Chapter 10
Cultural and historic heritage
Chapter 10: Cultural and Historic Heritage

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10 CULTURE AND HISTORIC HERITAGE

10.1 INTRODUCTION

The Environmental Impact Statement (EIS) guidelines for the Project require an adequate assessment of the proposed action and provision of "... a description and location of indigenous and non-indigenous sites, places or objects of historic or contemporary cultural heritage significance..." under Part 3 of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

This chapter presents information on the potential Project risks in relation to cultural and historic heritage values, with a particular focus on Class III and Class IV risks, new treatments identified during the risk assessment (Appendix 6). In addition to these high risks the chapter also includes discussion of any lower ranked risks known to be of particular interest to stakeholders.

Also presented in this chapter are details of the cultural environment relating to the existing Ranger mine and the Project, which are located within the traditional estate of the Mirarr. For example, sites, places or objects of cultural heritage significance are based on cultural heritage surveys and assessments undertaken by the Aboriginal Area Protection Authority and the Gundjeihmi Aboriginal Corporation (GAC) appointed independent archaeologist. It describes how these matters, such as cultural heritage sites and sites of significance are dealt with by means of ERA's cultural heritage management system in compliance with the relevant heritage legislation. Adherence to these cultural heritage operational procedures and guidelines ensures that formal approvals are obtained prior to disturbing land for any purpose and this is also discussed.

Assessment of potential impacts resulting from the Project is undertaken with particular reference to heritage legislation and ERA's cultural heritage management system using the risk assessment approach described in Chapter 5. Specifically, this chapter discusses:

- indigenous and non-indigenous sites, places or objects of historic or cultural heritage significance (Section 10.2);
- areas of particular values to indigenous people (Section 10.3);
- assessment of risks (Section 10.4);
- mitigations of risks (Section 10.5); and
- summary (Section 10.6).
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10.2 EXISTING VALUES

10.2.1 Registers

The Ranger Project Area (RPA) is surrounded by, but separate from Kakadu National Park (Kakadu). Kakadu is inscribed on the World Heritage List under the World Heritage Convention for its outstanding natural and indigenous cultural values. The Kakadu world heritage listing (including its world heritage values) is described in detail in Chapter 14.

The National Heritage List is a list of places with outstanding heritage value to our nation, including places overseas. These places are protected under the Australian Government's national environment law, the EPBC Act. Kakadu was included on the list on 21 May 2007.

The Commonwealth heritage list is a list of natural, indigenous and historic heritage places owned or controlled by the Australian Government. Fifteen sites are listed in the Northern Territory (NT), but none relate to Jabiru, or the RPA. The Koolpin Gorge Area is the closest listing, some 90 km distant.

The NT heritage register, established under the Heritage Act, contains declared and provisional heritage places protected under that act. There are three declared sites, and one provisional site within the West Arnhem Shire. The declared places are:

1. Munmarlary Homestead Complex (55 km from the RPA);
2. McLachlans Tree (120 km from the RPA); and
3. Fort Wellington (Raffles Bay) (300 km from the RPA).

The provisional site is: Copeland Island (Mountnorris Bay) Macassan Site (200 km from the RPA).

The Register of the National Estate was a list of natural, indigenous and historic heritage places throughout Australia, originally established under the Australian Heritage Commission Act 1975 (repealed). Under that Act, the Australian Heritage Commission entered more than 13,000 places in the register. In 2004 responsibility for maintaining the Register shifted to the Australian Heritage Council, under the Australian Heritage Council Act 2003 (Dept of Environment 2014). Also in 2004, the National Heritage List was established under the EPBC Act, resulting in significant overlap between the Register of the National Estate and the heritage lists at the national, state, territory and local government levels.

The register was closed in 2007 with all references to the register in the EPBC Act subsequently removed in February 2012 (Department of Environment 2014). Nevertheless, the register remains publicly available until such time as all statutory reference to it is phased out.

Table 10-1 lists the areas in the Alligator Rivers Region that were previously listed on the register and their approximate distance from the RPA. None are located within the RPA. The Mt Brockman massif is the closest listed indigenous heritage place and is located on an escarpment some 1.5 km south of the southern RPA boundary, and approximately 5.5 km from the proposed Ranger 3 Deeps underground mine.
Table 10-1: Areas in the Alligator Rivers Region previously listed on the Register of the National Estate

<table>
<thead>
<tr>
<th>Name</th>
<th>Status</th>
<th>Approximate distance from RPA (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alligator Rivers Region Arnhem Highway</td>
<td>Registered</td>
<td>Adjacent</td>
</tr>
<tr>
<td>Ballyangardy Spring Jungles</td>
<td>Registered</td>
<td>50</td>
</tr>
<tr>
<td>Gimbat / Goodparla Pastoral Leases, (former) Kakadu Highway</td>
<td>Registered</td>
<td>100</td>
</tr>
<tr>
<td>Kakadu, Arnhem Highway</td>
<td>Declared property*</td>
<td>Adjacent</td>
</tr>
<tr>
<td>Kakadu, Arnhem Highway</td>
<td>Listed place**</td>
<td>Adjacent</td>
</tr>
<tr>
<td>Kakadu and (former) Gimbat and Goodparla Leases Arnhem Highway</td>
<td>Registered</td>
<td>100</td>
</tr>
<tr>
<td>Koolpin Gorge Area</td>
<td>Registered</td>
<td>90</td>
</tr>
<tr>
<td>Nourlangie Rock Nourlangie Road</td>
<td>Registered</td>
<td>20</td>
</tr>
<tr>
<td>Mount Brockman Massif</td>
<td>Registered</td>
<td>1.5</td>
</tr>
<tr>
<td>Rainforest Gorge Jungle</td>
<td>Registered</td>
<td>70</td>
</tr>
<tr>
<td>Upper East Alligator River</td>
<td>Registered</td>
<td>20</td>
</tr>
<tr>
<td>Wildman River Catchment Arnhem Highway</td>
<td>Registered</td>
<td>70</td>
</tr>
<tr>
<td>Woolwonga Wildlife Sanctuary (former) Nourlangie Camp Road</td>
<td>Registered</td>
<td>35</td>
</tr>
</tbody>
</table>

* The World Heritage Committee has inscribed the property in the World Heritage List and registered it on the National Heritage List.
** Listed as a component of Nourlangie Rock – i.e. Nourlangie Rock or Mount Brockman Massif.

The searches conducted for all available national and territory heritage registers indicate there are no listed or nominated non-indigenous heritage and indigenous heritage places occurring within the RPA.

