Kimba National Radioactive Waste Management Facility

Aboriginal Heritage Desktop Assessment Report

PUBLIC VERSION
Approval for issue

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Executive Summary

The Australian Government, Department of Industry Innovation and Science (the Department) is seeking to establish a National Radioactive Waste Management Facility (the Facility), to manage low level and intermediate level waste generated in Australia. The Study Areas at Lyndhurst and Napandee in South Australia are two of three sites throughout Australia which were voluntarily nominated and currently under assessment to determine their viability to host the Facility.

RPS has been engaged by the Department to undertake an independent preliminary Aboriginal heritage desktop assessment which, in conjunction with other specialist studies, will provide an understanding of the nominated sites.

The Study Areas for this desktop assessment consist of those portions of Napandee and Lyndhurst that have been nominated as a potential location for the Facility. Both Study Areas are located within the District Council of Kimba Local Government Area and the Barngarla Native Title Claim Determination area.

The key findings of this preliminary desktop report are as follows:

- There is a paucity of archaeological research available for the northern Eyre Peninsular.
- A search of the Department of State Development-Aboriginal Affairs and Reconciliation (DSD-AAR) Central Archive did not identify any registered Aboriginal sites within a ten kilometre radius of either the Lyndhurst or Napandee Study Areas.
- Archaeological predictive mapping prepared for the Study Areas has identified areas of archaeological potential. These areas are associated with linear dunes that occur within the Study Areas and identified water sources. It is considered that stone artefact scatters are the most likely site type to occur within the Study Areas.
- Geoscience Australia has identified one potential 100ha location for the Facility within each Study Area.
- A number of key risks and key opportunities have been identified, based on the results of the preliminary desktop assessment:
  - Key risks have been identified for proposed facility and associated infrastructure to cause harm to unknown tangible and intangible heritage.
  - Key opportunities exist to involve the Traditional Owners in future stages of the project, providing training for younger members of the community on country and recording oral histories and accounts that may not have otherwise been recorded.
  - Key opportunity to consider land access agreements in the early stages of the project design and construction (if site selection for Lyndhurst or Napandee proceeds) to ensure the Traditional Owners have access to Country.
  - Key opportunities exist to create employment for the Traditional Owners not just during construction but also during the operational phase.
  - Key opportunities exist to involve local Traditional Owner artists in the aesthetic design of the Facility and to consult with the local community in regards to colours, materials, embellishments and cultural plantings to ensure the Facility is sympathetic to the local landscape and the Traditional Owners of the area.

The following recommendations are based on the preliminary findings of the desktop assessment and in consideration of the relevant legislation and guidelines:
It is recommended that consultation with Traditional Owners commence as soon as practicable. Aboriginal people are the primary determinants of their cultural heritage and should be given the opportunity to play an active role in shaping the management of that heritage.

A cultural heritage site visit with representatives and knowledge holders from the Traditional Owner community is recommended, in order to

- Ground-truth the findings of desktop research.
- Identify significant unrecorded archaeological sites.
- Identify unrecorded cultural heritage sites and discuss the cultural heritage values of the Study Area(s).

Comprehensive archaeological survey and assessment should be conducted, with Traditional Owner representatives, should Lyndhurst and/or Napandee be selected to host the Facility.

If the Study Areas are chosen to host the Facility, impacts to Aboriginal archaeological sites, areas of archaeological potential and Aboriginal cultural sites should be avoided as a priority. Where impacts cannot be avoided, management or mitigation measures should be formulated, in consultation with Traditional Owners. Mitigation measures would include, as a minimum:

- Consultation with the Barngarla community.
- Detailed archaeological and anthropological survey of the selected Facility location.
- Detailed recording, reporting and artefact analysis, including subsurface investigation if necessary.
- Detailed recording and reporting of intangible heritage values.
### Table 1.1 Abbreviations used in this report

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Details</th>
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<tbody>
<tr>
<td>ACHA</td>
<td>Aboriginal Cultural Heritage Assessment</td>
</tr>
<tr>
<td>ACHAR</td>
<td>Aboriginal Cultural Heritage Assessment Report</td>
</tr>
<tr>
<td>ACHMP</td>
<td>Aboriginal Cultural Heritage Management Plan</td>
</tr>
<tr>
<td>AHA</td>
<td>Aboriginal Heritage Act</td>
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<tr>
<td>BDAC</td>
<td>Barngarla Determination Aboriginal Corporation</td>
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<tr>
<td>CHL</td>
<td>Commonwealth Heritage List</td>
</tr>
<tr>
<td>DSD-AAR</td>
<td>Department of State Development-Aboriginal Affairs and Reconciliation</td>
</tr>
<tr>
<td>EPBC</td>
<td>Environment Protection and Biodiversity Conservation</td>
</tr>
<tr>
<td>GIS</td>
<td>Geographic Information System</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>HWG</td>
<td>Heritage Working Group</td>
</tr>
<tr>
<td>LGM</td>
<td>Last Glacial Maximum</td>
</tr>
<tr>
<td>LIDAR</td>
<td>Originally a portmanteau of ‘light’ and ‘radar’, sometimes considered to stand for Light Imaging, Detection, And Ranging</td>
</tr>
<tr>
<td>mya</td>
<td>million years ago</td>
</tr>
<tr>
<td>NHL</td>
<td>National Heritage List</td>
</tr>
<tr>
<td>NNTT</td>
<td>National Native Title Tribunal</td>
</tr>
<tr>
<td>NRM</td>
<td>National Resource Management</td>
</tr>
<tr>
<td>RARBs</td>
<td>Register of Recognised Aboriginal Representative Bodies</td>
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<tr>
<td>SA</td>
<td>South Australia</td>
</tr>
<tr>
<td>UNESCO</td>
<td>United Nations Educational, Scientific and Cultural Organization</td>
</tr>
<tr>
<td>WHL</td>
<td>World Heritage List</td>
</tr>
<tr>
<td>yBP</td>
<td>Years Before Present, with 1950 considered as present</td>
</tr>
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</table>
1 Introduction

The Australian Government, Department of Industry Innovation and Science (the Department) is seeking to establish a National Radioactive Waste Management Facility (the Facility), to manage low level and intermediate level waste generated in Australia. The Study Areas at Lyndhurst and Napandee in South Australia are two of three sites throughout Australia which were voluntarily nominated and currently under assessment to determine their viability to host the Facility.

RPS has been engaged by the Department to undertake an independent preliminary Aboriginal heritage desktop assessment which, in conjunction with other specialist studies will provide an understanding of the nominated sites.

1.1 Project background

Project phases

The National Radioactive Waste Management Facility project consists of four stages. This desktop report along with other environmental technical assessments, is intended to inform the “Site Characterisation” phase. This phase also includes the development of a detailed business case for each site under consideration with reference to site specific design and cost estimates. In addition the Australian Government is consulting the surrounding community on what hosting the Facility means for their community.

As part of this detailed phase, studies are being undertaken to assess each site’s environment, cultural heritage and access to infrastructure and enabling services. These assessments will provide an understanding of the nominated sites, and the provisions needed to be made should a Facility be established at any of the sites.

If a site progresses to the next stage, further assessment will be needed, including:

- More detailed environmental assessments to further develop a conceptual site model and establish baseline environmental conditions, prior to submitting applications to regulators for approvals to construct the Facility.
- An Aboriginal Cultural Heritage Assessment Report (ACHAR) to identify key cultural heritage values relevant to the preferred site. Based on the findings of this report, an Aboriginal Cultural Heritage Management Plan would be compiled to implement the recommendations of the ACHAR. The Aboriginal Cultural Heritage Management Plan would be updated, in consultation with Traditional Owners, throughout construction and during the life of the Facility.
- Reviewing the options identified for enabling infrastructure and developing a concept design for a preferred option for each type of enabling infrastructure, with input from the community.

This phase would also include the further development of a detailed business case for the Project with final engineering and other technical design costings. A Facility Management Committee would be established with community representation. Community engagement would continue through this phase to develop opportunities for capacity building for local businesses and employees.

The third and fourth stages of the Project are the Construction and Operational phases.
1.2 Study Area definition

The Study Areas for this desktop assessment are defined as the nominated portions of Lyndhurst and Napandee properties (Figure 1.1). Both Study Areas are located within the District Council of Kimba Local Government Area.

The Lyndhurst Study Area is located north of Bindawalla Gate Road. It is located approximately 1.8 kilometres south of Lake Gilles and approximately 15 kilometres north east of Kimba.

The Napandee Study Area is located at the corner of Larwood Road and Tola Road. It is approximately 1.2 kilometres north of the Pinkawillinie Conservation Park. Kimba is located approximately 22 kilometres east of the Napandee Study Area.

