and PAD. The 2021 survey identified an additional 20 silcrete flakes in association with WB 41 which extends across a large claypan. The site appears to extend further south within the investigation area than previously mapped. The site extent is now 750 m x 460 m. No evidence of the hearth was identified within the investigation area.
WB 45	47-2-0267	Rata/Marma	Artefact scatter, hearth scatter, PAD	724430	6189065	Low density artefact scatter, dispersed heat retainers indicating a disturbed hearth, and PAD. WB 41 is situated on a highly eroded area. Artefacts are dispersed in low concentrations across the scald, with no discernible patterning. The 2021 survey identified an additional 30 silcrete flakes in association with WB45 which extends across a vast claypan. No evidence of disturbed hearth within the survey area. Site extent is now 1000 m x 500 m.
WB 47	47-6-0607	Condoulpe	Artefact scatter, PAD			Small scatter of 6 silcrete artefacts, assessed as in poor condition (Niche 2015). The site is situated on soft sandy soils with scattered re-growth trees. The 2021 survey did not relocate any of the previously identified material.

Table 4.4.3 Outcomes of inspection of previously recorded Aboriginal sites within the investigation area

Site name	AHIMS #	Land system	Site type	Easting	Northing	Description
WB 102	47-2-0310	Rata	Artefact scatter, PAD	723687	6189913	Low density, small artefact scatter. Further surface and subsurface artefact predicted to be present in remnant vegetation mounds and deeper soils. The 2021 survey identified a high concentration of surface artefacts on a highly eroded scald with fringing vegetation mounds, recording an additional 50 silcrete flakes in association with WB102. The site extends to the north of previously mapped area Site extent is now 150 m x 90 m.



Plate 4.13 Additional silcrete flakes and a flaked river pebble associated with WB 40.



Plate 4.14 WB 40: location of flakes and river pebble showing low visibility and PAD, view north-west.



Plate 4.15 Additional silcrete core found associated with WB 41.



Plate 4.16 Location of core within WB 41 showing extensive claypan, view east.



Plate 4.17 Example of a dark brown silcrete core flake found associated with WB 45.



Plate 4.18 Location of artefact in Plate 4.17 within WB45 showing eroded claypan and adjoining PAD with vegetation, view south.



Plate 4.19 Sample of additional silcrete flakes found associated with WB 102.



Plate 4.20 Location of artefacts in Plate 4.19 within WB 102 showing claypan, view west.

4.4.2 New Aboriginal sites identified during survey

The survey team identified 12 previously undocumented Aboriginal sites within the investigation area: 11 artefact scatters and one isolated find (WB 170).

Aboriginal site boundaries were determined largely by their densities and position within the same landscape context. Where boundaries between artefact scatters was uncertain, the 40 m rule – as consistent with the Niche 2015 ACHA – was utilised to determine site extents. The results of the survey reflect a general background scatter of cultural materials across the landscape, with localised areas of higher activity (eg WB 102). As the visibility and exposure varied across the Rata and Marma land systems, the location of artefacts within this landscape likely reflects inconsistencies between these two variables, as well as the bias of where the survey team walked, rather than reflecting defined areas of activity. Aside from WB 170 (an isolated find), no artefacts were identified within the low-lying swampy area in the eastern portion of the surface infrastructure investigation area, indicating this was an undesirable place for past Aboriginal occupation.

The artefacts that were identified across the landscape were generally small flakes and cores comprised of silcrete and quartzite with artefacts retaining little cortex, suggesting that the raw materials were highly utilised. Some retouched tools were identified as well.

A breakdown of the newly identified Aboriginal sites is listed in Table 4.4 and representative photos are shown in Plate 4.21 – Plate 4.28.

Table 4.4 Previously undocumented Aboriginal sites identified during survey

Site name	Land system	Site type	Easting	Northing	Description
WB 162	Rata	Artefact scatter	723395	6190741	WB162 is an artefact scatter comprising >55 silcrete flakes exposed on a series of erosion scalds. Site extent is ~500 m x 170 m.
WB 163	Rata	Artefact scatter	723325	6190506	WB163 is an artefact scatter comprising ~30 silcrete flakes exposed on an erosion scald. Site extent is 90 m x 80 m.
WB 164	Rata/Marma	Artefact scatter	723607	6190478	WB164 is a low-density artefact scatter comprising >80 silcrete flakes exposed across a series of erosion scars. Site extent is 430 m x 240 km.
WB 165	Marma	Artefact scatter	723624	6190179	WB165 is a very low-density artefact scatter comprising three silcrete flakes exposed on an erosion scar and access track. Site extent is 150 m x 50 m.
WB 166	Rata	Artefact scatter	723963	6190213	WB166 is a low-density artefact scatter comprising >15 silcrete flakes exposed across a series of erosion scars. Site extent 260 m x 170 m.
WB 167	Rata	Artefact scatter	723679	6190064	WB167 is a low-density artefact scatter comprising >15 silcrete flakes exposed within a series of erosion scars. Site extent is 285 m x 90 m.
WB 168	Rata	Artefact scatter	723908	6189904	WB168 is an extensive low-density artefact scatter comprising 35 silcrete flakes exposed across a series of small claypans. Site extent is 310 m x 145 m.
WB 169	Rata	Artefact scatter	723665	6189743	WB169 is a small artefact scatter comprising four silcrete flakes and two silcrete cores. Site extent is 55 m x 50 m.
WB 170	Rata	Isolated find	724321	6189590	WB170 is an isolated silcrete flake exposed on an erosion scald.
WB 171	Marma	Artefact scatter	724363	6188435	WB171 is a small artefact scatter comprising five silcrete flakes exposed on a small claypan. Site extent is 20 m x 10 m.
WB 172	Marma	Artefact scatter	724531	6188140	WB172 is an artefact scatter comprising ~45 silcrete flakes and several silcrete cores exposed on an extensive claypan. Other artefact types include several large quartzite flakes and quartzite cores. Site extent is 390 m x 110 m.
WB 173	Marma	Artefact scatter	724646	6187906	WB173 is a low-density artefact scatter comprising <10 silcrete flakes exposed on a claypan. Site extent is 130 m x 90 m.



Plate 4.21 Sample of silcrete flakes associated with WB162.



Plate 4.22 Location of silcrete flakes found within WB162, view south.



Plate 4.23 Sample of silcrete flakes associated with WB164.



Plate 4.24 Location of flakes within WB164, view north.



Plate 4.25 Silcrete core found within WB169 artefact scatter.



Plate 4.26 Location of silcrete core within WB169, view north.



Plate 4.27

Sample of two silcrete flakes and a silcrete core associated with WB172.



Plate 4.28

Location of artefacts from Plate 4.27 within WB172, view south.

4.5 The archaeological resource

During survey, artefact scatters within the MOD1 investigation area were found to comprise low to medium density artefact scatters consistent with previous findings within the study area and largely representative of a consistent background scatter across areas of high archaeological risk within the investigative area. The most common raw material is silcrete and this is likely to have been extracted from sources to the north of the study area such as the Willandra Lakes system near Lake Mungo (Bowler 1998:150-1). There are no known quarries of stone suitable for artefact manufacture located in or near the project area.

While hearths are relatively common within the study area (17 sites contained hearths), no hearths were identified during survey. The three previously recorded sites with hearths extend beyond the boundary of the investigation area and if the hearths have survived, they are likely to be outside the investigation area. Very few mature trees of sufficient size to contain cultural scarring were identified within the investigation area. Where present, mature trees tended to be box trees, located in the low-lying swampy area on the eastern side of the mine and infrastructure investigation area. A sample of the trees were inspected but no cultural scars were identified. The one recorded site with a scarred tree (WB 40), extends beyond the boundary of the investigative area where this tree may be located.

The majority of soils in the study area have been subject to reworking and disturbance from windblown sediments and the impacts of grazing. Many of the sites within these soils will have deflated from their original context, resulting in surface scatters across pans and scalds. However, one area, WB 40 and the western dunes of Muckee Lake was initially identified as a key area of interest for further investigation in the EIS 2014 ACHA (Niche 2015). The dunes retain a deeper soil profile, and PAD was identified in areas where artefacts were found eroding out of the topsoils onto surrounding erosion scars. Furthermore, remnant vegetation mounds on Marma landscape retain a deeper soil profile than the surrounding scalds and are predicted to have archaeological potential, albeit limited.

Test excavation is required across the approved EIS project area as set out in the ACHMP⁵ (Niche 2016), including the MOD1 investigation area. However, no excavation effort has been implemented yet, meaning the local area is largely untested and questions relating to subsurface archaeological potential and local archaeological chronologies are still to be investigated to provide further insights into the archaeological character of the local area. Sites WB 40, WB 41, WB 45 and WB 102 within the investigation have been identified with PAD that warrants test excavation to explore the subsurface archaeological character.

Further detail about the archaeological potential and opportunities for test excavation are provided in a test excavation methodology prepared for this ACHA (Appendix E, Table E.1).

⁵ In select locations and on the provision that project ground disturbance is proposed in those locations.

5 Significance assessment

5.1 Overview

Aboriginal objects in NSW are protected under the *National Parks and Wildlife Act 1974* (NPW Act). It is recognised that the destruction of sites may be necessary to allow other activities or developments to occur. In order for the consent authority to make informed decisions on such matters, an important element of cultural resource management is determining the significance of cultural heritage places and objects to understand what may be lost; and how best it can be mitigated.

Cultural significance is outlined in Article 1.2 of the Burra Charter – the best practice document for managing cultural heritage – as ‘aesthetic, historic, scientific, social or spiritual value for past, present or future generations’ (Australia ICOMOS 2013). These values are reiterated in the NSW guidelines, which determines cultural significance of a place can be assessed by identifying the values that are present across the subject area and assessing what is important and why (OEH 2011).

In assessing the scientific significance of sites, aspects such as rarity and representativeness and the integrity must be considered. Generally, a site or object that is rare will have a heightened significance, although a site that is suitable of conservation as ‘representative’ of its type will also be significant. Conversely an extremely rare site may no longer be significant if its integrity has been sufficiently compromised.

Cultural significance is derived from the values outlined in Table 5.1.

Table 5.1 A summary of criteria used to assess the cultural significance (OEH 2011, 8–10)

Criterion	Definition
Social value — does the place have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons?	Social (or cultural) value refers to the spiritual, traditional, historical or contemporary associations and attachments the place or area has for Aboriginal people. Social or cultural value is how people express their connection with a place and the meaning that place has for them. Social or cultural value can only be identified through consultation with Aboriginal people.
Historic value — is the place important to the cultural or natural history of the local area and/or region and/or state?	Historic value refers to the association of a place with a historically important person, event, phase or activity. Historic places do not always have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). They may have ‘shared’ historic values with other (non-Aboriginal) communities.
Scientific (archaeological) value — does the place have potential to yield information that will contribute to an understanding of the cultural or natural history of the local area and/or region and/or state?	Scientific (archaeological) value refers to the importance of a landscape, area, place or object because of its rarity, representativeness and the extent to which it may contribute to further understanding and information. Information about scientific values is gathered through archaeological investigation undertaken in this report.
Aesthetic value — is the place important in demonstrating aesthetic characteristics in the local, regional, and/or State environment?	Aesthetic value refers to the sensory, scenic, architectural and creative aspects of the place. It is often linked with social value, and can consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use. This value is only relevant to archaeological sites on only rare occasions, such as rockshelters that contain art, or culturally modified trees in prominent positions, etc.

5.2 Assessment of significance

A summary of all sites within the MOD1 investigation area and their significance is included in Table 6.2. This primarily includes previously recorded sites which were assessed in the EIS 2014 ACHA (Niche 2015, Section 12.2.2), and subsequent due diligence level investigations (refer ACHMP Section 3.3). These previously recorded sites have not been reassessed for this ACHA.

In assessing the scientific significance of newly identified sites within the MOD1 investigation area, criteria for their grading have been based on the criteria set out in the EIS 2014 ACHA (Niche 2015, Section 12.2.1) for consistency, which is also summarised in Table 5.2 below.

There are 12 sites identified during the 2021 survey for this ACHA. Previously identified sites that extended into the investigation area were verified during survey and additional cultural materials found associated with WB 40, WB 41, WB 45 and WB 102. The boundaries of these sites were therefore expanded to reflect the extent of the scatter within the study area (refer Section 4.4) and also revaluated for their significance.

Table 5.3 includes an updated assessment of previously recorded sites within the investigation area, as well as well as new sites identified during survey.

Table 5.2 Grading values and significance (Niche 2015, Table 24 p.113)

Significance	Description
Low	The site or object contains a single or limited number of features, has low research potential to meaningfully inform our understanding of the past. The site or object is a representative but unexceptional example of the most common class of sites or objects in the region.
Moderate	The site or objects contains features both archaeological and contextual which may contribute to our understanding of the local past. These features include, but are not limited: to the relationship with landscape features or other Aboriginal archaeological sites or areas of identified heritage importance; diagnostic archaeological or landscape features that inform a chronology; and a relatively large assemblage of stone artefacts. A diverse artefact and feature assemblage and connectedness with landscape features and other notable sites provide relatively higher representative and rarity values.
High	The site or object contains archaeological and/or contextual features which may significantly contribute to our understanding of the past, both locally and on a regional scale. Features include but are not limited to: Aboriginal ancestral remains; the site's relationship with landscape features or other Aboriginal archaeological sites or areas of identified heritage importance; diagnostic archaeological or landscape features that inform a chronology; and a very large assemblage of stone artefacts associated with other features such as oven remains or shell midden. Such sites are relatively rare and representative of a limited number of similar sites.

Table 5.3 **Significance of Aboriginal objects and/or sites within the MOD1 investigation area**

Site	AHIMS #	Site Type	Significance			
			Research Potential	Representative-ness	Rarity	Overall
Previously registered sites in the investigation area						
WB 40	47-2-0262	Artefacts, hearth, shell, culturally modified tree and PAD	H	M	M	M
WB 41	47-2-0263	Artefacts, hearth and PAD	M	L	L	L
WB 45	47-2-0267	Artefacts, hearth and PAD	M	L	L	L
WB 47	47-6-0607	Artefacts and PAD	L	L	L	L
WB 102	47-2-0310	Artefacts and PAD	M	L	L	L
Sites identified during survey						
WB 162	TBC	Artefact scatter	L	L	L	L
WB 163	TBC	Artefact scatter	L	L	L	L
WB 164	TBC	Artefact scatter	L	L	L	L
WB 165	TBC	Artefact scatter	L	L	L	L
WB 166	TBC	Artefact scatter	L	L	L	L
WB 167	TBC	Artefact scatter	L	L	L	L
WB 168	TBC	Artefact scatter	L	L	L	L
WB 169	TBC	Artefact scatter	L	L	L	L
WB 170	TBC	Isolated find	L	L	L	L
WB 171	TBC	Artefact scatter	L	L	L	L
WB 172	TBC	Artefact scatter	L	L	L	L
WB 173	TBC	Artefact scatter	L	L	L	L

6 Impact assessment

The proposed modification represents a potential ground disturbance footprint of approximately 119 ha.

Despite the underground mining method, the nature of the proposed MOD1 impacts to Aboriginal cultural heritage values remains the same. The proposed modification has the potential to impact all the Aboriginal sites within its disturbance footprint (as indicated by the MOD1 investigation area) through topsoil stripping over underground mining areas and earthworks associated with the construction of surface infrastructure.

Changes to the alignment to the EIS approved haul road will impact Aboriginal sites on Marma, Hatfield and Rata land systems in the north of the MOD1 investigation area, particularly where the road intersects with the boundaries of WB 40 on the western dunes of Muckee Lake, and to a lesser extent WB 41 and WB 45.

All known sites within the EIS approved portion of the MOD1 investigation area have approval for project related impacts and the implementation of associated management measures in accordance with the project ACHMP (Niche 2016). The inclusion of these sites in this impact assessment is to present a consolidated summary of impacts associated with proposed MOD1, as these impacts are not additional to impacts accounted for in the EIS 2014 ACHA (Niche 2015).

This ACHA considers the potential impacts to 17 recorded sites, which are made up of:

- 14 sites wholly within the MOD1 investigation area;
- 3 sites that extend across portions of the MOD1 investigation area and beyond the Balranald Project area (WB40, WB 41 and WB 45); and
- 3 sites that extend across portions of the MOD1 investigation area and outside all project areas (WB 63, WB 42 and WB 161).

All recorded Aboriginal sites within the study area are shown on Figure 4.1a to Figure 4.1c and a list of these sites is attached as Appendix A.

6.1 Project sources of impact

Although the proposed modified mining extraction method will not involve broad scale earthworks associated with open cut mining as previously planned, it is predicted that Aboriginal sites would still be impacted in the following ways:

- earthworks associated with the construction of infrastructure;
- ground surface disturbance and rehabilitation which will involve topsoil, subsoil and overburden stripping and vegetation clearance above underground mining areas; and
- potential subsidence impacts from underground mining including potential ground movement of soils and strata and through subsequent accelerated erosional secondary effects if not mitigated.

The proposed modification would impact all the Aboriginal sites within its disturbance footprint through topsoil stripping over underground mining areas and earthworks associated with the construction of surface infrastructure. It is unlikely that potential ground subsidence above the mining areas would increase Aboriginal heritage impacts, as these areas would experience topsoil stripping (ie removal of archaeological layers) prior to underground mining commencing.

Overall, the nature of the proposed direct archaeological impacts will remain the same to that of the previously approved EIS open mining cut method, potentially resulting in total removal of archaeological material within the proposed modification disturbance footprint if not mitigated.

6.1.1 Definition of impact type

Direct impacts can occur on a varying scale. Disturbance means Aboriginal sites and objects will be disrupted and moved a short distance through the displacement of ground. Loss entails complete removal of a site's elements, such as through large-scale earthworks.

The total modification of a landscape also can constitute loss, even if artefacts are collected and later returned to the modified surface in their original position because the context (an integral part of archaeological site value) is irretrievably lost. Total loss is when the entirety of a site will be lost as a result of the project. Partial loss describes the loss of part of a site.

This assessment considers that the large-scale earthworks required as part of the proposed modification would constitute loss to all Aboriginal objects within topsoil stripping and construction boundaries.

6.2 Aboriginal heritage impact

Of the 95 sites within the study area, 14 sites are wholly within the MOD1 investigation area and three sites are partially within the investigation area. The remaining sites are situated within the approved EIS portion of the MOD1 investigation area.

As recorded on AHIMS, eight sites within the approved portion of the MOD1 investigation area have been destroyed and Table 6.1 summarises the loss of value through impacts to the remaining 17 valid sites within the MOD1 investigation area.

Table 6.1 Archaeological significance and corresponding loss of value through impact within the approved EIS boundary and proposed MOD1 investigation area

Archaeological significance	Total loss of value	Partial loss of value	No loss of value	Total number of sites
Within MOD1 investigation area (outside EIS approval boundary)				
High	-	1	-	1
Moderate	-	1	-	1
Low	12	2	1	15
TOTAL	12	4	1	17

Overall, for MOD1 the majority of valid sites within MOD1 are artefact sites (n=81) and most are rated as of low significance (n=77). One site (WB 40) is considered to be of high significance.

With regard to impacts to sites outside the EIS approval boundary, the most significant site is WB 40. The significance of this site is rated as high due to the range of stone artefacts, the presence of hearths and a culturally modified tree, and the potential for archaeological deposits. However, only approximately 10% of WB 40 is within the MOD1 investigation area and, when the site was inspected during survey, no evidence of the scarred tree or hearths was identified within the investigation area boundary. It is therefore likely that these site features are outside the study area and will avoid impacts.

Similarly, two other sites WB 41 and WB 45 are also recorded as containing hearths, but only approximately 20% of each site (as per the updated site boundaries) is situated within the MOD1 investigation area and, similar to WB 40, no evidence of hearths was identified during survey. It is therefore assumed that the hearths lie outside the study area boundary. Within the EIS approval boundary of the MOD1 investigation area, there are eight identified hearth sites. One of these sites has been destroyed and the rest will be excavated prior to impacts in accordance with the ACHMP.

Table 6.2 **Potential impacts to sites within the MOD1 investigation area**

AHIMS	Site Name	Site Type	Significance	Project area	Approval status	Type of potential harm	Degree of potential harm	Consequence of potential harm
47-2-0262	WB 40	Artefacts, hearth, scarred tree, PAD	High	Haul Road	Partially within approved 2014 EIS disturbance area, partially outside of approved disturbance area (pending approval) and partially outside study area	Direct	Partial	Partial loss of value
47-2-0263	WB 41	Artefacts, hearth, PAD	Moderate	Haul Road / Underground mining	Partially within approved 2014 EIS disturbance area, partially outside of approved disturbance area (pending approval) and partially outside study area	Direct	Partial	Partial loss of value
47-2-0264	WB 42	Artefacts, hearth, PAD	Moderate	Mine and infrastructure area	Partially within approved 2014 EIS disturbance area	Direct	Partial	Partial loss of value
47-2-0267	WB 45	Artefacts, hearth, PAD	Low	Haul Road / Mine and infrastructure area	Partially within approved 2014 EIS disturbance area, partially outside of approved disturbance area (pending approval) and partially outside study area	Direct	Partial	Partial loss of value
47-6-0607	WB 47	Artefact site, PAD	Low	N/A	Outside approved disturbance area (pending approval)	None	None	No loss of value
47-2-0284	WB 63	Artefacts, hearth, PAD	Moderate	Mine and infrastructure area	Partially within approved 2014 EIS disturbance area	Direct	Partial	Partial loss of value
47-2-0310	WB 102	Artefact site, PAD	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC**	WB 161	Artefacts, hearth, PAD	Moderate	Haul Road	Partially within approved 2014 EIS disturbance area	Direct	Partial	Partial loss of value

Table 6.2 Potential impacts to sites within the MOD1 investigation area

AHIMS	Site Name	Site Type	Significance	Project area	Approval status	Type of potential harm	Degree of potential harm	Consequence of potential harm
TBC***	WB 162	Artefact site	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC***	WB 163	Artefact site	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC***	WB 164	Artefact site	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC***	WB 165	Artefact site	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC***	WB 166	Artefact site	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC***	WB 167	Artefact site	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC***	WB 168	Artefact site	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC***	WB 169	Artefact site	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC***	WB 170	Isolated find	Low	Mine and infrastructure area	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value
TBC***	WB 171	Artefact site	Low	Haul Road	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value

Table 6.2 **Potential impacts to sites within the MOD1 investigation area**

AHIMS	Site Name	Site Type	Significance	Project area	Approval status	Type of potential harm	Degree of potential harm	Consequence of potential harm
TBC***	WB 172	Artefact site	Low	Haul Road	Partially outside approved disturbance area (pending approval)	Direct	Partial	Partial loss of value
TBC***	WB 173	Artefact site	Low	Haul Road	Outside approved disturbance area (pending approval)	Direct	Total	Total loss of value

Notes: *The 2016 ACHMP states that AHIMS site cards were lodged in February 2016. However, current searches of AHIMS indicate these sites are not registered. This matter is being resolved and AHIMS numbers will be added to the ACHMP when completed.

 ** Site identified during management for geotechnical works (October 2021) and lodged with AHIMS (EMM 2021b).

 *** Sites identified during 2021 survey for this ACHA and will be lodged with AHIMS.

6.3 Cumulative impacts and intergenerational loss/equity

Cumulative impacts have been considered by the level of additional impacts proposed by MOD1 in relation to the approved EIS project. This means, what level of additional impacts are proposed that were not already assessed under the EIS 2014 ACHA and approved under SSD-5285. As such, the focus of considering cumulative impacts is on assessing the impacts proposed within the MOD1 investigation area outside the approved EIS boundary.

There are significant limitations to quantifying additional impacts based on counting site numbers alone, as site boundaries are often arbitrary delineations of continuous archaeological distributions. Furthermore, the number of recorded sites within the approved project area is also indicative only, and it is important to note that many more Aboriginal sites/objects are likely to be identified through further survey and collection requirements under the ACHMP⁶.

A broad but informative way to understand cumulative impacts are to consider the proposed additional impacts in terms of the net additional area that will be disturbed and the archaeological significance of that area. Of the ~715 ha for proposed MOD1, the modification would represent an approximate ~119 ha increase in total EIS approved project area where ground disturbance could occur, all of which is within high archaeological the risk layer (ie mining and surface infrastructure area and haul road north area).

The proposed MOD1 investigation area resides outside the approved Balranald Project boundary.

Additional impacts proposed to known sites of low and moderate significance are not considered substantial, as such sites are relatively common in the local area⁷.

There will be an increased impact to WB 40 which is considered to be of high archaeological significance, but which requires archaeological excavation for its true significance to be determined. A linear segment of WB 40 will be impacted by the proposed haul road north area in addition to approved impacts within the EIS project area. Alternative route deviations to the haul road would not be beneficial, as the adjacent land to the east and west of its proposed alignment fall within a landscape of equal significance⁸. The main counterbalance to this proposed impact is that a significant portion of this site (approximately 50 ha) and the landscape surrounding Muckee Lake will remain avoided. Notwithstanding, WB 40 warrants particular investigative focus to determine appropriate mitigation to its additional impacts as part of the proposed MOD1 (Section 7).

Aboriginal heritage management is based on the principle of intergenerational equity, which has the intention to ensure present generations consider future generations when making management decisions. This principle is possibly the most relevant part of the notion of ecologically sustainable development (ESD) when considering Aboriginal cultural heritage management.

⁶ Further Aboriginal sites are likely to be found within the approved project area because the EIS 2014 ACHA surveyed only discrete portions of the project area, and made predictions of archaeological potential for the rest using risk layer mapping.

⁷ The EIS 2014 identified 317 sites of low significance and 57 sites of moderate significance subject to impact within the project area.

⁸ WB 40 and the western edge of Muckee Lake continues to the east, and interconnected sites of potentially equal significance (WB 67 to WB 81) occur to the west within the approved project area.

A substantial local archaeological resource will remain, as it is acknowledged key relict lakes in the region (Tin Lake, Pitarpunga Lake and Muckee Lake) and their western lunettes (featuring Pleistocene material such as WB 66) will remain avoided. A cross section of the archaeological resource occurs within and outside the MOD1 project area and study area, including stone artefact sites, middens, hearths, scarred trees and potential datable deposits. While it is acknowledged that proposed MOD1 will cause impacts to Aboriginal heritage, the proposed management measures presented in Section 7 are anticipated to provide the local Aboriginal community with examples of site contents and opportunities to maintain a cultural connection with the landscape.

Additional investigation of sites and salvage measures will also help to achieve intergenerational equity by allowing retention of cultural materials for the enjoyment and education of future generations.

7 Management strategy and recommendations

7.1 Management framework

This section describes the management measures for identified Aboriginal cultural heritage values in the MOD1 investigation area. The management measures respond to:

- the impacts identified in the preceding section;
- the assessed significance of the Aboriginal sites;
- the views of the Aboriginal community as represented by the RAPs;
- the need to address intergenerational equity in the values of Aboriginal heritage;
- the need to protect sites not impacted by the project but under the care of (Iluka); and
- the need to mitigate the loss of impacted Aboriginal sites and Aboriginal objects.

While Aboriginal sites cannot be replaced once lost, the salvage of Aboriginal objects impacted by the Balranald Project will provide a tangible monument to those sites. Furthermore, with care in curation, those salvaged materials can be better studied to help understand other Aboriginal sites present in the landscape.

The management measures presented should be read in conjunction with the ACHMP (Niche 2016) where further detail is provided.

7.2 Approved ACHMP management

The ACHMP (Niche 2016) sets out the management of Aboriginal cultural heritage within the approved EIS project area and remains in force for the components of proposed MOD1 investigation area within this boundary. In summary, there is existing management approved for this portion the MOD1 investigation area with required management measures primarily guided by archaeological risk layer mapping. No management changes are proposed within the EIS approved portion of the proposed MOD1 investigation area, as the same level of impact is anticipated.

Management of Aboriginal cultural heritage outside of the approved EIS project area (ie MOD1 investigation area) will align with the provisions of the ACHMP so that the management approach remains consistent for the entire Balranald Project and generally conforms to expectations by regulators and RAPs developed during the 2014 EIS ACHA. It is intended that the management measures developed for Aboriginal cultural heritage values within the MOD1 investigation area will be managed in accordance with existing ACHMP measures (Niche 2016), unless subject to additional requirements or changes set out in this section. The ACHMP includes protocols for the discovery of new Aboriginal sites (Section 7.4 of ACHMP) and the management of potential and confirmed Aboriginal human remains (Section 7.5 of ACHMP).

7.3 Proposed management measures

7.3.1 Overview

The management measures to be applied to each identified site are illustrated in Figure 7.1a to Figure 7.c. A detailed summary of each site, its type, significance rating, impacts and proposed management measures is provided in Table 7.1.