10.2.2 Sacred Sites

In 1975, George Chaloupka and Dr Ian Keen produced a report on land ownership of the Alligator Rivers Region for the Northern Land Council (NLC). They recorded the clans and mapped their respective territories and sites of significance in the NT by traversing the Territory via traditional, rather than modern routes. This method assisted clans to remember place names, djang (sacred) sites and incidents that occurred there, and was particularly useful if they had been absent from their land for some time.

The report formed the backbone of the anthropological evidence submitted to the Fox Inquiry. The report listed 15 sites of significance on the Mirarr estate. None of these sites occur on the RPA which is located within the Mirarr estate.
The Fox Report (Fox et al. 1977) describes sacred sites in the cultural landscape as:

"The sites with particular spiritual associations are commonly referred to as sacred sites. These may differ considerably in physical characteristics – they can be waterholes, rock formations, caves, shelters, hills or gorges, and their degree of religious significance." "The sacred sites within the Region associated with spirit beings or dreamtime heroes are divided into two basic categories. Those subject to secrecy, taboo, prohibition and danger (described as Djang Nadjamun) and those without these associations (described simply as Djang). Sites of both categories are found within the Region. The religious sites are, in many cases, connected by what Aboriginal people believe to be the tracks or pathways made by the dreamtime heroes during their wanderings over the land at the time of creation. Traditionally Aboriginal people followed these routes as part of their ritual observances." (Fox, et al. 1977; p. 35)

Similarly, the Aboriginal Areas Protection Authority (2014) describes sacred sites as:

"...places within the landscape that have a special significance under Aboriginal tradition. Hills, rocks, waterholes, trees, plains and other natural features may be sacred sites. In coastal and sea areas, sacred sites may include features which lie both above and below the water. Sometimes sacred sites are obvious ... [i]n other instances sacred sites may be unremarkable to an outside observer..."

The Aboriginal Areas Protection Authority administers the functions of the NT Aboriginal Sacred Sites Act 1989. Aboriginal sacred sites are recognised and protected as an integral part of Australian and NT cultural heritage under both the Commonwealth's Aboriginal Land Rights (Northern Territory) Act 1976 and the NT Aboriginal Sacred Sites Act 1989 (Sacred Sites Act), respectively. Both of these Acts define a sacred site as:

"Sacred site" means a site that is sacred to Aboriginals or is otherwise of significance according to Aboriginal tradition, and includes any land that, under a law of the Northern Territory, is declared to be sacred to Aboriginals or of significance according to Aboriginal tradition."

The establishment of the Sacred Sites Act provides the NT Legislative Assembly power to enact laws for:

"...the protection of, and the prevention of the desecration of, sacred sites in the Northern Territory..."

The Sacred Sites Act was passed under this power to establish procedures for the protection and registration of sacred sites, and the avoidance of sacred sites in the development and use of land. The protection of sacred sites in the NT is further aided by Section 69 of the Aboriginal Land Rights (Northern Territory) Act 1976 which prohibits entry to, and remaining on, any land in the NT that is a sacred site, unless a law of the NT specifies otherwise.
**Authority certificates**

People proposing to use or work on land in the NT may apply to the Authority (under Section 19B of the Sacred Sites Act) for an Authority certificate to cover their proposed activities. This certificate provides a statutory indemnity against prosecution in relation to the works, or uses, covered by the certificate, provided the applicant complies with any conditions imposed. An Authority certificate provides certainty that the proposed use or work can proceed without the risk of damage to a sacred site.

**ERA Authority Certificate – C94/202**

The Aboriginal Areas Protection Authority has two classifications for listed sacred sites, "registered" and "recorded". The difference between registered and recorded sites was advised by the Aboriginal Areas Protection Authority in 2010 (Aboriginal Areas Protection Authority Advice dated 7 June 2010; Ref Site No 5472-15):

"Sacred Sites known to the Authority are "registered sacred sites" or "recorded sacred sites". Sacred sites listed as registered sacred sites are sacred sites that Aboriginal custodians have asked the Authority to protect and have subsequently been documented and evaluated by the Authority and entered into the Register of Sacred Sites in accordance with the Northern Territory Aboriginal Sacred Sites Act 1989.

Sites listed as recorded sacred sites are sites that have not been evaluated or placed in the Register but there is information indicating that they are nonetheless significant according to Aboriginal tradition and therefore sacred sites within the meaning of the Act. The Authority does not purport to hold detailed information regarding all these sites."

Aboriginal Areas Protection Authority Certificate C94/204 was issued to ERA for the construction of Pit 3 in December 1994 ([Appendix 7](#)). This certificate identifies that there are no registered sacred sites in the RPA and that Site 5472-15 is the only recorded sacred site in the RPA. This site is approximately 5 km north of the existing mine site (Figure 10-1). This is a surface site, which holds significant cultural value to the Mirarr.

ERA applied for an updated authority certificate for the RPA following the development of Pit 3 in April 2011 (Application No. 76794); however, this certificate has yet to be issued. The Aboriginal Areas Protection Authority has advised ERA that traditional owners have been consulted and the issue of the certificate is in progress. In the interim, the Aboriginal Areas Protection Authority confirmed in 2013 that Certificate C94/204 (issued December 1994) remains current and identifies the recorded and registered sacred sites on the entire RPA.
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This image has been removed at the request of the Mirarr Traditional Owners

Figure 10-1: Sites of cultural significance on the RPA
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10.2.3 Protected Archaeological Sites and Objects

Under Section 8(1) of the NT Heritage Act, an archaeological object is a relic that:

"(a) relates to the past human occupation of the Territory and;

(b) is in an archaeological place ..."

In the NT, all Aboriginal and Macassan archaeological places and objects are automatically protected by the Act.

A review of recorded or listed heritage and indigenous heritage places in the RPA was conducted in 2010 (Crassweller 2014, 2010). This independent review included a search of seven archives being both NT and Commonwealth heritage registers (refer Section 10.2.5.2).

There are no traditional and historic Aboriginal Torres Strait Islander and Macassan protected archaeological objects identified on either NT or Commonwealth heritage registers or that have been found on the RPA. In addition, no historic Aboriginal Torres Strait Islander or Macassan protected archaeological objects originating from the RPA are stored in Aboriginal Keeping Places, or stored away from their origin as a result of approved relocation.

Cultural heritage surveys have been conducted within the RPA since the implementation of the Interim Cultural Heritage Agreement, between ERA and GAC in 2006. This Agreement requires the conduct of a cultural heritage survey prior to the disturbance of land. This applies across the entire RPA, with the exclusion of the operational area of the mine (Figure 10-2). While the Interim Cultural Heritage Agreement excludes the Ranger mine footprint from survey, the mine footprint is still subject to NT and Commonwealth heritage legislation as acknowledged in the ERA cultural heritage management system procedures.