Preliminary desktop analyses undertaken by Geoscience Australia have identified a 100ha area within each Study Area as suitable locations for the proposed Facility (Figure 1.1). The locations identified by Geoscience Australia do not limit this study.

1.3 Purpose and Scope of this Report

This report presents the findings of desktop research, literature review, LiDAR survey results and landscape analysis and provides a preliminary assessment of Aboriginal cultural heritage values within the Study Areas.

It is understood that the Department will work with the Barngarla Determination Aboriginal Corporation (BDAC) for the purposes of the Aboriginal Cultural Heritage Assessment should the Project proceed at either Study Area and further detailed assessment be required. As such, Aboriginal community consultation has not undertaken for this desktop assessment report.

This report provides a preliminary assessment of impacts associated with potential locations for the Facility within the Study Areas and provides recommendations as to how the Department might avoid, minimise or mitigate the direct and indirect impacts of the Facility on identified Aboriginal cultural heritage values.

This report includes the following:

- A description of the proposed works and site selection process.
- A discussion of the environmental context of each Study Area.
- A discussion of the Aboriginal and historical context of each Study Area.
- A preliminary summary of the archaeological context of each Study Area including a discussion of previous archaeological work in the area.
- The results of LiDAR survey and landscape analysis.
- Preliminary statements regarding an archaeological predictive model.
- Development of preliminary significance and impact assessments.
- Development of preliminary management and mitigation principles.
FIGURE 1.1 LOCATION OF THE STUDY AREAS

LOCATION

DC OF KIMBA

PURPOSE: HERITAGE

LOCATOR: RPS, AECOM, ESRI, GeoScience Australia

© Commonwealth of Australia (Geoscience Australia), 2017. This product is released under the Creative Commons Attribution 4.0 International Licence. http://creativecommons.org/licenses/by/4.0/legalcode, Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community. SaferEar, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AaeroGRID, IGN, and the GIS User Community.

Location Path: N:\Projects\Conics_Sydney\PR140661 - Kimba National Radioactive Waste Management Facility\GIS\MXD\Figure1.1_Location.mxd

Version (Plan By): C. Rayner

Datum: GDA94

Projection: MGA Zone 56

Data Sources: RPS, AECOM, ESRI, GeoScience Australia

Data: NRI Projects Center, Sydney, PR140661 - Kimba National Radioactive Waste Management Facility/GIS/MD5/Figure1.1_Location.mxd

Job Ref: PR140661

Date: 11/08/2017

Scale: 1:155,000 at A4 size

Client: DIIS

Technician: claire rayner

Date: 27-Jun-18

Technician: claire rayner
2 Legislative Context

Legislation and heritage management guidelines relevant to Aboriginal heritage and the project are outlined in this chapter. The following overview of the legal framework is provided solely for information purposes for the client for the purpose of explaining the background to the factors relevant to cultural and heritage assessment, it should not be interpreted as legal advice. RPS will not be liable for any actions taken by any person, body or group as a result of this general overview and recommend that specific legal advice be obtained from a qualified legal practitioner prior to any action being taken.

**National Radioactive Waste Management Act 2012 (Cth)**

The *National Radioactive Waste Management Act 2012* (*NRWMF Act*) establishes a legislative framework for siting a National Radioactive Waste Management Facility on volunteered land. Under the Act a facility will be established to manage radioactive waste generated by Australia’s medical, industrial, agriculture and research use of nuclear materials. The Act was developed in accordance with international best practice and includes provisions to ensure the selected site undergoes full environmental, heritage and other approval processes. Currently, Australia’s radioactive waste is stored at more than 100 sites around Australia, many of which were not built for this purpose. It is internationally accepted that centralised radioactive waste management facilities offer substantial safety and security benefits by minimising risk of accidental loss of control of radioactive waste, thereby protecting the community and environment from any adverse effects.

The NRWM Act overrides certain State and Commonwealth laws to the extent they regulate, hinder or prevent activities which are necessary for or incidental to the site selection activities described in section 11 of the NRWM Act, provided those activities are carried out by the Commonwealth, a Commonwealth entity or its contractors, employees or agents.

Similarly, the NRWM Act also overrides certain State and Commonwealth laws to the extent they regulate, hinder or prevent activities which are necessary for or incidental to the activities set out in section 23 of the NRWM Act, including the development, operation, maintenance and decommissioning of the facility, provided those activities are carried out by the Commonwealth, a Commonwealth entity or its contractors, employees or agents.

**Environment Protection and Biodiversity Conservation Act 1999 (Cth)**

The *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*) is overridden by the NRWM Act so far as it relates to site selection activities. However, the EPBC Act is not overridden in respect the development, operation, maintenance and decommissioning of the facility.

This report therefore takes the EPBC Act into account and will ultimately inform the referral, assessment and approval process for the Facility. In particular, this report has regard to the definitions of environment, heritage value and Indigenous heritage values, and also the *EPBC Act Policy Statement on the Definition of Environment* and the *Ask First: A Guide to Respecting Indigenous Heritage Places and Values and Engage Early: Guidance for proponents on best practice Indigenous engagement for environmental assessments under the EPBC Act*.

**Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)**

The NRWM Act overrides the *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (*ATSIHP Act*) for site selection activities and enables regulations to be made which would do that for development, operation, maintenance and decommissioning of the facility, however no such regulations have been made to date.
This report takes the ATSIHP Act into account, by having regard to the definitions of significant Aboriginal area, significant Aboriginal object, Aboriginal tradition and Aboriginal remains in that Act.

**Aboriginal Heritage Act 1988 (SA)**

South Australian laws which relate to the issues listed in section 12 and 24 of the NRWM Act have no effect (that is, are overridden) to the extent they regulate, hinder or prevent activities which are necessary for or incidental to the site selection activities described in sections 11 of the NRWM Act or the activities described in section 23 of the NRWM Act, provided those activities are carried out by the Commonwealth/Aboriginal Heritage Act 1988 (SA) (AHA) is therefore affected by the override in the NRWM Act.

This includes South Australian laws so far as they relate to the archaeological or heritage values of the land, including the significance of land, premises or objects in the traditions of Indigenous people. The Aboriginal Heritage Act 1988 (SA) (AHA) is therefore affected by the override in the NRWM Act.

This report takes the AHA into account by having regard to the definitions in the AHA of Aboriginal sites, objects and remains, and the definition of traditional owners. It also utilises information contained the Register of Aboriginal Sites and Objects which is maintained as part of the South Australia State Records Central Archive (requests for information are managed by the Department of State Development-Aboriginal Affairs and Reconciliation (DSD-AAR)).

The AHA provides for Recognised Aboriginal Representative Bodies (RARBs) to be appointed for the purposes of the AHA. If any RARBs are appointed relevant to the Study Area that the Department has not already consulted, the Department will consult them in due course.

**The Native Title Act 1993 (Cth)**

The Native Title Act 1993 (NTA) established the recognition under Australian law of the Native Title of Aboriginal and Torres Strait Islander peoples over their lands. Native Title recognises that Aboriginal and Torres Strait Islander peoples had a system of law and ownership of their lands before European settlement. Native Title differs from other legislative land rights systems in Australia as it is not a grant or right created by the Australian government or dependant on recognition by the common law to be recognised. Rather it is a pre-existing right, inherent to Indigenous peoples by virtue of their distinct identify as first owners and occupiers of the land and their continuing systems of law.

Both Study Areas are located within the area covered by the Barngarla Native Title Determination (Figure 2.1). The outside boundary of the Barngarla determination area covers a large portion of the Eyre Peninsula to the west of Port Augusta and north of Wudinna. It includes three national parks, the Lake Gilles Conservation Park, Pinkawillinie Conservation Park and Hambidge Wilderness Protection Area.

On 6 April 2018, the Federal Court confirmed that Native Title has been extinguished over both Study Areas. The Court also determined that Native Title is extinguished in other parts of the determination area, and continues to exist in other areas as described in the determination. For example, Native Title continues to co-exist with the rights of the Crown and others in conservation and wilderness parks created pursuant to the National Parks and Wildlife Act 1972 (SA) and the Wilderness Protection Act 1992 (SA), but that those other interests prevail over the Native Title rights and interests to the extent of any inconsistency. Where it exists, Native Title is held by the Barngarla People within the determination area.

