Kilimiraka Notice of Intent

Kilimiraka Mineral Sands Project, Bathurst Island, N.T.

July 2012

Prepared for: Matilda Zircon Limited
Document Control Record

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REVISION STATUS

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<td>13/8/2012</td>
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1 Introduction

Matilda Zircon Limited (Matilda Zircon) proposes to establish a mineral sands mine at the Kilimiraka deposit on the south-west coast of Bathurst Island, Northern Territory. The project would involve surface mining (using open cut dozer trap methods) and processing of about 56.2 million tonnes of mineralised ore body over an anticipated mine life of 8-10 years. Estimated production is 890,000 tonnes of Heavy Mineral Concentrate (HMC) to service the expanding Chinese market for this product (Matilda Zircon 2011). The project will remove sand, extract 1.6% heavy mineral sand, replace the remaining silica sand and clays back into the original landform, and then re-establish vegetation.

The Kilimiraka project is Matilda Zircon’s fourth mining project on the Tiwi Islands after Andranangoo, Lethbridge West and Lethbridge South mines, but is the first project on Bathurst Island. It is envisaged that the resources at Kilimiraka will potentially underpin a significantly larger development than the company’s previous operations (Matilda Zircon 2011).

This Notice of Intent (NOI) documents Matilda Zircon’s intention to develop the Kilimiraka mineral sand mine on Bathurst Island.

![Figure 1: Location of Matilda Zircon Exploration and Mineral Leases on the Tiwi Islands](image-url)
1.1 Project Location and Access

The Kilimiraka Prospect (within EL24329) is located 50 km west of Wurrumiyanga (previously known as Nguiu) on the south-east coast of Bathurst Island (Figure 1). Bathurst Island is situated approximately 60 km north of Darwin (Figure 2).

The mineralised dune systems at Kilimiraka occur along Bathurst Island's south coast. Current access to the area is via four wheel drive vehicle along the Wurrumiyanga-Ranku road for about 40 km, then 30 km south-west along Cape Fourcroy road.

![Figure 2: Location of Kilimiraka Project](image)
1.2 Company History and Project Background

Matilda Minerals Limited (the predecessor of Matilda Zircon) started investigations on the Tiwi Islands (Bathurst Island and Melville Island) for high value zircon and rutile rich deposits in 2003 and acquired the first tenement on the Tiwi Islands in April 2004. The company made its transition from explorer to producer in October 2006 and commenced their first sand mining operation at Andranangoo Creek on Melville Island. Mining operations at Andranangoo lasted for 24 months until the mine was decommissioned in September 2008. The Lethbridge Bay West mine site was next scheduled to commence operations following Andranangoo. However, the economic feasibility of the project was reassessed in late 2008 and, due to increased fuel and shipping costs and the lack of port facilities, Matilda Minerals opted to suspend mining activities on the Tiwi Islands. In October 2008, Matilda Minerals went into voluntary administration (EcOz 2010).

In early 2009, the Tiwi Island tenements and mining plant of Matilda Minerals were purchased by Stirling Resources Limited. In June 2009, Stirling Resources on-sold the tenements and mining plant to Matilda Zircon Limited (previously known as Olympia Resources Limited), a company dedicated to the development of mineral sands operations in Australia.

Matilda Zircon assessed the deposits and decided to initially mine the Lethbridge West and Lethbridge South deposits at Lethbridge Bay. In June 2010 Matilda Zircon started mining the small high-grade deposits at Lethbridge West (MLN 24511) on Melville Island and successfully produced 11,400 tonnes of concentrate from 134,500 tonnes of ore mined, within four months (June 2010-Oct 2010). Rehabilitation and re-vegetation success at Andranangoo and Lethbridge West mine introduced an economic model for the company to continue mining on the Tiwi Islands (Matilda Zircon 2011).

Once mining operations at Lethbridge West were complete, Matilda Zircon gained approval in May 2011 to move operations to Lethbridge South (MLN 27438); located four kilometres south-east of the Lethbridge West Deposit. The ore reserves at Lethbridge South are six times larger than Lethbridge West but are of a lower grade. These reserves are expected to produce approximately 29,000 tonnes of concentrate over a ten month operation. Mining at Lethbridge South was originally scheduled to commence in June 2011, however, this was postponed due to fire damage during the assembly of the processing facility. Mining mine these deposits commenced early in 2012 and will is planned to be completed by end of 2012 (Matilda Zircon 2011).