An external cultural heritage specialist, working on behalf of GAC and with traditional owners, has conducted 31 cultural heritage surveys within the RPA. These surveys have covered 73% of the RPA (approximately 52 km²) including the Ranger 3 Deeps Project area. The surveys recorded 99 archaeological sites and 69 areas, where the latter contained isolated stone artefacts and are referred to as "background scatters" (also described under the NT Heritage Act as "archaeological objects") 2. The details of the archaeological places and objects recorded during these surveys have been submitted to the NT Heritage Branch.

All archaeological objects identified and recorded during archaeological surveys on the RPA for the period 2006 – 2013 remain in-situ (Crassweller 2014). Detailed discussion of the identified archaeological sites relevant to the Project is provided in Section 10.2.4.2.

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1 An archaeological site is defined under Section 6 of the NT Heritage Act 2011 as a place that: "... relates to the past human occupation of the Territory; and (b) has been modified by the activity of the occupier".

2 That is defined in Section 8 of the Heritage Act as: "... a relic that (a) relates to the past human occupation of the Territory; and (b) is in an archaeological place".
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Figure 10-2: Archaeological sites, background scatters area surveyed (unshaded)

This image has been removed at the request of the Mirarr Traditional Owners
10.2.4 Indigenous Cultural Heritage Significance

10.2.4.1 Kakadu

Kakadu has been home to Aboriginal people for more than 50,000 years (C'wth of Australia 1999, Roberts, et al. 1990) and many of the Park's extensive rock art sites date back thousands of years.

The places of highest cultural heritage significance may be places related to spiritual beliefs such as sacred sites. Such places are numerous in Kakadu and the surrounding Alligator Rivers Region where in excess of 5,000 Aboriginal rock art sites and habitation sites have been recorded as places of cultural significance or sacred sites.

Generally sites of cultural significance are divided into two groups: One has religious (and therefore more important) connotations; and, the other could be broadly described as archaeological sites.

Kakadu's rock art provides a window into human civilisation in the time before the last ice age. Detailed paintings reveal insights into hunting and gathering practices, social structure and ritual ceremonies of indigenous societies from the Pleistocene Epoch until the present. These sites are central to the living traditions of contemporary indigenous landowners of Kakadu. Areas of particular significance for rock art include Cannon Hill, Ngarradj Warde Djobkeng, and the Nourlangie-Mt Brockman massif, Ubirr, Namarrgon Djahdjam, and Deaf Adder Creek (Commonwealth of Australia 2002).

The primary mechanism that has protected places of indigenous and non-indigenous historic or cultural heritage significance in Kakadu from the effects of uranium mining since 1980 is ERA's compliance with the Commonwealth Environmental Requirements. Compliance with the Environmental Requirements is monitored and audited by the Commonwealth Office of the Supervising Scientist through a number of forums and reporting processes, in which the NLC and the Mirarr Traditional Owners are represented (refer Chapter 1).

10.2.4.2 Ranger Project Area

The entire RPA is located within the Mirarr estate (Figure 10-3). Therefore, the proposed Ranger 3 Deeps Project lies within the traditional estate of the Mirarr people. All of the Mirarr estate is of value to the Mirarr people; while the areas used for mining are not regularly used for traditional purposes, the physical and spiritual values remain.

While some aspects of the traditional estate may have changed over the past 40 years or so, other general descriptions remain as relevant today as they did when first recorded. The following extracts from the second Fox Report (Fox, et al. 1977) attempt to describe the cultural landscape of 'traditional estate', while a description of sacred sites in the cultural landscape was provided previously under Section 10.2.2.
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On relationship with the cultural landscape:

"Of all the relationships traditional Aboriginal man has with anybody or anything, the most important is that which binds him to a particular tract of land which he/she refers to as 'his/our country'. This is a religious bond. The people have a spiritual relationship with the species and the physical features of their environment expressed through the concept of the dreaming."

Before the dreaming, according to Aboriginal lore (sic). The land existed but was without shape or life. Then 'spirit beings' or 'dreamtime heroes' travelled over the land creating the natural environment as it now exists [and] ... gave the people their own tracts of land along with their languages and social institutions. Particular features of the landscape are believed to retain part of the spiritual essence of the dreamtime heroes who created them... The spiritual relationship between Aboriginal people and the land is given emphasis in the belief that for a child to be born a spirit must first enter the womb to give the child life. The spirit derives from one of the various sites associated with the dreamtime heroes. Consequently there is a direct personal link between the spirit being the child and the place from which the spirit came. That place is the source of the person's life force, and he or she is inseparably connected with it. The spirit is part of the land and therefore the land is very much part of the Aboriginal. This relationship is not broken as even in death, as the Aboriginals spirit is returned to the site from which it first came". (Fox, et al. 1977; p. 33)

Mirarr have obligations and responsibilities linked to the traditional estate. The management of the estate includes responsibility and obligation by Mirarr people to other people from surrounding or neighbouring estates. Such obligations include caring for their country, maintaining the health of country, and particularly ensuring significant and sacred sites are not damaged. For instance, maintaining the health of Magela Creek is a responsibility of the Mirarr. Approximately 5 km downstream beyond the RPA, the creek flows into the Madjinbardi Billabong, beside which sits the small Mirarr community of Madjinbardi. The creek flows for a further 8 km downstream through numerous large billabongs before flooding into the expansive Magela wetland system. The wetland system is abundant in a variety of fish and bird life, which is a rich supply of traditional food sources for the Mirarr people. The wetlands also contain a number of cultural sites. The products of this wetland system are shared by a number of neighbouring and downstream estates, and consequently Mirarr people bear great responsibilities and obligations for ensuring the health of this wetland system. It is these values, and the natural cultural values of the Mirarr estate, that have significantly contributed to the World Heritage listing of the surrounding Kakadu.

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3 Also spelt "Mudginberri".
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The landscape of the RPA is predominantly Eucalypt woodland/open forest. Magela Creek, which originates from the Arnhem Land Plateau, flows diagonally from the south-east to the north-west through the RPA over a distance of approximately 5 km. This creek is the major tributary feeding the Magela floodplain, which is used extensively by Aboriginal people for hunting and gathering. Given the importance of water and all associated flora and fauna that this environment supports, Magela Creek is a feature of the landscape that has high cultural importance to the Mirarr.

There are no sandstone escarpment outliers, formations or other stony features located on the RPA, as are otherwise found in the surrounding Kakadu. Consequently, there are no rock art sites or habitation sites in rock shelters in the RPA.

As described in Section 10.2.3 there are a total of 171 recorded places of indigenous cultural heritage significance on the RPA, 99 archaeological sites and 69 archaeological background scatters.