The Lyndhurst Study Area is bordered to the north by an area where the Gawler Ranges People have been determined to hold Native Title, and that Native Title co-exists with the interests held under the Uno Pastoral Lease. The Gawler Ranges determination provides that in that area, the rights of the pastoral lessee prevail over the relevant Native Title rights and interests to the extent of any inconsistency.
Native Title South Australia Act 1994 (SA)

The Native Title South Australia Act 1994 (NTSAA) was implemented by the South Australian Government to validate past acts and incorporate provisions to validate intermediate period acts through later amendments - Native Title (South Australia) (Validation and Confirmation) Amendment Act 2000 (SA).
FIGURE 2.1 NATIVE TITLE DETERMINATIONS IN RELATION TO THE STUDY AREA.

Note that on 6 April 2018 the Federal Court determined Native Title is extinguished over both Study Areas (source: National Native Title Tribunal).

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Data Sources: RPS, AECOM, ESRI, GeoScience Australia
3 Methodology

3.1 Preliminary Aboriginal heritage desktop assessment

The methodology for this assessment has been developed with regard to legislative requirements and heritage best practice.

Desktop research

The aim of the desktop assessment is to identify existing Aboriginal heritage constraints as well as any potential Aboriginal heritage constraints. The desktop assessment, in conjunction with other specialist studies, will provide an understanding of the nominated Study Areas.

This component includes the following steps:

- Identification of statutory requirements relevant to the project.
- Australian Heritage Database searches, including the World Heritage List, National Heritage List, Commonwealth Heritage List and South Australian Register of Aboriginal Sites and Objects.
- Literature review.
- Landform assessment.
- Evaluate known and potential impacts.
- Discussion and recommendations.

Consultation

The purpose of community consultation is to ensure that Aboriginal people play an active role in shaping the management of their cultural heritage. Aboriginal people are the primary determinants of the cultural significance of sites and places. The Heritage Commission publication “Ask First: a guide to respecting Indigenous heritage places and values” (Ask First guide) provides guidelines for Aboriginal community consultation in accordance with the requirements of the Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act). As per the Ask First guide, cultural significance is determined in accordance with relevant Aboriginal cultural groups before decisions can be made regarding the management of places and heritage values.

Productive consultation, that benefits both project outcomes and Aboriginal stakeholders, hinges upon transparent and consistent communication regarding proposed impacts to and management of heritage values.

It is understood that the Department will work with the Barngarla Determination Aboriginal Corporation (BDAC) for the purposes of an Aboriginal Cultural Heritage Assessment if either Study Area is selected to host the Facility. This will draw on an independent study commissioned by the BDAC as well as further direct consultation with Traditional Owner elders and knowledge custodians. Should the project proceed at either site further detailed assessment will be required, including the development of strategies to protect and promote any heritage that may be present.

Landscape mapping and LiDAR survey

Landscape mapping is used to identify sensitive landform features and areas with potential for unlisted or registered Aboriginal sites. By considering existing environmental features such as soil landscapes, geology, water sources and landform disturbance with cultural knowledge it is possible to predict where Aboriginal
sites are likely to occur within the Study Areas. The predictive model developed for the Study Areas was formed through the consideration of a number of conditions that influence the location of Aboriginal sites in the landscape. These were applied using buffering techniques and Boolean queries. The results of the landscape analysis and Predictive Model adopted for the Study Areas are described in Section 5.

Parameters that informed the identification of sensitive landforms and prevalence of site types within the region are based on data gathered during desktop research for this assessment. Landscape mapping may be refined during the Aboriginal Cultural Heritage Assessment, based on data gathered during Aboriginal community consultation.

3.2 Limitations and constraints

This report presents the findings of preliminary desktop research and LiDAR survey and landscape analysis. Consultation with Traditional Owners has not formed part of this assessment, it is understood that the Department will consult with Traditional Owners for the purposes of the Aboriginal Cultural Heritage Assessment. If either of the Kimba Study Areas are selected to host the Facility broad community consultation would be undertaken during the technical investigation phase.

3.3 Investigators and contributors

This report has been prepared by RPS Heritage Consultants. LiDAR Data was provided by AECOM. GIS mapping and analysis of LiDAR results was prepared by RPS Heritage Consultants and RPS GIS geospatial specialists.

Community consultation with Barngarla Traditional Owners has not been undertaken as a component of this study. Any comments contain herein about Barngarla culture have been gathered through literature review and would need to be reviewed and refined following community consultation.
4 Environmental and Aboriginal Heritage Context

4.1 Introduction

An understanding of the environmental context of the Study Areas is important in appraising the type and availability of natural resources which would have been available and utilised by Aboriginal people in the past. This environmental context discusses each Study Area as a whole in order to build an understanding of the subject landscape.

4.2 Environmental Context

The Study Areas are located within the northern Eyre Peninsular. They are located to the south east of the Gawler Ranges and south west of the Flinders Ranges. The landforms present within this region are closely related to and influenced by the underlying geology of the area (Twidale & Campbell 1985). The Gawler Craton is the oldest and largest geological province in South Australia and includes the York Peninsular, extending west to Lake Torrens, north to Marla and west to Ooldea (Parker et al 1985). This province is tectonically stable and virtually unaffected by tectonic events since it was formed 1,450 million years ago (mya). The area is characterised by rolling plains, longitudinal dunes, limestone uplands, granite hills and salt lakes. Rich mineral deposits are regularly exploited in the region, predominantly iron ore. The granite hills provide a source of quartz and outcrops of silcrete and chert are also known in the area (Twidale & Campbell 1985).

Based on Twidale and Campbell’s (1985) geomorphological classification of the Eyre Peninsular, the Lyndhurst Study Area is located within the Kimba Peneplain, a rolling plain geomorphological unit. This region is characterised as an extensive plain of low broadly rolling relief underlain by weathered rocks (Twidale and Campbell 1985: 66). Much of the surface carries a veneer of calcrete with some areas featuring linear dune development (Twidale & Campbell 1985: 67).

The geomorphological unit in which the Napandee Study Area is located is characterised as siliceous sand ridge plains, longitudinal dunes and Pinkawillinie Plain (Twidale & Campbell 1985). This unit consists of fields of siliceous quartz dunes with some longitudinal or parabolic dunes superimposed on low rolling plains cut in to granite rocks (Twidale & Campbell 1985: 68). These dunes are generally north west to south east trending. The origins of the dunes are debated however it is thought that formation occurred through aeolian processes approximately 10,000 30,000 years ago (ya) when the climate was more arid than today (Twidale & Campbell 1985: 67).

The Napandee Study Area is underlain by Moornaba Sands, a Quaternary sediment body consisting of white pale grey orange sand forming dunes and spreads (Flint & Rankin 1989). Moornaba Sands occur along the Gawler Ranges margins. These sands are underlain by the Pooraka formation, a colluvial and fluvial dark brown and mottled grey gravelly clay. Geotechnical testing undertaken by AECOM within the Napandee Study Area identified a fine to medium grained orange-brown silty sand topsoil to 20 centimetres below ground surface underlain in some test units by a gravelly sand with angular to subangular cobbles (2018). The lowest layer in the test units generally consists of fine to medium grained orange-brown sand or clayey sand to 3.2 metres below ground surface (AECOM 2018).

The underlying geology of the Lyndhurst Study Area is predominantly comprised of Moornaba Sands (Parker & Flint 1983). The southern portion of the Study Area is underlain by undifferentiated quaternary profiles consisting of thin soil veneers over relatively thick and locally exposed Pooraka Formation. A small portion of the Study Area is underlain by Warrow Quartzite which forms part of the Hutchinson Group. This geological
formation consists of flaggy to massive, micaceous and feldspathic quartzite. The Geotechnical testing program undertaken in the Lyndhurst Study Area by AECOM identified similar deposits to the Napandee Study Area with no obvious differentiating characteristics (AECOM 2018).

The Study Areas are characterised by a semi-arid climate receiving less than 350 millimetres of rain per year with high evapotranspiration rates (Brandle 2010: 5). Salt Creek is the closest watercourse to the Study Areas, located approximately 55 kilometres south of the Lyndhurst Study Area and approximately 60 kilometres south east from the Napandee Study Area. Various unnamed minor watercourses are located to the north of the Study Areas, associated with the Gawler Ranges. Lake Gilles is located just east of the Lyndhurst Study Area. This is an ephemeral lake system surrounded by samphire vegetation communities (DEWNR 2014).

The Study Areas have largely been cleared for agricultural activities however remnant vegetation communities of Mallee Woodland and Shrubland with Hummock Grasses associated with consolidated dunes do occur. It is likely prior to European settlement that the Mallee Woodland covered the entirety of both Study Areas. A rich variety of native mammals, birds and reptiles have been identified within the Eyre Peninsula IBRA region (Brandle 2010). In association with Mallee woodland and shrubland animals such as macropods, native rodents, carnivorous marsupials, native honey eaters, lizards and skinks have all been recorded (Brandle 2010).