7.3.2 Archaeological surface collection

In accordance with Section 6.3 of the ACHMP, archaeological surface collection within the EIS approved portions of the MOD1 investigation area will be completed for land that falls within moderate and high archaeological risk layers. Surface collection is not required for low archaeological risk layers.

Note that not all areas were previously surveyed in the EIS 2014 ACHA and will therefore require joint survey and collection in accordance with the ACHMP (Niche 2016, Section 6.3, p.26). A significant portion of the proposed MOD1 haul road falls within the low archaeological risk layer and therefore will not be subject to the surface collection effort.

Archaeological surface collection will also be undertaken in the proposed mining and surface infrastructure areas and haul road north portion of the MOD1 investigation area which are all within the high archaeological risk layer. As these areas received a comprehensive survey effort in 2021, surface collection can be defined by the modification disturbance footprint and boundaries of known Aboriginal sites rather than it requiring additional survey (refer Niche 2016, Section 6.3, p.26).

All subsequent recording, analysis, reporting and storage of salvaged materials will follow the requirements of the ACHMP.

7.3.3 Archaeological excavation

i Overview

Archaeological excavation is proposed for the MOD1 investigation area to address two key requirements:

- to comply with excavation requirements under the ACHMP relevant to the approved EIS project area; and
- to investigate the character and significance of Aboriginal sites within the MOD1 investigation area prior to finalising their appropriate management measures.

ii Excavation within the approved EIS project area

Section 6.2 of the ACHMP (Niche 2016) details the requirements for an archaeological subsurface excavation program within the approved EIS project area. The MOD1 investigation area intersects with one of the eight project 'subsurface excavation locations' (Location 8).

Location 8 requires a range of methods including stratigraphic trenches, exploratory test pits and targeted open area salvage excavation to a volume of up to 20 cubic metres within a considerable area of 183 ha (Niche 2016, Table 8, p.25). Approximately 13 ha of the proposed MOD1 intersects with Location 8, which is also within a portion of low archaeological risk mapping, partly due to its highly cultivated condition and absence of deeper soils (whereas most of Location 8 is part of the high archaeological risk layer).

Considering the predicted low sensitivity of Location 8/MOD1 intersecting area, only a limited amount of exploratory test pitting will be completed in this area (Figure 7.1a and Figure 7.b) unless the results dictate otherwise.

The exploratory test pitting will follow the provisions under Appendix 6 of the ACHMP.

Additionally, the proposed MOD1 intersects within three of the seven EIS approved 'exploratory test locations' at the West Balranald Mine. These areas were selected during the EIS to provide subsurface data on the sandplain/drainage features within moderate and high archaeological risk layers.

Exploratory test pitting in these areas will follow the provisions under Appendix 6 of the ACHMP with geomorphologist input to be sought to refine the scope and location of test pitting.

The excavation requirements for these areas within the approved EIS project area will be implemented prior to any MOD1 project-related disturbance.

iii Excavation within MOD1 investigation area

The MOD1 investigation area intersects with four Aboriginal sites with PAD (WB 40, WB 41, WB 45 and WB 102) that warrant archaeological test excavation and reassessments of archaeological significance prior to the development of appropriate management measures. The portions of these sites within the MOD1 investigation area do not currently have approved impacts and management as they fall outside the approved EIS project area boundary.

Heritage NSW has been consulted about the scope timing of proposed test excavation in the MOD1 investigation area and recommended that the required fieldwork and reporting is completed for their review prior to approval of the proposed modification (refer Appendix F). As such, test excavation within the MOD1 investigation area will be undertaken subsequent to the submission of the modification report to DPE with the outcomes to be provided in an ACHA addendum and submitted as part of the submission report.

EMM has developed a methodology for test excavation within the MOD1 investigation area (Appendix E) which will be consulted with project RAPs and Heritage NSW prior to the commencement of excavation. The methodology has been developed to align with the test excavation procedures outlined in the Appendix 6 of the ACHMP (Niche 2016) and is summarised as follows:

- Four indicative areas for test excavation are shown on Figure 7.1a and Figure 7.b. Refinement of the test excavation areas and final placement of pits will be determined in consultation with a geomorphologist during a site visit with an archaeologist and RAPs (if available).
- Test excavation will be undertaken by hand, but with the provision for machine excavation in certain circumstances.
- Dating samples will be collected and analysis undertaken when it will add significantly to an understanding of a site's stratigraphy.
- Artefacts will be catalogued.
- Spatial data will be provided to Iluka, and all sites will be added to the BAHD and updated in the AHIMS database.

Note that only test excavation is proposed in the MOD1 investigation area prior to approval of the proposed modification. The requirement for salvage excavation in any part of the investigation area will be revisited in the ACHA addendum and would only be undertaken subsequent to DPE approval of MOD1.

iv Proposed amendment to subsurface excavation Location 8 boundary

The proposed MOD1 haul road north intersects with a section of WB 40 directly adjacent to the approved EIS project area/Location 8 subsurface excavation area.

The existing boundary of the subsurface excavation Location 8 is currently shaped to align with the approved EIS project area at its eastern edge. The purpose of the Location 8 area is to sample the landforms of 'margins of the western lunette and dune deposit of Muckee Lake, within West Balranald Mine, and associated with WB 40 and WB 67 to WB 81' (Niche 2016, Table 8).

It is proposed that the Location 8 subsurface excavation boundary is amended to include the proposed modification haul road north in proximity to WB 40 (Figure 7.1b). The amended portion includes the same landscape of WB 40 that was originally targeted by Location 8. The original Location 8 boundary was arbitrarily cut-off at the project area's eastern edge and therefore the amendment is considered justified to include this additional area.

The proposed test pitting of WB 40 within the MOD1 investigation area (refer Section 7.3.3.iii above), and any subsequent salvage measures would contribute to the excavation commitments for Location 8 as detailed in Section 6.2 and Appendix 6 of the ACHMP.

v Hearth excavation

There are no identified hearths within the MOD1 investigation area.

Should any hearths be identified within the MOD1 investigation area they will be subject to excavation to take bulk samples to confirm cultural or natural origins and dating samples collected. This will follow the methods site out in Section 6.2 of the ACHMP (Niche 2016, p.27).

7.3.4 Avoidance provisions

This ACHA has been prepared based on the assumption that all land within the proposed MOD1 investigation area will be disturbed and therefore no site avoidance measures are currently proposed. Notwithstanding, Section 7.7 of the ACHMP (Niche 2016) sets out measures that will be implemented to Aboriginal sites that have been surveyed and/or salvaged and disturbance can be avoided. Such measures will be adopted for the proposed MOD1 where relevant.

There are a number of Aboriginal sites that extend beyond the proposed MOD1 investigation area and outside all approval boundaries. Such sites will be managed in accordance with Section 7.8 of the ACHMP which addresses the management of identified Aboriginal sites outside approved disturbance areas.

7.3.5 Update of ACHMP

The ACHMP (Niche 2016) will be updated in consultation with Heritage NSW and project RAPs to reflect the changes of the proposed modification.

The updated ACHMP will be prepared after modification approval, and in addition to the points above, will address all relevant conditions of consent. The ACHMP will provide the details of the management measures outlined in the sections below.

7.4 Management summary

Table 7.1 provides a summary of all Aboriginal sites, significance ratings, impact types and management recommendations presented as part of this report.

Table 7.1 Site significance, impact and management summary

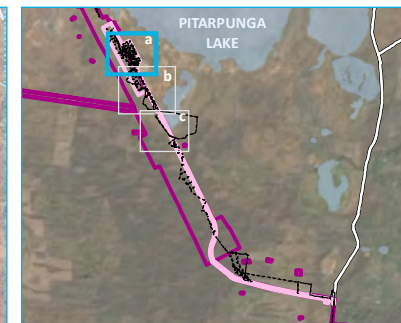
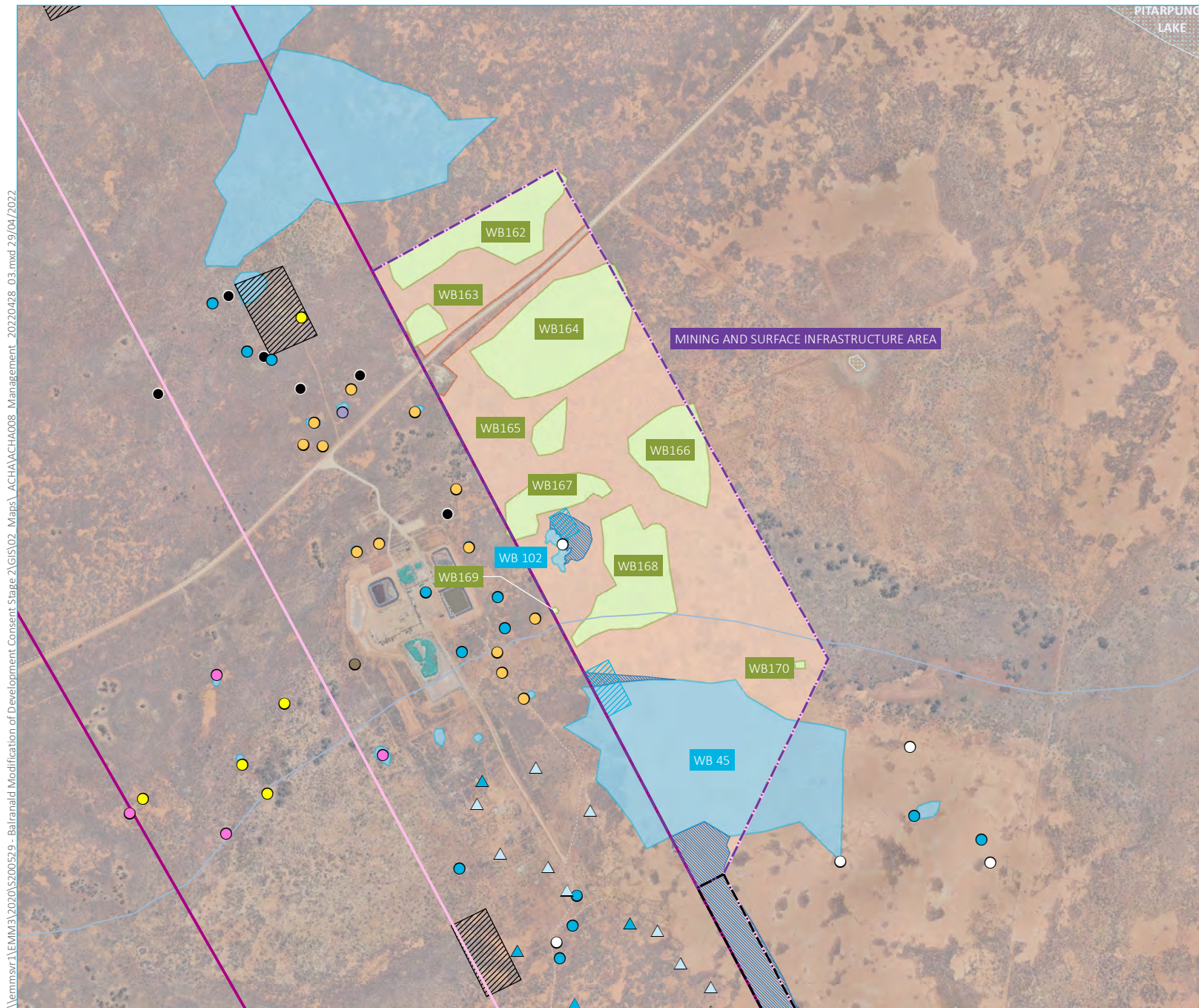
AHIMS	Site name	Site type	Significance rating	Level of impact	Approval status	MOD1 management strategy
47-2-0262	WB 40	Artefacts, hearth, scarred tree, PAD	High	Partial	Partially within approved 2014 EIS disturbance area, partially outside of approved disturbance area (pending approval) and partially outside investigation area.	Test excavation Surface collection Consideration for further excavation under ACHMP as part of Location 8 area
47-2-0263	WB 41	Artefacts, hearth, PAD	Moderate	Partial	Partially within approved 2014 EIS disturbance area, partially outside of approved disturbance area (pending approval) and partially outside investigation area.	Test excavation Surface collection
47-2-0264	WB 42	Artefacts, hearth, PAD	Moderate	Partial	Partially within approved 2014 EIS disturbance area	Existing approval - surface collection and hearth excavation
47-2-0267	WB 45	Artefacts, hearth, PAD	Low	Partial	Partially within approved 2014 EIS disturbance area, partially outside of approved disturbance area (pending approval) and partially outside investigation area.	Test excavation Surface collection
47-6-0607	WB 47	Artefact site, PAD	Low	None	Outside proposed disturbance area	Avoidance
47-2-0284	WB 63	Artefacts, hearth, PAD	Moderate	Partial	Partially within approved 2014 EIS disturbance area	Existing approval - surface collection and hearth excavation
47-2-0310	WB 102	Artefact site, PAD	Low	Total	Outside approved disturbance area (pending approval)	Test excavation Surface collection
TBC**	WB 161	Artefacts, hearth, PAD	Moderate	Partial	Partially within approved 2014 EIS disturbance area	Existing approval - surface collection and hearth excavation
TBC***	WB 162	Artefact site	Low	Total	Outside approved disturbance area (pending approval)	Post approval - surface collection
TBC***	WB 163	Artefact site	Low	Total	Outside approved disturbance area (pending approval)	Post approval - surface collection
TBC***	WB 164	Artefact site	Low	Total	Outside approved disturbance area (pending approval)	Post approval - surface collection
TBC***	WB 165	Artefact site	Low	Total	Outside approved disturbance area (pending approval)	Post approval - surface collection
TBC***	WB 166	Artefact site	Low	Total	Outside approved disturbance area (pending approval)	Post approval - surface collection
TBC***	WB 167	Artefact site	Low	Total	Outside approved disturbance area (pending approval)	Post approval - surface collection
TBC***	WB 168	Artefact site	Low	Total	Outside approved disturbance area (pending approval)	Post approval - surface collection
TBC***	WB 169	Artefact site	Low	Total	Outside approved disturbance area (pending approval)	Post approval - surface collection

Notes: *The 2016 ACHMP states that AHIMS site cards were lodged in February 2016. However, current searches of AHIMS indicate these sites are not registered. This matter is being resolved and AHIMS numbers will be added to the ACHMP when completed.

** Site identified during management for geotechnical works (October 2021) and lodged with AHIMS.

*** Sites identified during survey for this ACHA and will be lodged with AHIMS.

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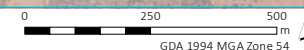
- KEY**
- EIS Approved Balranald Project Area (SSD-5285) (project area)
 - Proposed modification (study area)
 - Existing track
 - Watercourse/drainage line
 - Waterbody
 - Investigation area**
 - Mining and surface infrastructure area
 - Haul road north area
 - 2021 survey results**
 - Extended site boundary (EMM 2021)
 - Newly identified Aboriginal site (EMM 2021)
 - Previously recorded sites**
 - BAHD sites (not on AHIMS)**
 - ▲ Artefacts
 - △ Isolated artefact
 - AHIMS (13/10/2021)**
 - Art site
 - Artefact site
 - Artefact site: isolated find
 - Artefact site; hearth
 - Artefact site; hearth; PAD
 - Artefact site; PAD
 - Hearth
 - Hearth; PAD
 - Heritage site boundary (Niche 2015)
 - Approved management (ACHMP 2016)**
 - Exploratory test pit
 - Proposed management: investigation area**
 - Surface collection
 - Indicative test excavation area

Management recommendations

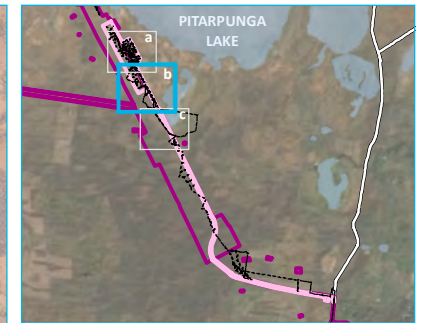
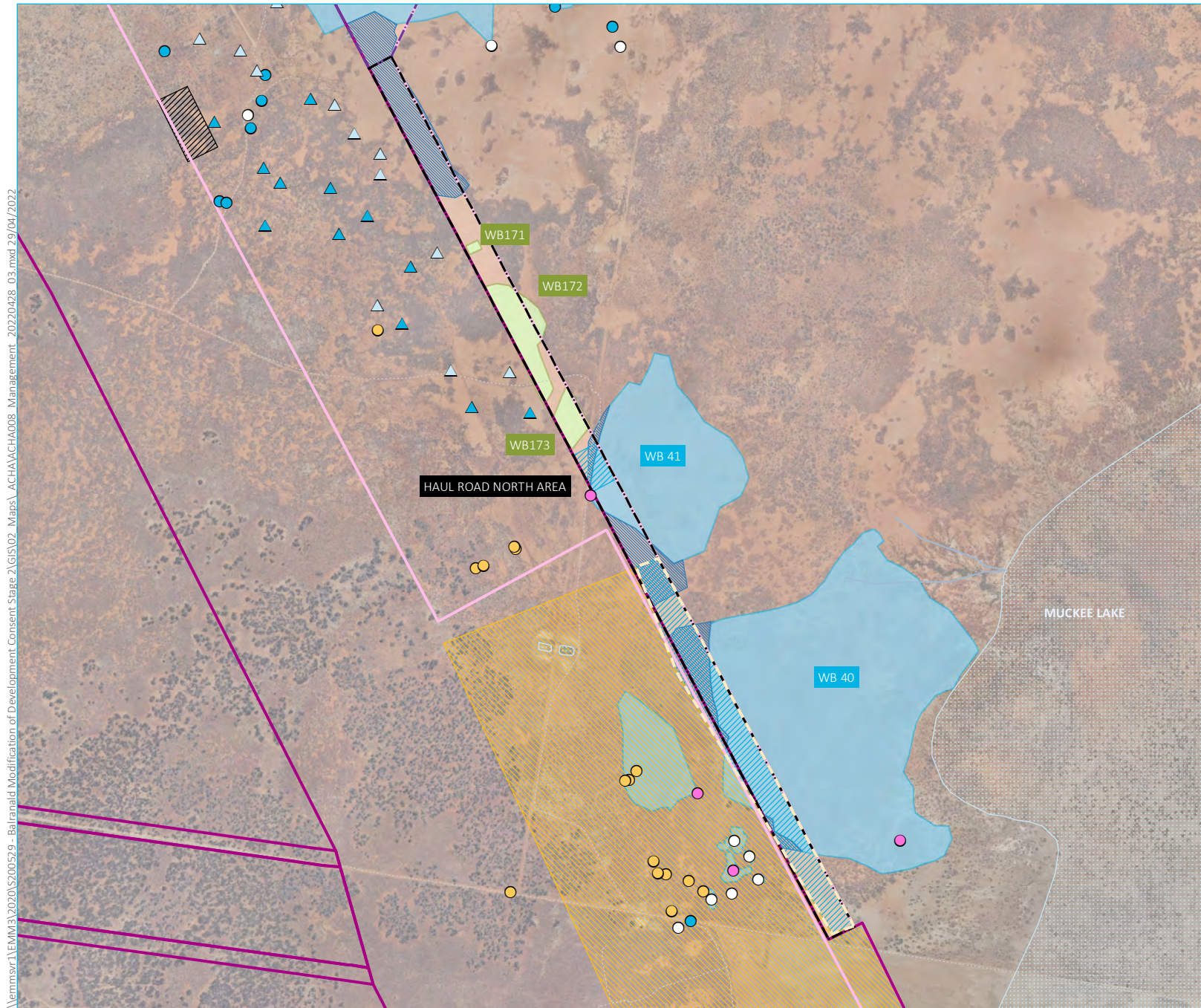
Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 7.1a



Source: EMM (2014, 2021, 2022); ESRI (2022); Iluka Resources (2018, 2021); OEH (2021); DFSI (2017); Niche (2015, 2016); GA (2011)



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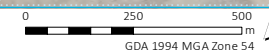
- KEY**
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 - Proposed modification (study area)
 - Existing track
 - Watercourse/drainage line
 - Waterbody
 - Investigation area**
 - Mining and surface infrastructure area
 - Haul road north area
 - 2021 survey results**
 - Extended site boundary (EMM 2021)
 - Newly identified Aboriginal site (EMM 2021)
 - Previously recorded sites**
 - BAHD sites (not on AHIMS)
 - ▲ Artefacts
 - △ Isolated artefact
 - AHIMS (13/10/2021)
 - Artefact site
 - Artefact site: isolated find
 - Artefact site; hearth; PAD
 - Artefact site; PAD
 - Heritage site boundary (Niche 2015)
 - Approved management (ACHMP 2016)**
 - Exploratory test pit
 - Approved management (ACHMP 2016)**
 - Location 8 excavation area
 - Proposed management: investigation area**
 - Surface collection
 - Indicative test excavation area
 - Location 8 proposed extension

Management recommendations

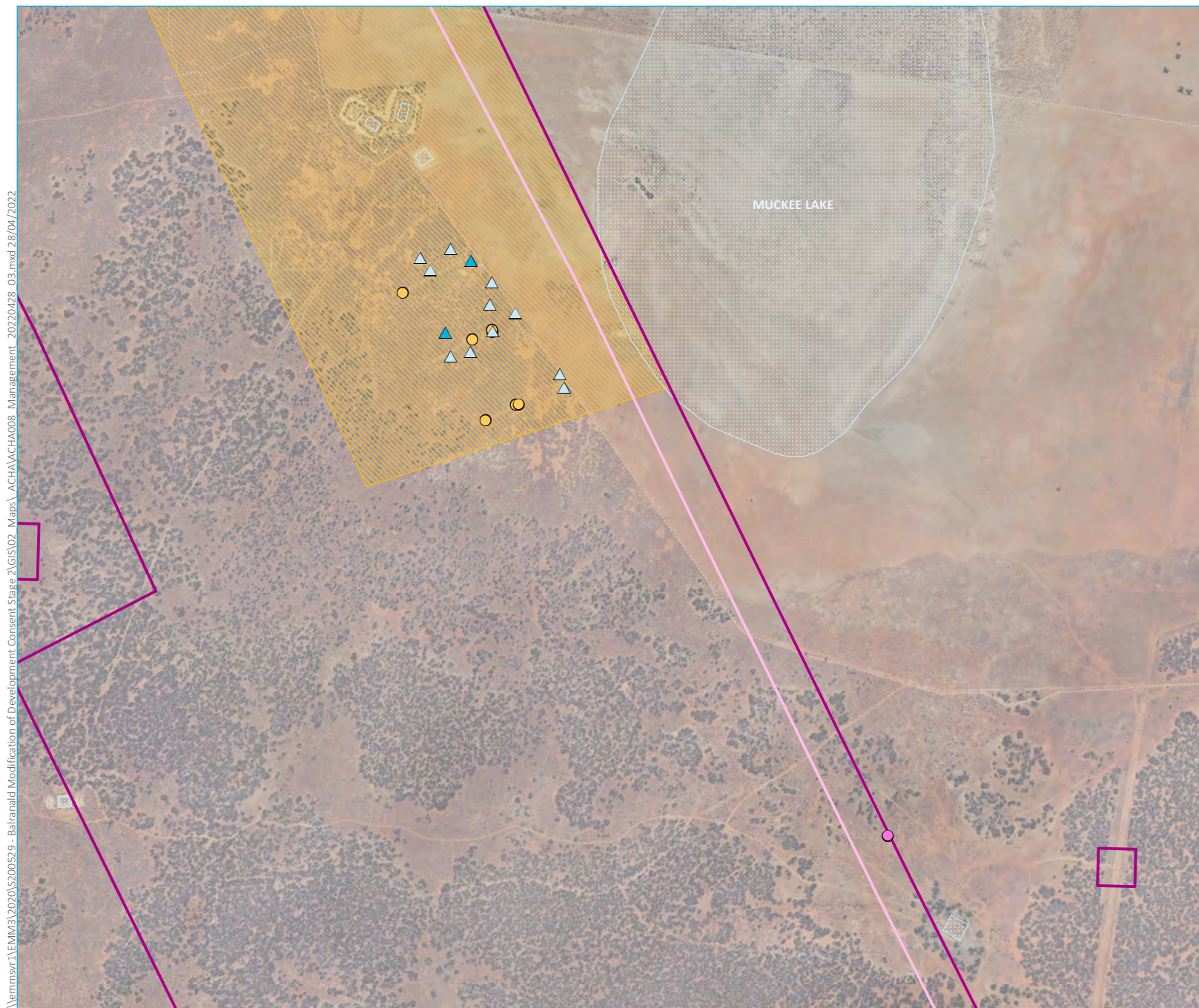
Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 7.1b



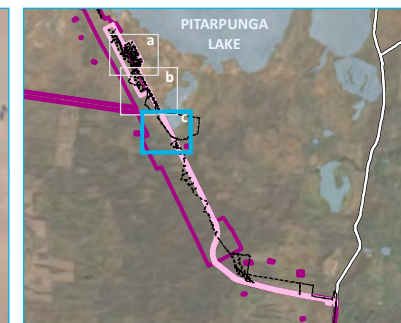
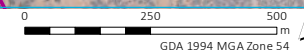
Source: EMM (2014, 2021, 2022); ESRI (2022); Iluka Resources (2018, 2021); OEH (2021); DFSI (2017); Niche (2015, 2016); GA (2011)



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Source: EMM (2014, 2021, 2022); ESRI (2022); Iluka Resources (2018, 2021); OEH (2021); DFSI (2017); Niche (2015, 2016); GA (2011)



- KEY**
- EIS Approved Balranald Project Area (SSD-5285) (project area)
 - Proposed modification (study area)
 - Existing track
 - Waterbody
- Previously recorded sites**
- BAHD sites (not on AHIMS)
- ▲ Artefacts
 - △ Isolated artefact
- AHIMS (13/10/2021)
- Artefact site: isolated find
 - Artefact site; hearth; PAD
- Approved management (ACHMP 2016)**
- Location 8 excavation area

Management recommendations

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 7.1c



8 Conclusion

EMM has completed a ACHA for the proposed MOD1 which has audited the existing archaeological resource within the approved EIS project area to account for additional archaeological fieldwork completed since the EIS 2014 ACHA. This has allowed for an updated impact assessment for the MOD1 investigation area which will be used to also guide the required ongoing approved management under the ACHMP.

The ACHA included additional archaeological survey in the MOD1 investigation area that extends beyond the currently approved EIS boundaries of the Balranald Project area. These additional investigations have identified new Aboriginal cultural heritage values in the form of surface and potential subsurface archaeological remains. The surface remains are widely of low significance and will be managed by surface collection which is a method consistent with the ACHMP.

Archaeological test excavation is proposed to be undertaken within sites with PAD (WB 40, WB 41, WB 45 and WB 102) to characterise the nature of subsurface archaeology in the local area, which will determine appropriate management measures. Once test excavation is completed within the MOD1 investigation area and management measures are proposed and approved, the ACHMP will be updated to account for all the additional measures included as part of this report and an addendum to be submitted during as part of the submissions report.

The MOD1 ACHA has corresponded with the opportunity for Iluka to reinvigorate consultation with the local Balranald Project RAPs. Iluka has highlighted their intention for ongoing and meaningful engagement with the local Aboriginal community which will be developed through ongoing cultural heritage management within the EIS project area under the ACHMP, further investigations as part of this MOD1 ACHA and MOD1 post-approval measures as required.