Refer Chapter 2 for a detailed description of vegetation communities on the RPA.
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Tree Snake Dreaming, which was identified via archaeological survey, is located immediately north-east of Pit 3 and is not registered with the Aboriginal Areas Protection Authority. In 2010, the GAC indicated that they would register this site as a sacred site with the authority; however, this has not yet occurred.

Another site of indigenous cultural heritage significance on the RPA is a cemetery where a small number of local Aboriginal people are buried; this was established during the minerals exploration period that occurred prior to mining. This is not a gazetted cemetery and the burials were contemporary for the period rather than being traditional Aboriginal burials (Figure 10-1).

There is one surface site of cultural significance located within the surface projection of the Ranger 3 Deeps underground mine. This site, R34, is an archaeological site that provides evidence of occupation via a quartz quarry, area of stone implements and grinding holes. The site is located within a fenced exclusion zone, which protects the site from potential surficial impacts such as clearing. Potential risks and mitigations relating to this site are discussed in Section 10.3 and Section 10.4, respectively.

There are no recorded or registered subsurface sites of cultural significance on the RPA.

10.2.5 Non-Indigenous Cultural Heritage Significance

10.2.5.1 Kakadu

The Kakadu region was not settled by Europeans until the township of Jabiru was built (1978 – 1980) to accommodate uranium mining in the Alligator Rivers Region (Fox, et al. 1976). The area was crisscrossed by early buffalo shooters since 1880 and then by missionaries on journeys to and from Oenpelli Mission in North West Arnhem. This was followed by small pastoral enterprises from the 1960s, ceasing in the early 1980s, to accommodate the establishment of Kakadu. Any remains of this early use of the area may consist of blazed trees marked when missionaries, early miners or buffalo hunters may have passed through the area.

The Godden McKay Report 1994 (which can be accessed by contacting Kakadu National Park management) lists places and objects or relics of European origin in Kakadu. Such places and relics include places of European occupation, old buffalo catchers' camps, old cars, and parts of crashed World War II aircraft. Of the 147 listed places described in the report, all occur within Kakadu and outside the RPA.

10.2.5.2 Ranger Project Area

In 2010, ERA engaged an independent cultural heritage specialist, through the GAC, to conduct a review of recorded, listed and unlisted heritage and indigenous heritage places on the RPA (Crassweller 2010). The review included a search of seven archives, including both NT and Commonwealth heritage registers.
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NT registers included:

- The Archaeological Site Register held by Heritage Branch, NT Environmental Protection Authority (NT EPA).
- The Heritage Register held by Heritage Branch, NT EPA.
- The Register of Significant Places maintained by the National Trust of Australia (NT Branch).
- The register held by the Aboriginal Areas Protection Authority NT.

Commonwealth registers included:

- The Register of the National Estate held by the Australian Heritage Council.
- The register held by the Northern Land Council.
- The National Heritage List held by the Australian Heritage Council.

There were no additional places or sites of heritage recorded for the RPA.

The review demonstrated that all early non-Aboriginal activities in the vicinity of and within the RPA were fleeting or short-term, and that a permanent presence in the RPA did not occur until uranium exploration and mining in the 1970s. No permanent dwellings, houses or other infrastructure have been classified as heritage places (NT Heritage Act) or national heritage places.

10.3 EXISTING MANAGEMENT CONTROLS

ERA has a comprehensive cultural heritage management system that protects the cultural heritage values within the RPA. All aspects of cultural heritage management associated with the Project will be incorporated into the existing system for the life of the project.

The ERA cultural heritage management system is informed by the requirements of the ERA GAC Interim Cultural Heritage Protocol (agreed with Traditional Owners of the RPA in 2006), NT and Commonwealth heritage legislation and Rio Tinto cultural heritage management standards.

The protocol provides for an agreed process, which ensures that cultural heritage surveys are conducted on the RPA prior to any land disturbance on undisturbed land or land that has already been disturbed with authorisation. This process must include Mirarr Traditional Owners. As previously discussed, ERA has conducted cultural heritage surveys across approximately 73% of the RPA under this agreement; including the location of the proposed Ranger 3 Deeps underground mine.

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5 Formerly the NT Department of Natural Resources, Environment, the Arts and Sport (NRETAS).
The system is designed to achieve a number of key outcomes in relation to cultural heritage management. Essentially, these outcomes are to:

- Ensure that all identified areas of significance and cultural sites on the RPA remain undisturbed;
- Provide ERA employees and contractors with the necessary cultural heritage training and awareness of their cultural heritage responsibilities;
- Provide ERA employees and contractors with the necessary cultural heritage operational procedures, process and work instructions to ensure the protection of all cultural sites; and
- Ensure regulatory compliance by mitigating the potential risk of disturbance or damage to cultural heritage sites by operational, construction, and rehabilitation activity.

The management system comprises elements which are used to ensure that its objectives are met. These are listed below.

### 10.3.1 Cultural Heritage Procedures and Work Instructions

As outlined above, the cultural heritage management system comprises a number of elements to ensure the ongoing protection of the cultural heritage values on the RPA. One component is ERA's cultural heritage procedures and work instructions including:

- Land disturbance permit;
- Land disturbance procedure: excavation penetration permit;
- Action damage or disturbance to cultural heritage sites;
- Action finding unrecorded cultural heritage sites (chance finds);
- Action finding human remains;
- Planning and conduct of cultural heritage survey;
- Cultural heritage management system manual;
- Cultural heritage sites management plans;
- Remote area access permit; and
- Access to Aboriginal land permit application process.

Standard operational procedures are control documents embedded in the ERA health safety and environment quality management system. These procedures and associated work instructions detail a specific procedure and process with specific accountabilities. They are updated regularly to ensure that they are appropriate to the current potential risk that ERA operations may pose to significant areas and cultural sites, and that ERA remains compliant with NT and Commonwealth heritage legislation.
10.3.2 Physical Controls

The cultural heritage management system contains a number of physical control elements. These include:

- cultural heritage surveys prior to land disturbance;
- boundary of archaeological sites marked with red star pickets;
- boundary of significant sites enclosed with permanent steel post and rail fence;
- generic cultural heritage awareness signage placed across the RPA;
- all cultural sites marked with cultural heritage signage;
- bunding or other environmental protection near sites;
- cultural site vibration monitoring;
- site marked out with flagging tape with project supervisors prior to land disturbance;
- feral animal control program for pigs; and
- periodic audits of all cultural sites by an external cultural heritage specialist and Mirarr.

Physical controls may be added subject to conditions as a particular works site warrants. For example, a physical control imposed around the R34 archaeological site is a galvanised steel posted rail fence with signage at seven points.