The environmental features of the local region provided ample resources for Barngarla people in the past and today. The underlying geology of the nearby Gawler Ranges includes raw materials suitable for stone tool production such as silcrete, quartz and cherts. The local area features an abundance of ancillary resources such as animals and plants influenced by the ancient landscape that has formed over millions of years.

4.3 Aboriginal Ethno-Historical Context

The eastern Eyre Peninsula is home to the Barngarla people. Barngarla country is described as extending north from Port Lincoln towards the Gawler Ranges as far as the southern end of Lake Torrens (Clendon 2015: 1). Barngarla is a member of the South Australian Thura-Yura group of languages. The geographical range of these languages extends from the Mount Lofty Ranges in the southeast to the Flinders Ranges in the north and west along the South Australian coast (Clendon 2015: 2). Thura-Yura languages were generally mutually intelligible, at least along their margins. For example, a Barngarla, Adnyamathanha and Kuyani speaker could understand each other in their own language (Clendon 2015: 2). Whilst Kaurna, Nhukenu and Nharrangga to the south could understand each other (Clendon 2015: 2). These similarities across linguistic groups suggest transmission of ideas and social and material exchanges between differentiated social units. Berndt suggests that this is evidence of territorial flexibility rather than Tindale’s model of inflexible tribal barriers and territories (Berndt 1985: 127). This is not to say that Thura-Yura language groups were not territorial, rather that cultural exchanges occurred across these boundaries within the social obligations in regard to one’s own and others Country.

Clamor Schürman, a Lutheran missionary, recorded much of what is known today about early Barngarla people and practices during his stay in Port Lincoln in the 1840s (Clendon 2015: 8). Schürman published a Barngarla grammar in 1844 and later his observations of Barngarla life in 1846 (Schürman 1846).

Early European accounts should generally be treated with caution for their inherent biases and knowledge gaps. It should also be noted that Schürman was living and writing about Barngarla life in Port Lincoln on the coast of the southern Eyre Peninsula. However, aspects of Schürman’s account combined with what is known of other Thura-Yura groups provide a glimpse of Barngarla life in the early colonial period.

Barngarla is a matrilineal exogamous moiety system (Schürman 1846: 222). This system sees each Barngarla person belonging to one of two moieties, Madharhi and Garharru (after Clendon 2015, also
spelled Mattiri and Karraru Schürman 1846). A Madharhi woman may marry a Garharru man, but not a Madharhi man (Berndt 1985:129). Similarly a Garharru man may marry a Madharhi woman, but not a Garharru woman (Berndt 1985: 129). A child of these unions would belong to the moiety of the mother and share in the social and ritual obligations of that moiety (Berndt 1985: 129).

Barngarla people used an extensive tool kit adapted to their environment. Spears were constructed of young thin gums and used by men for hunting either with or without barbs attached to the end (Schürman 1846: 213). Schürman describes men carrying a bundle of spears likely adapted to different hunting tasks and prey whilst the midla was used to assist in throwing spears (Schürman 1846: 213). Heavy wooden clubs called wirris were used for hunting small prey such as a kangaroo rat but could also be used in a fight before taking up spears (Schürman 1846: 214). Roots were dug up using a thick short stick called a kiatta (Schürman 1846: 214). Bags woven from plant fibres or constructed of animal skins were carried by both Barngarla men and women, called a nurti (Schürman 1846: 215). Schürman described the men’s nurti as containing:

“All the above weapons and implements… a large flat shell for drinking, a round smooth stone for breaking the bones of animals, one or more kinds of paint, a wooden scoop used in roasting roots, some pieces of quartz and the whole skin of some animal which answers for a purse to keep minute things in such as kangaroo sinews and pointed bones of various sizes…sharp edged bones to peel roots with, tufts of feathers, tips for beards, strings, spear barbs…”

Schürman’s mention of kangaroo sinews and bone points are related to the clothing made from kangaroo skins worn by men and women (Schürman 1846: 210). The feathers and beard tips relate to items used by men to decorate themselves using string and feathers in their hair or attaching dingo tails to their beards (Schürman 1846: 211). These descriptions of material culture are valuable as animal skins, delicate bone points and wooden implements often do not survive in the archaeological record to the extent that more robust items such as stone tools do.

The Barngarla divided food into two categories, mai, vegetable and plant foods and baru (after Berndt 1985:130, also spelled paru Schürman 1846), animal foods (Schürman 1846: 216). Within these food groups restrictions were applied to who could eat certain foods based on age and gender (Schürman 1846: 220). For example, young men and women were restricted from eating bandicoot as it would age them prematurely (Berndt 1985: 131). In other cases, the consumption of some foods was encouraged such as snake meat by females as it was believed to ensure fertility (Berndt 1985: 131). Barngarla people exploited a range of foods including wallaby, kangaroo, kangaroo rat as well as a range of grubs, native fruits and roots. Schürman describes the seasonal availability of foods on the Eyre Peninsular such as the menka and nondo beans which grew in abundance between Coffin and Sleaford Bays (Schürman 1846: 217). The abundance of food attracted large numbers of Barngarla and neighbouring groups to the region in Summer.

Ceremonies would be held generally in Summer attended by large numbers of Barngarla and neighbouring groups. Men and women would decorate themselves with black, red and white ochre (Schürman 1846: 212). Schürman notes that red ochre would be sourced from the far north (Schürman 1846: 212). This could be a reference to the Parachilna Ochre source which was located on a major trade route in the Flinders Ranges within Adnyamathanha Country (McBryde 2000). The Wilyakinyis, which is the third and last stage of the Barngarla initiation ceremony has been noted for its similarities with the Wilyaru ceremony also shared by the Adnyamathanha, Wirangu, and Kuyani people and even further afield with the Arrernte people. This could provide further evidence of cross cultural interactions between the Thura-Yura language groups.

The arrival of Europeans on the Eyre Peninsular had devastating and irreversible impacts on Barngarla life. Early clashes between Barngarla people and the settlers at Port Lincoln were incredibly violent. The hostility of the Barngarla people in these early interactions is reported to have almost turned the settlers away (Brock 1987: 117). It is only recently that the profound effects of these hostilities have been accepted into the dominant historical discourse of the area. An example of this is the memorial erected at Waterloo Bay to commemorate the victims of the Elliston Bay Massacre (Gage 2017). In 2016 the Barngarla Native Title...
Claim was determined, 20 years after it was first registered with the Native Title Claim’s Register. Since 2012 a program to reclaim the Barngarla Language has been underway by the University of Adelaide and the Barngarla Community.

4.4 European Land Use Context

The arrival of Europeans in Australia had a profound and devastating effect for Aboriginal people across the continent. The first documented arrival of Europeans to the area was in 1802, when Matthew Flinders sailed up the Spencer Gulf in a sloop named The Investigator (Bonney 2007:12). During this expedition, Flinders gave many of the surrounding landmarks European names such as ‘Mt. Brown’ and ‘Mt. Arden.’ Flinders put a land party to shore, where they trekked through the local hills and collected botanical samples. There is no recorded contact from Flinders with the local Aboriginal people during this expedition, however, it is likely that the exploration party was observed by Barngarla, Nukuna and Adnyamathanha people (Bonney 2007:12).

Thirty-eight years later, Edward Eyre under the organisation of Captain Charles Sturt embarked on an overland expedition into ‘the interior of Australia’ (Bonney 2007:12). Eyre, who had travelled north the previous year to the top of Spencer Gulf and beyond had observed Lake Torrens, described the area as a ‘dry, barren landscape.’ It was during this expedition that Mount Eyre was named (Bonney 2007:13). This 1839 expedition also resulted in the naming of the Gawler Ranges, after George Gawler, then Governor of South Australia at the time of the expedition (Department Environment and Heritage 2007). Eyre is known to have travelled north-west from Lincoln to Streaky Bay, then inland through the Gawler Ranges to the head of Spencer Gulf (Sumerling 1987).

It was on these expeditions in the pursuit of agricultural land that Eyre had his first contact with the local Aboriginal community. At Scott’s Creek, Eyre’s second-in-command captured and held an Aboriginal woman for several days (Wilton et al 1986:11). Fifty or more Aboriginal men are recorded as threatening the explorer’s camp, though no blood was shed. Eyre gave one of the men a tomahawk and released the Aboriginal woman, and the expedition continued on (Wilton et al 1986:11). Eyre is also known to have been accompanied by ‘an Aborigine [sic]’ when travelling to Point Bell on this expedition (Sumerling 1987). European exploration in the area marked a period of confrontation and conflict between the Aboriginal community and European settlers and explorers. While conducting a privately funded expedition to the country west and north-west of Port Lincoln and Spencer Gulf, John Charles Darke was speared by an Aboriginal man and was buried at Darke Peak, approximately 40 kilometres south-west of Kimba (Casanova 1992:84).