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Abbreviations

Abbreviations

AHD	Australian Height Datum
ACHA/ACHAR	Aboriginal cultural heritage assessment report
AHIMS	Aboriginal Heritage Information Management System
ACHMP	Aboriginal Cultural Heritage Management Plan
BP	Years before present
c.	circa
CEMP	Construction Environmental Management Plan
cm	centimetres
DEC	Department of Environment and Conservation, now DPC
DECCW	Department of Environment Climate Change and Water, now DPC
DPC	Department of Premier and Cabinet
DPE	Department of Planning and Environment, now DPIE
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMM	EMM Consulting Pty Ltd
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
ERM	Environmental Resources Management
ESD	Ecologically sustainable development
FGS	Fine grained siliceous
FSL	full supply level
g	grams
GIS	geographical information system
GPS	global positioning system
ha	hectare
ICOMOS	International Council on Monuments and Sites
IMTC	Indurated mudstone/tuff/chert
ka	thousand years ago
km	kilometres
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
m	metres
m ²	square metres
mm	millimetres
n	Number
NSW	New South Wales
OEH	Office of Environment and Heritage, now DPIE
PAD	Potential archaeological deposit
PMF	Probable maximum flood
RAP	Registered Aboriginal Party

Abbreviations

SEARs	Secretary's Environmental Assessment Requirements
t	Tonne
TEC	Total Earth Care
TP	Test pit



Appendix A

AHIMS search results



SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
47-2-0195	West Balranald 75	GDA	54	724974	6186482	Open site	Valid	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>	Niche Environment and Heritage,Ms.Clare Anderson					<u>Permits</u>		
47-2-0300	West Balranald 67	GDA	54	725187	6186586	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Ms.Clare Anderson					<u>Permits</u>		
47-2-0643	BSE14	GDA	54	725624	6185155	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>	EMM Consulting - St Leonards - Individual users,Ms.Pamela Chauvel					<u>Permits</u>		
47-2-0262	West Balranald 40	GDA	54	725703	6186587	Open site	Valid	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr.Giles Hamm					<u>Permits</u>		
47-3-0270	paika 212	GDA	54	736390	6180516	Open site	Valid	Earth Mound : -, Hearth : -, Shell : -		
	<u>Contact</u>	<u>Recorders</u>	Badger Bates,Doctor.Sarah Martin					<u>Permits</u>		
47-3-0269	paika 211	GDA	54	736516	6180397	Open site	Valid	Artefact : -, Earth Mound : -, Hearth : -, Shell : -		
	<u>Contact</u>	<u>Recorders</u>	Badger Bates,Doctor.Sarah Martin					<u>Permits</u>		
47-3-0370	paika west 22	GDA	54	736657	6180187	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					<u>Permits</u>		
47-2-0198	West Balranald 78	GDA	54	724949	6186485	Open site	Valid	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>	Niche Environment and Heritage,Ms.Clare Anderson					<u>Permits</u>		
47-2-0286	West Balranald 65	GDA	54	725073	6186734	Open site	Valid	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr.Giles Hamm					<u>Permits</u>		
47-2-0301	West Balranald 68	GDA	54	725233	6186538	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Ms.Clare Anderson					<u>Permits</u>		
47-6-0798	Pine Lodge 7	GDA	54	734242	6173680	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Niche Environment and Heritage					<u>Permits</u>		
47-6-0799	Pine Lodge 8	GDA	54	734248	6173767	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Niche Environment and Heritage					<u>Permits</u>		
47-6-0800	Pine Lodge 9	GDA	54	734292	6173689	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Niche Environment and Heritage					<u>Permits</u>		
47-6-0803	Pine Lodge 13	GDA	54	734388	6173676	Open site	Valid	Artefact : -		

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : S200529-Balranald pt2

Client Service ID : 628101

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Niche Environment and Heritage					Permits		
47-3-0210	paika lake 405	GDA	54	736798	6179729	Open site	Valid	Hearth : -		
	Contact	Recorders	Mr.Smokey Murray,Doctor.Sarah Martin					Permits		
47-3-0359	paika west 11	GDA	54	736820	6179701	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					Permits		
47-3-0357	paika west 9	GDA	54	736860	6179637	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					Permits		
47-3-0263	paika 205	GDA	54	736879	6179963	Open site	Valid	Hearth : -, Non-Human Bone and Organic Material : -, Shell : -		
	Contact	Recorders	Badger Bates,Doctor.Sarah Martin					Permits		
47-2-0199	West Balranald 79	GDA	54	724489	6186427	Open site	Valid	Artefact : 1		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson					Permits		
47-2-0648	BSE22	GDA	54	725643	6185392	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Ms.Pamela Chauvel					Permits		
47-2-0644	BSE15	GDA	54	725705	6185197	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Ms.Pamela Chauvel					Permits		
47-2-0645	BSE16	GDA	54	725712	6185198	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Ms.Pamela Chauvel					Permits		
47-6-0804	Pine Lodge 15	GDA	54	734232	6173724	Open site	Valid	Artefact : -		
	Contact	Recorders	Niche Environment and Heritage					Permits		
47-6-0794	Pine Lodge 3	GDA	54	734359	6173751	Open site	Valid	Artefact : -		
	Contact	Recorders	Niche Environment and Heritage					Permits		
47-3-0372	paika west 24	GDA	54	736411	6180502	Open site	Valid	Artefact : -, Earth Mound : -, Hearth : -, Shell : -		
	Contact	Recorders	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					Permits		
47-3-0350	paika west 2	GDA	54	736470	6180461	Open site	Valid	Earth Mound : -		
	Contact	Recorders	Ms.Elaine Purtill,Doctor.Sarah Martin					Permits		
47-3-0268	paika 210	GDA	54	736611	6180296	Open site	Valid	Hearth : -, Shell : -		
	Contact	Recorders	Badger Bates,Doctor.Sarah Martin					Permits		
47-3-0267	paika 207	GDA	54	736652	6180234	Open site	Valid	Modified Tree (Carved or Scarred) : -		

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with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 91

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0366	paika west 18	GDA	54	736784	6180024	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0262	paika 204	GDA	54	736816	6179797	Open site	Valid	Hearth : -, Shell : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0361	paika west 13	GDA	54	736827	6179708	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0305	West Balranald 72	GDA	54	725050	6186336	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0302	West Balranald 69	GDA	54	725262	6186466	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0647	BSE21	GDA	54	725641	6185398	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-6-0607	West Balranald 47	GDA	54	731292	6175312	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-6-0793	Pine Lodge 2	GDA	54	734405	6173743	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-6-0802	Pine Lodge 12	GDA	54	734409	6173605	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0215	paika lake 409	GDA	54	736155	6180753	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0373	paika west 25	GDA	54	736267	6180636	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0214	paika lake 410	GDA	54	736649	6180245	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0265	paika 208	GDA	54	736675	6180122	Open site	Valid	Earth Mound : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0368	paika west 20	GDA	54	736738	6180097	Open site	Valid	Artefact : -		

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Client Service ID : 628101

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0212	paika lake 407	GDA	54	736755	6179874	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0315	paika lake 104	GDA	54	737034	6179547	Open site	Valid	Artefact : -, Hearth : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0201	West Balranald 81	GDA	54	724936	6186523	Open site	Valid	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0197	West Balranald 77	GDA	54	724992	6186367	Open site	Valid	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0196	West Balranald 76	GDA	54	725090	6186430	Open site	Valid	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0646	BSE20	GDA	54	725588	6185372	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-6-0796	Pine Lodge 5	GDA	54	734300	6173749	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0371	paika west 23	GDA	54	736643	6180255	Open site	Valid	Artefact : -, Earth Mound : -, Hearth : -, Shell : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0266	paika 209	GDA	54	736667	6180177	Open site	Valid	Hearth : -, Shell : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0364	paika west 16	GDA	54	736797	6179955	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0209	paika lake 404	GDA	54	736799	6179700	Open site	Valid	Hearth : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0261	paika 203	GDA	54	736803	6179825	Open site	Valid	Habitation Structure : -, Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-3-0360	paika west 12	GDA	54	736821	6179701	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		

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with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 91

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Extensive search - Site list report

Your Ref/PO Number : S200529-Balranald pt2

Client Service ID : 628101

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
47-3-0356	paika west 8	GDA	54	736863	6179639	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					Permits		
47-2-0652	BSE31	GDA	54	724859	6186777	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Ms.Pamela Chauvel					Permits		
47-2-0306	West Balranald 73	GDA	54	725012	6186316	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Ms.Clare Anderson					Permits		
47-2-0304	West Balranald 71	GDA	54	725184	6186495	Open site	Valid	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Ms.Clare Anderson					Permits		
47-6-0797	Pine Lodge 6	GDA	54	734255	6173743	Open site	Valid	Artefact : -		
	Contact	Recorders	Niche Environment and Heritage					Permits		
47-3-0374	paika west 26	GDA	54	736255	6180635	Open site	Valid	Artefact : -, Earth Mound : -, Hearth : -, Shell : -		
	Contact	Recorders	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					Permits		
47-3-0271	paika 213	GDA	54	736381	6180520	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Badger Bates,Doctor.Sarah Martin					Permits		
47-3-0369	paika west 21	GDA	54	736670	6180151	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					Permits		
47-3-0367	paika west 19	GDA	54	736738	6180092	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					Permits		
47-3-0264	paika 206	GDA	54	736765	6180034	Open site	Valid	Habitation Structure : -, Hearth : -		
	Contact	Recorders	Badger Bates,Doctor.Sarah Martin					Permits		
47-3-0213	paika lake 408	GDA	54	736767	6180010	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Mr.Smokey Murray,Doctor.Sarah Martin					Permits		
47-3-0259	paika 201	GDA	54	736838	6179727	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	Recorders	Badger Bates,Doctor.Sarah Martin					Permits		

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Extensive search - Site list report

Your Ref/PO Number : S200529-Balranald pt2

Client Service ID : 628101

<u>SiteID</u>	<u>SiteName</u>	<u>Datum</u>	<u>Zone</u>	<u>Easting</u>	<u>Northing</u>	<u>Context</u>	<u>Site Status **</u>	<u>SiteFeatures</u>	<u>SiteTypes</u>	<u>Reports</u>
47-3-0260	paika 202	GDA	54	736846	6179758	Open site	Valid	Aboriginal Resource and Gathering : -, Habitation Structure : -		
	<u>Contact</u>							<u>Permits</u>		
47-3-0206	paika lake 401	GDA	54	736973	6179631	Open site	Partially Destroyed	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>							<u>Permits</u>		
47-3-0316	paika lake 105	GDA	54	736986	6179567	Open site	Valid	Artefact : -, Hearth : -, Shell : -		
	<u>Contact</u>							<u>Permits</u>		
47-2-0650	BSE28	GDA	54	724882	6186803	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>							<u>Permits</u>		
47-2-0200	West Balranald 80	GDA	54	725044	6186462	Open site	Valid	Artefact : 1		
	<u>Contact</u>							<u>Permits</u>		
47-2-0307	West Balranald 74	GDA	54	725116	6186403	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>							<u>Permits</u>		
47-2-0303	West Balranald 70	GDA	54	725179	6186422	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>							<u>Permits</u>		
47-6-0801	Pine Lodge 10	GDA	54	734328	6173691	Open site	Valid	Artefact : -		
	<u>Contact</u>							<u>Permits</u>		
47-6-0805	Pine Lodge 16	GDA	54	735905	6175775	Open site	Valid	Artefact : -		
	<u>Contact</u>							<u>Permits</u>		
47-3-0375	paika west 27	GDA	54	736178	6180699	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>							<u>Permits</u>		
47-3-0365	paika west 17	GDA	54	736781	6180026	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>							<u>Permits</u>		
47-3-0363	paika west 15	GDA	54	736802	6179944	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>							<u>Permits</u>		

Report generated by AHIMS Web Service on 06/10/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 54, Eastings : 723827.0 - 737099.0, Northings : 6173234.0 - 6187292.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 91

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : S200529-Balranald pt2

Client Service ID : 628101

<u>SiteID</u>	<u>SiteName</u>	<u>Datum</u>	<u>Zone</u>	<u>Easting</u>	<u>Northing</u>	<u>Context</u>	<u>Site Status **</u>	<u>SiteFeatures</u>	<u>SiteTypes</u>	<u>Reports</u>
47-3-0358	paika west 10	GDA	54	736828	6179669	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					<u>Permits</u>		
47-2-0651	BSE30	GDA	54	724846	6186774	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>	EMM Consulting - St Leonards - Individual users,Ms.Pamela Chauvel					<u>Permits</u>		
47-2-0649	BSE24	GDA	54	725402	6185497	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>	EMM Consulting - St Leonards - Individual users,Ms.Pamela Chauvel					<u>Permits</u>		
47-6-0795	Pine Lodge 4	GDA	54	734338	6173800	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Niche Environment and Heritage					<u>Permits</u>		
47-6-0792	Pine Lodge 1	GDA	54	734483	6173769	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Niche Environment and Heritage					<u>Permits</u>		
47-3-0376	paika west 28	GDA	54	736139	6180752	Open site	Valid	Artefact : -, Earth Mound : -, Hearth : -, Non-Human Bone and Organic Material : -, Potential Archaeological Deposit (PAD) : -, Shell : -		
	<u>Contact</u>	<u>Recorders</u>	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					<u>Permits</u>		
47-3-0349	paika west 1	GDA	54	736450	6180477	Open site	Valid	Earth Mound : -		
	<u>Contact</u>	<u>Recorders</u>	Ms.Elaine Purtill,Doctor.Sarah Martin					<u>Permits</u>		
47-3-0211	paika lake 406	GDA	54	736781	6179821	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr.Smokey Murray,Doctor.Sarah Martin					<u>Permits</u>		
47-3-0362	paika west 14	GDA	54	736810	6179772	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					<u>Permits</u>		
47-3-0208	paika lake 403	GDA	54	736835	6179638	Open site	Valid	Hearth : -		
	<u>Contact</u>	<u>Recorders</u>	Mr.Smokey Murray,Doctor.Sarah Martin					<u>Permits</u>		
47-3-0207	paika lake 402	GDA	54	736848	6179639	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr.Smokey Murray,Doctor.Sarah Martin					<u>Permits</u>		
47-3-0355	paika west 7	GDA	54	736905	6179607	Open site	Valid	Modified Tree (Carved or Scarred) : -		

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with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 91

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : S200529-Balranald pt2

Client Service ID : 628101

<u>SiteID</u>	<u>SiteName</u>	<u>Datum</u>	<u>Zone</u>	<u>Easting</u>	<u>Northing</u>	<u>Context</u>	<u>Site Status **</u>	<u>SiteFeatures</u>	<u>SiteTypes</u>	<u>Reports</u>
	<u>Contact</u>	<u>Recorders</u>	Mr.Brendan Kennedy,Mr.Andrew Smith,Mr.Ray Murray					<u>Permits</u>		

**** Site Status**

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 06/10/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 54, Eastings : 723827.0 - 737099.0, Northings : 6173234.0 - 6187292.0
with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 91

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : S200529-Balranald MOD 1

Client Service ID : 628091

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
47-2-0489	Karra 50	GDA	54	721756	6188579	Open site	Valid	Artefact : -		
	Contact	Recorders				Niche Environment and Heritage			Permits	
47-2-0494	Karra 56	GDA	54	722153	6188622	Open site	Valid	Artefact : -		
	Contact	Recorders				Niche Environment and Heritage			Permits	
47-2-0202	West Balranald 82	GDA	54	722605	6190315	Open site	Valid	Hearth : 1		
	Contact	Recorders				Niche Environment and Heritage,Ms.Clare Anderson			Permits	
47-2-0272	West Balranald 51	GDA	54	722988	6190521	Open site	Valid	Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders				Mr.Giles Hamm			Permits	
47-2-0208	West Balranald 88	GDA	54	723145	6190365	Open site	Valid	Hearth : 1		
	Contact	Recorders				Niche Environment and Heritage,Ms.Clare Anderson			Permits	
47-2-0216	West Balranald 99	GDA	54	723437	6189905	Open site	Valid	Artefact : 1		
	Contact	Recorders				Iluka Resources Limited - individual users,Ms.Clare Anderson			Permits	
47-2-0267	West Balranald 45	GDA	54	724430	6189065	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders				Mr.Giles Hamm			Permits	
47-2-0491	Karra 52	GDA	54	721890	6188636	Open site	Valid	Artefact : -		
	Contact	Recorders				Niche Environment and Heritage			Permits	
47-2-0226	West Balranald 1	GDA	54	722728	6191824	Open site	Valid	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders				Mr.Giles Hamm			Permits	
47-2-0205	West Balranald 85	GDA	54	723023	6190238	Open site	Valid	Artefact : 1		
	Contact	Recorders				Niche Environment and Heritage,Ms.Clare Anderson			Permits	
47-2-0212	West Balranald 92	GDA	54	723196	6189915	Open site	Valid	Artefact : 1		
	Contact	Recorders				Niche Environment and Heritage,Ms.Clare Anderson			Permits	
47-2-0251	West Balranald 29	GDA	54	723206	6189350	Open site	Destroyed	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders				Niche Environment and Heritage,Ms.Clare Anderson,Mr.Giles Hamm			Permits	
47-2-0253	West Balranald 31	GDA	54	723321	6189785	Open site	Valid	Artefact : -		
	Contact	Recorders				Mr.Giles Hamm			Permits	
47-2-0210	West Balranald 90	GDA	54	723402	6190061	Open site	Valid	Artefact : 1		
	Contact	Recorders				Niche Environment and Heritage,Ms.Clare Anderson			Permits	
47-2-0663	South1 IF2	GDA	54	723582	6188580	Open site	Valid	Artefact : -		

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : S200529-Balranald MOD 1

Client Service ID : 628091

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0658	South2 OS2	GDA	54	723671	6188848	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0490	Karra 51	GDA	54	721706	6188533	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0493	Karra 55	GDA	54	721922	6188660	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0495	Karra 57	GDA	54	722146	6188660	Open site	Valid	Hearth : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0228	West Balranald 3	GDA	54	722615	6191928	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0277	West Balranald 56	GDA	54	722843	6190429	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0273	West Balranald 52	GDA	54	722889	6190416	Open site	Valid	Hearth : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0261	West Balranald 39	GDA	54	723132	6189593	Open site	Valid	Art (Pigment or Engraved) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0215	West Balranald 95	GDA	54	723584	6189500	Open site	Valid	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0660	South2 Access IF2	GDA	54	723714	6188893	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0653	BSE34	GDA	54	724076	6188178	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0655	BSE40	GDA	54	724382	6187436	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0657	BSE42	GDA	54	724505	6187496	Open site	Destroyed	Artefact : 1		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0276	West Balranald 55	GDA	54	724832	6189062	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0492	Karra 53	GDA	54	721856	6188730	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
47-2-0192	KARRA 1	GDA	54	722316	6191432	Open site	Valid	Artefact : 16		
	<u>Contact</u>	<u>Recorders</u>						<u>Permits</u>		
	Mr.Ray Murray	<u>Recorders</u>						<u>Permits</u>		
		<u>Recorders</u>						<u>Permits</u>		

Report generated by AHIMS Web Service on 06/10/2021 for Ryan Desic for the following area at Datum :GDA, Zone : 54, Eastings : 721465.0 - 725390.0, Northings : 6187292.0 - 6192052.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 69

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
47-2-0271	West Balranald 50	GDA	54	722793	6190577	Open site	Valid	Hearth : -		
	Contact	Recorders	Mr.Giles Hamm						Permits	
47-2-0203	West Balranald 83	GDA	54	722993	6190180	Open site	Valid	Artefact : 1		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson						Permits	
47-2-0207	West Balranald 87	GDA	54	723121	6190328	Open site	Valid	Artefact : 1		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson						Permits	
47-2-0211	West Balranald 91	GDA	54	723380	6189994	Open site	Valid	Hearth : 1		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson						Permits	
47-2-0656	BSE41	GDA	54	724405	6187444	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Ms.Pamela Chauvel						Permits	
47-2-0654	BSE39	GDA	54	724501	6187503	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Ms.Pamela Chauvel						Permits	
47-2-0257	West Balranald 35	GDA	54	722830	6189324	Open site	Valid	Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Giles Hamm						Permits	
47-2-0204	West Balranald 84	GDA	54	723045	6190176	Open site	Valid	Artefact : 1		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson						Permits	
47-2-0213	West Balranald 93	GDA	54	723136	6189894	Open site	Valid	Artefact : 1		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson						Permits	
47-2-0209	West Balranald 89	GDA	54	723292	6190267	Open site	Valid	Artefact : 1		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson						Permits	
47-2-0661	West1 IF1	GDA	54	723411	6189046	Open site	Valid	Artefact : -		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Ms.Taylor Reid						Permits	
47-2-0309	West Balranald 101	GDA	54	723533	6189689	Open site	Valid	Artefact : -		
	Contact	Recorders	Ms.Clare Anderson						Permits	
47-2-0310	West Balranald 102	GDA	54	723687	6189913	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Ms.Clare Anderson						Permits	
47-2-0496	Karra 58	GDA	54	722107	6188597	Open site	Valid	Artefact : -		
	Contact	Recorders	Niche Environment and Heritage						Permits	
47-2-0256	West Balranald 34	GDA	54	722564	6189233	Open site	Valid	Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Giles Hamm						Permits	
47-2-0227	West Balranald 2	GDA	54	722683	6191944	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Giles Hamm						Permits	

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : S200529-Balranald MOD 1

Client Service ID : 628091

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
47-2-0260	West Balranald 38	GDA	54	722943	6189487	Open site	Valid	Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Giles Hamm							
47-2-0218	West Balranald 96	GDA	54	723513	6189624	Open site	Valid	Artefact : 1		
	Contact	Recorders	Iluka Resources Limited - individual users,Ms.Clare Anderson							
47-2-0219	West balranald 97	GDA	54	723614	6189714	Open site	Valid	Artefact : 1		
	Contact	Recorders	Iluka Resources Limited - individual users,Ms.Clare Anderson							
47-2-0662	South1 IF1	GDA	54	723604	6188575	Open site	Valid	Artefact : -		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Ms.Taylor Reid							
47-2-0664	South2 OS1	GDA	54	723680	6188807	Open site	Valid	Artefact : -		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Ms.Taylor Reid							
47-2-0279	West Balranald 58	GDA	54	724628	6189186	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Giles Hamm							
47-2-0255	West Balranald 33	GDA	54	722529	6189194	Open site	Valid	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Giles Hamm							
47-2-0274	West Balranald 53	GDA	54	722750	6190558	Open site	Valid	Artefact : -		
	Contact	Recorders	Mr.Giles Hamm							
47-2-0254	West Balranald 32	GDA	54	722762	6189563	Open site	Valid	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Giles Hamm							
47-2-0259	West Balranald 37	GDA	54	722787	6189140	Open site	Valid	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Mr.Giles Hamm							
47-2-0206	West Balranald 86	GDA	54	723099	6190266	Open site	Valid	Artefact : 1, Hearth : 1		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson							
47-2-0252	West Balranald 30	GDA	54	723418	6189626	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson,Mr.Giles Hamm							
47-2-0214	West Balranald 94	GDA	54	723525	6189570	Open site	Valid	Artefact : 1		
	Contact	Recorders	Niche Environment and Heritage,Ms.Clare Anderson							
47-2-0659	South2 Access IF1	GDA	54	723725	6188973	Open site	Valid	Artefact : -		

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Extensive search - Site list report

Your Ref/PO Number : S200529-Balranald MOD 1

Client Service ID : 628091

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	<u>Contact</u>	<u>Recorders</u>	EMM Consulting - St Leonards - Individual users, Ms. Taylar Reid					<u>Permits</u>		
47-2-0281	West Balranald 62	GDA	54	724617	6189371	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Giles Hamm					<u>Permits</u>		
47-2-0283	West Balranald 62	GDA	54	724807	6189123	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Giles Hamm					<u>Permits</u>		
47-2-0266	West Balranald 44	GDA	54	721840	6188352	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Giles Hamm					<u>Permits</u>		
47-2-0269	West Balranald 48	GDA	54	722909	6190408	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Giles Hamm					<u>Permits</u>		
47-2-0258	West Balranald 36	GDA	54	722897	6189246	Open site	Valid	Hearth : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Giles Hamm					<u>Permits</u>		
47-2-0270	West Balranald 49	GDA	54	722986	6190329	Open site	Valid	Hearth : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Giles Hamm					<u>Permits</u>		
47-2-0308	West Balranald 100	GDA	54	723514	6189773	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Ms. Clare Anderson					<u>Permits</u>		
47-2-0263	West Balranald 41	GDA	54	724739	6187662	Open site	Valid	Artefact : -, Hearth : -, Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Mr. Giles Hamm					<u>Permits</u>		

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Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

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Appendix B

Aboriginal community consultation



Aboriginal Consultation Requirements for Proponents (DECCW 2010)*								Response received
ABORIGINAL CONSULTATION RECORD								No response received.
Project Name: Balranald Mineral Sands Project Modification 1								Other
Project #: S200529								
DECCW 2010*	ORGANISATION	CONTACT TYPE	Address	SUBJECT	SENT DATE	RESPONSE DUE	RESPONSE DATE	COMMENT/S
4.2 / 4.3	Stage 2/3: Presentation of information about the proposed project and gathering information about cultural significance							
4.2.1 / 4.3.1 / 4.3.3	the Balranald Local Aboriginal Land Council;	email	ceo.blalc@gmail.com	Project information and methodology	25/Nov/21	23/Dec/21	N/A	
4.2.1 / 4.3.1 / 4.3.3	the descendants of Alice Kelly, the Muthi Muthi people, represented by Mr. Daniel Kelly through the Balranald Aboriginal Health Service;	email	danielkelly1952@gmail.com; rdk038@gmail.com; tbruton74@gmail.com	Project information and methodology	25/Nov/21	23/Dec/21	N/A	
4.2.1 / 4.3.1 / 4.3.3	Paul Charles Kullila Site Consultants;	email	kullilasiteconsultants@hotmail.com	Project information and methodology	25/Nov/21	23/Dec/21	N/A	email undeliverable.
4.2.1 / 4.3.1 / 4.3.3	National Koori Site Management; and	email	ali.n.maher@hotmail.com; g.m.maher@hotmail.com	Project information and methodology	25/Nov/21	23/Dec/21	N/A	email undeliverable to ali.n.maher@hotmail.com
4.2.1 / 4.3.1 / 4.3.3	Kay Dowdy.	N/A		Project information and methodology	25/Nov/21	23/Dec/21	N/A	EMM has been advised by members of the Muthi Muthi people that Kay Dowdy is deceased.
15	CoP Requirement 15: Pre-conditions to carrying out test excavation							
Req 15c	Heritage NSW -	email	HERITAGEMailbox@environment.nsw.gov.au>; John.Gilding@environment.nsw.gov.au>	Notification of test excavation	1/Jan/20	N/A	15/Mar/22	14 days prior to undertaking test excavation - addressed to Heritage NSW project archaeologist John Gilding
4.4	Stage 4: Review of draft cultural heritage assessment report							
4.4.2	the Balranald Local Aboriginal Land Council;	email	ceo.blalc@gmail.com	Cultural information and ACHA review	1/Jan/20	29/Jan/20	N/A	
4.4.2	the descendants of Alice Kelly, the Muthi Muthi people, represented by Mr. Daniel Kelly through the Balranald Aboriginal Health Service;	email	danielkelly1952@gmail.com; rdk038@gmail.com; tbruton74@gmail.com	Cultural information and ACHA review	1/Jan/20	29/Jan/20	N/A	
4.4.2	Paul Charles Kullila Site Consultants;	email	kullilasiteconsultants@hotmail.com	Cultural information and ACHA review	1/Jan/20	29/Jan/20	N/A	
4.4.2	National Koori Site Management; and	email	ali.n.maher@hotmail.com; g.m.maher@hotmail.com	Cultural information and ACHA review	1/Jan/20	29/Jan/20	N/A	

Ryan Desic

From: Jeremy Kenna <Jeremy.Kenna@iluka.com>
Sent: Thursday, 25 November 2021 3:12 PM
To: ceo.blalc@gmail.com; danielkelly1952@gmail.com; rdk038@gmail.com; tbruton74@gmail.com; ali.n.maher@hotmail.com; g.m.maher@hotmail.com; kullilasideconsultants@hotmail.com
Cc: Andrew Porter; Dave Wright; Vicki Hood
Subject: Upcoming Iluka fieldwork - Balranald 29/11/21-03/12/21
Attachments: S200529_BalranaldMOD_RAPs_v1.pdf

Hi All,

Firstly, a big note of thanks to those who were able to participate in the recent survey work at the Iluka Balranald Project site. It was a big area that was covered thoroughly and safely with both Iluka and EMM representatives learning much from the RAP members. Also a big thanks to the RAP members who were the first ones to go through our new, streamlined payment system. I was pleased to hear that payments for the work were in bank accounts only a few days after the end of the survey.

As I mentioned in the previous email, there's a large amount of heritage survey work that we are looking forward to working with you all on in 2022 and we look forward to supporting your involvement as best we can.

With the work program for the remainder of 2021 we are aiming to complete a five day survey (Starting November 29) As always, we would like to support participation in the survey any way we can, so please reach out to me (or others from the Iluka team) if there are any RAP members that would like to be involved with the survey but might be finding it difficult to be there. I will reach out to you all individually over the next day or two to check in with how everyone is going and to give some of the logistical details.

This area will cover off an area that has been identified as requiring a modification (MOD 1) to our current project area. (Information is attached)

As part of the proposed MOD 1, Iluka propose to conduct an archaeological survey of a potential additional mining area and two sections of the proposed haul road where they extend beyond the current EIS (Environmental Impact Statement) project area boundary.

The MOD 1 process will involve much more consultation and discussions with you, the Traditional Owners of the area, so we will be making sure that everyone has all the information they need throughout the process.

If you have any questions regarding the proposed fieldwork program, please do not hesitate to contact me (Jeremy Kenna) ph:0447 280 262. Email: jeremy.kenna@iluka.com)

Kind Regards,

Jeremy Kenna | Senior Advisor - Communities
Iluka Resources Limited
Mobile 0447 280 262



I respectfully acknowledge the Traditional Owners of the land on which I live and work, and pay respect to all First Nations Peoples and their Elders, past and present.

Jeremy Kenna | Senior Advisor - Communities

Iluka Resources Limited

Mobile 0447 280 262



I respectfully acknowledge the Traditional Owners of the land on which I live and work, and pay respect to all First Nations Peoples and their Elders, past and present.