10.3.3 Administrative Elements

In addition to the above physical controls, the cultural heritage management system also contains a number of administrative elements, including:

- dedicated cultural heritage geographic information system (GIS);
- site-wide cross cultural training and awareness (classroom);
- site-wide community induction;
- cultural heritage management training (web based);
- Rio Tinto cultural heritage standards;
- Rio Tinto health safety environment and quality management system;
- Rio Tinto cultural heritage management system business conformance audits;
- Rio Tinto social risk analysis;
- site managed assessments;
- ERA GAC Interim Cultural Heritage Protocol; and
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- NT and Commonwealth heritage acts and regulations.

The cultural heritage management system is subject to triennial Rio Tinto business conformance audits, risk reviews, ERA site managed assessments and ongoing improvements. Elements may vary due to changes in the working environment of ERA operations, changes to NT or Commonwealth heritage legislation, or cultural criteria as requested by Traditional Owners.

10.3.4 Procedures for the Discovery of Surface or Sub-surface Items

In addition to the elements outlined above, two operational procedures apply to the discovery of surface or subsurface items, both of which are integral to the cultural heritage management system.

**Action finding unrecorded cultural heritage sites**

This procedure, which is applicable to the entire RPA, is used for the discovery of unrecorded archaeological places or objects (chance finds). These are usually located on the surface but may also be subsurface. The procedure allocates roles and responsibilities for all personnel involved and ensures compliance with NT heritage legislation. Where required, Traditional Owners are consulted and involved in actions and processes following the discovery.

**Action identifying human remains**

This procedure is to be used for the discovery, or chance find, of human remains. Any such find in the RPA may potentially involve indigenous or non-indigenous remains. ERA has made investigations into the possibility of indigenous human remains on the RPA through consultation with Traditional Owners and heritage investigations. ERA is confident that, other than an identified cemetery in the RPA, there are no known human remains or traditional burial sites. The identification of human remains, however, requires the intervention of NT police and Aboriginal Traditional Owners, and for these reasons a separate procedure is in place.

**Procedure in the event of a chance find/unrecorded site**

Both situations trigger immediate action, including:

- halting of work;
- switching off machinery;
- avoiding further disturbance of the site;
- notification of the supervisor; and
- referring to operational procedures.

A range of further actions then takes place in accordance with the procedure.
Given the location of the Project’s surface infrastructure in areas that have already been disturbed, it is improbable that surface or subsurface items will be discovered. Construction of the portal access and exploration decline is complete. The portal access is located between the existing warehouse yard and the edge of Pit 3 in an area that has been disturbed by various mining activities over the previous 30 years. No surface or subsurface items have been identified in this area during either portal construction or the previous 30-year period.

The existing ventilation raise, constructed for the exploration decline project, is located approximately 100 m from the edge of Pit 3 within the Magela Land Application Area (Magela LAA). The area has been progressively disturbed since 1981, primarily from irrigation of treated pond water, close spaced exploration drilling and construction of a ventilation raise for the Ranger 3 Deeps exploration decline. No surface or subsurface items have been identified in this area during either the construction of the ventilation raise or the previous 30-year period of mining operations.

### 10.4 ASSESSMENT OF RISK

#### 10.4.1 Risk Assessment

The environmental risk assessment identified a total of 80 risks. The initial identification of risks was aided by applying a prompt list derived from the major identified risks in the EIS guidelines and augmented by previous and current operational risk registers. Potential impacts on sensitive receptors (e.g. world heritage values of Kakadu, Mount Brockman) were considered when evaluating and rating each risk scenario. Where multiple impacts are associated with a risk scenario, the impact with the highest risk rating defines the risk management class. Risk ratings reflect the implementation of appropriate mitigation measures (existing controls and new treatments).

Of the 80 risks identified, seven are related to Aboriginal and cultural heritage. Of these, six risks were identified as having a current (inherent) Class III (high) risk rating (Table 10-2). A comparison of current and residual risk profile indicates there are three residual Class III risks (TA5-02, TB2-01 and TE7-02) with the balance of the residual risks having a low risk ranking of Class I (low) or Class II (moderate). There are no Class IV (critical) risks associated with Aboriginal and cultural heritage.

The level of certainty associated with the overall risk ranking, based on the quality of data and information available, and the effectiveness of the treatments in mitigating the risk has also been included in Table 10-2.

Of the seven risks identified during the risk assessment that were related to Aboriginal and cultural heritage, five risks were further subjected to a Bow Tie analysis to gain a better understanding of the extent, quality and effectiveness of mitigation measures being proposed across the broader scope of potential impacts. These risks were selected for further analysis as they were identified as having a ranking based on a "high consequence/low likelihood scenario". These risks are provided in Table 10-3 below. Details of the Bow Tie analysis are provided in Appendix 6, with the overview shown in Figure 10-4. The preventative and mitigation controls identified in this Bow Tie analysis may be...
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demed to be critical risk controls, i.e. they are controls associated with the most significant risks, and are already embedded in the existing cultural heritage management system to ensure ongoing application.

While it is the Class III Aboriginal and cultural heritage risks listed in the Table 10-2 that are the primary focus of the discussion in this chapter, any lower ranked risks known to be of particular interest to stakeholders are also discussed in the following sections. New treatments (controls) identified during the risk assessment are also discussed.

A description of the risk assessment methodology is provided in Chapter 5; for a comprehensive discussion on the risks associated with the Project and the risk register, see Appendix 5.

Table 10-2: Class III current Aboriginal and cultural heritage risks

<table>
<thead>
<tr>
<th>Risk Title</th>
<th>Possible causes (triggers/indicators)</th>
<th>Potential impacts</th>
<th>Current risk ranking(^1) (with controls)</th>
<th>Residual risk ranking(^1)</th>
<th>Certainty level(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA3-02: Project infrastructure may generate noise levels that are incompatible with traditional lifestyle, public amenity, and/or fauna.</td>
<td>Underground mining activities</td>
<td>Impact on the ability to undertake traditional activities</td>
<td>III</td>
<td>II</td>
<td>C2</td>
</tr>
<tr>
<td>TA5-02: Greater than predicted dust generation may occur from the paste plant</td>
<td>Operation of the paste plant.</td>
<td>Impact on damage to site of cultural significance.</td>
<td>III</td>
<td>III</td>
<td>C2</td>
</tr>
<tr>
<td>TB2-01: A sensitive underground anthropological site may be inadvertently discovered or disturbed during mining.</td>
<td>Location or existence of site not known by ERA.</td>
<td>Impact on damage to item of cultural significance.</td>
<td>III</td>
<td>III</td>
<td>C2</td>
</tr>
<tr>
<td>TB2-02: Pit 3 walls may become destabilised by Ranger 3 Deeps.</td>
<td>Underground blasting and general underground mining activities.</td>
<td>Pit wall collapse.</td>
<td>III</td>
<td>II</td>
<td>C3</td>
</tr>
<tr>
<td>TB2-03: Vibration from underground mining may impact on cultural sites of significance.</td>
<td>Underground blasting.</td>
<td>Change or impact to cultural site of significance.</td>
<td>III</td>
<td>II</td>
<td>C3</td>
</tr>
<tr>
<td>TE7-02: Impacts to archaeological sites may occur during closure earthworks.</td>
<td>Operator error.</td>
<td>Impacts to archaeological sites may occur during closure earthworks.</td>
<td>III</td>
<td>III</td>
<td>C3</td>
</tr>
</tbody>
</table>

\(^1\) Risk ranking: Class IV – Critical; Class III – High; Class II – Moderate; Class I – Low.