Within the 20 years following Eyre’s expedition, a large number of pastoral farmers came to the area. In 1834, the South Australia Act empowering His Majesty to erect and establish provinces in South Australia. These pastoral farmers generally ran sheep and cattle and often took up long-term crown leases of vast tracts of land (Bonney 2007:16). Patterns of settlement were such that coastal regions of the Eyre Peninsula were settled first, with areas further from ports settled later (Sumerling 1987). By the mid-1850s land under pastoral lease stretched along the coast, with tracts of land from Port Augusta to the Gawler Ranges also settled (Sumerling 1987). Records from 1863 indicate that during this period of settlement the land surrounding Kimba was ‘partly unknown’.

From 1870 onwards, European settlement of the area began in earnest. The ‘Great Northern Railway’ was constructed from Port Augusta to Maree in 1879, intended to service the region for the transport of agricultural and pastoral material and stock. The rail initially consisted of a narrow gauge through the Pitch Richi Pass to Quorn and Hawker and was extended along the western side of the Flinders Ranges to Maree in 1883 (Wilton et al 1980:11). The railway was extended to include Kimba in 1905, encouraging further settlement in the area. There are further references to European settlers moving to Kimba in 1915 in order to run stock. These cattle and sheep farmers altered the landscape to make it suitable for stock farming, although it has been noted that ‘despite working such dry land for a long period of time, little evidence remains to tell that this occurred, the ability of native vegetation to reclaim its own is vindicated’ (Casanova 1992:59).
Periods of severe drought have been known to occur within the area, impacting established pastoral leases and agricultural interests. Mentions of a water shortage in 1876 made it difficult to run cattle or sheep in the areas surrounding Kimba, and the Kimba Country Women’s Association Golden Jubilee pamphlet makes note of a four-year drought in 1931 (Kimba CWA, Casanova 1992:49). Around 1919, there are recorded mentions of a ‘Randall Tank’ being built near the Kimba turn off, designed to catch water from Wetigo Rock – a natural catchment of some 400 gallons (1800 litres) (Casanova 1992:60).

A map from 1886 is indicative of the previously mentioned pattern of coastal settlement, with areas further inland remaining largely unsettled (Plate 4.1).

It is highly likely that the Study Areas were in use some time after 1886 as pastoral leases, as further land was purchased by European settlers in order to farm sheep and cattle. This likely would have resulted in fences, structures and the possible modification of drainage lines along both properties. Superficial disturbance to topsoil is known to occur to landscapes which have been subject to grazing by animals.

Plate 4.1 Map showing general vicinity of Kimba and the Study Areas unclaimed during the 1880s (John Sands, 1886)

4.5 Aboriginal Archaeological Context

There is a paucity of Aboriginal archaeological research for the northern Eyre Peninsular with most studies focusing on coastal resource zones or tailored to areas of targeted development (Wood & Westell 2014: 24). The following discussion draws on archaeological data gathered from similar landform contexts and environmental data to give a background on conditions that may have influenced Aboriginal occupation of the Study Areas and the likely archaeological resource.

The earliest dated archaeological records of Aboriginal people in in the region come from Port Augusta (40,000ya) and the Flinders Ranges (49,000ya) (Hamm et al 2016; Walshe 2012). Evidence of Aboriginal occupation elsewhere in Australia dates to 65,000ya, based on a recently excavated rock shelter site at Madjedbebe in the Northern Territory (Clarkson et al 2017). It is therefore highly likely that Aboriginal people
were occupying much of the continent during the periods of climatic fluctuations that characterise the Late Pleistocene and early Holocene.

The Study Areas are located at the interface between the Australian arid zone and southern temperate regions (Plate 4.2). The arid zone is defined as the area in Australia where evaporation equals or exceeds precipitation (Edwards & O’Connell 1995). Much of the archaeological discourse surrounding the Australian arid zone has centred around human responses to fluctuating climatic conditions (Lampert & Hughes 1988; Veth et al 1990, Walshe 2005).

Plate 4.2 Map of the main climatic classifications and systems influencing the modern and probably Holocene, Australian landmass (Williams et al 2015)

Evidence gathered from the Lake Eyre Basin suggests wetter and cooler conditions prevailed in the southern arid zone around 55,000 to 40,000ya and again at 26,000 to 22,000ya (Walshe 2005). Pleistocene flooding events were extensive and are well documented for the Lake Eyre Basin (Timms 2007). Periods of increased rainfall resulted in the formation of mega lakes across much of the interior (Williams et al 2015). Evidence from other inland lakes such as the Willandra Lakes and Lake Mungo in NSW and rivers in the Murray-Darling River dated between 50,000 and 42,000ya indicate water levels were much higher at this time (Cohen et al 2011; Lampert & Hughes 1988: 141; Walshe 2005). This increase in water levels and low temperatures would have influenced monsoonal weather patterns and reduced evaporation (Walshe 2005:.
31). Prior to the LGM, Aboriginal occupation of sites was generally sparse indicating that groups were highly mobile (Williams et al 2015). This is suggested based on the low density of artefacts from pre-LGM archaeological deposits. For example 22 artefacts were retrieved from the lower units of Puritjara Rockshelter compared with 12,677 artefacts retrieved from Holocene deposits (Williams et al 2015: 99).

Conditions within the arid zone during the LGM are generally characterised as dry and cold with higher aridity than today (Edwards & O’Connell 1995: 772). This increased zone of aridity is shown in Plate 4.3 and would have include the Study Areas. It is likely that climatic changes were gradual over time. Thermoluminescence (TL) dates from sites in the Strezlecki Desert indicate dune building underway by at least 25,000ya, suggesting increasing aridity towards the onset of the Last Glacial Maximum (LGM) (Lampert & Hughes 1988:141). The longitudinal dunes which characterise the northern Eyre Peninsular including the Study Areas are likely to have begun to be formed during this period (Twidale & Campbell 1985: 63).

The polar ice caps expanded during the LGM which resulted in lower sea levels this would have seen the Spencer Gulf form a land bridge during this time connecting the Eyre and York Peninsulas (Alpers et al 2016: 2). Water would have been scarce during this time and vegetation and faunal populations would have been reduced from their former levels. Climate conditions appear to have ameliorated after around 16,000 to 17,000yBP (Cohen et al 2011). Pollen data and sedimentary records taken from the floor of Lake Frome indicate increased levels of precipitation and revegetation of the shoreline (Cohen et al 2011: 169; Smith et al 1991: 190). Fossil remains and evidence from major salt lakes in the region support improved climatic conditions with higher water levels by 13,000yBP (Smith et al 1991; Twidale 1969). Towards the end of the Pleistocene summer monsoons would have occurred across the southern arid zone. It is likely that during this time vegetation and faunal populations increased thus attracting people to these areas.

Plate 4.3 The Australian arid zone showing present limits (after Mabbutt 1971), estimated limits at Last Glacial Maximum (after Veth 1993) (from Edwards & O’Connell 1995).
period indicate vegetation changes corresponding to drier and more arid conditions (Walshe 2005). Lakes such as Lake Gairdner would have retreated to their current state and the modern weather patterns of frequent drought and low rainfall were established. Archaeological data indicates there was widespread occupation of the Australian interior during the favourable conditions of the Holocene with a period of decline in the spread of sites after around 3,000ya (Williams et al 2015).

Various models have been devised to explain human occupation of the arid zone during the periods of climate oscillations described above. Veth’s model explains human use of the landscape within a biogeographical framework through the concepts of refuges, barriers and corridors (Veth 1989). Fluctuating climate patterns are likely to have resulted in large areas of the arid zone becoming barriers to human occupation at various times (Veth 1989:84). Conversely as temperatures dropped and climates became drier other landforms would have become refuges for human populations (Veth 1989).

Refuge landforms are described as piedmont or montane uplands and riverine or gorge systems providing networks of permanent water sources (Veth 1989). Uplands such as the Flinders Ranges and the Gawler Rangers are examples of refugia. The density of sites within the Flinders Ranges illustrate the use of the area as a refuge during harsh climate phases (Williams et al 2015). Excavations in rock shelters such as the Warratyi Rockshelter show continuous occupation from 49,000ya until around 10,500ya (Hamm et al 2016). Warratyi Rockshelter is also significant for the association of remains of megafauna Diptoprodon optatum and eggshells of a large megapode bird Genyornis newtoni with human occupation (Hamm et al 2016). The location of the rock shelter at the top of a steep slope suggest that it is unlikely that D. optatum would have climbed to the rock shelter alone and absence of carnivore teeth marks on the bones suggest that they have an anthropogenic origin (Hamm et al 2016).