25 November 2021

Re: Balranald Mineral Sands Project Modification 1: Aboriginal consultation letter: presentation of project information, assessment methods and request for cultural information.

Dear Registered Aboriginal Party

On behalf of Iluka Resources Limited (Iluka), thank you for your continued involvement as a Registered Aboriginal Party (RAP) for the approved Balranald Mineral Sands Project (the project). This letter relates to an Aboriginal cultural heritage assessment (ACHA) for a proposed modification to the project's development consent (SSD-5285).

EMM Consulting Pty Ltd (EMM) has been engaged by Iluka to prepare the ACHA to support a broader environmental assessment currently being prepared for the proposed modification.

The aims of this letter are to:

- provide an overview of the proposed modification and its approval pathway under relevant legislation;
- provide a draft of the proposed ACHA methods for your review and comment, and in particular:
 - how we intend to assess and manage Aboriginal sites within the previously approved project boundary where Aboriginal cultural heritage investigations have already occurred; and
 - how we intended to investigate, assess and manage Aboriginal cultural values for proposed areas outside the approved project boundary;
- provide your party with an opportunity to inform EMM about the significance and desired management of the Aboriginal cultural heritage values associated with the proposed modification, and how such factors may influence its design and/or assessment methods; and
- notify your party of upcoming fieldwork as part of archaeological investigations for the proposed modification.

We welcome your written feedback at your earliest opportunity, and no later than **24 December 2021**. Letters attached to email is the preferred mode of written communication as it will reduce postal waiting periods.

Yours sincerely,

Ryan Desic

EMM Associate Archaeologist - Heritage Team Leader

rdesic@emmconsulting.com.au

1 Proposed modification

1.1 Project background and previous heritage assessment

Iluka proposes to develop a mineral sands mine in south-western New South Wales (NSW), known as the Balranald Mineral Sands Mine (the project). The project includes construction, mining, primary processing and rehabilitation of two linear mineral sand deposits, known as the West Balranald and Nepean deposits, located approximately 12 kilometres (km) and 66 km north-west of the town of Balranald (Balranald town), respectively (Figure 1.1).

An environmental impact statement (EIS) was prepared and submitted in 2015 to accompany a State significant development (SSD-5285) application under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) for an open cut, truck and shovel mining method. Development consent under Part 4 of the EP&A Act was granted on 5 April 2016. The project included undertaking a bulk sampling activity at the West Balranald deposit to test the removal of up to 100,000 tonnes (t) of ore using underground mining methods.

The project EIS was supported by an ACHA prepared by Niche Environment and Heritage Pty Ltd in 2015 (Niche 2015) which identified and assessed the Aboriginal cultural heritage values across the project area in consultation with RAPs. In 2016, an Aboriginal Cultural Heritage Management Plan (ACHMP, Niche) was developed in consultation with project RAPs and approved in accordance with Condition #20 of the development consent. The ACHMP broadly sets out management for individual Aboriginal sites, but also includes mapped 'archaeological risk layers' (classed as low, moderate, and high) that guide the future identification, assessment and management of Aboriginal cultural values within the approved project boundary.

Since approval of the ACHMP, Iluka has engaged RAPs and archaeologists to carry some archaeological salvage measures within the project boundary during 2016 and due diligence surveys in 2018, 2019 and October 2021 under its provisions.

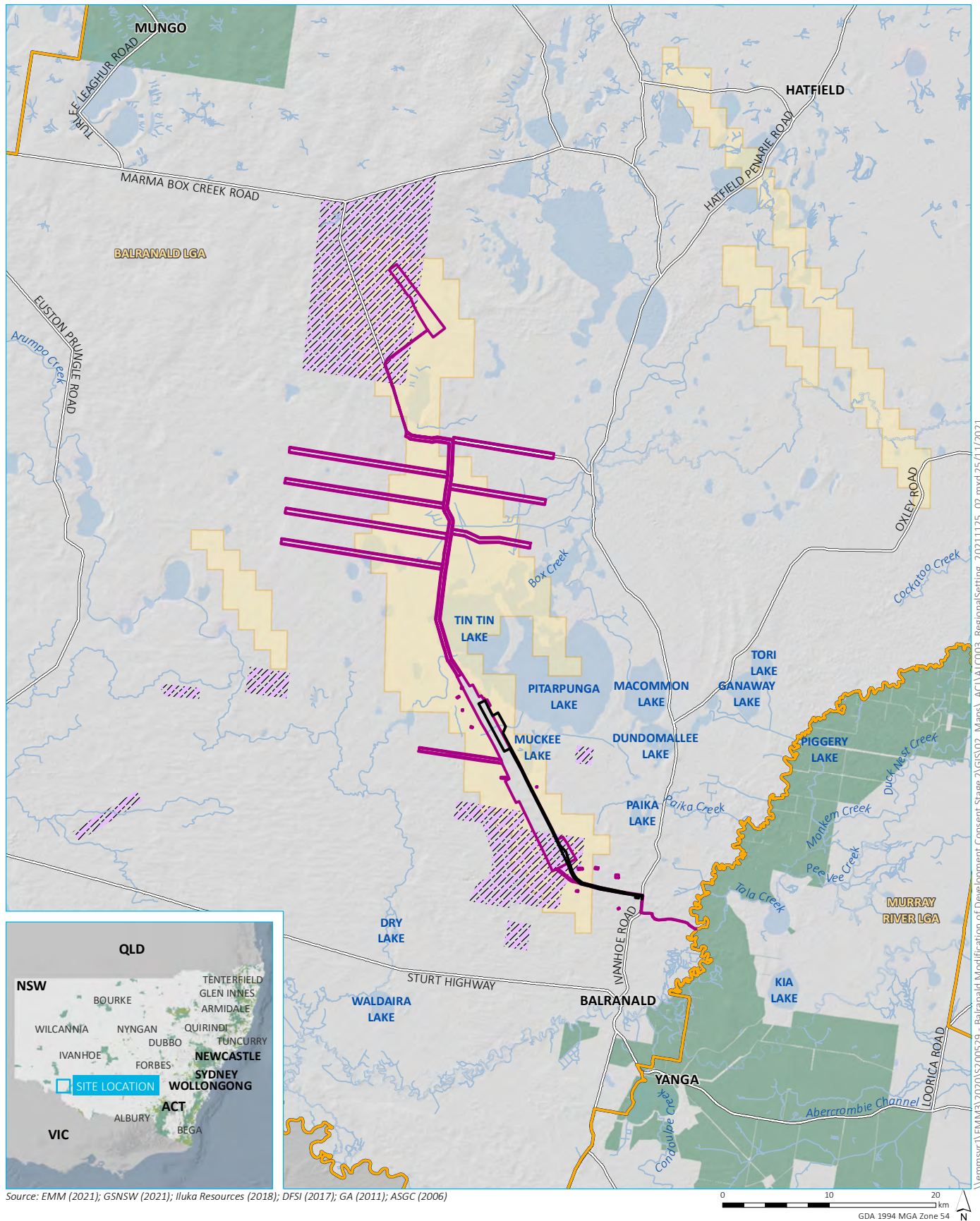
1.2 Overview of proposed modification

Since project approval, Iluka has extracted ore using an underground mining method (referred to as bulk sampling) at the West Balranald mine. These sampling activities have confirmed that underground mining methods are effective and Iluka propose to continue using this method.

The proposed modification would involve the continuation of the underground mining method and associated ore processing within a portion of the approved disturbance footprint of the West Balranald mine, as well as an extension of underground mining and minor changes to the alignment to the approved haul road (Figure 1.2).

The construction of site infrastructure approved under SSD-5285 development consent would be undertaken to support the underground mining operation. This would include mineral processing infrastructure, access roads, upgrade of external roads and intersections (if required), gravel extraction, monitoring infrastructure and other infrastructure as required. The majority of this infrastructure would be required regardless of the mining method (ie open cut as approved under the development consent, or underground).

For all other land located outside of the proposed modification area, ie other areas of the West Balranald mine and the Nepean mine, Iluka proposes no change to the currently approved open cut mining method.



- KEY**
- Approved (EIS) boundary
 - MOD 1 study area
 - EL7450
 - Southern Mallee Conservation Area (2015)
 - Major road
 - Watercourse/drainage line
 - Waterbody
 - NPWS reserve

- INSET KEY**
- NPWS reserve
 - State forest

Regional context

Balranald Mineral Sands Project Modification 1
Aboriginal consultation letter
Figure 1.1

Although the proposed modified mining extraction method will not involve broad scale earthworks associated with open cut mining as previously planned, it is predicted that Aboriginal sites would still be impacted in the following ways:

- ground surface rehabilitation which will involve topsoil, subsoil and overburden stripping and vegetation clearance; and
- subsidence impacts from underground mining including potential ground movement of soils and strata and through subsequent accelerated erosional secondary effects if not mitigated.

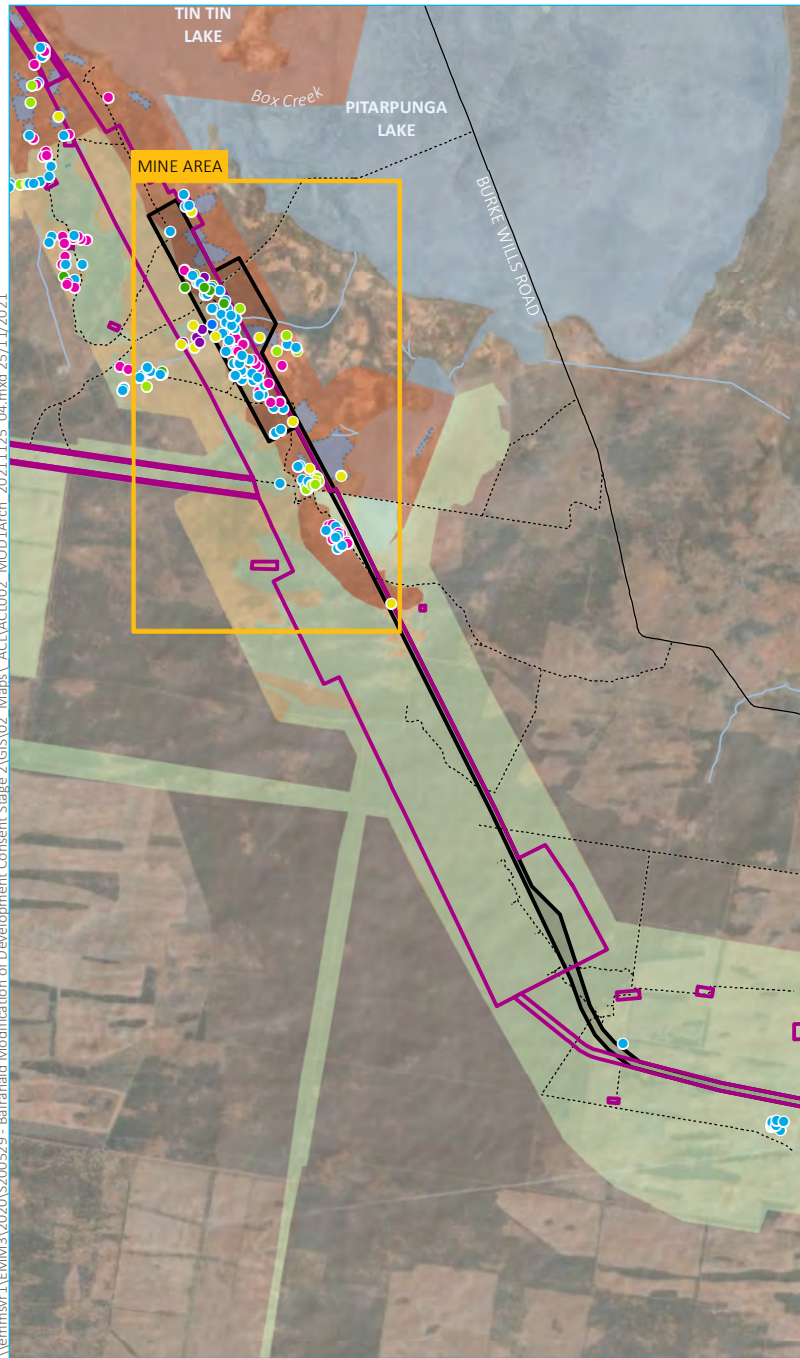
It is therefore considered that the alternative mining method under the proposed modification would have equal impact to that of open cut mining – that is total removal of archaeological material within the proposed modification disturbance footprint.

1.3 Approval pathway of proposed modification

The proposed modification will be assessed by Department of Planning, Industry & Environment (DPIE) as a modification to the existing Balranald Mineral Sands Project (SSD-5285). The approval pathway of the proposed modification influences how Aboriginal cultural heritage is assessed and managed. Importantly, the project already has an approved ACHMP in force which sets out the management of Aboriginal cultural heritage within the approved project boundary. The ACHA and subsequent heritage management measures for the proposed modification will therefore align with the project ACHMP where relevant. It is also intended that the management standards set out in the ACHMP will be adopted, where appropriate, for the proposed modification area that extends outside the current project approval boundary.

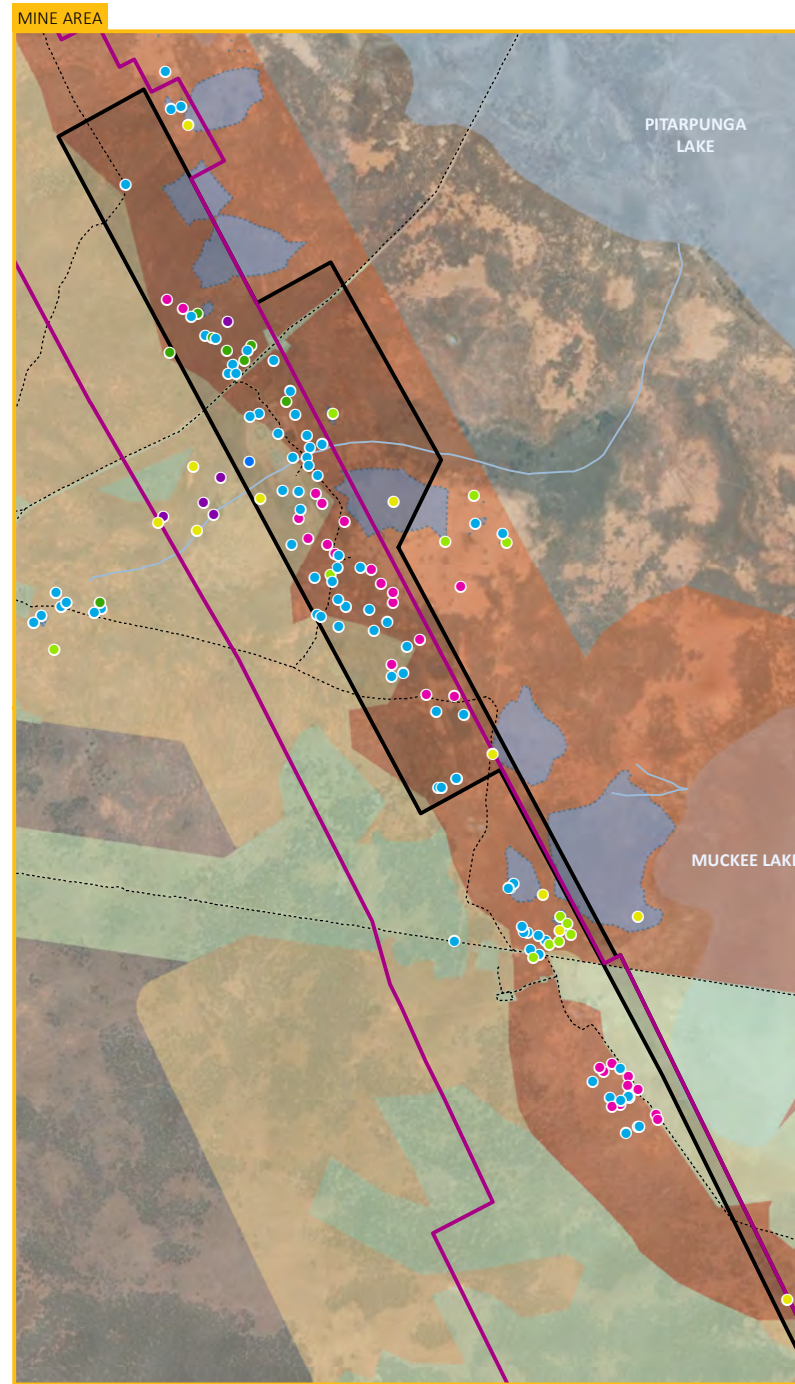
Overall, Iluka intend to maintain consistency with the approach to cultural heritage management that RAPs have previously reviewed and agreed to during the main project ACHA (Niche 2015) and ACHMP (Niche 2016).

\\lemmsvr1\EMM3\2020\S200529 - Balranald Modification of Development Consent Stage 2\GIS\02 Maps\ ACL\ACI002 MOD1Arch 20211125 04.mxd 25/11/2021



Source: EMM (2021); Iluka Resources (2021); ESRI (2021); DFSI (2017); GA (2011)

0 1 2
km



0 0.5 1
km
GDA 1994 MGA Zone 54

- KEY**
- Approved (EIS) boundary
 - MOD 1 study area
 - Major road
 - Minor road
 - Existing track
 - Watercourse/drainage line
 - Waterbody
 - Aboriginal heritage site
 - Recorded aboriginal site**
 - Art (pigment or engraved)
 - Artefact
 - Artefact and hearth
 - Artefact and PAD
 - Artefact, hearth and PAD
 - Culturally modified tree
 - Hearth
 - Hearth and PAD
 - Isolated artefact
 - Archaeological risk level**
 - High
 - Moderate
 - Low

MOD 1 study area and local
archaeological context

Balranald Mineral Sands Project
Modification 1
Aboriginal consultation letter
Figure 1.2

2 Proposed assessment and management

2.1 Overview

An ACHA will be undertaken for the proposed modification. The ACHA will be largely based on the main project ACHA previously completed by Niche (ACHA 2015), with a focus on the proposed modification area. The ACHA will aim to address the following key items:

- impact assessment and proposed management for areas within the approved project boundary (desktop only, refer Section 2.2); and
- further Aboriginal cultural heritage assessment, archaeological investigation, impact assessment and management recommendations for all areas outside of the approved project boundary (Figure 1.2).

2.2 Management of cultural heritage within the approved project boundary

2.2.1 Potential impacts

The ACHA completed in 2015 by Niche included an impact assessment for the West Balranald mine component of the project, which is also where the modification is proposed. The West Balranald mine impact assessment considered a disturbance footprint of 3,059 hectares (ha).

The proposed modification footprint that Iluka is currently investigating is significantly smaller than the overall footprint of the West Balranald mine, comprising a mine area of approximately 430 ha and haul road of 201 ha (total approximately 630 ha).

Within the previously approved portion of the proposed modification area, there are 80 recorded sites, four of which are partially within the approved boundary but extend beyond it. These sites are shown on Figure 1.2 and a list of these sites are attached to this letter as Appendix A.

The proposed modification would impact all the Aboriginal sites within its disturbance footprint through the required topsoil stripping and/or potential subsidence from underground mining. As such, although the mining method has changed since project approval, the impacts to Aboriginal sites within the proposed modification disturbance footprint remain the same.

2.2.2 Proposed management

The management provisions in the 2016 ACHMP remain relevant for the proposed modification and must be completed prior to underground mining and topsoil stripping. Iluka has approval to undertake all required management and mitigation measures within the approved site boundary and intend to complete this for the area where the proposed modification overlaps with the approved project disturbance boundary.

Measures will be completed in accordance with the ACHMP and will include fieldwork programs of RAP representatives and archaeologists undertaking additional survey, surface collection of artefacts and archaeological excavation. It is likely that Iluka will undertake these works within relevant areas of the approved project boundary before the proposed modification is approved. This is to ensure that the proposed modification is not delayed after its approval. Iluka will have ongoing contact with RAPs to schedule these fieldwork programs, which is anticipated to occur in the first quarter of 2022.

The proposed modification ACHA will provide more detail on the impact assessment and proposed management within the approved project boundary. However, all fieldwork and reporting for this area will be addressed separately and in accordance with the ACHMP (Niche 2016).

2.3 Assessment approach for areas outside the approved project boundary

Iluka propose to undertake ACHA and archaeological investigation for the new areas in consultation and participation with project RAPs. The ACHA will be guided by best practice documents *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011) and involve archaeological investigation in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (the Code) (DECCW 2010a).

This will involve an archaeological survey of the new areas by EMM archaeologists and RAP representatives over the course of approximately five days. Iluka has been in contact with RAPs about this fieldwork and invited RAP site officers to attend. The results of the investigation will be documented in the ACHA. Any Aboriginal objects identified will be assessed for their significance against project impacts and management measures will be proposed. Any management measures for these new areas would be completed after the proposed modification is approved by DPIE.

There is currently one known site wholly within the unapproved portion of the proposed modification boundary (WB 102). Additionally, there are three sites that partially extend into the proposed modification boundary (WB 40, WB 41 and WB 45). Refer to Appendix A for site summary details.

The requirement for an archaeological test excavation as part of the ACHA is yet to be determined. Test excavation programs are typically implemented after survey fieldwork in areas where potential archaeological deposits (PADs) have been identified (such as lunettes and dunes) and cannot be avoided by project impacts. If test excavation is required, EMM propose to follow the Code (DECCW 2010a) and with reference to the methods present for the project ACHMP. Deviations from the Code may be required depending on the nature of any PADs identified and their location.

3 Request for cultural information

Aboriginal heritage incorporates a wide range of values such as stories, traditions and cultural practices. EMM welcomes any advice from the Aboriginal community about any form of Aboriginal cultural heritage values (which might include archaeological sites or other types of values) relevant to the project area and its surrounds, specifically the areas outside the approved project boundary.

Knowledge of areas of cultural significance may include, but are not limited to:

- sites or places associated with ceremonies, spiritual/mythological beliefs and traditional knowledge, which date from pre-contact period (note that these activities do not have to have persisted until the present time);
- sites or places associated with historical associations, which date from the post-contact period and are remembered today (eg plant and animal resource use areas and known camp sites); and
- sites or places of contemporary significance, for which the significance has been acquired in recent times.

If you are aware of any form of Aboriginal cultural heritage values (which might include archaeological sites or other types of values), please let us know so that we can take these values into account in the ACHA. We are happy to meet to discuss any information which you may be willing to share, and will respect confidentiality where requested.

4 Next steps

Iluka would like to highlight their intention for ongoing meaningful engagement and consultation with the local Aboriginal community. The five-day fieldwork stint proposed in this letter represents only a small

portion of upcoming fieldwork opportunities, which are expected to proceed in the first quarter of 2022 in accordance with the approved ACHMP.

Further information about these opportunities and other consultation initiatives will be explored in correspondence to RAPs in the following months. We appreciate your patience during this time and will aim to provide as much notice as possible regarding these larger scale archaeological fieldwork opportunities.

We look forward to receiving any response your party wishes to make about the methodology or any cultural information or protocols you would like to provide that may influence the project. Your response will be documented and considered as part of the ACHA. Please remember to respond prior to **24 December 2021**.

If you have any questions regarding the proposed fieldwork program, please do not hesitate to contact Jeremy Kenna (ph:0447 280 262. Email: jeremy.kenna@iluka.com). Otherwise, Iluka will be in contact with you shortly to discuss fieldwork arrangements if they have not already.

Appendix A

Recorded Aboriginal sites relevant to proposed modification area

Table A.1 Recorded Aboriginal sites relevant to proposed modification area

Site Name	Site Type	Relationship to approved disturbance boundary and MOD boundary	Aboriginal heritage risk layer
BSE34	Artefact site: isolated find	Within approved portion of MOD boundary	Moderate
BSE39	Artefact site: isolated find	Within approved portion of MOD boundary	High
BSE40	Artefact site: isolated find	Within approved portion of MOD boundary	High
BSE41	Artefact site: isolated find	Within approved portion of MOD boundary	High
BSE42	Artefact site: isolated find	Within approved portion of MOD boundary	High
Karra 1	Isolated Artefact	Within approved portion of MOD boundary	High
South1 IF1	Artefact site	Within approved portion of MOD boundary	Moderate
South1 IF2	Artefact site	Within approved portion of MOD boundary	Moderate
South2 Access IF1	Artefact site	Within approved portion of MOD boundary	High
South2 Access IF2	Artefact site	Within approved portion of MOD boundary	High
South2 OS1	Artefact site	Within approved portion of MOD boundary	High
South2 OS2	Artefact site; PAD	Within approved portion of MOD boundary	High
WB 100	Isolated Artefact	Within approved portion of MOD boundary	High
WB 101	Isolated Artefact	Within approved portion of MOD boundary	High
WB 102	Artefacts and PAD	Within unapproved portion of MOD boundary	High
WB 113	Artefacts	Within approved portion of MOD boundary	Moderate
WB 114	Artefacts	Within approved portion of MOD boundary	Moderate
WB 115	Isolated Artefact	Within approved portion of MOD boundary	Moderate
WB 117	Isolated Artefact	Within approved portion of MOD boundary	High
WB 118	Isolated Artefact	Within approved portion of MOD boundary	High
WB 132	Artefacts	Within approved portion of MOD boundary	Moderate
WB 133	Isolated artefact	Within approved portion of MOD boundary	Moderate
WB 134	Isolated artefact	Within approved portion of MOD boundary	Moderate
WB 135	Isolated artefact	Within approved portion of MOD boundary	High
WB 136	Isolated artefact	Within approved portion of MOD boundary	Moderate
WB 137	Isolated artefact	Within approved portion of MOD boundary	High
WB 138	Isolated artefact	Within approved portion of MOD boundary	High
WB 139	Isolated artefact	Within approved portion of MOD boundary	High
WB 140	Artefacts	Within approved portion of MOD boundary	High
WB 141	Artefacts	Within approved portion of MOD boundary	High
WB 143	Isolated artefact	Within approved portion of MOD boundary	High
WB 144	Isolated artefact	Within approved portion of MOD boundary	High
WB 145	Artefacts	Within approved portion of MOD boundary	Moderate
WB 146	Isolated artefact	Within approved portion of MOD boundary	Moderate

Table A.1 Recorded Aboriginal sites relevant to proposed modification area

Site Name	Site Type	Relationship to approved disturbance boundary and MOD boundary	Aboriginal heritage risk layer
WB 147	Artefacts	Within approved portion of MOD boundary	High
WB 148	Isolated artefact	Within approved portion of MOD boundary	High
WB 149	Artefacts	Within approved portion of MOD boundary	High
WB 150	Artefacts	Within approved portion of MOD boundary	High
WB 151	Isolated artefact	Within approved portion of MOD boundary	High
WB 152	Artefacts	Within approved portion of MOD boundary	High
WB 153	Isolated artefact	Within approved portion of MOD boundary	High
WB 154	Artefacts	Within approved portion of MOD boundary	High
WB 155	Artefacts	Within approved portion of MOD boundary	Moderate
WB 157	Artefacts	Within approved portion of MOD boundary	High
WB 158	Isolated artefact	Within approved portion of MOD boundary	High
WB 159	Artefacts	Within approved portion of MOD boundary	High
WB 160	Artefacts	Within approved portion of MOD boundary	Moderate
WB 161	Artefacts, Hearth, PAD	Within approved portion of MOD boundary	High
WB 29	Artefacts and Hearth	Within approved portion of MOD boundary	Moderate
WB 30	Isolated Artefact and Hearth	Within approved portion of MOD boundary	High
WB 31	Isolated Artefact	Within approved portion of MOD boundary	High
WB 39	Artefacts	Within approved portion of MOD boundary	Moderate
WB 40	Artefacts, Hearth, Scarred Tree and PAD	Partially within unapproved MOD boundary	High
WB 41	Artefacts, Hearth and PAD	Partially within approved/unapproved portions of MOD boundary	High
WB 42	Artefacts, Hearth, and PAD	Partially within approved portion of MOD boundary	High
WB 45	Artefacts, Hearth and PAD	Partially within approved/unapproved portions of MOD boundary	High
WB 46	Artefacts, Hearth, and PAD	Within approved portion of MOD boundary	High
WB 48	Isolated Artefact	Within approved portion of MOD boundary	High
WB 49	Hearth	Within approved portion of MOD boundary	High
WB 50	Hearth	Within approved portion of MOD boundary	High
WB 51	Hearth, and PAD	Within approved portion of MOD boundary	High
WB 52	Hearth	Within approved portion of MOD boundary	High
WB 53	Isolated Artefact	Within approved portion of MOD boundary	High
WB 56	Isolated Artefact	Within approved portion of MOD boundary	High
WB 63	Artefacts, Hearth, and PAD	Partially within approved portion of MOD boundary	High
WB 83	Isolated Artefact	Within approved portion of MOD boundary	High

Table A.1 Recorded Aboriginal sites relevant to proposed modification area

Site Name	Site Type	Relationship to approved disturbance boundary and MOD boundary	Aboriginal heritage risk layer
WB 84	Isolated Artefact	Within approved portion of MOD boundary	High
WB 85	Artefacts	Within approved portion of MOD boundary	High
WB 86	Artefacts and Hearth	Within approved portion of MOD boundary	High
WB 87	Artefacts	Within approved portion of MOD boundary	High
WB 88	Hearth	Within approved portion of MOD boundary	High
WB 89	Artefacts	Within approved portion of MOD boundary	High
WB 90	Isolated Artefact	Within approved portion of MOD boundary	High
WB 91	Hearth	Within approved portion of MOD boundary	High
WB 92	Isolated Artefact	Within approved portion of MOD boundary	High
WB 93	Artefacts	Within approved portion of MOD boundary	High
WB 94	Isolated Artefact	Within approved portion of MOD boundary	High
WB 95	Artefacts	Within approved portion of MOD boundary	High
WB 96	Isolated Artefact	Within approved portion of MOD boundary	High
WB 97	Isolated Artefact	Within approved portion of MOD boundary	High
WB 99	Isolated Artefact, Hearth	Within approved portion of MOD boundary	High
West1 IF1	Artefact site	Within approved portion of MOD boundary	Moderate

Ryan Desic

From: Jeremy Kenna <Jeremy.Kenna@iluka.com>
Sent: Monday, 28 February 2022 6:39 PM
To: Daniel Kelly; ceo.blalc@gmail.com; kullilasteconsultants@hotmail.com; ali.n.maher@hotmail.com
Cc: Andrew Porter; Vicki Hood; Leigh Whyte
Subject: Iluka Balranald Project MOD1 - Aboriginal Cultural Heritage Assessment - RAP Review

Dear Registered Aboriginal Party members,

Introduction

Thank you for your continued involvement in the Balranald Mineral Sands Project (the project). You may recall that we notified your party about a proposed development modification to the project in November 2021 and undertook a five day field survey between 29 November and 3 December. We are now up to the next stage of consultation for the project which is providing the draft ACHA (Aboriginal Cultural Heritage Assessment) for your review and comments.