\(^2\) Certainty level: C1 – Low; C2 – Moderate; C3 – High. (refer Chapter 5)
Table 10-3: Aboriginal and cultural heritage risk subjected to a Bow Tie analysis

<table>
<thead>
<tr>
<th>Risk ID</th>
<th>Risk title</th>
</tr>
</thead>
<tbody>
<tr>
<td>TA1-01</td>
<td>Vegetation clearing may generate excessive airborne dust.</td>
</tr>
<tr>
<td>TA5-02</td>
<td>Greater than predicted dust generation may occur from paste plant.</td>
</tr>
<tr>
<td>TB2-02</td>
<td>Pit 3 walls may become destabilised by Ranger 3 Deeps.</td>
</tr>
<tr>
<td>TB2-03</td>
<td>Vibration from underground mining may impact on cultural sites of significance.</td>
</tr>
<tr>
<td>TB6-03</td>
<td>Seepage losses from Magela Creek into the underground workings may impact on flow regimes in the creek.</td>
</tr>
</tbody>
</table>
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Figure 10-4: Bow Tie analysis – Project interaction with cultural heritage site, place object

Abbreviations:

CH:  Cultural heritage
TARP: Trigger Action Response Plan
GIS: Geographic information systems
10.4.2 Potential Impacts

The environmental risk assessment identified six initial Class III Aboriginal and cultural heritage risks, broadly relating to noise (TA3-02), dust (TA5-02), vibration (TB2-03), and impacts from civil works during construction, operation and/or closure (TB2-01, TB2-02 and TE7-02).

10.4.2.1 Noise

The environmental risk assessment identified that there was one risk associated with noise emissions (TA3-02). This risk relates the potential to generate noise levels that are incompatible with enabling local indigenous people to undertake cultural activities within the RPA. Areas such as billabongs and Magela Creek are of cultural value and used for camping, hunting and the collection of natural resources. The risk also identified potential ecological impacts which have been discussed in Chapter 6.

Risks associated with noise emissions and cultural practices during all phases of the Project have been assessed through established modelling and methods which have been discussed in Chapter 6.

The modelling predicts that cumulative noise levels (existing noise levels combined with those generated by the Project) during construction and operation, under the most conservative assessment conditions would remain below public receptor noise criteria. At certain locations such as Magela Creek (closest point) and Georgetown Billabong, noise levels may be higher. The predicted noise levels at these locations and others are not anticipated to be incompatible with enabling local indigenous people to undertake cultural activities.

Additional treatments identified include the installation of noise attenuation in selected exhaust fans in addition to purchasing equipment such as refrigeration plants and compressors with pre-installed noise suppression technology. These controls have reduced the TA3-02 from a Class III to a Class II risk ranking.

10.4.2.2 Dust and Emissions

The environmental risk assessment identified that there were two risks associated with dust emissions. These dust related risks have the potential for both the backfill plant (TA5-02) and ventilation emissions (TA3-04) to generate dust levels that may impact on the R34 cultural heritage site. Located within the surface projection of the Project, R34 is the closest site to the backfill plant and the exhaust ventilation raises.

Risks associated with dust deposition on R34, during all phases of the Project, have been assessed through air quality modelling and assessment methods described in Chapter 6. The modelling predicts that dust levels for the life of the Project remain below the dust deposition amenity criteria of 4 g/m²/month as defined by the New South Wales Department of Environment (NSW DEC 2005) at sensitive cultural receptors. Consequently, the risk of dust related impacts to R34 and other cultural heritage sites are not considered significant.

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6 At its closest proximity to ventilation exhaust fan 1, cumulative noise level is predicted to be 58 dBA while Georgetown Billabong is predicted to be 51 dBA.
Additional treatments identified to mitigate the risks TA3-04 and TA5-02 include conventional dust suppression techniques,\textsuperscript{7} in addition to the design of the backfill plant and ventilation system. For example, the transfer of materials within the backfill plant occurs predominantly within an enclosed system with little potential for dust release. The ventilation exhaust system has been designed to improve dispersion characteristics, and consequently minimise ground level concentration and deposition in the surrounding environment.\textsuperscript{8}

\textbf{10.4.2.3 Vibration}

The environmental risk assessment identified there was one risk associated with vibration where there was the potential for vibration from underground blasting to potentially impact on cultural heritage sites within close proximity to the Project (TB2-03).

Prior to commencing construction of the Ranger 3 Deeps exploration decline (May 2012) and ceasing mining in Pit 3 (November 2012), ERA expanded the existing vibration monitoring program\textsuperscript{9} to measure vibration at R34 and Tree Snake Dreaming. These two new monitoring sites supplement the existing monitoring sites located within the vicinity of Retention Pond 2 (RP2) and Mt Brockman at the southern end of the RPA.

In April 2013, to augment monitoring of site R34, the monitor located at RP2 was relocated to the Magela LAA (\textbf{Figure 10-5}).

The results of vibration monitoring up to June 2013 indicate that the vibration measured at all monitoring locations is less for the development of the Ranger 3 Deeps exploration decline compared to blast vibration historically associated with Pit 3 mining operations.\textsuperscript{10}

Since June 2013, the decline has progressed deeper and further away from the cultural sites to a point where vibration at sites R34 and Tree Snake Dreaming have become undetectable and are therefore at background levels. Additional treatments identified to mitigate risk TB2-03 include blast design\textsuperscript{11} which, if necessary, will be modified to reduce surface vibration. Surface vibration monitoring will be undertaken at culturally significant locations in the first 12 months of mine development to validate predicted vibration identified in the vibration impact assessment and inform blast design parameters where necessary.