Barrier landforms may have been temporary or continuous and generally consisted of inhospitable landscapes such as the Eyrean Barrier to the north east of the Study Areas or the Nullarbor to the west (Alpers et al 2016; Veth 1989). Temporary barriers may have acted as corridors at times during the LGM and after (Veth 1989). These landscapes include peripheral areas of deserts such as the Great Sandy Desert and large tracks of land between refuges and barriers (Veth 1989).

The location of the Study Areas near the Gawler Ranges and salt lakes could indicate the use of these areas during ameliorate climatic conditions during the early Pleistocene and LGM. During periods of increased rainfall fresh water would have been more available, attracting fauna and people to the areas. As the area became more arid it is likely that people would have targeted refuge landforms, retreating to areas such as the Gawler Ranges where resources were more reliable. The importance of water resources is highlighted in studies undertaken elsewhere on the Eyre Peninsular (Nicholson 1994). However, without further archaeological investigation of the local area it is difficult to make concrete assumptions for Aboriginal occupation of the Study Areas. Any hypotheses proposed for Aboriginal land use of these areas in the past would need to be ground-truthed and tested through further research.

### 4.5.1 Previous Cultural Heritage Assessments

**Archaeological investigations at Olympic dam in arid northeast South Australia – Hughes, Hiscock, Sullivan & Marwick, 2011**

This report by Hughes, Hiscock, Sullivan & Marwick outlines a large ongoing research-oriented salvage program that has evolved from past archaeological impact assessment studies at Olympic Dam in arid northeast South Australia.

In the course of archaeological investigations for the proposed Olympic Dam mining project in 1980, Hughes and Hiscock developed an environmentally-based predictive model that used terrain pattern mapping based on a combination of landform types, which were used to predict the location and frequency of occurrence of suitable ‘campsites’, sources of water and the ease with which people could move across the landscape.
(Table 4.1), and underlying geology which was used to predict the availability of different rock types which could be used for making stone artefacts (Table 4.2). Initially data from 133 archaeological sites and their environmental settings was used to develop and test the predictive statement. The model was then tested further using data from an additional 352 archaeological sites recorded in sample surveys at Olympic Dam and in a regional survey within a 50 kilometres radius of Olympic Dam. Use of the predictive model in the region extending from Spencer Gulf in the south to Lake Eyre in the north established the model as a useful tool for guiding further survey work or for projecting likely impacts from development.

Table 4.1 Predicted influence of landforms on the nature and distribution of archaeological sites (via Hughes et al 2011: 24)

<table>
<thead>
<tr>
<th>Landform Type</th>
<th>Model Prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 and 2 Tableland and Tableland with dissection slopes</td>
<td>Sites occur infrequently in these landform types and when they do they are mainly quarries and knapping floors where locally available raw materials have been exploited. The quarry sites are commonly very large (&gt;1,000m²) and have high density artefact scatter (1-10/m²) of the locally available raw material. Where isolated dunes occur within these landform types they generally contain rich, diverse artefact scatters.</td>
</tr>
<tr>
<td>3 Drainage depressions</td>
<td>While archaeological sites occur infrequently in this landform type, they occur mainly on sand dunes around the margins of the large moisture-holding depressions which characterise this landform type. The sites tend to be very large and to have very high densities of artefacts (&gt;10/m²). These is also a very high diversity of raw material types and a wide range of implement types. This combination of characteristics indicates that the drainage depressions and their associated dunes acted as focal points for occupation and supported a wide range of domestic activities.</td>
</tr>
<tr>
<td>4 Widely spaced dunes covering &lt;30% of the land surface</td>
<td>Sites in this landform type are generally medium to large (10-1,000m²) and have medium to high densities of artefacts (0.1-10/m²) which include a range of implement types. Artefacts are made from a low to medium diversity of raw materials. Most sites are artefact scatters on sand dunes and tend to be concentrated around the interdunal pans. In terrain patterns formed on K, A and P sites occur with low to medium frequencies. In contrast on Czs, where silcrete crops out most frequently, quarry sites and associated knapping floors also occur and the frequency of occurrence of sites is very high. Compared with landform types 1, 2 and 3, sites in landform type 4 are more evenly dispersed across the landscape. Artefact scatters occur more frequently, are richer and are more diverse on those sand dunes which are adjacent to pans. In contrast, sites in dunes adjacent to quarries (especially silcrete) tend to consist of knapping floors with a low diversity of raw material. The richest sites in this landform type are to be found in dunes adjacent to areas where pans and silcrete quarries occur in close proximity.</td>
</tr>
<tr>
<td>5 Moderately spaced dunes covering 30 – 60% of the land surface</td>
<td>The nature and distribution of sites in this landform type follow the same pattern as that for landform type 4 except that sites occur much less frequently and tend to be less rich. This is taken to reflect the less common occurrence of pans and outcrops of raw material, due in part to the increased cover of sand.</td>
</tr>
<tr>
<td>6 Closely spaced dunes covering &gt;60% and usually &gt;80% of the land surface</td>
<td>Sites occur very infrequently in this landform type, because of the almost continuous cover of sand, the absence of water and stone sources, and the practical difficulty in traversing these landscapes.</td>
</tr>
</tbody>
</table>
Table 4.2 Predicted influence of geological regime on availability of raw materials for stone artefact manufacture (via Hughes et al/2011: 25)

<table>
<thead>
<tr>
<th>Geological Regime</th>
<th>Description</th>
<th>Materials for Artefact Manufacture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q Quaternary</td>
<td>Aeolian sand dune fields and clay plans</td>
<td>No materials exposed</td>
</tr>
<tr>
<td>Czs Tertiary</td>
<td>Silicified sandy beach ridges of ancient lake to the west</td>
<td>The main source of silcrete</td>
</tr>
<tr>
<td>K Cretaceous</td>
<td>Deeply weathered kaolinitic siltstones, shales and sandstone (Bulldog Shale) – contains extensive deposits of ice-rafted pebbles, cobbles and boulders, predominantly quartzite</td>
<td>The main source of quartzite – some chert and quartz from the ice-rafted rocks – some silcrete from silicified weathered sediments</td>
</tr>
<tr>
<td>A Cambrian</td>
<td>Andamooka Limestone</td>
<td>Main source of chert</td>
</tr>
<tr>
<td>P Precambrian</td>
<td>Simmens Member of the Arcoona Quartzite</td>
<td>Not suitable for flaking but possible source for grinding stone and hearthstones</td>
</tr>
</tbody>
</table>

Survey undertaken in the area between 2007 and 2009 found that the archaeological sites defined in Table 4.1 encompass the range of site locates and assemblage characteristics present over the wider region. Regional surveys undertaken for the Olympic Dam project by Hughes and colleagues have shown that the same kinds of archaeological sites, in the same range of environmental settings, continue in a north-south direction from Port Augusta in the south to Lake Eyre in the north, over a distance of about 45 kilometres and over an area exceeding about 200 kilometres squared.

Consistent with the model, a substantial majority of archaeological sites assessed during the survey represent the evidence of short term occupation of the kind found throughout arid northeast South Australia, and arid Australia more generally. Large numbers of small sites containing assemblages with low richness in landscape context with no access to permanent water are typical archaeological signatures of mobile foragers, both in the region of Olympic Dam as well as in order arid zone contexts in Australia.

Archer Exploration – Campoona Graphite Project: Indigenous and non-Indigenous desktop cultural heritage study – Wood and Westell 2014

Wood and Westell compiled a desktop heritage assessment for a proposed mine project near Cleve on the Eyre Peninsular approximately 50 kilometres south of the Study Areas. The study included a search of the Register of Aboriginal Sites and Objects for previously recorded Aboriginal sites, a literature review of previous archaeological studies in the area and development of a predictive model to inform an archaeological survey strategy.

The search of the Register of Aboriginal Sites and Objects did not identify any previously documented sites within the subject area or surrounds. The closest sites to the subject area consisted of two anthropological sites and a stone artefact scatter along a watercourse. Based on the desktop review the following predictive statements were made:

- Archaeological materials will be closely aligned along or at sources of fresh water, including rock holes, water holes, creek lines, soakages and lagoons.
- The frequency of archaeological sites will decrease beyond major water courses and will generally comprise small assemblages depicting task specific activities, for example the exploitation of localised outcrops of knappable stone.
- Archaeological materials will most commonly comprise stone artefacts manufactured from quartz, chert, quartzite and silcrete.
The preservation of archaeological sites will be influenced by modification to land surfaces.