Notes for your review and comment on the draft ACHA (Aboriginal Cultural Heritage Assessment)

Iluka is seeking your feedback on the draft ACHA document. In particular, we would like to gather any feedback about the proposed investigation and management measures for the Aboriginal sites within the proposed modification development footprint.

If you have specific comments for the draft ACHA document, please identify the section heading and page number so that we know specifically which part of the document to address. Our preference is for you to provide your comments in writing via email or letter. You will note that there are highlighted sections of the document that will be updated based on further consultation and amended for the final report.

When to respond by

If you wish to comment on the draft ACHA, please provide your consolidated comments within 28 days (ie by **28 March 2022**). If you are having trouble responding within this timeframe please let us know early so that we can consider alternative options.

Downloading the draft ACHA document

The document is available to download using the following link:

<https://spaces.hightail.com/receive/Fup6mLK8pw>

Closing

Please do not hesitate to contact me on my details below for any matters regarding the project or if you have any difficulties in downloading or reading the documents.

Regards,

Jeremy Kenna | Senior Advisor - Communities

Iluka Resources Limited

Mobile 0447 280 262



I respectfully acknowledge the Traditional Owners of the land on which I live and work, and pay respect to all First Nations Peoples and their Elders, past and present.



Appendix C

Survey transect data

Not included in draft for 28-day RAP consultation



Transect number:	Date:	Survey method:	Landform pattern:	Landform element:	length_m	width_m	Exposure:	Visibility:	Ground cover types:	Exposure types:	Other' exposure type:	Vegetation:	Disturbance:	Describe 'Low' disturbance:	Describe 'High' disturbance:	Comment:
1	29/11/2021 1:00	pedestrian	plain	Rata	2,658	25	20%	80%	shrubs	sheet wash, claypans						
2	29/11/2021 1:00	pedestrian	plain	Marma	3,749	25	30%	50%	shrubs	scalds,sheet wash, claypan						Ephemeral pools. Low artefact density. Isolated finds. Exposure 30% Visibility 50%
3	30/11/2021 1:00	pedestrian	plain	Rata	2,876	25	30%	40%	shrubs	scald, sheet_wash, animal_track	gilgai	Grasses, saltbush	low	Past ploughing		Start of transect on dunes beside lake
4	30/11/2021 1:00	pedestrian	plain	Marma	4,146	25	70%	90%	shrubs	claypans,sheet wash						Clay pans
5	1/12/2021 1:00	pedestrian	plain	Marma	3,345	25	70%	80%	none	claypan						Clay pan. WB45. Start of day
6	1/12/2021 1:00	pedestrian	plain	Rata	6,589	25	50%	60%	shrubs,scrub,grass,native trees	gilgai,animal tracks						Fan of drainage lines. Not all with water. Up to 50cm deep
7	2/12/2021 1:00	pedestrian	plain	Condoulpe	678	25	20%	50%	gravel,disturbance	road cutting		Mallee	high		Road verge	Either side of road.
8	2/12/2021 1:00	pedestrian	plain	Condoulpe	2,173	25	40%	50%	shrubs,grass	ploughing	Plough lines		moderate			Cropped paddock
9	2/12/2021 1:00	pedestrian	plain	Condoulpe	3,569	25	50%	40%	leaf_litter,regrowth_trees,native_trees	animal_track,scald		Open woodland. Wattle and mallee				
10	3/12/2021 1:00	pedestrian	plain	Rata	7,137	25	50%	50%	shrubs,native trees	sheet wash, claypans						Blue bush and saltbush. Scalds. Swampy water channels in part



Appendix D

Additional information for archaeological assessment



D.1 Environmental context

D.1.1 Rationale

The following sections summarise the key findings of the EIS 2014 ACHA which provides a comprehensive investigation into the local and regional environmental context (Niche 2015). It provides relevant implications for the MOD1 investigation area.

D.1.2 Landscape overview

The study area is located within the Murray Basin, a broad, shallow sedimentary basin, formed approximately 60 million years ago. Topography is generally flat with little relief.

The landscape is characterised by dune fields and sand plains with windblown and eroded shallow depressions, vegetated by mallee communities, and undulating plains vegetated with saltbush, bluebush, belah and rosewood communities. Within and surrounding the study area are swamp depressions and ephemeral small lakes, and a system of large relict lakes with fringing lunette formations.

Landforms that formed during the Pleistocene (~2.5 million – 12,000 BP) and Holocene (from 12,000 BP) are important to understanding Aboriginal archaeological site distribution within the region, particularly as evidence of human occupation dating to ~50 ka has been found at nearby Lake Mungo, approximately 75 km to the north-east of the study area (see Figure 3.2a).

Pleistocene relict landforms are found in the vicinity of the study area near Muckee Lake (0.5 km to the east), Tin Tin Lake (3 km to the north) and Pitarpunga Lake 3 km to the east). As the climate became increasingly arid into the mid Holocene (~5,000 years ago), groundwater declined to a depth where it no longer discharged onto the surface. Lake Mungo dried out ~ 14.5 ka (Gillespie 1998 cited in Niche 2015) and the current Willandra riverine system and floodplains developed ~14 – 7 ka.

D.1.3 Geomorphology of the project area

In 2012, geomorphologist Dr Peter Mitchell undertook an analysis of the landscape patterns within and surrounding the project area (Appendix 2 in Niche 2015). Mitchell's report placed the geomorphology of the Balranald project area within the larger context of the lower reaches of the Lachlan and Murrumbidgee Rivers. During the Pleistocene, these rivers comprised large alluvial fans that changed frequently in flow and meander. The current study area is situated approximately 3 km south of Tin Tin and 3 km west of Pitarpunga lakes, and on the western edge of Muckee Lake. The lakes which are now dry, originally functioned as overflow lakes from Box Creek (2.8 km to the north of the study area), which is a distributary stream to the Lachlan River.

Mitchell characterises the landscape surrounding the project area as comprising the following features (illustrated in Plate D.1):

- Meandering channels generally fringed by low levees and with channel beds close to the same level as the adjacent backplain.
- A wider meander plain within containing abandoned channels, active channels and occasional source bordering sand dunes and swamps.
- An extensive backplain with swamps, marshes and gilgai.
- Lakes found throughout the landscape but most often on the backplains comprise two types:
 - freshwater lakes or clay pans that are filled from river channels during floods; and
 - saltwater lakes or saltpans that are groundwater evaporation basins.
- Lakes and clay pans have crescent shaped lunettes on their eastern shores, formed over time as sediments were moved by waves and accumulated.
- Beach facies are usually present along the lake shores although Mitchell notes that Tin Tin and Pitarpunga Lakes (on the edge of the study area) are now dry clay plains that have been partly cultivated since the 1970s and no beaches are evident.
- Muckee Lake once functioned as an overflow lake from Pitarpunga Lake when it reached 2 m deep. In a major flood, Muckee Lake would have a maximum depth of about 8 m. This depth is sufficient for waves to develop and a beach to form at the base of the lunette. Mitchell (2012) hypothesises that the limited traces of human occupation on the shores of Muckee Lake could be because the clay lunettes made the ground unattractive for camping when wet; or that there were no trees and therefore no fuel or cover for hunting; or that when the lake was dry other locations for camping were sought.
- Away from meander plains and lakes, the country is covered in red and yellow-red sand formed in longitudinal dunes. The dunes and sand sheets have a core of sand cemented by a calcium carbonate pan, a material often used as heat retainers in Aboriginal hearths and ovens. Gilgai may occur in these areas and support ephemeral wetland vegetation.

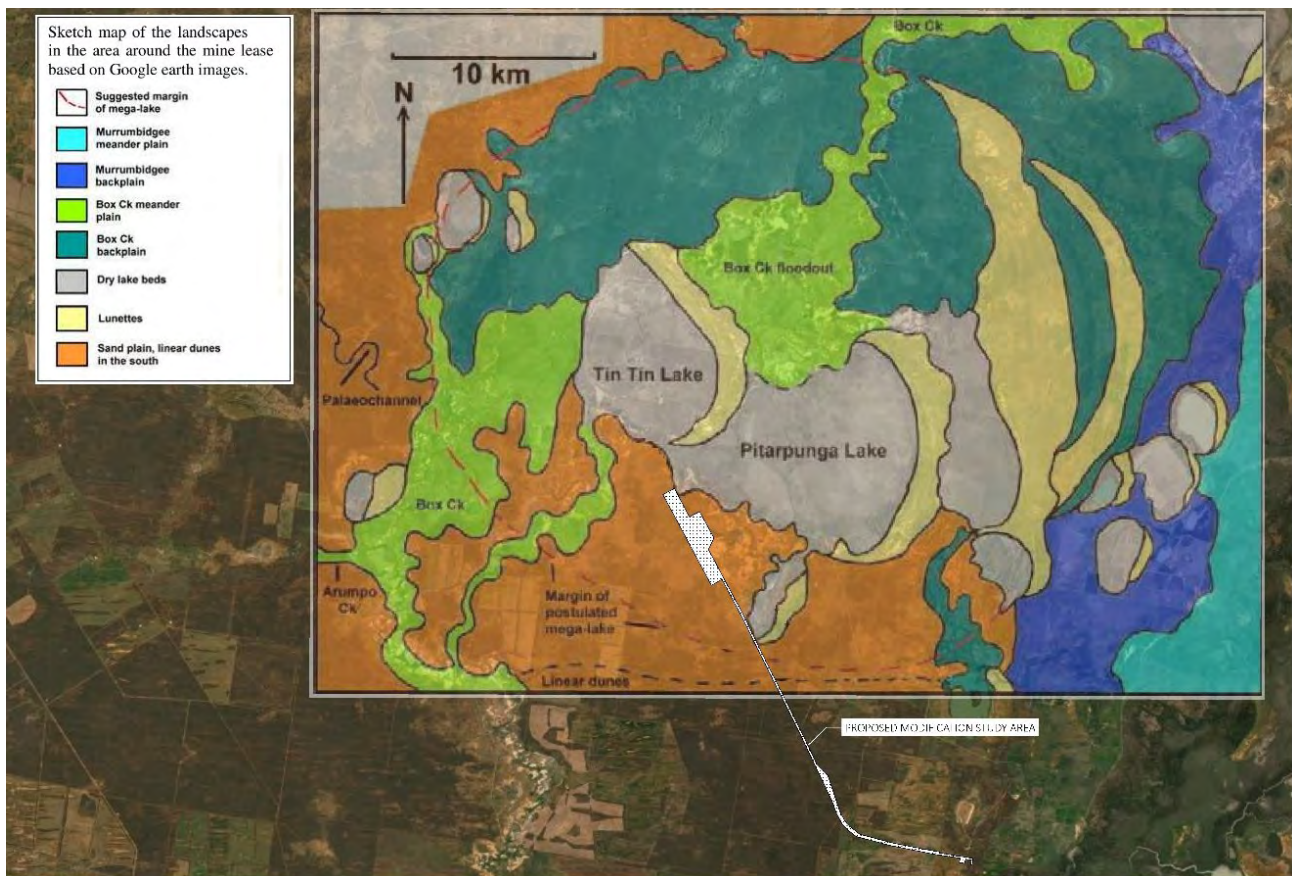


Plate D.1 Adapted from Mitchell (2012) showing the location of the study area on the sand plain and in relation to the ancient lakes.

Based on these geomorphological findings, Mitchell differentiates between early and sustained human occupation of the lunettes on the large lake edges during the Pleistocene when the lakes were full, and short-term occupation of smaller gilgai on the sand plain country during the Holocene after the lakes dried up.

The implication of this assessment is that occupation within the study area which is situated on the sandplain away from the lakes and rivers, may have depended on sufficiently heavy rain to flood the gilgai. Occupation of the study area is therefore likely to date to the late Holocene, after the large lakes dried permanently. Mitchell describes this period as “dispersed occupation of the sand plain country based on ephemeral water supplies and wetlands provided by flooded gilgai.”

Lunettes form when sediments in the lake basins are blown by the prevailing westerly winds and build up as crescent shaped dunes on the eastern edges of the lake. Therefore, while part of the proposed haul road is situated on the shore of Muckee Lake, as it is on the western edge of the lake, deeper Palaeolithic archaeological remains, including burials and middens, are less likely to be present than in the deeper sands of lunettes on eastern shore of Muckee Lake, where WB66 was identified (see Section 3.1.2 and Figure 3.2a).

D.1.4 Hydrology

Locally, the main surface water feature within the Balranald project area is Box Creek, which is an ephemeral watercourse and a tributary of the Murray River, approximately 2.5 km to the north-east of the study area (see Figure 3.1). Box Creek was not an active channel in terms of floodplain deposition for the majority of the Holocene, but prior to this would have actively meandered across the plains. In more recent times, the creek only flows during and immediately following heavy local rainfall or large flooding events. Permanent surface water flows therefore, are confined to the major rivers and their associated backwaters outside of the Balranald Project area.

Within the study area, there are no perennial watercourses and only one unnamed ephemeral first order drainage line that crosses the study area from west to east, continuing north around the edge of Pitarpunga Lake, to join Box Creek. Other water sources within the study area are primarily episodic lakes and depressions (gilgai) which fill during local rain events, or major flood events. Gilgai provide temporary wetlands that retain surface water and would have been an important resource for Aboriginal people in the past.

The proposed haul road crosses the western shores of Muckee Lake (see Figure 3.1) a dry relic lakebed currently used for agricultural activities including grazing and cropping.

D.1.5 Soils and geology

The study area contains a number of land systems which are defined in *Land Systems of Western New South Wales* (Soil Conservation Service of NSW 1991). The Western NSW land system classifications and their boundaries provide pre-defined areas that are classified by several geographic features and which are informative for the archaeological investigation. They provide localised information including landform patterns, soils, geology, rock outcrop percentage, land use and vegetation. This information provides another layer to categorise the landscape for the predictive model, additional to what a topographic description can provide. Land system information builds on underlying geology and identifies areas that are characterised by erosion or skeletal soils versus those that may contain a deeper profile where cultural material may be buried.

The land systems relevant to the study area are presented in Figure 3.1. Table D.1 provides commentary about the archaeological implications of certain land systems.

Table D.1 Western NSW land systems of the study area

Soil landscape and type	Landform pattern and hydrology	Location in study area	Slope and relief	Geology	Soil summary	Vegetation	Implications for archaeology
Rata	Extensive saltbush plain with small subcircular depressions. Isolated rises of coarse-textured aeolian material	Mining and infrastructure, northern haul road	Relief to 2 m. Slopes: flat – 2%	Relict floodplain of grey, fine-textured alluvium with small shallow sub-circular depressions to 500 m wide.	Plains of grey cracking clays and compact clays	Dense stands of bladder saltbush; canegrass and nitre goosefoot in depressions; black bluebush, scattered belah and rosewood on sandy rises; abundant annual saltbushes, copperburrs, annual forbs and grasses.	The presence of gilgai and diverse natural resources prior to European settlement would have made the fringe of Muckee Lake an attractive camping area. Deeper soils may contain cultural material.
Marma	Ill-defined scalded drainage tracts associated with Riverine Plain. Associated floodplain of fine-textured Quaternary alluvium and aeolian sandplains	Mining and infrastructure, northern haul road	Relief to 5m Slopes: flat – 5%	Severely scalded levees with associated swamps, pans and lunettes	Levees of red and yellow texture-contrast soils and grey cracking clays	Scattered to dense bluebushes, bladder saltbush and old man saltbush; canegrass in swamps; abundant forbs, copperburrs arid annual saltbushes.	Severe scalding and watersheeting has exposed large areas providing high surface visibility but clay pan areas are highly eroded onto clay. Portions of intact soils with PAD may have been retained in remnant vegetation mounds with potential for cultural material (such as hearths and artefacts).
Hatfield	Extensive undulating plains with bluebush.	Northern haul road	Relief to 5 m Slope: 2 – 3%	Undulating sandplain of Quaternary aeolian material, east-west trending dunes; depressions of fine textured alluvium to 500 m wide and 5 m deep.	Plains of solonixed brown soils, red and brown texture-contrast soils and red earths. Depressions of grey clays.	Scattered clumps of rosewood and belah; moderately dense bluebushes and bladder saltbush; dunes of deep brownish sands with clumped white cypress pine, prickly wattle and bluebushes; depressions with nitre goosefoot, dillon bush and canegrass.	Deeper soils may contain cultural material.

Table D.1 **Western NSW land systems of the study area**

Soil landscape and type	Landform pattern and hydrology	Location in study area	Slope and relief	Geology	Soil summary	Vegetation	Implications for archaeology
Condoulpe	Sandplain between dunefields and the Riverine Plain near Balranald. Terminal drainage basins locally depressed to 2 m.	Haul road	Relief to 5m. Slopes: 2 – 3%	Sandplain of Quaternary aeolian material with large areas of east-west trending dunes.	Plain and flats of predominantly solonized brown soils and areas of red earths. Dunes of deep brownish sands. Drainage basins of grey cracking clays.	Dense to scattered belah and mallee; areas of dense edible chenopods; drainage basins of dense black box, nitre goosefoot and Dillon bush; variable speargrass, annual saltbushes and forbs.	High disturbance where there has been extensive clearance and cropping. Limited reliable sources of water. Likely to only contain evidence of sporadic and limited use.

D.1.6 Vegetation

The study area contains mostly agricultural land used for grazing, with remnant native vegetation consisting predominantly of low open scrubland in the north of the study area and Chenopod Sandplain on the proposed haul road. Trees large enough for cultural bark removal are largely absent across the study area either due to clearance and/or an unsuitable environment (see Plate 4.1 – Plate 4.12). More details about the species present on the different land systems are provided in Table D.1. Much of the project area is grazed by livestock (as well as feral animals, particularly goats) which has resulted in degradation of the shrub and ground vegetation layers within mallee vegetation across the project area and surrounds.

Mitchell (2012) divides the vegetation within the study area into three main groups:

- palatable plants including softer herbs, nutritious grasses and some of the annual saltbushes that are rapidly consumed, set seed less frequently and decrease in abundance over time. Prior to European occupation, these species would have been far more abundant;
- less nutritious plants and those with prickles or toxic components such as bluebush have increased in abundance on the sandplain country where grasses and herbs would originally have been dominant; and
- invasive weeds and exotic plants.

D.1.7 Disturbance

Soils in the study area have been impacted by land clearance and grazing by hard hooved animals. Since the mid to late nineteenth century, the land within the study area has been used for stock which has impacted the nature and abundance of vegetation as well as the quality of the soil. Stock trampling has resulted in the destruction of biological soil crusts, exposing the soil to erosion (Eldridge and Torzer 1997, cited in Mitchell 2012), while stock grazing of herbs and nutritious grasses has resulted in an abundance of other species such as bluebush.

Land clearance has largely resulted in the removal of trees across the study area and trees of sufficient age to contain cultural scarring are likely to be rare within the study area.

Sheet erosion of the sandplain has stripped topsoil and exposed large areas of B-horizon clay, creating large hard surfaced scalds with remnant vegetation mounds on the margins of the scald and scattered across it (Plate 3.1). The vegetation mounds comprise an original soil profile overlaid with wind-blown sediment and trapped by vegetation. Therefore, vegetation mounds may contain relatively undisturbed archaeology (Mitchell 2012).

D.2 Aboriginal heritage background

D.2.1 Regional context

The first peopling of Australia occurred approximately 50,000 years ago (50 ka), and likely consisted of reasonably large groups of technologically advanced hunter-gatherers (Bradshaw et al. 2019; O’Connell et al. 2018). The peopling of the continent was rapid and reveals the importance of the major river systems that extend throughout the semi-arid and arid regions of Australia to hunter-gatherers. The earliest evidence of Aboriginal people in the southern latitudes of Australia all come from archaeological sites within, or on the fringe of, these regions at sites such as Devil’s Lair (WA), Warraty (SA), and Lake Mungo (NSW) (Bowler et al. 2003; Hamm et al. 2016; Turney et al. 2001). Genomic research has shown that following these initial explorations of the continent, regional populations or nomadic sedentism, was established by ~40 ka (Tobler et al. 2017). These small populations were highly mobile, but remained within a broad spatial geographic area, dictated in general by the nature of resources and water availability. In the case of some of the arid parts of the continent, mobility encompassed thousands of square kilometres (Gould 1970), while major riverine corridors such as the Murray River had near permanent settlements (Pardoe 1995).

In NSW, the earliest evidence of Aboriginal people is at Lake Mungo in the WLRWHA approximately 45 km north-east of the study area. WLRWHA comprises a system of interconnected ancient lakes formed over the last two million years. The lake basins are now dry and fringed by crescent shaped dunes or lunettes. Aboriginal cultural sites at Willandra include a cremation dating to ~42 ka (Bowler et al. 2003; O’Connell et al. 2018) believed to be the oldest ritual cremation site in the world and an ochred burial, believed to date from c~40 ka (the burials were discovered in 1968 and 1974 respectively). The presence of red ochre covering the remains represents a society with significant cultural and symbolic complexity (Langley et al 2011).

During the Pleistocene (last ice age), the lakes at Mungo would have been full and Aboriginal people camped along the eastern lake shore, collected freshwater mussels (*Velesunio ambiguous*) and fish (eg *Macquaria ambigua*) from the lakes, and hunted various terrestrial fauna (e.g. macropods, emus, etc) attracted to the water bodies (Stern, 2015). Nearly 460 fossilised human footprints dating to 20 ka were discovered in clay at WLRWHA in 2003.

Reduced temperatures and water levels in the region made some fish and freshwater mussels locally extinct from ~25 ka. At about this time, megafauna disappeared on the Darling River and Willandra Lakes system (Niche 2015, p.51). Traces of complex plant-food gathering systems at WLRWHA date to before 18 ka, including grindstones used to process wild grass seed into flour. Archaeologists have noted the greater numbers of grindstones indicating increased plant processing during periods of environmental change, specifically increased aridity and the expansion of grassland (Hiscock 2008).

The landscape of the study area is surrounded by ancient lakes similar to WLRWHA. Pleistocene relict landforms are found near Muckee Lake, Tin Lake and Pitarpunga Lake. Therefore, while the archaeologically significant eastern lunettes of these lakes are outside the study area and archaeological evidence on landforms within the study area is predicted to date to the late Holocene (Mitchell 2012), there is potential for earlier deposits if deeper undisturbed soils have survived.

The end of the Pleistocene and early Holocene (~18 – 8 ka) was characterised by significant environmental change. Rapid inundation of much of the coastal shelf resulted in the reduction of the continent by ~21% (~2 million km²) (Williams et al. 2018) and climatic conditions improved. This “Holocene climatic optimum” (Williams et al. 2015a; 2015b) resulted in increasing population growth, expansion of ranging territories, increasing sedentism (longer patch residence time) and the beginnings of low-level food production (eg aquaculture). The initiation of social and cultural groupings can be observed in the late Holocene (Williams et al. 2015b). This period also produced a broader range of archaeological site types such as the Roonka Flat burial ground on the banks of the Murray River within which some 147 individuals were interred through the Holocene (Pate et al. 1998), and the increasing use of marine resources.

The late Holocene saw significant population increase, with hunter-gatherers reaching their zenith of ~1.2million at 0.5 ka, a tenfold increase on Pleistocene levels (Williams 2013). Data suggests that the highest populations during this time were in the south-east of Australia. Williams et al. (2015b) suggest that this increase was likely a result of intensification of earlier technological advancements, including hafting-technology, plant and seed processing, and localized landscape management (using fire), allowing climatic downturns to be successfully weathered. These climactic conditions included a strong, arid El Nino Southern Oscillation (ENSO) between 4 – 2 ka, and increasingly turbulent climatic conditions during the Medieval Climatic Anomaly (1.3 – 1 ka) (generally wetter) and Little Ice Age (0.3 – 0.5ka) (generally drier) (Williams et al. 2010; 2015b). A result of these denser populations was the decreased freedom of movement and the formation of strong classificatory kinship systems, complex cultural and symbolic landscapes based on geographic totemism (the ‘Dreaming’), distinctive graphic art systems, land rights in the form of ritual property, and formalized exchange networks (Williams et al. 2015b). In the vicinity of the study area, the most dominant Holocene landforms are the linear dune field systems to the south of the study area (see Plate D.1) which date to ~15ka, and ephemeral creeks and channels such as Box Creek to the north.

Overall, the study area is likely to have received Pleistocene occupation around Muckee Lake, although archaeological evidence is more likely to have survived on the eastern lunettes of the lake outside the study area, rather than on the western shores of the lake. Evidence of Holocene occupation is more probable in areas where water collected in the low points of the landscape, such as the gilgai on the Rata land system north-west of Muckee Lake, and “these areas are likely to preserve comparatively large and dense (compared to the continuous background distribution of artefacts) archaeological sites containing stone artefacts, hearths and possibly midden material” (Niche 2015 p.31).

D.2.2 Ethno-historical context

Information about the socio-cultural structure of Aboriginal society prior to European contact largely comes from ethno-historical accounts made by colonial settlers. These accounts and observations were often made after significant social disruption due to disease and displacement. As a result, this information is often contentious, particularly in relation to language group boundaries. Therefore, it is likely that language group boundaries were far more diffuse than the arbitrary demarcations drawn by colonial observers.

Charles Sturt’s expedition of 1829 – 1830 is the first recorded European incursion into the region. A few years later, Mitchell’s account of his visit to the region includes descriptions of the use of heat retainers in Aboriginal hearths and how the Aboriginal people of the Murrumbidgee erected a small, thatched hut over the burial of the dead (Mitchell 1839, Vol 2, Ch 3.4 cited in Niche 2015, p.56).

Robinson (1846 in Clark 2000) recorded that the Aboriginal people of Lake Tala and Lake Yanga were called “Watty”, while lower down the junction of the Murrumbidgee were the “Mutte”. Robinson described the two groups as speaking the same language. Cameron (1899) believed that the “Wathi” were located between Balranald and the junction of the Lachlan and Murrumbidgee Rivers. Pardoe and Martin (2001, p.19 cited in Niche 2015) interpret the language group boundary as occurring around the town of Balranald and the two groups most likely amalgamated in the post contact period. Tindale (1974) describes the land of the “Muthimuthi” as being on Murrumbidgee River at Balranald, south-west to the Murray River, west to near Lake Nenannee, and at Reedy Lake north to west of Carrawathal.

The diaries of George Hobler (1825–1871), who established stations in the area, recorded his observations about the local Aboriginal people he encountered. He describes cloaks and water bags made of possum skins, the use of European iron and glass items to use as tools and how the tribe who inhabited the extensive inland plains between the Murrumbidgee and the Darling (including the study area) would deepen the depressed areas in the Mallee plains and depended entirely on surface water. Other sources noted that Aboriginal people of the plains move to the Murrumbidgee and Lachlan Rivers once water dries up on the plains (Niche 2015, p.60).

A more detailed ethnography and history of the project area can be found in Section 8.4 of the project ACHA (Niche 2015).