\textbf{Figure 10-5 shows the location of the vibration monitors}\textsuperscript{12}

\textsuperscript{7} Conventional dust suppression consists of applying sprayed water to haulage routes and during loading/unloading activities which have potential to generate dust.

\textsuperscript{8} Whilst the residual ranking is listed as Class III (and medium level of certainty) this reflects the situation at the conclusion of the risk workshop. Subsequent completion of the air model predicts dust levels very significantly below the criteria level, such that the residual risk can more reasonable be considered Class I.

\textsuperscript{9} Vibration monitoring has taken place at a location near Pit 3 (while open pit mining occurred) and at the southern end of the RPA.

\textsuperscript{10} These measurements do not exceed sensitive receiver criteria (5 mm/s).

\textsuperscript{11} Blast design parameters used to limit surface vibration include a reduction in charge weight per delay.

\textsuperscript{12} At the request of Traditional Owners, the location of one vibration monitor is not identified.
A risk has been identified where underground blasting and general underground mining activities produce vibration with the potential to destabilise the Pit 3 walls causing damage to R34 (TB2-02). ERA continues to monitor the pit wall stability during the backfill of the lower section of the pit with 30 million tonnes of waste rock. The backfill is effectively buttressing the Pit 3 wall\textsuperscript{13}. While the likelihood of TB2-02 eventuating has been assessed as rare, additional treatments have been identified. These consist of blast design\textsuperscript{14} and adopting a safety margin between Pit 3 and the stoping areas. These treatments in combination with the fore mentioned buttressing will significantly reduce the risk of impact to nearby cultural heritage sites from vibration associated with underground mining.

\textsuperscript{13} The backfilling of Pit 3 will be completed in 2014.
\textsuperscript{14} The magnitude of underground blasts are less than those historically associated with Pit 3 open cut mining operations.
For further information on the vibration assessment refer to Section 6.7.

10.4.2.4 Ground Disturbance

Cultural heritage site R34 is the only cultural site in the vicinity of the Project. The only surface disturbance associated with the Project that will occur within proximity of the R34 site is the construction of two ventilation raises (Figure 10-5). The location of the ventilation raises are provided in Section 3.5, (Figure 3-16). Construction of the raises occurs on a formed pad approximately 40 m by 40 m, with no activity occurring outside this area.

Other potential effects may include unauthorised/ unintentional damage by heavy machinery, and/or unauthorised entry and damage by unauthorised personnel (risk item TB2-01; TE7-02). Land disturbance, in any form and particularly with the use of heavy machinery, has the highest potential to damage a cultural site but is readily manageable. For example, in 2013 a levee construction took place in the immediate vicinity of archaeological site R34. This project involved major earthworks (80,000 tonnes of material), and excavation with heavy machinery working day and night without significant impact. Land disturbance on the RPA is rigidly managed via a land disturbance permit system which in turn is a key component of the ERA cultural heritage management system.

TB2-01 relates to the disturbance of an unknown anthropological site underground, this risk is specifically managed within the existing cultural heritage management system through a series of procedures and work instructions. These are described previously in Section 10.3.1.4. Once identified, management of the site is agreed with the Mirarr and the GAC on the advice of the external cultural heritage specialist.

Through the rigid application of the land disturbance permit system and other physical controls, ERA has effectively reduced the potential of adverse effects to R34 and all sites on the RPA to as low as practically achievable.

There have been no adverse physical impacts on cultural sites on the RPA identified during ERA's 30 years of open cut mining at Ranger. It is not expected that any of the elements, processes, or machinery used or personnel involved with the Project will add to, or alter, the potential to have an effect on cultural sites.

10.4.2.5 Visual Amenity

The environmental risk assessment identified that visual amenity associated with the ventilation stacks (TA3-01) has the potential to impact on cultural activities being undertaken within the undisturbed areas of the RPA, such as Magela Creek. The visual amenity risk focuses on the ventilation stacks due to their height (~10 m) and their proximity to areas of cultural value within the RPA such as the Magela Creek.

To assess the risk posed a study was undertaken assessing the visual amenity of the Project area and surrounding area including:

- the built form (physical structures) and natural features such as landform (topography) and vegetation;
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- visual catchment of the Project and potential views from public roads, townships and communities that contribute to the visual amenity of the project area;
- the value of existing vegetation as a visual screen; and
- the capacity of the Project to accommodate a change in land use without a detrimental impact on the existing visual quality and landscape character.

A line-of-sight analysis was conducted using a geographic information system (GIS) to determine whether a hypothetical observer at a given location could see the ventilation stacks. During the risk assessment process the ventilation stacks were identified as the highest infrastructure associated with the Project to be constructed and therefore posed the highest risk to visual amenity. As they have the potential to impact on the desire of local indigenous people to access the Magela Creek for traditional uses. Information on the height of vegetation and terrain was sourced from airborne laser data (LiDAR) that was captured in October 2010. Multiple lines-of-sight were calculated to each stack, based on randomly selected observer locations on the main access road, in the Magela LAA, and on the track to the north of Magela Creek (Figure 10-6). A 1.5 m height parameter was used for the observer, and a 12 m height parameter for the target (ventilation stack). For each defined line-of-sight, points of obstruction were calculated from the GIS.

A summary of the line-of-sight results from the analysis are provided in Table 10.7. Table 10.7 shows examples of line-of-sight plots for visible and non-visible ventilation shafts. Exhaust 4a ventilation stack is visible from the access road from observer location 11, but is not visible from the North Magela location (5) or from the Magela LAA (16). Exhaust 1 ventilation stack is visible from observer location 7 on the mine access road (Figure 10-7(d)), but is not visible from the North Magela or the Magela LAA locations.

None of the ventilation stacks are visible from observation points north of Magela Creek, as the riparian vegetation provides an effective screen. For potential observation locations further north of Magela Creek, the land surface is relatively flat, and there is a lack of elevated topographic features (e.g. hills) to allow an observer to see the vent stacks. The woodland vegetation in the Magela LAA also provides an effective screen for observation points in the area and from several of the other observer locations along the main access road.