**Coopers Dune, Port Augusta – Walshe et al 2001; Walshe 2012**

Archaeological investigations were undertaken on Cooper’s Dune prior to the extension of the Port Augusta Aerodrome between 1997 and 1999. Observations of archaeological material eroding from dunes around Port Augusta was first recorded in the 1930s by Tindale and later by Lampert in the 1970s. Skeletal material associated with the extinct megafauna, *Diprotodon*, was recovered from nearby Dempsey’s lake during paleontological investigations in the 1950s.

Cooper’s Dune is one of a series of late Quaternary-aged dunes located to the west of Port Augusta, approximately 152 kilometres north east of the Lyndhurst Study Area. The dune consists of a north west trending highly eroded linear dune located to the south of Dempsey’s Lake. The archaeological investigations undertaken included an initial field survey, surface salvage and later test excavation.

The surface salvage collected approximately 200 grams of fragmented bones consisting of macropods, wombats and emu egg shell. A total of 2,952 stone artefacts were collected. These comprised debitage, core tools, flaked tools, cobble or pebble choppers and fragments of grinding stones. The artefacts were considered to be a lag deposit whereby continual wind activity strips sand from the surface of some sections of the dune. This creates depressions in the dune surface where artefacts resettle, indicating the artefacts were not *in situ* and had likely been redeposited. Artefacts were predominantly quartzite and silcrete with lower frequencies of chert and quartz. A silcrete outcrop was previously recorded in association with Dempsey’s Lake and numerous cobbles of silcrete and quartzite were identified in the assemblage.

Following the surface salvage, a series of test trenches were excavated by mechanical backhoe to a depth of two metres. No artefactual material was identified in the trenches, however the excavated material was not sieved. A series of sand samples were collected from the exposed walls of the trenches and submitted for optically stimulated luminescence (OSL) testing. Samples retrieved from the base of the dune were dated to approximately 100,000yBP and samples towards the top of the dune were dated to approximately 35,000 to 30,000yBP.

Several years later following unusual rainfall and winds a hearth (PACD H1) was identified low towards to the south eastern end of the dune. The hearth consisted of burnt sandy sediment, some of which was formed into clumps. Unfortunately, the hearth was exposed to environmental processes and destroyed before it could be archaeologically excavated. However, a sample of the burnt sediment was collected and submitted for radiometric dating and OSL. The dates retrieved from above and below the hearth provide a date of approximately 40,000yBP, supported by the radiometric dates and OSL dates.

### 4.5.2 Previously Identified Archaeological Sites

A search of the Register of Aboriginal Sites and Objects (the Register) was requested on 15 June 2018. A response was received on 26 June 2018. The requested search areas included the Study Areas with a 10 kilometre buffer around each area. The search did not identify any previously recorded Aboriginal sites within the search areas (see Appendix A).

DSD-AAR identified two organisations which may have an interest in the Study Areas. These are:

**For Lyndhurst and Napandee:**

- Barngarla Determination Aboriginal Corporation.

**For Lyndhurst:**

- Gawler Ranges Aboriginal Corporation.
4.6 Summary

The Study Areas are located within a geologically ancient landscape in the traditional land of the Barngarla people. The Study Areas would have provided resources for the Barngarla people in the past during favourable climatic periods. As aridity decreased and ocean levels rose, higher frequency of rainfall would have filled inland lakes promoting vegetation growth and attracting wildlife to the area. Archaeological investigations of deflating linear dunes have identified high densities of artefacts and a hearth dated to 40,000yBP. Other archaeological investigations of the Eyre Peninsular have highlighted the relationship between site occurrence and water availability or features such as silcrete outcrops. Previous land use within the Study Areas has included vegetation clearance for stock grazing, which may impact the integrity archaeological sites in this area. However, disturbance and modification associated with stock grazing is likely to be superficial in nature. Where necessary depth of deposits exist, intact archaeological deposits may remain beneath disturbed topsoils. Furthermore, historical land uses are unlikely to have impacted intangible heritage values that may exist in the area.
5 Landscape Analysis and Predictive Model

5.1 Preamble

The nature of Aboriginal land use patterns prior to European colonisation has largely been reconstructed through analysis of archaeological site distributions and ethnographic studies. Other sources used include observations made by early European settlers and environmental information known about available natural resources.

Aboriginal people in the arid zone and semi-arid zone in the past employed mobile semi-sedentary subsistence strategies. As such, it is likely that they would have moved across the landscape between resources more frequently than today. Land-use would have been impacted by climatic fluctuations with refuge areas occupied intensely during periods of climatic amelioration and barrier/corridor landscapes occupied intermittently during better climatic conditions.

Site types would be influenced by the local environment, for example rock shelter and rock art sites are likely to occur where the necessary geology exists. Another important influence on site distribution is the location of current and former watercourses and the availability of water throughout the year. Artefact scatters are common indicators of activity in the landscape and may comprise evidence of previous campsites (which may have high densities of artefacts) or opportunistic knapping events or hunting activities (which may have low densities of artefacts). Artefact densities may be predicted based on distance to known reliable water sources and raw material sources.

Site preservation over time is an important factor in any attempt at archaeological predictive modelling. Site preservation can be influenced through natural processes such as erosion, wind and flooding as well as anthropogenic activities such as excavation of the ground surface or construction of structures.

Two predictive models have been proposed for the Eyre Peninsular and surrounds previously (Hughes et al 2011, Wood & Westell 2014). The predictive model proposed for this assessment builds on previous models and comprises a series of statements about the nature and distribution of evidence of Aboriginal land use that is expected within the Study Areas. Archaeological predictive mapping incorporates spatial data such as elevation, slope, vegetation, hydrology and geology to support these statements.

Due to the paucity of previous archaeological research conducted in the northern Eyre Peninsular, any hypotheses proposed for Aboriginal land use of the Study Areas would need to be ground-truthed and tested through further research.

5.2 Aboriginal Archaeological Predictive Statements

The predictive statements are as follows:

- Stone artefact scatters are ubiquitous across the region and it is expected that this site type would be the most frequent within the Study Areas.
- Artefact densities are expected to vary according to distance from creeks, aquifers and raw material sources within the Study Areas. Greater artefact densities are likely to occur closer to water sources and raw material sources.
- Raw materials identified are likely to consist of silcrete, quartz, cherts and quartzite. It is likely that these materials would have been brought into the Study Areas from outside sources such as outcrops associated with the Gawler Ranges.
- Archaeological investigations of linear sand dunes in the region have identified stone artefacts eroding out of the surface and in one instance a hearth. The natural processes of wind and water movement
have the potential to expose and cover Aboriginal campsites. Therefore, where dune features occur in the study area, these are likely to be archaeologically sensitive and artefact scatters and hearths may be identified.

- Due to the underlying geology of the Study Areas it is unlikely that sites such as quarries, grinding grooves, rock art sites and rock shelters would be identified.
- The predominant vegetation community of both Study Areas is Mallee open woodland. It is unlikely that Scarred Trees would occur associated with this vegetation community.
- Ethnographic studies have described the location of ceremonial sites and song cycles in association with important travel and trade routes. Where a route may intersect the Study Areas there is potential for additional song lines or cycles and sites associated with the Dreaming to be identified.

5.3 Landscape Analysis

The landscape analysis undertaken for the development of the predictive model is based on the LiDAR data collected for the Study Areas and background research. The LiDAR data collected was used to create accurate models for each Study Area. The models created include:

- Digital Elevation Model (DEM)
- Slope

Datasets for drainage and contours as well as orthographic imagery for the Study Area was also collected. The predictive mapping developed for this assessment combine the predictive statements above with the LiDAR spatial data. Constraints for certain site types were identified and converted into Boolean queries that were applied to the data. The following maps (Figure 5.1 and Figure 5.2) present the results of the predictive mapping for both Study Areas. Artefact scatters are considered to be the most likely archaeological site to occur within the Study Areas due to the environmental context of both areas. The predictive assumptions used for the artefact scatters were as follows:

- Landscape features such as dunes have potential for artefact scatters on the surface and in subsurface deposits.
- There is potential for artefact scatters to be identified within two kilometres of a waterbody such as Lake Gilles.

5.4 Conclusion

The predictive mapping compiled for this assessment provides a starting point for future archaeological assessments of the Study Areas. Predictive models do not replace comprehensive archaeological survey, rather they aid in the formulation of effective survey strategies. The validity of these models would be tested during future archaeological assessments of Napandee and/or Lyndhurst. This would provide opportunities to further refine the model, as well as the predictive statements and assumptions that have informed it.
6 Discussion

This desktop report has identified preliminary heritage values and archaeological potential associated with the Study Areas. Aboriginal occupation of the wider area is evidenced through previously recorded Aboriginal sites. The physical environment would have provided resources and raw materials that Traditional Owners could have utilised in the past.