D.2.3 Summary of Balranald Project ACHA (Niche 2015)

i Overview

The 2014 project EIS was supported by an ACHA prepared by Niche (Niche 2015) which identified and assessed the Aboriginal cultural heritage values across the project area in consultation with RAPs. The ACHA considered a project area of 9,964 ha across eight key elements: West Balranald Mine (3,059 ha) Nepean Mine (805 ha), West Balranald access road (128 ha), Nepean access road (173 ha), injection borefields (5,721 ha), gravel extraction (42 ha), water supply pipeline (29 ha), and accommodation facility (7 ha). However, total predicted disturbance footprint of the project was significantly smaller at 5,346 ha. The MOD 1 study area falls partially within and adjacent to the West Balranald Mine, West Balranald access road and accommodation facility portions of the assessed project area.

Cultural heritage surveys for the Balranald Project EIS were conducted over three field programs between 2012 and 2014 (535 person days). The initial layout of the project footprint dictated the parameters of the survey area. These areas tended to be larger than the disturbance footprint to allow for changes in the future. The surveys sampled a cross section of landforms across the EIS 2014 project area and beyond⁹. Local survey polygon data available on the Balranald Project Aboriginal Heritage Database (BAHD) from the EIS 2014 ACHA is shown on Figure 3.2a to Figure 3.2c. The purpose of the BAHD is to collate a central database containing the location of all Aboriginal sites, Aboriginal site boundaries and survey transects for all archaeological investigations in the project area including the EIS field programs, the due diligence assessments and the AHIMS results.

A total of 548 Aboriginal sites were identified in the Project ACHA (Niche 2015), of which 383 were located within the project area, including 43 within the MOD 1 study area. These sites were added to the BAHD.

Since the Project ACHA was finalised in 2015, an additional 52 sites within the study area have been identified (including the 12 artefact sites that were identified during the survey for this assessment). Sites have been identified during salvage surface collection and due diligence assessment work by Niche and EMM in accordance with the ACHMP (Niche 2016) which have been undertaken to address ground disturbance activities for infrastructure and geotechnical works.

Therefore, the total number of identified Aboriginal sites within the study area is 95 sites. These sites are all entered in the BAHD. Site types identified within the study area include artefacts, hearths, a culturally modified tree, and areas of potential archaeological deposit (PAD). A full list of sites is provided in Table 7.1.

Of particular significance was site West Balranald 66 (WB66) (#47-2-0287) on the lunette on the eastern shore of Muckee Lake which is at a minimum of 1.7 km to the east of the study area. Although this site has now been excised from the project area as an avoidance measure, it is significant in that it is located on the eastern lunette of an ancient lake. In the local region, sub-surface cultural material associated with Pleistocene occupation are typically only be found where lake lunettes are present (ie on the eastern shores of ancient lakes) and may contain burials and middens.

WB66 was identified during fieldwork for the project ACHA in 2012. The site contains scattered heat retainers, silcrete and calcrete artefacts, an artefact made of mussel shell and fragments of burnt *Genyornis* eggshell which were found eroding near the calcrete hearth scatters. An eggshell fragment was dated by AMS radiocarbon by Giles Hamm. Its uncalibrated age was 14,341 ±48 years BP and returned a calibrated date of approximately 17,000 years calBP (Wk: 35436). This date suggests that the exposed lunette unit is probably part of the Zanci geomorphic unit, which also occurs at Lake Mungo in the WLRWHA (Bowler et al 2012 cited in Niche 2015, p.111). The Arrumpo-Zanci units (deposited 25–14 ka) overlie the older depositional units of Lower and Upper Mungo (50–34 ka) and are characterised by a thicker unit of interbedded sands and clayey sands (Fitsimmons et al 2014). Sites such as this one and potentially the eastern and western lunettes and source bordering dunes to the north of the study area, near Pitarpunga and Tin Lakes have the potential to provide evidence of changing Holocene-Pleistocene land-use patterns. The landforms present in the study area are more likely to contain late Holocene deposits. As discussed in Section 3.4, while the eastern lunette of Muckee Lake was found to contain late Pleistocene- early Holocene cultural material, the western shores within the study area were assessed by Niche to have low archaeological potential (refer Figure 3.2).

ii Aboriginal sites by land system

In their recording and analysis of the data for the Project ACHA, Niche used the Western NSW land system categories (see Section D.1.5) to identify archaeological distributional patterns and develop archaeological predictive modelling. Of relevance to the study area are their findings on the following four land systems: Rata, Marma, Hatfield and Condoulpe. The following discussion is based on Table 14 (p.92) of the EIS project ACHA which presents the results for all known sites within the project area (n=383) and provides a larger sample size than focusing only on sites within the study area.

The highest number of sites (n=156) were identified on the Rata land system, representing 41.5% of all Aboriginal sites within the project area for the ACHA. It also contained the highest number of hearths (n=50). However, it should be noted that approximately twice as many hectares (721.98) of Rata were surveyed compared to the Marma (347.77 ha) and Hatfield (331.26 ha) land systems. In addition, artefact concentrations were relatively low, averaging nine artefacts per site. The Rata land system is characterised by salt bush plains with small circular depressions that would have provided ephemeral water sources.

The Marma land system is characterised by ill-defined scalded drainage tracts associated with swamps and scalded and windsheet eroded pans. This land system had the second highest number of Aboriginal sites (n=115 or 30% of all sites identified in the project area). However, the concentrations of artefacts per site were relatively high, averaging 43 artefacts/site and potentially represents more focused occupation. There were also a relatively high number of hearths (n=36) identified on the Marma land system.

The Hatfield landscape represents a small area within the MOD 1 study area and is wholly within the previously approved boundary. This land system is characterised by undulating aeolian sandplains with bluebush. Seventy sites (18%) were identified including eight hearths and low to medium density artefact scatters (averaging 16 artefacts/site).

In the south of the study area, the Condoulpe land system is characterised by ploughed dunefields and sandplains with cleared and regrowth mallee with no reliable water sources. The Condoulpe land system was the least surveyed (26.54 ha) and only one small artefact site was identified. It is likely that this landform would have only been used sporadically by Aboriginal people in the past.

Further information about these land systems can be found in Table D.1 on Figure 3.1 on Figure 3.1.

iii Archaeological risk layers

The 2014 EIS ACHA developed a predictive model for the likelihood of Aboriginal objects being present in the project area, which gave consideration to the number of sites, artefacts and the density of sites and artefacts in relationship to:

- the Western NSW land systems;
- the distance from permanent and temporary water sources or vegetation like old man bitterbush and blackbox which indicate the presence of water; and
- the changes in landform and elevation that indicated either built up areas of sediment which may contain subsurface archaeological deposit (such as dunes and lunettes) and/or depressions which may indicate areas where water could be found temporarily.

Analysis of the BAHD, undertaken as part of the 2014 EIS ACHA, examined the number and density of sites and artefacts recorded along with their proximity and relationship to these environmental factors. Stronger associations with the presence and density of sites were noted with certain landscape features including the Box Creek tributary stream of the Lachlan River (at the northern end of the West Balranald mine), areas of relict lake fringes and depressions associated with the northern injection borefields to the north of the MOD 1 study area.

These associations were then classified into areas of high, moderate and low archaeological risk and visualised in GIS to form the archaeological risk layer according to the predicted likelihood of Aboriginal objects being present. The moderate and high archaeological risk layers are most likely to feature sites that are likely to reveal information about the chronology and nature of Aboriginal settlement of the region, the local and regional use and distribution of resources and how the utilisation of this area relates to the episodic filling history of the lakes as the availability of water changed from the terminal Pleistocene to the present. Areas of low archaeological risk tend to feature landscapes associated with low archaeological potential or infrequent, isolated Aboriginal objects of low significance, typically characterised by disturbed land or limited temporary or permanent water sources.

The archaeological risk layers were used to extrapolate archaeological predictions for the project area where physical archaeological survey has not been undertaken. The risk layers were integrated into the project ACHMP (Niche 2016) which includes mapped layers classed as 'low, moderate and high' that guide future identification, assessment and management requirements of Aboriginal heritage values within the approved project boundary. The risk layers developed by Niche also covered land outside of the current project area and include the entirety of the MOD 1 study area. Descriptions of the risk layers are provided in Table 3.2 and mapping of the risk layers is provided in Figure 3.2.

D.3 Site definitions and recording methods used for this assessment

D.3.1 Aboriginal sites

In the AHIMS database, Aboriginal sites are defined in several ways. At the simplest level, sites are recorded as 'closed' or 'open'. Closed sites are associated with rockshelters and include other evidence of Aboriginal occupation that may be present, such as areas where subsurface Aboriginal objects may occur within the shelter ('potential archaeological deposit' (PAD)), faunal remains, and art on the shelter walls (paintings/engravings). Open sites are broadly defined and encompass all other types of Aboriginal site features that are located in areas where there is no rockshelter. The most common open site features found generally include artefacts, grinding grooves, art, culturally modified trees, and shell deposits (middens) (OEH 2012). The presence or absence of stone artefacts is often a defining factor in site identification, with almost every site likely to have at least some associated artefacts, as discard or loss of this most ubiquitous and practically indestructible marker of past Aboriginal visitation.

Any one site (or group of linked sites described as a 'complex') can contain several different site features. For example, a shelter may have art on the walls, artefacts on the floor surface or outside the shelter, and be predicted to contain faunal remains and further artefacts in the accumulated deposit inside.

A description of terms used to describe different site features known to occur in the vicinity of the study area is provided in Table D.1 and use definitions provided by Heritage NSW and those adopted by EMM in their field investigations to ensure consistency in recording. Similarly, there may be places of contemporary significance to Aboriginal people in the region and that will require consultation with this community to identify.

Table D.1 Site definitions and recording

Site feature	Definition and recording methods
Aboriginal ceremony and Dreaming	Previously referred to as mythological sites these are spiritual/story places where no physical evidence of previous use of the place may occur; eg natural unmodified landscape features, ceremonial or spiritual areas, men's/women's sites, dreaming (creation) tracks, marriage places etc.
Artefact site (open stone artefact site)	Objects such as stone tools, and associated flaked material, spears, manuports, grindstones, discarded stone flakes, modified glass or shell demonstrating evidence of use of the area by Aboriginal people. Open stone artefact sites were defined by the presence of one (isolated find) or more (artefact scatter) stone artefacts visible on the ground surface. The boundaries of a site are limited to the spatial extent of the visible stone artefacts. The mapped site points and/or 'site areas' do not represent the areas of potential archaeological deposit (PAD) that also apply to some sites (refer to the term 'PAD' below). Open stone artefact sites were recorded by marking each artefact location or each cluster of artefacts within a 5 m radius as a separate waypoint in the GPS. Site boundaries were allocated by drawing a line around the cluster waypoints for each site using ArcGIS software. In the Project ACHA, site boundaries were defined using an arbitrary distance of 40 m between visible Aboriginal object or, in some cases, landform features were used to define site boundaries (Niche 2015, p.65). Rationale around extending and creating site boundaries was undertaken in accordance with Niche's previous method. EMM acknowledges that the 40 m rule applied here is an arbitrary distinction for site boundaries and is used mainly for efficiencies in site management and to establish consistency in site recording methods, while also allowing for landform features to be taken into account.
Burials	A traditional or contemporary (post-contact) burial of an Aboriginal person, which may occur outside designated cemeteries and may not be marked; eg in caves, marked by stone cairns, in sand areas, along creek banks etc.
Fish trap	A modified area on watercourses where fish were trapped for short-term storage and gathering.

Table D.1 **Site definitions and recording**

Site feature	Definition and recording methods
Grinding grooves	Grinding grooves were defined as an area of outcropping bedrock containing evidence of one or more grinding grooves where ground-stone hatchets or other grinding practices (ie seed grinding) were implemented.
Habitation structure	Structures constructed by Aboriginal people for short or long-term shelter. More temporary structures are commonly preserved away from the NSW coastline, may include historic camps of contemporary significance. Smaller structures may make use of natural materials such as branches, logs and bark sheets or manufactured materials such as corrugated iron to form shelters. Archaeological remains of a former structure such as chimney/fireplace, raised earth building platform, excavated pits, rubble mounds etc.
Modified tree (carved or scarred)	Trees which show the marks of modification as a result of cutting of bark from the trunk for use in the production of shields, canoes, boomerangs, burials shrouds, for medicinal purposes, foot holds etc., or alternately intentional carving of the heartwood of the tree to form a permanent marker to indicate ceremonial use/significance of a nearby area, again these carvings may also act as territorial or burial markers. Modified trees (either carved or scarred) can be difficult to identify. Scars commonly occur on trees through natural processes such as branch tears, insect damage, storm and fire damage and faunal damage. Scars can also occur from mechanical damage from vehicles or farming equipment. The attributes of potential scarred trees were discussed during the survey amongst archaeologists and RAPs before it was decided if a scar would be recorded or not. A precautionary approach was adopted, whereby some of the more ambiguous examples were recorded anyway. The assessment of scar trees was made from the experience of the survey team and the guideline <i>Aboriginal scarred trees in New South Wales: a field manual</i> (DEC 2005). In some of the more ambiguous examples, it cannot be verified whether some scars recorded during the survey are of natural or Aboriginal origin. In such instances, an expert evaluation by a scar tree expert (arborist or other) would be required to determine the status of certain trees.

Table D.1 **Site definitions and recording**

Site feature	Definition and recording methods
Potential archaeological deposit (PAD)	An area where Aboriginal objects may occur below the ground surface. The term ‘potential archaeological deposit’ was first applied in Sydney regional archaeology in the 1980s and referred to rockshelters that were large enough and contained enough accumulated deposit to allow archaeologists to predict that subsurface cultural material was likely to be present. Since then, the term has come to include open sites where the same prediction can be made. EMM has defined PADs as the predicted extent of concentrated subsurface Aboriginal objects in a particular area. PADs are not technically Aboriginal sites until, and if, subsurface Aboriginal objects are identified, which is typically established through archaeological test excavation. PAD areas have been assigned to landforms that are distinguishable from the surrounding landscape (eg elevated areas with good outlook overlooking watercourses) as being likely to retain higher artefact densities than the assumed ‘background scatter’ of archaeological material in the broader landscape. The identification of PADs associated with Aboriginal open camp sites was partly based on observations in the field and discussions with RAPs, but also related to the predictive model. Although PAD was attributed to areas for a variety of reasons, the main qualifiers were: • The presence of surface artefacts or other Aboriginal objects. Ground surface visibility as part of the archaeological survey effort was typically considered high enough in each PAD area to identify at least one or more surface artefacts thereby indicating likelihood of subsurface potential. Notwithstanding, finding no visible surface artefacts in an area would not disqualify an area from being attributed with PAD. • Level to gently inclined ground (<10%) indicating suitable camping or activity areas. • Contours that distinguish the landforms with PAD from the surrounding landscape (eg spur crest, hill crest or knoll). Landform boundaries were also interpreted through observations in the field. Notably, rocky crest landforms that were protected from intensive cultivation were often attributed with PAD. • Proximity to water: typically up to 100 m from 1st and 2nd order streams and up to 200 m from 3rd order streams and above. Elevated landforms at the confluence of higher order streams were also more likely to be attributed with PAD. EMM acknowledges that all PAD areas have been historically cleared of native vegetation and some have been subject to pasture improvements such as ploughing. As such, the term PAD does not assume high subsurface integrity; instead it is a prediction of potential subsurface artefact concentrations. All stone quarry sites are predicted to have PAD. The assumption is that in most cases the visible surface material at quarries is represented by larger artefacts (such as cores) and that smaller material (eg flakes) is likely to be buried.
Restricted	Site information contained in the Aboriginal Heritage Information Management System is available only to certain authorised groups of people, as requested by the Aboriginal community. Detailed information may not be available in search reports.
Shell	An accumulation or deposit of shellfish from beach, estuarine, lacustrine or riverine species resulting from Aboriginal gathering or consumption. Usually found in deposits previously referred to as shell middens. Must be found in association with other objects like stone tools, fish bones, charcoal, fireplaces/hearths, and burials. Will vary greatly in size and composition.

Table D.1 **Site definitions and recording**

Site feature	Definition and recording methods
Stone quarry	Usually a source of good quality stone which is quarried and used for the production of stone tools. Stone quarries represent where Aboriginal people gathered raw stone materials for stone tools and/or manufactured stone tools from the adjacent source material. Quarry sites are found at rock outcrops where the material was of suitable quality to have been used to manufacture stone tools. Stone quarries were defined by the presence of outcropping stone material with nearby evidence of the same material type used in the stone tool manufacture process. This was most commonly indicated by large stone cores or stone flakes distributed amongst the same naturally outcropping material. EMM acknowledges that the 'open stone artefact' site type shares some of the same characteristics as 'stone quarries', such as the presence of stone artefacts. However, they have been distinguished from each other because quarries can not only represent open camping activities, but also a fixed location where Aboriginal people needed to visit to extract a resource. In contrast, the location of typical open camp sites were not fixed, but chosen by Aboriginal people for their favourable conditions.



Appendix E

Test excavation methodology



E.1 Overview

This methodology relates to the proposed test excavation program within the MOD1 investigation area as outlined in Section 7.3.3iii of this report. Archaeological test excavation is proposed where the MOD1 investigation area intersects with the following four Aboriginal sites with PAD: WB 40, WB 41, WB 45 and WB 102, which are within high archaeological risk layers.

The overarching aim of the test excavation is to assess the subsurface archaeological character in these areas where proposed modification impacts cannot be avoided. The outcomes of the test excavation will guide future management measures.

The methodology has been prepared to generally conform with the excavation approach set out in the approved ACHMP (Niche 2016, Section 6.2 and Appendix 6), to maintain consistency of approach and to gather results that will be easily comparable to future excavation results within the approved EIS project area. Notwithstanding, slight variations to the ACHMP methods are proposed (Section E.5), but which are still in agreement with best practice methods under the *Code Of Practice For Archaeological Investigation Of Aboriginal Objects In NSW* (DECCW 2010a).

E.2 Test excavation aims

In accordance with the ACHMP (Niche 2016 p.24), the aim and objective of the archaeological test excavation is to:

- obtain better resolution on the nature, distribution, and state of preservation of subsurface deposits in the landscape;
- provide a range of dating samples including soil columns, soil for optically stimulated luminescence (OSL), and shell or charcoal samples (if available) for C14 dating in order to add to understanding of the chronology of Aboriginal occupation in the investigation area;
- provide a sample of artefacts and other cultural materials (eg shell, bone), if present, to add to understanding Aboriginal occupation and land use in the investigation area; and
- gain an improved assessment of the archaeological resources and Aboriginal heritage values of the investigation area based on subsurface excavation data to inform the management of Aboriginal heritage values in the MOD1 investigation area.

E.3 Test excavation areas

The test excavation areas relate to recorded Aboriginal sites with PAD and are shown on Figure 7.1. Table E.1 provides an overview of the Aboriginal sites chosen and justification for test excavation in each area based on their archaeological potential.

Overall, test excavation of site WB 40 near Muckee Lake will be the primary focus of the program as it features a diverse assemblage and the largest tracts of relatively intact soil suitable to have retained archaeological material.

Test excavation of sites within sandplain environments (WB 41, WB 45 and WB 102) are largely in areas with discontinuous vegetation mounds between large scalds, and test excavation of these areas would be limited to attempts to gather chronological information rather than identify areas that retain extensive deposits potentially warranting salvage.

Table E.1 **Proposed test excavation within the investigation area**

Test area	Aboriginal site	Description	Observations made during survey	Implications for archaeological potential	Opportunities for test excavation
1	WB 40 (47-2-0262)	High density archaeological complex with a high volume and range of stone artefacts, hearths, a culturally modified tree and PAD. The site represents the most intense and diverse assemblage in the project area. Site is on exposed gentle slopes draining towards Muckee lake, gilgai micro-topography.	No evidence of hearths were identified within the MOD1 investigation area. There were very few trees within the investigation area. Trees were inspected but no cultural scars were identified. Artefacts dispersed across scald areas, with no discernible patterning. Site extends further north than originally mapped and site boundary was updated. Few shell fragments (<5) were noted and mapped, but not considered indicative of a midden.	This site was identified in the 2014 EIS ACHA (Niche 2015) as having the greatest archaeological potential because of the relative diversity of the assemblage. Soils are comparatively undisturbed and potentially deep (up to 1 m). The presence of gilgai and diverse natural resources prior to European settlement would have made this an attractive camping area on the fringe of Muckee Lake. During the 1895–1902 drought (Mitchell 2012) drift sand was trapped by bluebush and vegetation mounds formed. There is potential for natural soil beneath the aeolian sand. Artefact densities in the natural soil (PAD) within the vegetation mounds are likely to be in similar concentrations to what is visible on the surface. Archaeological deposits likely date to the late Holocene.	The test excavation program will focus on this area, targeting deeper sandy soils. The results of test excavation will inform future excavation in subsurface excavation Location 8 under the ACHMP (Niche 2016). This area provides the best opportunity for gathering the following samples if feasible: • OSL samples for dating (in consultation with geomorphologist). • C14 samples of shell and/or charcoal (if available) for dating. • Column soil sample for geochemical analysis.
2	WB41 (47-2-0263)	Low to moderate artefact density, hearth and PAD. Site is on exposed on gentle slopes draining towards Muckee lake, gilgai micro-topography.	No evidence of the hearth was identified within the MOD1 investigation area. Artefacts dispersed across the scald areas, with no discernible patterning. Site extends further south than originally mapped and site boundary was updated.	The scald was likely formed during the 1895-1902 drought (Mitchell 2012) when drift sand was trapped by bluebush and vegetation mounds formed. There is potential for natural soil beneath the aeolian sand. Artefact densities in the natural soil (PAD) within the vegetation mounds are likely to be in similar concentrations to what is visible on the surface. When compared to WB 40, the site is further from Muckee Lake, with fewer areas of continuous soil deposit suitable for testing. As such, PAD areas are far more isolated and disjointed by extensive erosion scalds. Archaeological deposits likely date to the late Holocene.	Test excavation would target larger vegetation mounds on the margins and across the scald (Plate 3.2). The primary aim of excavation would be to determine the archaeological integrity of vegetation mounds and gather any OSL samples for dating if feasible (in consultation with geomorphologist).

Table E.1 **Proposed test excavation within the investigation area**

Test area	Aboriginal site	Description	Observations made during survey	Implications for archaeological potential	Opportunities for test excavation
3	WB45 (47-2-0267)	Low density artefact scatter, dispersed heat retainers indicating a disturbed hearth, PAD. Site is on an extensive scald located on a levee edge of a paleo-channel. Disturbance from water management ditches.	Highly eroded area. Artefacts dispersed in low concentrations across the scald, with no discernible patterning. No evidence of the disturbed hearth was identified within the MOD1 investigation area during survey.	This area is unlikely to retain extensive subsurface cultural material as the site is largely not intact and available soil mounding for excavation is highly discontinuous. As per Mitchell's geomorphological observation (2012) "Little of WB45 is intact and this area may not justify more archaeological work although a dating program would be informative". Archaeological deposits likely date to the late Holocene.	Targeted excavation of vegetation mounds and OSL samples for dating (in consultation with geomorphologist).
4	WB102 (47-2-0310)	Low density, small artefact scatter. Further surface and subsurface artefact predicted to be present in residual soils. Site is on a slight rise in the scalded plains of the Rata land system.	High concentration of surface artefacts. Highly eroded scalds with fringing vegetation mounds. Site extends to the north of previously mapped area.	Artefact densities in the natural soil (PAD) within the vegetation mounds may be in similar concentrations to what is visible on the surface. Archaeological deposits likely date to the late Holocene.	Targeted test excavation of fringing vegetation mounds and OSL samples for dating (in consultation with geomorphologist).

E.4 Contribution to ACHMP investigations

The ACHMP sets out a broader subsurface archaeological excavation program for the approved EIS project area in specifically identified areas where impact cannot be avoided within the moderate and high archaeological risk layers prior to disturbance of the areas. The aim being to obtain a representative sample of artefacts and evidence which will help answer research questions (Niche 2016 p.22).

The ACHMP program has as its goal a greater understanding of:

the story of the Box Creek distributary streams of the Lachlan River and how people have utilised it and the nearby lakes as the availability of water changed from the terminal Pleistocene to the present. Of particular interest is whether people were using this area at different times and in different ways to the Willandra Lakes Region World Heritage Area (WLRWHA) and the Lachlan River (Niche 2016, p21).

The ACHMP outlines a subset of overarching archaeological questions which are outlined in Table E.2. The table also provides commentary on how the test excavation program may contribute to answer some of these questions. It is important to note that not all the questions are likely to be answered based on the test excavation results alone. However, the results may contribute to future reporting and analysis after more investigation and salvage has been completed across the project area.

Table E.2 ACHMP archaeological questions and how test excavation in the investigation area may contribute to their resolution

ACHMP archaeological questions (Niche 2016)	Potential opportunities for the test excavation to contribute to answering these questions
1. How and when was the landscape formed?	Geomorphologist report. OSL samples to be analysed from investigation area. These sites are to be chosen in consultation with a geomorphologist.
2. When was water available in the landscape?	Geomorphologist report.
3. Are there buried and dateable archaeological deposits in the project area?	OSL samples to be taken from a sample of test pits. Shell has been observed at WB40. If samples of shell (and/or charcoal) are identified during test excavation, a sample will be subject to C14 analysis. Lithic analysis of tool type, retouch or material that may correlate with known time frames.
4. How have site formation processes affected the archaeological deposits?	Geomorphologist report. Vertical soil column sample to be taken where/if appropriate and in consultation with the geomorphologist in order to analyse the soil geochemistry and evaluate environmental changes. Stratigraphic information from test excavation.
5. When were people occupying the landscape?	Stratigraphic analysis of artefact distribution and any other cultural material (such as hearths). Dating material if available (OSL and C14).
6. How were people utilising the landscape and what activities were they undertaking?	Analysis of recovered lithics, shell and bone. For example, species selection (shell and bone), use wear and residue analysis (lithics).
7. How were people utilising stone raw materials in the project area and is there a connection to the stone resources at WLRWHA?	Analysis of recovered lithics. Comparative analysis with published information about WLRWHA.
8. Do the contents and spatial patterning of sites within the project area demonstrate any relationships between the availability of resources within the landscape in the project area over time and how people were utilising the landscape within the project area and what activities they were undertaking over time?	Spatial analysis of artefact distribution and any other cultural material (such as hearths).

E.5 Test excavation method

E.5.1 Location of test pits

Four indicative testing locations within the MOD1 investigation area have been identified (Figure 7.1a and Figure 7.b). Rationale for the selection of each of these locations is provided in Table E.1.

A geomorphologist will be consulted to refine the test excavation areas and to determine what geomorphic assessment components will be suitable. This may include assistance with the collection of samples from the program that may help characterise and interpret the stratigraphy of the broader EIS project area and the chronology of Aboriginal occupation of the landscape.

All test pit locations will be correlated to coordinates and Australian height datum (AHD) points established by a surveyor.

The following procedure for test excavation has been developed in accordance with Appendix 6 of the ACHMP (Niche 2016). If a hearth is encountered then the feature will be excavated by hand in accordance with standard archaeological practice.

E.5.2 Method

The purpose of exploratory test pitting is to help characterise the landscape and determine the nature and composition of the Aboriginal heritage evidence in a location. Information collected during this phase will inform whether further targeted salvage excavation is required. The proposed methods are generally as follows:

- Test pits (0.5 m by 0.5 m) to be set out at 10–20 m intervals within each test area.
- The first pit at each test location will be excavated by hand in 5 cm spits, then if suitable, each subsequent pit may be excavated in 10 cm spits or according to stratigraphic layers.
- Excavation of each test pit will be undertaken until it reaches either:
 - the depth of culturally sterile deposits;
 - bedrock;
 - the water table; or
 - a point where digging deeper would be unsafe.
- Test pits may be expanded, if necessary, in conjunction with a safe work method for excavating at depth or in unstable soil profiles.
- Controlled mechanical excavation may be necessary if, for instance soils are cemented or for safe work methods for excavating at depth or in unstable soil profiles. The size of mechanical pits would be as small as reasonably achieved and in 10–20 cm spits and/stratigraphic units.
- All excavated soils to be sieved using a maximum 5 mm aperture mesh, with smaller apertures used if considered warranted by the excavation director.
- All cultural will be bagged and labelled.
- All test pits will be documented using photographic records, written descriptions, and scaled drawings.
- Soil samples to be collected for description, sedimentological and chronological analysis where appropriate.
- All pits will be backfilled after recording.

The final number and location of test pits will be determined by the excavation director depending on the results of fieldwork as they come to hand. Excavation of any particular test pit may be ceased at any point at the discretion of the test excavation director.

9.2 Storing recovered material

Artefacts and other samples will be retained temporarily by EMM for the required analysis of technological attributes. Such objects will be stored in a secure location and returned to Iluka as soon as practical after analysis and record is completed. Aboriginal cultural material that is suitable for dating may be submitted to a laboratory and used for dating purposes. Long term storage of material will comply with Section 6.5 of the ACHMP (Niche 2016).