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15 "Stacks", including their fan assembly, are used for exhaust ventilation to aid dispersion. At air intake locations there is no requirement for a stack; however bulk air coolers are of a similar height. For simplicity, the visual amenity analysis and discussion employs the "stack" terminology for both.
Table 10-4: Summary of visibility analysis from observer locations to vent stack

<table>
<thead>
<tr>
<th>Observer #</th>
<th>Observer location</th>
<th>Ventilation stack</th>
<th>Distance to ventilation stack (m)</th>
<th>Visible</th>
<th>Obstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Main access road</td>
<td>Exhaust 1</td>
<td>549</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>8</td>
<td>Main access road</td>
<td>Intake 1</td>
<td>454</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>North Magela</td>
<td>Exhaust 1</td>
<td>275</td>
<td>No</td>
<td>Vegetation (riparian)</td>
</tr>
<tr>
<td>15</td>
<td>Magela LAA</td>
<td>Exhaust 1</td>
<td>443</td>
<td>No</td>
<td>Vegetation (woodland)</td>
</tr>
<tr>
<td>15</td>
<td>Magela LAA</td>
<td>Intake 1</td>
<td>295</td>
<td>No</td>
<td>Vegetation (woodland)</td>
</tr>
<tr>
<td>16</td>
<td>Magela LAA</td>
<td>Intake 1</td>
<td>378</td>
<td>No</td>
<td>Vegetation (woodland)</td>
</tr>
<tr>
<td>16</td>
<td>Magela LAA</td>
<td>Exhaust 2b</td>
<td>372</td>
<td>No</td>
<td>Vegetation (woodland)</td>
</tr>
<tr>
<td>5</td>
<td>North Magela</td>
<td>Exhaust 2b</td>
<td>824</td>
<td>No</td>
<td>Vegetation (riparian)</td>
</tr>
<tr>
<td>5</td>
<td>North Magela</td>
<td>Exhaust 4a</td>
<td>783</td>
<td>No</td>
<td>Vegetation (riparian)</td>
</tr>
<tr>
<td>6</td>
<td>North Magela</td>
<td>Exhaust 2b</td>
<td>1026</td>
<td>No</td>
<td>Vegetation (riparian)</td>
</tr>
<tr>
<td>6</td>
<td>North Magela</td>
<td>Intake 3</td>
<td>1063</td>
<td>No</td>
<td>Vegetation (riparian)</td>
</tr>
</tbody>
</table>
### Observer Location Table

<table>
<thead>
<tr>
<th>Observer #</th>
<th>Observer location</th>
<th>Ventilation stack</th>
<th>Distance to ventilation stack (m)</th>
<th>Visible</th>
<th>Obstruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Magela LAA</td>
<td>Intake 2</td>
<td>645</td>
<td>No</td>
<td>Vegetation (woodland)</td>
</tr>
<tr>
<td>18</td>
<td>Magela LAA</td>
<td>Exhaust 4a</td>
<td>536</td>
<td>No</td>
<td>Vegetation (woodland)</td>
</tr>
<tr>
<td>20</td>
<td>Magela LAA</td>
<td>Intake 2</td>
<td>691</td>
<td>No</td>
<td>Terrain</td>
</tr>
<tr>
<td>20</td>
<td>Magela LAA</td>
<td>Exhaust 4b</td>
<td>648</td>
<td>No</td>
<td>Vegetation (woodland)</td>
</tr>
<tr>
<td>21</td>
<td>Magela LAA</td>
<td>Exhaust 4b</td>
<td>580</td>
<td>No</td>
<td>Vegetation (woodland)</td>
</tr>
<tr>
<td>11</td>
<td>Main access road</td>
<td>Exhaust 4a</td>
<td>190</td>
<td>Yes</td>
<td>None</td>
</tr>
<tr>
<td>12</td>
<td>Main access road</td>
<td>Exhaust 4a</td>
<td>107</td>
<td>No</td>
<td>Vegetation (woodland)</td>
</tr>
</tbody>
</table>

Photographs were captured from the observation locations (Figure 10-6) used for the line-of-sight analysis. The purpose of the photos was to verify the GIS line-of-sight analysis, provide an on-ground representation of the view, and identify obstructions such as vegetation. The images were captured on 17 October 2013 between the hours of 1 pm and 3 pm, recorded at a height of 1.5 m, and orientated to the corresponding proposed ventilation stack using a hand-held compass.

Example photo points from visible and non-visible locations are shown in Figure 10-8. The photos verified the outcome of the line-of-sight analysis, and further highlighted the influence of vegetation as a screen.
Key:
- observer,
- non-visible vent stack,
- visible vent stack,
- point of obstruction,
- surface visible to observer,
- surface not visible to observer.


Figure 10-7: Line-of-sight plots for selected observer locations
Results of the visual amenity assessment have shown that the ventilation stacks will not be visible from areas within the RPA currently used for cultural purposes. There is unlikely to be a detrimental impact on the existing visual quality and landscape character, given the limited area to be disturbed, the effect of vegetation screening (particularly riparian), and the location of the proposed infrastructure predominantly within the existing operational footprint.
10.5 SUMMARY

ERA has in place a comprehensive cultural heritage management system which has been progressively developed since 2006. During the period 2006 to 2013, some 150 cultural sites have been identified across the RPA. Part of the cultural heritage management system requires periodic audits of cultural sites that are most susceptible to disturbance from operational activity. During the period 2006 – 2013, five audits of cultural sites in the vicinity of existing operations have been conducted by external cultural heritage specialists working on behalf of the Mirarr Traditional Owners, encompassing 134 inspections at cultural sites. The audits concluded that no archaeological material had been disturbed by mining activities.

The scale and location of the surface infrastructure related to the Ranger 3 Deeps Project is much smaller than many recent projects undertaken on the RPA e.g. the excavation and construction of the Magela levee, and close spaced exploration drilling pads at over 100 sites. These projects have been conducted in the immediate vicinity of cultural sites without adverse impacts.

The scale of disturbance of the above ground infrastructure associated with the Project will not add to the potential risk of damage to cultural sites. In effect, the potential risk reduces with an underground operation and all cultural sites in the RPA will continue to be managed through the cultural heritage management system over the life of the Project.

Results from vibration monitoring of Ranger 3 Deeps underground blasting indicate that the below ground aspect of the Project will not have a physical impact on surface cultural sites. There are no known subsurface sites upon which the Project could have an impact.

Air quality studies show that the potential impact of dust and emissions as a result of the Project will have no measurable physical effect on cultural sites. Ranger operations have involved two open cut mining pits over 30 years. Air quality as a result of the mining and stockpiling of mineralised material has had no significant physical impact on cultural sites in the RPA.

The cultural heritage management system has consistently provided protection of all cultural heritage sites on the RPA and has therefore demonstrated that protection of cultural sites in the immediate vicinity of a mining activity is feasible. The continued implementation of the cultural heritage management system and new treatments will protect all known cultural sites in the RPA from potential disturbance as a result of the Project.

Based on the information presented above, development of the Project is not expected to impact on the world heritage values for which Kakadu is listed. Compliance with the Commonwealth Environmental Requirements, aligned with the stakeholder audits, inspection and monitoring systems imbedded in Ranger’s ISO 14001:2004 environmental management system, has also demonstrated that the cultural heritage values of Kakadu remain protected.
10.6 REFERENCES