If either of the Study Areas are selected to host the Facility, there are opportunities throughout the life of the project to directly involve the Traditional Owners in decision-making processes. By investigating and identifying heritage constraints within the Study Areas early there are opportunities to avoid direct impact and minimise indirect impact to Aboriginal heritage. Of utmost importance through this process is to recognise the Traditional Owners as the primary custodians of their cultural heritage and to involve the community in all stages of the project.

It should be reiterated that potential impacts to areas of cultural significance to the Traditional Owners constitute major risks if the recommended avoidance, mitigation or management policies are not put in place prior to works commencing. Any potential impacts to these areas would require particular consideration of Traditional Owner comments and assessment against the EPBC criteria.

6.1 Key Opportunities and Risks Identified

This assessment has identified key opportunities and risks if the Study Areas are selected as the preferred site. Key opportunities may be incorporated in the early environmental assessment and design phase to minimise and avoid potential impacts to Aboriginal heritage values. Potential risks to the project exist where they are not avoided or mitigated according to the recommendations of this desktop assessment.

- Key risks have been identified for proposed facility and associated infrastructure to cause harm to unknown tangible and intangible heritage.
- Key opportunities exist to involve the Traditional Owners in future stages of the project, providing training for younger members of the community on country and recording oral histories and accounts that may not have otherwise been recorded.
- Key opportunity to consider land access agreements in the early stages of the project design and construction (if site selection for Lyndhurst or Napandee proceeds) to ensure the Traditional Owners have access to Country.
- Key opportunities exist to create employment for the Traditional Owners not just during construction but also during the operational phase.
- Key opportunities exist to involve local Traditional Owner artists in the aesthetic design of the Facility and to consult with the local community in regards to colours, materials, embellishments and cultural plantings to ensure the Facility is sympathetic to the local landscape and the Traditional Owners of the area.
7 Conclusion

The key findings of this preliminary desktop report are as follows:

- There is a paucity of archaeological research available for the northern Eyre Peninsular.
- A search of the Department of State Development-Aboriginal Affairs and Reconciliation (DSD-AAR) Central Archive did not identify any registered Aboriginal sites within a ten kilometre radius of either the Lyndhurst or Napandee Study Areas.
- Archaeological predictive mapping prepared for the Study Areas has identified areas of archaeological potential. These areas are associated with linear dunes that occur within the Study Areas and identified water sources. It is considered that stone artefact scatters are the most likely site type to occur within the Study Areas.
- Geoscience Australia has identified one potential 100ha location for the Facility within each Study Area.
- A number of key risks and key opportunities have been identified, based on the results of the preliminary desktop assessment:
  - Key risks have been identified for proposed facility and associated infrastructure to cause harm to unknown tangible and intangible heritage.
  - Key opportunities exist to involve the Traditional Owners in future stages of the project, providing training for younger members of the community on country and recording oral histories and accounts that may not have otherwise been recorded.
  - Key opportunity to consider land access agreements in the early stages of the project design and construction (if site selection for Lyndhurst or Napandee proceeds) to ensure the Traditional Owners have access to Country.
  - Key opportunities exist to create employment for the Traditional Owners not just during construction but also during the operational phase.
  - Key opportunities exist to involve local Traditional Owner artists in the aesthetic design of the Facility and to consult with the local community in regards to colours, materials, embellishments and cultural plantings to ensure the Facility is sympathetic to the local landscape and the Traditional Owners of the area.

The following recommendations are based on the preliminary findings of the desktop assessment and in consideration of the relevant legislation and guidelines:

- It is recommended that consultation with Traditional Owners commence as soon as practicable. Aboriginal people are the primary determinants of their cultural heritage and should be given the opportunity to play an active role in shaping the management of that heritage.
- A cultural heritage site visit with representatives and knowledge holders from the Traditional Owner community is recommended, in order to
  - Ground-truth the findings of desktop research.
  - Identify significant unrecorded archaeological sites.
  - Identify unrecorded cultural heritage sites and discuss the cultural heritage values of the Study Area(s).
Comprehensive archaeological survey and assessment should be conducted, with Traditional Owner representatives, should Lyndhurst and/or Napandee be selected to host the Facility.

If the Study Areas are chosen to host the Facility, impacts to Aboriginal archaeological sites, areas of archaeological potential and Aboriginal cultural sites should be avoided as a priority. Where impacts cannot be avoided, management or mitigation measures should be formulated, in consultation with Traditional Owners. Mitigation measures would include, as a minimum:

- Consultation with the Barngarla community.
- Detailed archaeological and anthropological survey of the selected Facility location.
- Detailed recording, reporting and artefact analysis, including subsurface investigation if necessary.
- Detailed recording and reporting of intangible heritage values.
8 References


Department for Environment and Heritage. (Date Unknown). *Gawler Ranges National Park*. Pamphlet.


Schürmann, C. 1846. *The Aboriginal Tribes of Port Lincoln in South Australia: Their Mode of Life, Manners, Customs, etc*. Adelaide: George Dehane.


Twidale, C. R. 1969. ‘A Possible Late-Quaternary Change in Climate in South Australia’, in *Quaternary Geology and Climate*, vol. 6, pp 43-48.


Walshe, K 2005. 'Aboriginal Occupation at Hawker Lagoon, Southern Flinders Ranges, South Australia', in *Australian Archaeology*, no. 60, pp. 24-33.

Walshe, K 2012. 'Port Augusta Hearth Site Dated to 40,000 Years', in *Australian Archaeology*, no. 74, pp. 106-110.


Online Resources

National Native Title Tribunal mapping resource:
Appendix A

DSD-AAR Central Archive Aboriginal Site Search
26 June 2018

Claire Rayner
Senior Heritage Consultant
RPS Group
Level 13, 255 Pitt Street
SYDNEY NSW 2000

Dear Claire

Thank you for your correspondence (email) dated 15 June 2018, regarding the Aboriginal cultural heritage assessment study areas Lyndhurst and Napandee near Kimba. The search was based on the shapefile and parcel details provided. The parcel details are CT 5925/858 H500700 S38 and CT 5937/542 H501000 S94.

I advise that the central archive, which includes the Register of Aboriginal Sites and Objects (the Register), administered by the Department of the Premier and Cabinet, Aboriginal Affairs and Reconciliation (DPC-AAR), has no entries for Aboriginal sites within the project area.

The applicant is advised that sites or objects may exist in the proposed development area, even though the Register does not identify them. All Aboriginal sites and objects are protected under the Aboriginal Heritage Act 1988 (the Act), whether they are listed in the central archive or not. Land within 200 metres of a watercourse (for example the River Murray and its overflow areas) in particular, may contain Aboriginal sites and objects.

Pursuant to the Act, it is an offence to damage, disturb or interfere with any Aboriginal site, object or remains (registered or not) without the authority of the Minister for Aboriginal Affairs and Reconciliation (the Minister). If the planned activity is likely to damage, disturb or interfere with a site, object or remains, authorisation of the activity must be first obtained from the Minister under Section 23 of the Act. Section 20 of the Act requires that any Aboriginal sites, objects or remains, discovered on the land, need to be reported to the Minister. Penalties apply for failure to comply with the Act.

It should be noted that this Aboriginal heritage advice has not addressed any relevant obligations pursuant to the Native Title Act 1993.

Please be aware in this area there are various Aboriginal groups/organisations/traditional owners that may have an interest, these may include:

For Lyndhurst and Napandee:

**BARNGARLA DETERMINATION ABORIGINAL CORPORATION**

**Address:** c/- Norman Waterhouse, Lvl 15, 45 Pirie Street.
ADELAIDE SA 5000

**Telephone:** (08) 8210 1200

**Email:** normans@normans.com.au
For Lyndhurst:

**GAWLER RANGES ABORIGINAL CORPORATION**

Chairperson: Elliott McNamara
Mobile: 0419 037 361
Address: C/- Norman Waterhouse, Lvl 15, 45 Pirie Street
          ADELAIDE SA 5000
Email: GRACcontact@gmail.com

If you require further information, please contact the Aboriginal Heritage Team on telephone (08) 8226 8900 or send to our generic email address dsdaarheritagesites1@sa.gov.au

Yours sincerely

Perry Langeberg
SENIOR INFORMATION OFFICER (HERITAGE)
ABORIGINAL AFFAIRS & RECONCILIATION