9.3 Post-fieldwork analysis

9.3.1 Artefact analysis

Basic recording and analysis will be undertaken for the artefact assemblage recovered from the test excavation with the aim to form a baseline characterisation of the excavated material. Analysis of excavated stone artefacts will include:

- initial sorting and cleaning of excavated material;
- establishment of a computer database using Microsoft Access or Microsoft Excel (depending on the size of the assemblages) to record all provenance information;
- measuring and recording the attributes of stone artefacts; and
- statistical analysis of the data to explore the frequency, distribution, raw material type, implement type and size of the artefacts in the assemblage.

9.3.2 Sample analysis

Select soil samples will be submitted to a laboratory and used for sedimentological and chronological analysis where appropriate. The results of sample analysis will be integrated into a test excavation report.

9.3.3 Reporting

AHIMS site cards will be completed for each Aboriginal site and an Aboriginal Site Impact Recording Form prepared for each site impacted by the test excavation.

The results of excavation and subsequent management measures derived from the results will be formulated in consultation with RAPs and will be provided prior to or as part of the submissions report so that DPIE and Heritage NSW can consider any new information prior to MOD1 approval.



Appendix F

Regulator consultation



Balranald Mineral Sands Project – Regulator Meeting Minutes / Actions



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E info@emgamm.com

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Date	15 December 2021
Attendees	Iluka – Vicki Hood, Andrew Porter, Dave Wright (BCD, MEG meetings) EMM – Paul Gibbons, Brett McLennan, Ryan Desic, Pamela Chauvel Heritage NSW – Jackie Taylor, John Gilding

Table 1 Meeting Minutes & Actions

Discussion Points / Actions

REGULATOR MEETING AGENDA

- Proposed modification of consent
 - ore production / processing rate no greater than approved under SSD-5285.
 - 6 years of production ~300+ktpa.
 - disturbance footprint ~750ha (including access road).
 - HMC stockpiled and transported off-site for downstream processing.
- Environmental assessment and management.
- Regulator engagement.
- Schedule, Next Steps.

A copy of the presentation is attached in appendix. Refer to presentation for further information.

Key Topics discussed

Presentation of:

- MOD1 project information and ACHA assessment background and methods.
- Summary of archaeological survey results in MOD1 investigation area and proposed test excavation scope and methods.

Schedule and timing of ACHA, noting that test excavation results would be provided after the MOD1 EIS and development application is submitted. Commitment to provide an addendum to the ACHA detailing the outcomes of test excavation as part of the MOD1 response to submissions report.

Outcomes

Heritage NSW generally supported proposed ACHA assessment methods. Heritage NSW suggested that the proposed test excavation include provisions for mechanical excavation methods if required, and to ensure that areas of low archaeological potential are established from the excavation. EMM adopted these methods into the test excavation methodology which is as **Error! Reference source not found.** of ACHA.

Heritage NSW supported the proposed timing of ACHA and provision of an addendum report during the MOD1 EIS response to submissions phase.

Ryan Desic

From: John Gilding <John.Gilding@environment.nsw.gov.au>
Sent: Tuesday, 15 March 2022 11:25 AM
To: Pamela Chauvel
Cc: Paul Gibbons; Ryan Desic; Lyndon Patterson
Subject: RE: Test excavation notification - Balranald Mineral Sands Project Modification 1

CAUTION: This email originated outside of the Organisation.

Dear Pamela,

Thank you for providing the notification of your intention to undertake subsurface assessment as part of the Iluka Resources Ltd Balranald Mineral Sand Project (SSD 5285).

Heritage NSW appreciates that the program has been developed following consultation with the Proponent, EMM and ACH Regulator (Jackie Taylor and John Gilding). During these discussions Heritage NSW approved the use of mechanical excavation in this context, due to the large geographic area to be investigated, coupled with the nature of the geography and type of development proposed.

Having reviewed the letter of notification, as well as supplementary information (Mod 1 Draft ACHAR), Heritage NSW has the following comments and acknowledgments:

1. The appropriate stage of consultation has been undertaken with RAPs presented a proposed method – inclusive of test excavation – for review and inputs. No feedback was provided by RAPs.
2. A geomorphologist will be present to assist in siting test pits and interpreting geological data to assist efficiency and accuracy of archaeological assessment.
3. Mechanical excavation will be used, and is approved by Heritage NSW, for the purposes of maintain work safe management and also for concreting geology. All excavated materials will be sieved.
4. Hearths encountered will be feature recorded, sampled for later analysis (including dating) and excavated through.
5. Retrieved excavation materials lithics will be retained by EMM and temporarily stored for analysis. Materials will be returned to Iluka upon completion of analysis and recording.

The proposed sampling strategy appears adequate to characterise the archaeological content of the area. Heritage NSW would just underscore that a representative sample should be made across all landforms, acknowledging that areas of higher potential should be more heavily focused on, and that all PADs should be subject to subsurface testing as per the CoP (DECCW 2010).

It should also be underscored that objects outside what is covered under the CoP (i.e. mounds, burials etc) should not be excavated. Should these be encountered activities that may harm the objects should stop and guidance from Heritage NSW sought. In the instance of suspected human remains being encountered the local NSW Police should be contacted as per the Coroners Act 2009.

All the best for your assessment and I hope it all goes well.

Cheers

JG

John Gilding | Archaeologist

Heritage NSW, Community Engagement, Department of Premier and Cabinet
T: 03 5483 9118 | john.gilding@environment.nsw.gov.au

From: Pamela Chauvel [mailto:pchauvel@emmconsulting.com.au]
Sent: Monday, 7 March 2022 4:22 PM
To: John Gilding <John.Gilding@environment.nsw.gov.au>
Cc: OEH HD Heritage Mailbox <HERITAGEMailbox@environment.nsw.gov.au>; Paul Gibbons <pgibbons@emmconsulting.com.au>; Ryan Desic <rdesic@emmconsulting.com.au>
Subject: Test excavation notification - Balranald Mineral Sands Project Modification 1

Dear John,

Please find attached, notice of a test excavation to be conducted at West Balranald NSW (part of the Balranald Mineral Sands Project) in accordance with Section 15c of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*.

The excavation is proposed to take place over 10 days between 21 March and 1 April. A methodology has also been attached in fulfilment of Requirement 15c of the Code.

Please feel free to contact me should you wish to discuss.

Kind regards,
Pamela

Pamela Chauvel

Senior Archaeologist



T 02 9493 9500
M 0459 345 156
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 Connect with us

SYDNEY | Ground floor, 20 Chandos Street, St Leonards NSW 2065

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Please note: My working days are Monday, Wednesday and Thursday

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Balranald Mineral Sands Project

Modification of consent

Heritage NSW - December 2021



Agenda

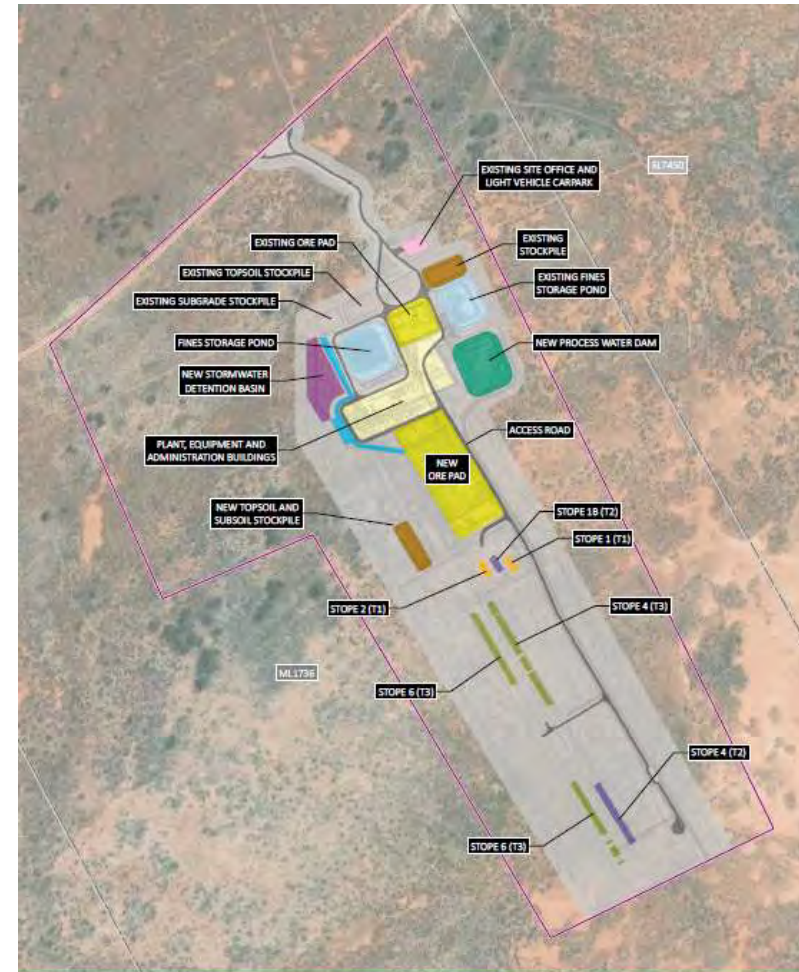
1. Introductions
2. Balranald Mineral Sands Project
3. Modification of consent for extended underground operations
4. Environmental assessment and management
5. Regulator engagement
6. Schedule
7. Next steps

Balranald Minerals Sands Project

- SSD-5285 granted April 2016 for open cut of West Balranald and Nepean deposits
 - Included 100,000 tonnes bulk sampling activity
- Mining Lease (ML 1736) granted May 2016
- Environmental Protection License (EPL 20795) granted June 2016
- EPBC [2012/6509] determination granted January 2017
- Bulk Sampling Activity has successfully passed milestones to confirm:
 - proof of concept (T1)
 - commerciality test – phase 1 (T2)
 - commerciality test – phase 2 (T3)
- The key T3 deliverables confirmed:
 - sustained production over a larger sample set
 - backfill process to deliver a whole mine life cycle process
 - environmental impacts to further validate key groundwater and subsidence impact prediction models



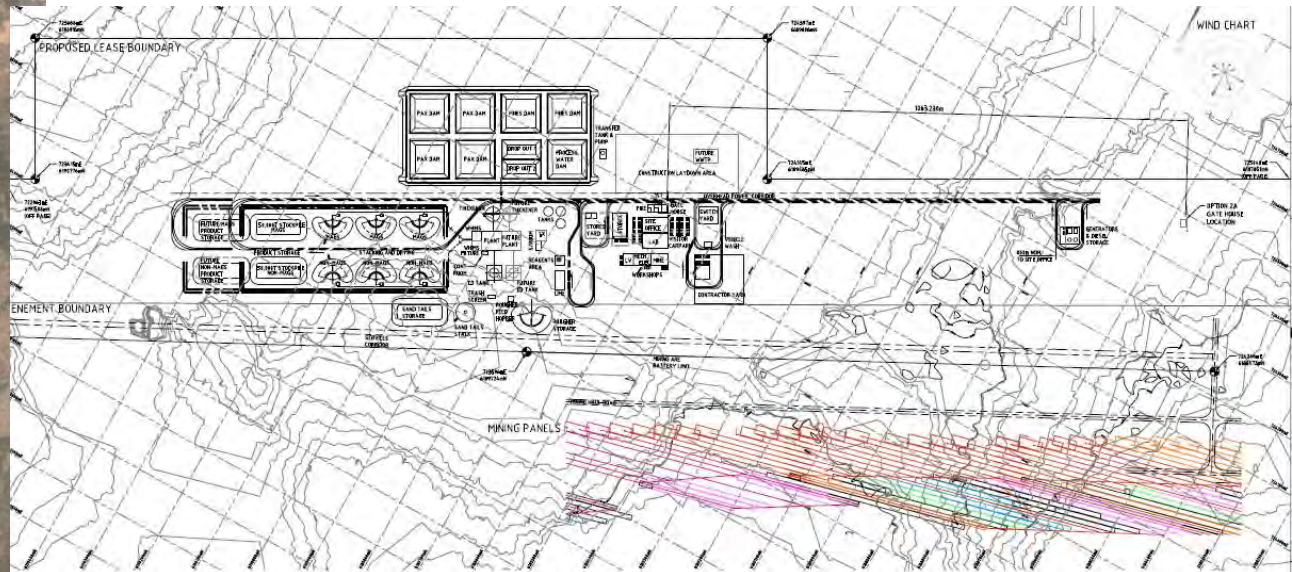
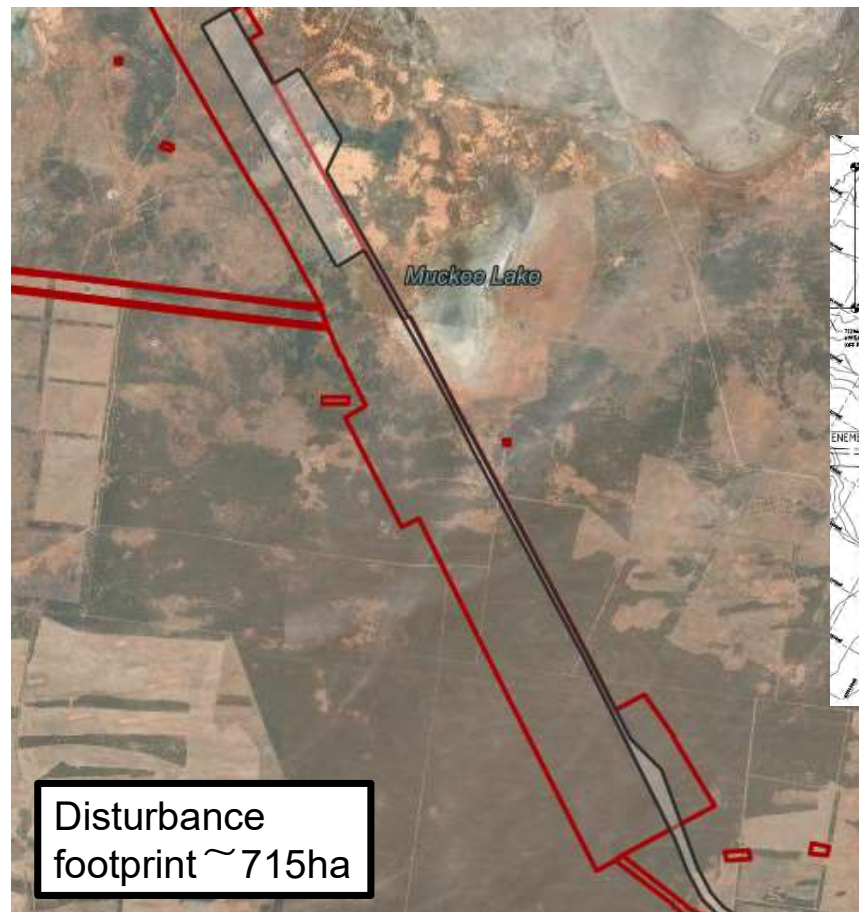
Mining Pictures



Balranald MOD1

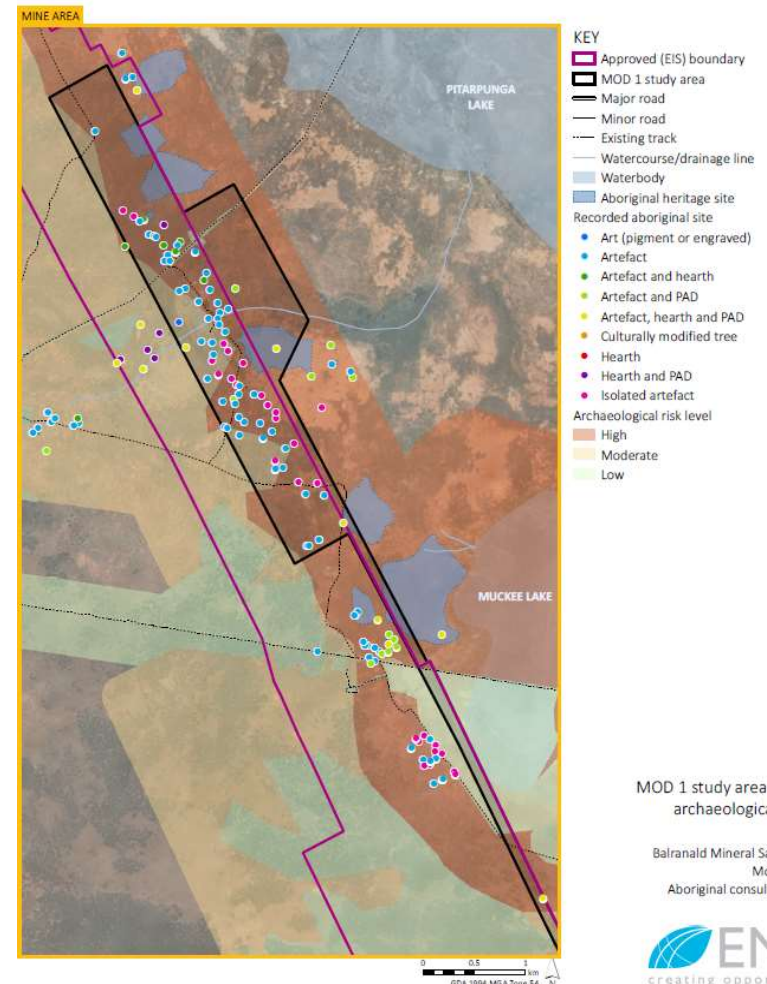
- Modification of consent to enable continuation of underground mining over a small portion of the deposit:
 - given mining method is still in development
 - maintain approval flexibility to return to open-cut
 - reduce approvals timeframe for initial production
- Underground mining and ore processing
 - mining a series of stopes (nominally 500 metres in length)
 - ore production / processing rate no greater than approved under SSD-5285
 - HMC stockpiled and transported off-site for downstream processing
- The impacts associated with the activity are considered to be minor and no greater or more significant to those identified in the EIS for the project

Site Layout



Aboriginal cultural heritage – background

- SSD-5285 and the associated EIS was supported by an ACHA prepared by Niche Environment and Heritage Pty Ltd (Niche 2015)
- In 2016, Niche developed an approved Aboriginal Cultural Heritage Management Plan (ACHMP) which sets out:
 - ‘archaeological risk layers’ (classed as low, moderate, or high)
 - management of archaeological sites
 - measures of surface artefact collection and archaeological excavation.
- Portions of the proposed MOD1 now extend beyond the approved SSD-5285 boundary and assessed areas.



MOD 1 study area and local archaeological context

Balranald Mineral Sands Project
Modification 1
Aboriginal consultation letter
Figure 1.2

Aboriginal cultural heritage assessment – MOD1

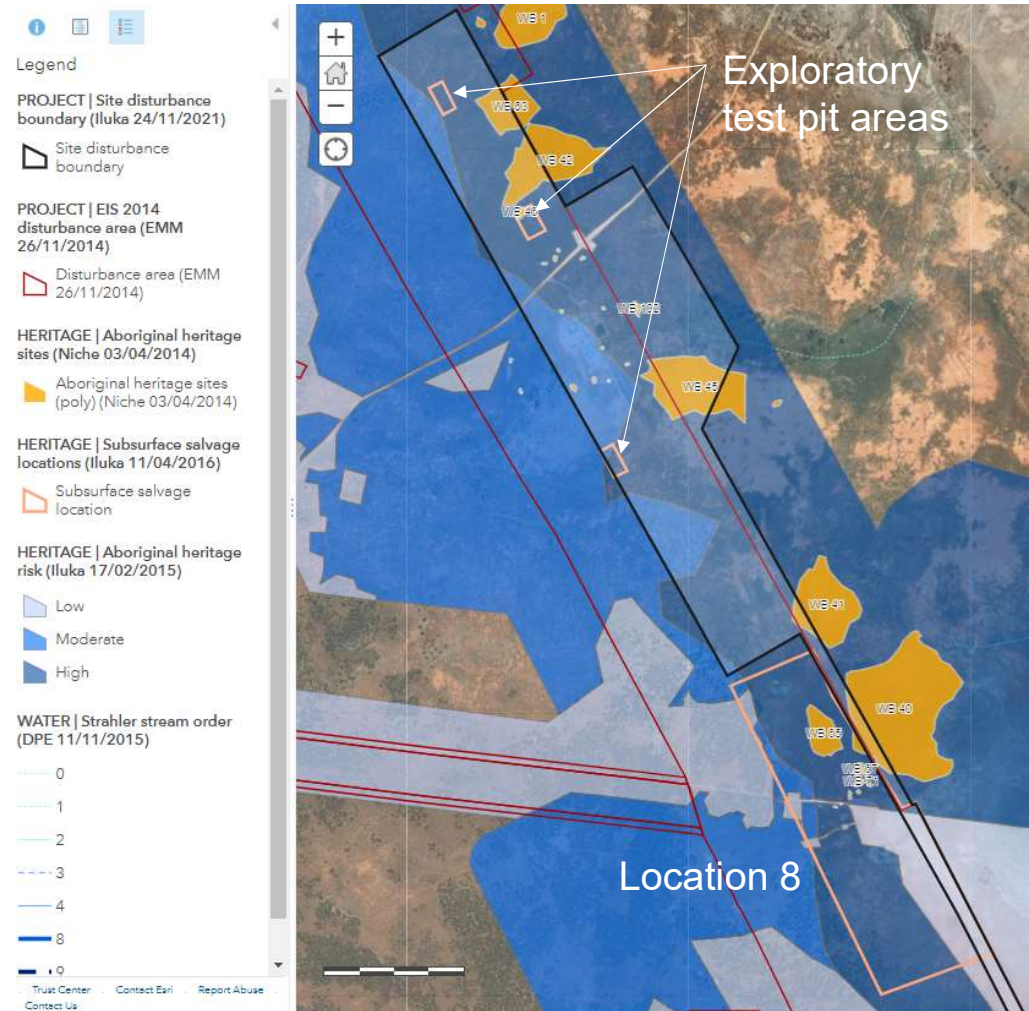
- EMM are undertaking an Aboriginal cultural heritage assessment (ACHA) for the proposed modification. This will build on the main ACHA prepared by Niche 2015 with a focus on the proposed modification area.
- The ACHA aims to address the following key issues:
 - impact assessment and management for proposed footprint with approved SSD-5285 boundary (desktop only);
 - further assessment, archaeological investigation, impact assessment and management for proposed footprint outside of approved SSD-5285 boundary.
- Iluka has been consulting with existing project registered Aboriginal parties (RAPs) for the modification and associated fieldwork.

Aboriginal cultural heritage - management within SSD-5285 boundary

- The proposed MOD1 would impact all the Aboriginal sites within its disturbance footprint.
- Iluka has approval to undertake all required management and mitigation measures within the approved site boundary and intend to complete this for the area where the proposed MOD1 overlaps with the approved SSD-5285 boundary.
- The 2016 ACHMP provisions remain relevant for the proposed modification and should be completed prior to ground disturbance works, comprising fieldwork programs of Iluka, RAP representatives and archaeologists:
 - undertaking additional survey;
 - surface collection of artefacts; and
 - archaeological excavation of identified locations (in consultation with a geomorphologist).

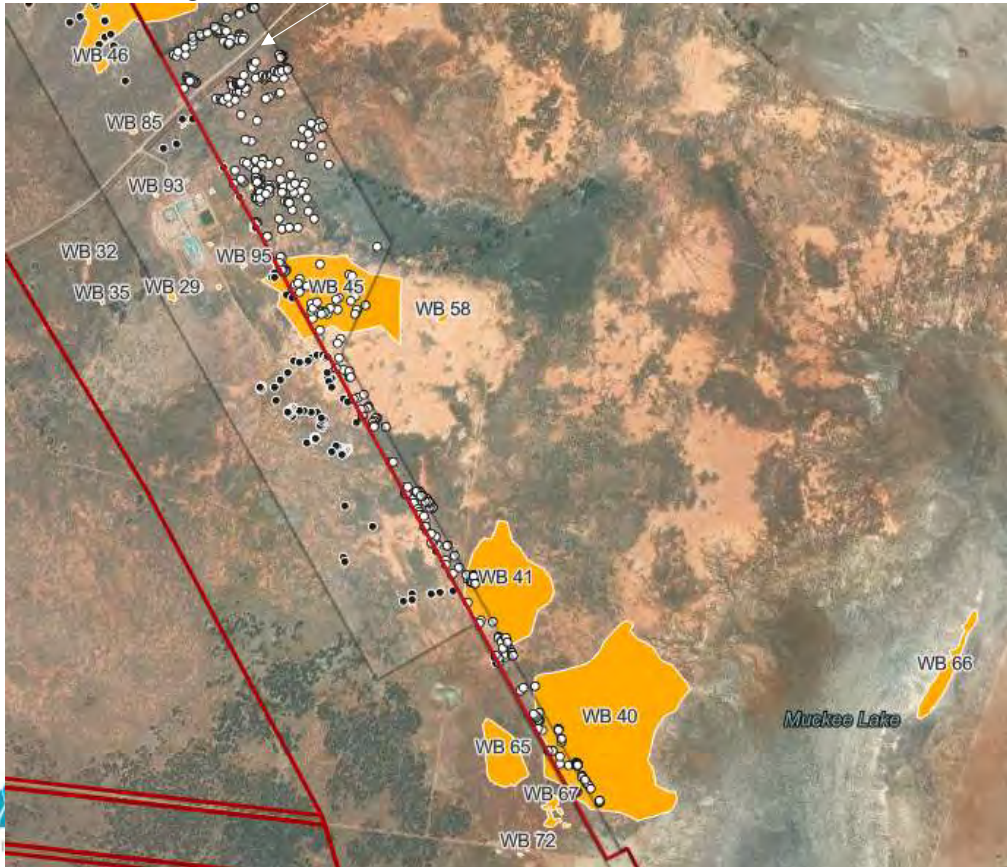
Test excavation within approved SSD-5285 boundary

- The proposed MOD1 intersects with one of the eight locations to be targeted by the archaeological subsurface excavation program, known as 'Location 8'.
- Additionally the proposed modification intersects with three of the twelve locations exploratory test pit areas.



Aboriginal cultural heritage – MOD1 approach outside approved boundary

- ACHA survey was completed over five days from 18 - 22 November 2021 with EMM archaeologists, RAP site officers and Iluka



Aboriginal cultural heritage – WB40 survey results



During the 1895-1902 drought (Mitchell 2012) drift sand was trapped by bluebush and vegetation mounds formed. There is potential for natural soil beneath the aeolian sand.

WB40

Aboriginal cultural heritage: WB41 survey results

WB41



Aeolian vegetation mound
Remnant A horizon
Wash slope
Remnant B horizon

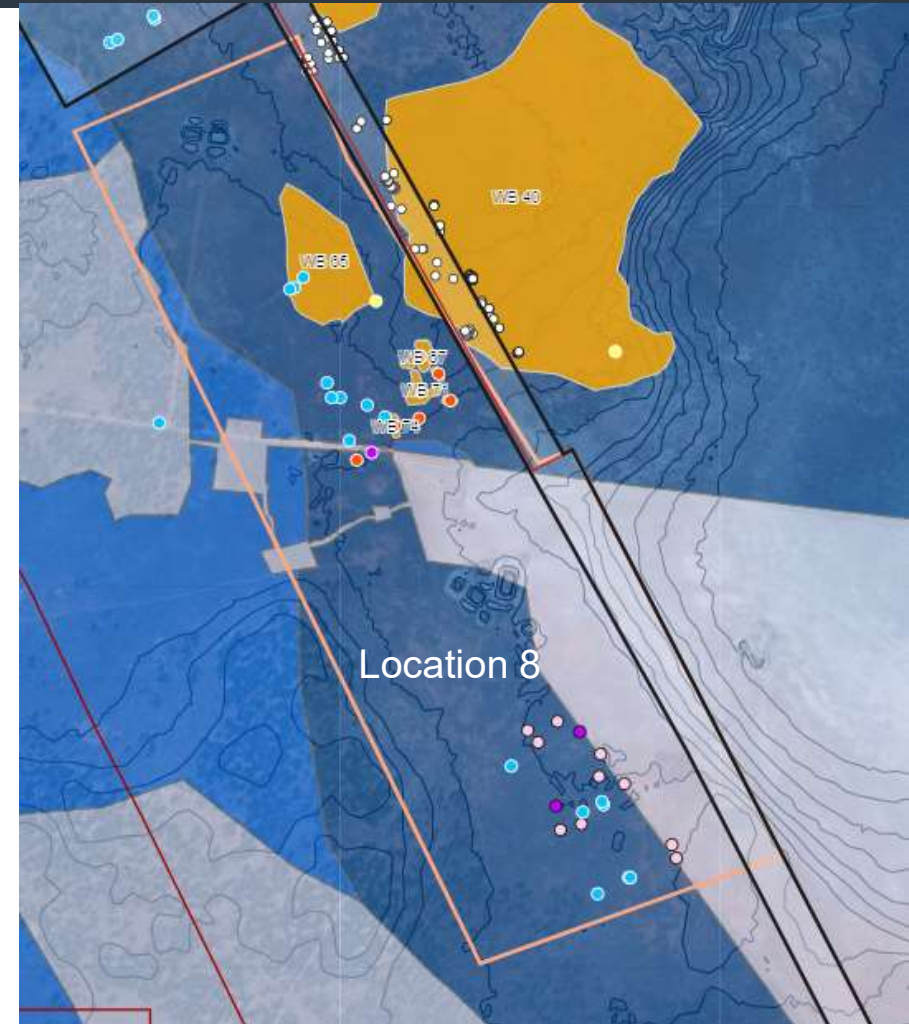
Aboriginal cultural heritage – WB45 & 120 survey results



WB 120 and WB 45

Aboriginal cultural heritage – MOD1 approach (con't)

- Implications of survey:
 - portion of the modification haul road intersecting with WB 40 should also be considered part 'Location 8' as it is part of the same landscape and is proposed to be addressed in accordance with the ACHMP archaeological subsurface excavation program for that area; and
 - PAD's identified as part of WB 41, WB 45 and WB 102 are discontinuous and comprise the same landscape that will be addressed by the exploratory test pitting within the approved SSD-5285 boundary portion of the proposed modification. Testing in these areas would therefore be limited but focus on vegetation mounds to gather OSL dating samples.



Proposed MOD1 ACHA schedule

Timing	Scope of tasks
Late January 2022:	Draft ACHA is provided to RAPs for 28-day review period. ACHA to include commitment to undertake test excavation program and update ACHA prior to MOD1 approval.
Early March 2022	RAP feedback is addressed and draft ACHA is finalised with test excavation commitment and submitted as part of MOD1.
March 2022:	Test excavation program is undertaken for areas outside approved SSD-5285 boundary in accordance with Code.
April 2022:	ACHA is updated with test excavation results, any amendments to modification are made and included as part of the MOD1 Submissions Report.
May/June 2022:	Heritage NSW reviews ACHA updates and final resolutions are made prior to MOD1 approval.

Regulator Engagement

- Stakeholder updates – scope and outcomes of assessment
 - DPIE – Assessments
 - DPIE – Water
 - DPIE – Biodiversity and Conservation Division
 - NSW Heritage
 - EPA
 - Transport for NSW
 - Mining, Exploration and Geoscience
 - Balranald Shire Council
 - DAWE (Commonwealth)
- Based on application of new mining method
 - SSE development of design criteria
 - Environmental impact summary
 - MOP, EMP, SMP, PIRMP, BMP, CHMP

Next Steps



7 March 2022

John Gilding
via email: John.Gilding@environment.nsw.gov.au

Ground floor, 20 Chandos Street
St Leonards NSW 2065
PO Box 21
St Leonards NSW 1590

T 02 9493 9500
E info@emmconsulting.com.au
www.emmconsulting.com.au

Re: Balranald Mineral Sands Project Modification 1 - notice of test excavation and sampling strategy

Dear John,

This letter provides notice of a test excavation to be conducted at West Balranald Mine, Balranald NSW (part of the Balranald Mineral Sands Project) in accordance with Section 15c of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (the Code DECCW 2010). A methodology is provided in fulfilment of Requirement 15c of the Code.

1 Overview

Iluka proposes to develop the Balranald Mineral Sands Mine. In 2015, an environmental impact statement (EIS) was prepared and submitted to accompany a State significant development (SSD-5285) application under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The project EIS was supported by an ACHA (Niche 2015) and in 2016, an Aboriginal Cultural Heritage Management Plan (ACHMP, Niche) was developed in consultation with project RAPs and approved in accordance with Condition #20 of the development consent.

The proposed modification (MOD1) investigation area intersects with four Aboriginal sites with PAD (WB 40, WB 41, WB 45 and WB 102) that warrant archaeological test excavation and reassessments of archaeological significance prior to the development of appropriate management measures. The portions of these sites within the MOD1 investigation area do not currently have approved impacts and management as they fall outside the approved EIS project area boundary.

Heritage NSW (Jackie Taylor and John Gilding) has been consulted about the scope timing of proposed test excavation in the MOD1 investigation area and recommended that the required fieldwork and reporting is completed for their review prior to approval of the proposed modification. As such, test excavation within the MOD1 investigation area will be undertaken subsequent to the submission of the modification report to DPIE with the outcomes to be provided in an ACHA addendum and submitted as part of the submission report.

2 Project location

West Balranald Mod 1 area is located approximately 12 km north-west of Balranald. The locations for the proposed test excavation are identified in the figures provided at the end of this letter.

3 Responsible entity

The responsible entity is Iluka Resources Limited (Iluka). The Iluka Mining contact is:

Jeremy Kenna

Senior Advisor – Communities
T: 0447 280 262
E: Jeremy.kenna@iluka.com

4 Person carrying out excavations

The excavation will be directed by Ryan Desic from EMM Consulting Pty Ltd (EMM):

Ryan Desic
Associate Archaeologist – Heritage Team Leader
T: 0411 329 712
E: rdesic@emmconsulting.com.au

5 Date and duration of excavations

The estimated start date is Monday 21 March 2022. The excavation is anticipated to run for 10 days. These dates may vary and if so, Heritage NSW will be advised.

6 Temporary storage location for Aboriginal objects

Artefacts and other samples will be retained temporarily by EMM for the required analysis of technological attributes. Such objects will be stored in a secure location and returned to Iluka as soon as practical after analysis and record is completed. Aboriginal cultural material that is suitable for dating may be submitted to a laboratory and used for dating purposes. Long term storage of material will comply with Section 6.5 of the ACHMP (Niche 2016).

7 Consultation

EMM initially presented the proposed assessment methodology for the project to registered Aboriginal parties (RAPs) in November 2021. This outlined that test excavation may be required as part of the project Aboriginal cultural heritage assessment (ACHA). EMM stated that the test excavation would follow the Code (DECCW 2010). No feedback was provided by RAPs in response to the methodology.

8 Sampling strategy

8.1 Method

The proposed excavation method will follow the Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010) and has been developed in accordance with Appendix 6 of the ACHMP (Niche 2016).

In accordance with the ACHMP (Niche 2016) a geomorphologist will be consulted to refine the test excavation areas and to determine what geomorphic assessment components will be suitable. This may include assistance with the collection of samples from the program that may help characterise and interpret the stratigraphy of the broader EIS project area and the chronology of Aboriginal occupation of the landscape.

The purpose of exploratory test pitting is to help characterise the landscape and determine the nature and composition of the Aboriginal heritage evidence in a location. Information collected during this phase will inform whether further targeted salvage excavation is required. The proposed methods are generally as follows:

- All test pit locations will be correlated to coordinates and Australian height datum (AHD) points established by a surveyor.
- Test pits (0.5 m by 0.5 m) to be set out at 10–20 m intervals within each test area.
- The first pit at each test location will be excavated by hand in 5 cm spits, then if suitable, each subsequent pit may be excavated in 10 cm spits or according to stratigraphic layers.
- Excavation of each test pit will be undertaken until it reaches either:
 - the depth of culturally sterile deposits;
 - bedrock;
 - the water table; or
 - a point where digging deeper would be unsafe.
- Test pits may be expanded, if necessary, in conjunction with a safe work method for excavating at depth or in unstable soil profiles.
- If a hearth is encountered then the feature will be excavated by hand in accordance with standard archaeological practice.
- Controlled mechanical excavation may be necessary if, for instance soils are cemented or for safe work methods for excavating at depth or in unstable soil profiles. The size of mechanical pits would be as small as reasonably achieved and in 10–20 cm spits and/stratigraphic units.
- All excavated soils to be sieved using a maximum 5 mm aperture mesh, with smaller apertures used if considered warranted by the excavation director.
- All cultural will be bagged and labelled.
- All test pits will be documented using photographic records, written descriptions, and scaled drawings.
- Soil samples to be collected for description, sedimentological and chronological analysis where appropriate.
- All pits will be backfilled after recording.

Areas to be targeted by test excavation are shown in the attached figure. Please note that the proposed method and targeted locations have been determined at desktop level. However, in consultation with the geomorphologist who will be inspecting the site, and once initial results from the test pits are assessed, test pit locations may be altered and/or omitted. This process would be determined in consultation with representatives of RAPs present on site.

8.2 Reporting

AHIMS site cards will be completed for each Aboriginal site and an Aboriginal Site Impact Recording Form prepared for each site impacted by the test excavation.

The results of excavation and subsequent management measures derived from the results will be formulated in consultation with RAPs and will be provided prior to or as part of the submissions report so that DPIE and Heritage NSW can consider any new information prior to MOD1 approval.

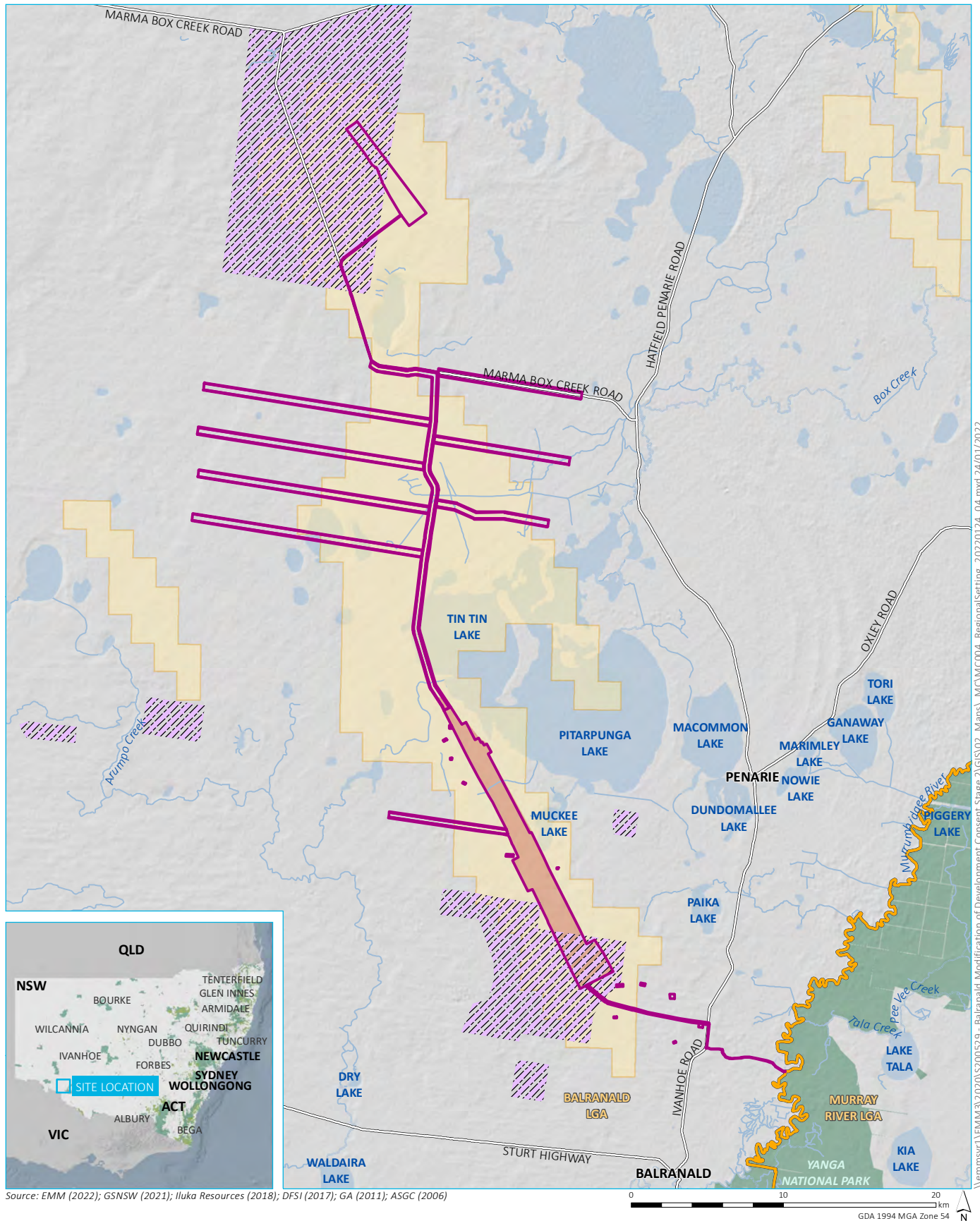
9 Closing

If you have any queries in regard to this letter and the proposed test excavation, please do not hesitate to contact me.

Yours sincerely

A handwritten signature in black ink, appearing to read 'P. Chauvel'.

Pamela Chauvel
Senior Archaeologist
pchauvel@emmconsulting.com.au



KEY

- EIS Approved Balranald Project Area (SSD-5285)
- Exploration Licence (EL7450)
- Mining Lease (ML1736)
- Southern Mallee Conservation Area (2015)
- Major road
- Watercourse/drainage line
- Waterbody
- NPWS reserve

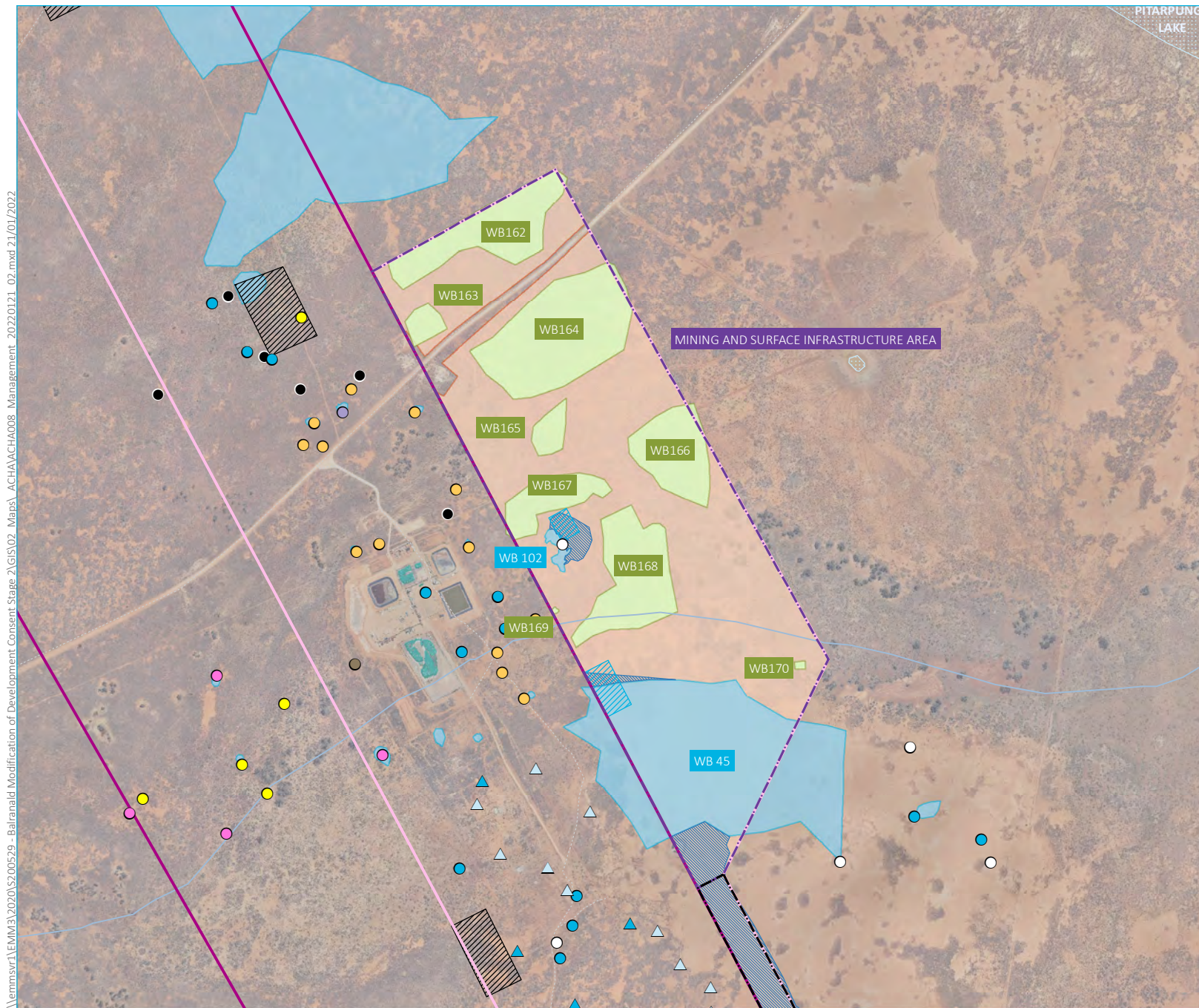
INSET KEY

- NPWS reserve
- State forest

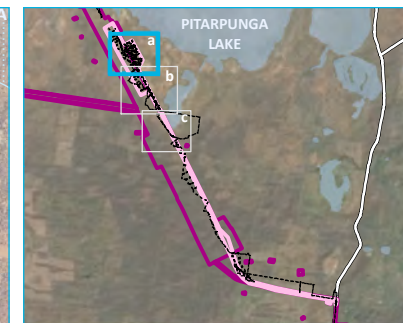
Regional setting

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 1.1

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Source: EMM (2014, 2021, 2022); ESRI (2022); Iluka Resources (2018, 2021); OEH (2021); DFSI (2017); Niche (2015, 2016); GA (2011)



KEY

■ EIS Approved Balranald Project Area (SSD-5285) (project area)

■ Proposed modification (study area)

--- Existing track

— Watercourse/drainage line

■ Waterbody

Investigation area

■ Mining and surface infrastructure area

■ Haul road north area

2021 survey results

■ Extended site boundary (EMM 2021)

■ Newly identified Aboriginal site (EMM 2021)

Previously recorded sites

BAHD sites (not on AHIMS)

▲ Artefacts

▲ Isolated artefact

AHIMS (13/10/2021)

● Art site

● Artefact site

● Artefact site: isolated find

● Artefact site; hearth

● Artefact site; hearth; PAD

○ Artefact site; PAD

● Hearth

● Hearth; PAD

■ Heritage site boundary (Niche 2015)

Approved management (ACHMP 2016)

■ Exploratory test pit

Proposed management: investigation area

■ Surface collection

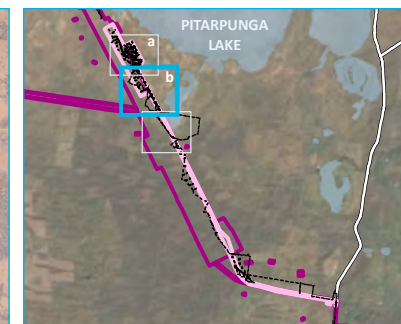
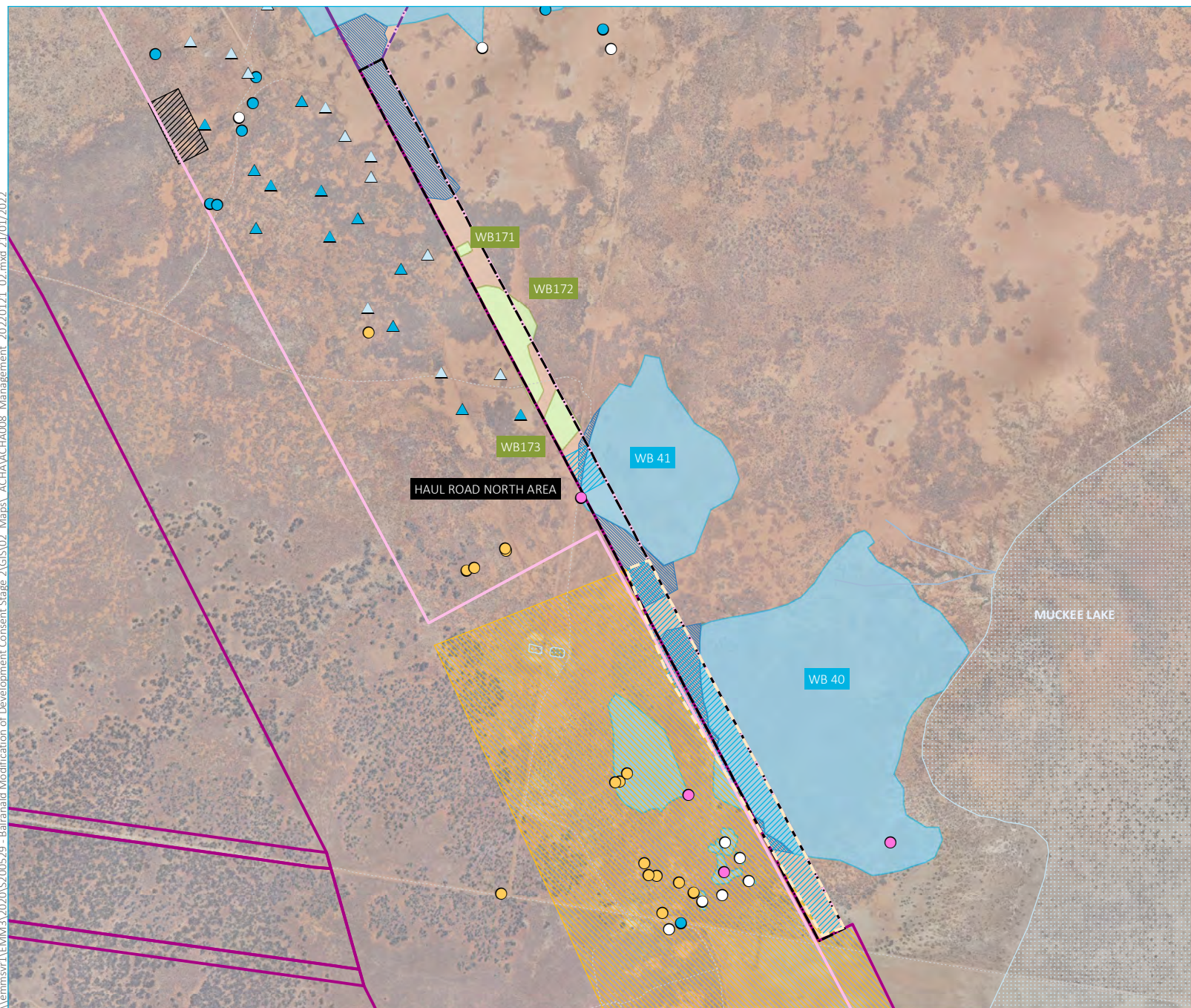
■ Indicative test excavation area

Management recommendations

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 7.1a



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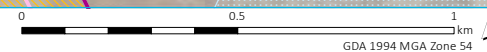
- KEY**
- EIS Approved Balranald Project Area (SSD-5285) (project area)
 - Proposed modification (study area)
 - Existing track
 - Watercourse/drainage line
 - Waterbody
 - Investigation area**
 - Mining and surface infrastructure area
 - Haul road north area
 - 2021 survey results**
 - Extended site boundary (EMM 2021)
 - Newly identified Aboriginal site (EMM 2021)
 - Previously recorded sites**
 - BAHD sites (not on AHIMS)
 - ▲ Artefacts
 - △ Isolated artefact
 - AHIMS (13/10/2021)
 - Artefact site
 - Artefact site: isolated find
 - Artefact site; hearth; PAD
 - Artefact site; PAD
 - Heritage site boundary (Niche 2015)
 - Approved management (ACHMP 2016)**
 - Exploratory test pit
 - Location 8 excavation area
 - Proposed management: investigation area**
 - Surface collection
 - Indicative test excavation area
 - Location 8 proposed extension

Management recommendations

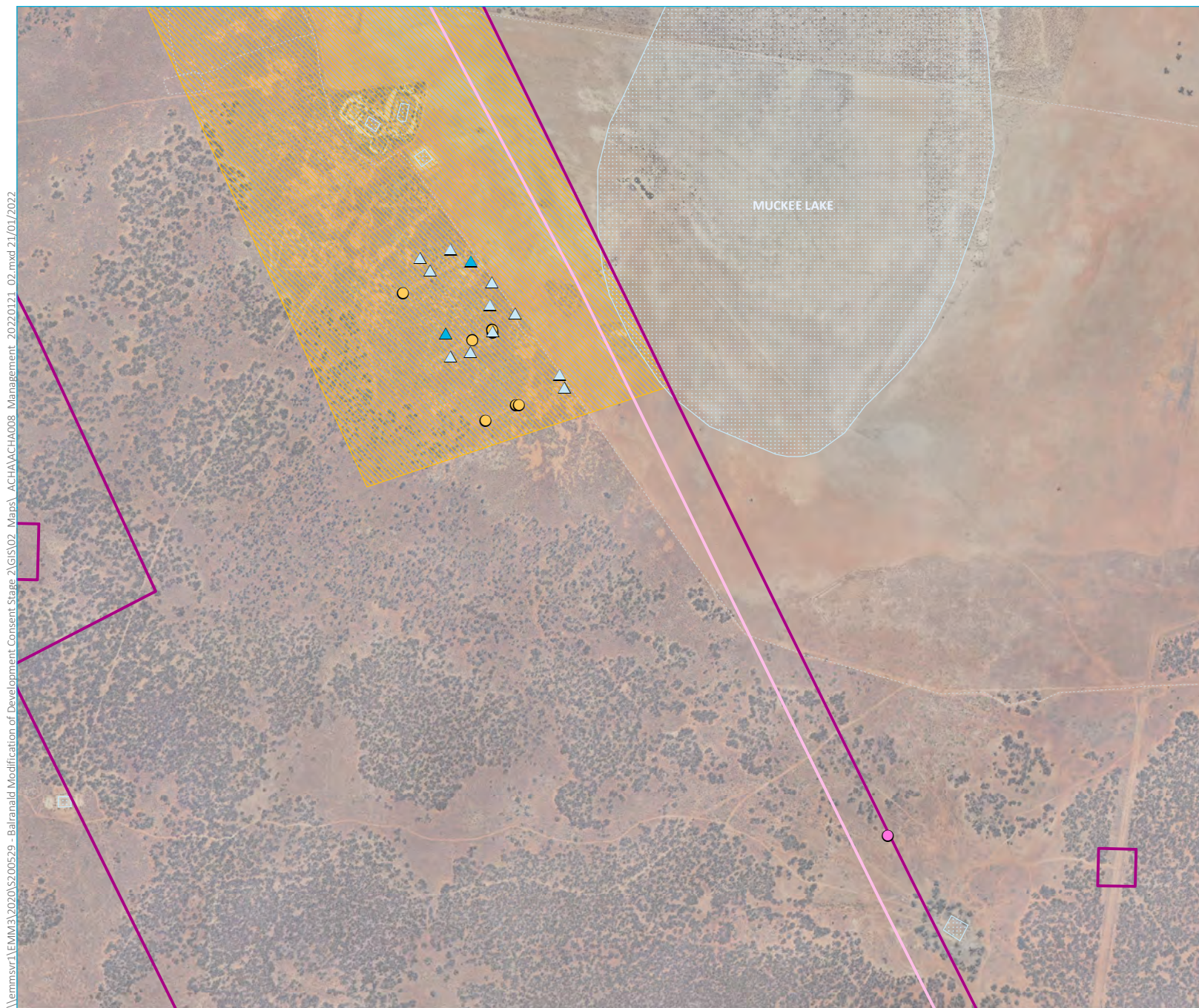
Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 7.1b



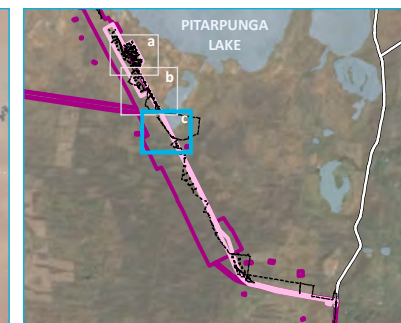
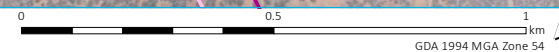
Source: EMM (2014, 2021, 2022); ESRI (2022); Iluka Resources (2018, 2021); OEH (2021); DFSI (2017); Niche (2015, 2016); GA (2011)



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Source: EMM (2014, 2021, 2022); ESRI (2022); Iluka Resources (2018, 2021); OEH (2021); DFSI (2017); Niche (2015, 2016); GA (2011)



KEY

- EIS Approved Balranald Project Area (SSD-5285) (project area)
- Proposed modification (study area)
- Existing track
- Waterbody

Previously recorded sites

BAHD sites (not on AHIMS)

- ▲ Artefacts
- ▲ Isolated artefact

AHIMS (13/10/2021)

- Artefact site: isolated find
- Artefact site; hearth; PAD

Approved management (ACHMP 2016)

- Location 8 excavation area

DRAFT

Management recommendations

Balranald Mineral Sands Project
Aboriginal cultural heritage assessment
Figure 7.1c