In 2011, Matilda Zircon discovered an area of extensive mineralisation at Kilimiraka, contained within EL 24329, on the south-west coast of Bathurst Island. The resource estimate for Kilimiraka includes a total inferred mineral reserve of 56.2 million tonnes, at an average grade of 1.6% heavy mineral made up of 40.6% ilmenite, 20.5% goethite, 13.5% leucoxene, 11.2% zircon and 6.8% rutile with minor trash elements (7.4%). This resource is contained in four large dunal systems.

1.3 Company details and contacts

<table>
<thead>
<tr>
<th>Operator Name:</th>
<th>Matilda Zircon Ltd</th>
</tr>
</thead>
<tbody>
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<td>Key Contact Person/s:</td>
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</tr>
<tr>
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<tr>
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<td>+61 8 9328 9800</td>
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<tr>
<td>Fax:</td>
<td>+61 8 9328 9911</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:peter.gazzard@matildazircon.com.au">peter.gazzard@matildazircon.com.au</a></td>
</tr>
</tbody>
</table>
1.4 Purpose of Notice of Intent

This Notice of Intent (NOI) provides formal notification to the Northern Territory Government and other interested parties of Matilda Zircon’s intention to develop the Kilimiraka resource within EL24329 and associated facilities to support the project. It provides the required information to the Department of Resources (DoR) and Department of Natural Resources, Environment, the Arts and Sport (NRETAS) to determine the appropriate level of environmental assessment for the project.

This NOI has been prepared in accordance with the NRETAS Information Guidelines for a Notice of Intent (NRETAS, 2007), as summarised in Table 1 and the DoR Environmental Assessment of Mining Proposals Advisory Note (DoR, 2008).

**Table 1: Information requirements for an NOI (NRETAS)**

<table>
<thead>
<tr>
<th>NOI Guideline Requirement</th>
<th>Report Section</th>
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<tbody>
<tr>
<td>1. Name of proponent and consultant</td>
<td>Section 1.4</td>
</tr>
<tr>
<td>2. Address and contact details of proponent</td>
<td>Section 1.4</td>
</tr>
<tr>
<td>3. Location of proposal</td>
<td>Section 1.2</td>
</tr>
<tr>
<td>4. Description of a proposal</td>
<td>Section 2</td>
</tr>
<tr>
<td>5. Outline of legislative consent and licensing requirements</td>
<td>Section 4</td>
</tr>
<tr>
<td>6. Description of site and existing environment</td>
<td>Section 3</td>
</tr>
<tr>
<td>7. Description of existing marine and land uses in and adjacent to proposal</td>
<td>Section 3.2</td>
</tr>
<tr>
<td>8. Description of waste management and pollution control on and offsite</td>
<td>Section 2.6</td>
</tr>
<tr>
<td>9. Description of other environmental factors</td>
<td>Section 3</td>
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<tr>
<td>10. Identification of greenhouse gas emissions from the proposal</td>
<td>Section 3.5</td>
</tr>
<tr>
<td>11. Aboriginal and sacred sites clearance</td>
<td>Section 5.7</td>
</tr>
<tr>
<td>12. Description of timing, including stages and decommissioning</td>
<td>Section 2.6.4</td>
</tr>
<tr>
<td>13. Description of environmental commitments, safeguards, and monitoring</td>
<td>Section 6</td>
</tr>
<tr>
<td>14. Description of proposed rehabilitation and decommissioning</td>
<td>Section 2.6.3</td>
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2 Project Description

Matilda Zircon Limited (Matilda Zircon) is an ASX-listed resource company (ASX: MZI). The company is focused on the development of mineral sands operations to meet zircon and titanium minerals demand into the expanding Chinese market. It has mineral sands projects in the Northern Territory and Western Australia.

Matilda Zircon’s inferred resource discovery at Kilimiraka will be a significantly larger development than the company’s combined Lethbridge Bay operations. Recently completed exploration drilling (Jan to May 2011) has identified four main dune deposits (Table 2 and Figure 3). These dunes contain a total inferred resource of 56.2 million tonnes of ore which can produce 893,700 tonnes of Heavy Mineral Concentrate (HMC). Heavy mineral production from these deposits will include 11.2% of Zircon content (99,680 tonnes) and 60.9% of titanium based products (rutile, ilmenite and leucoxene) (542,010 tonnes) with a very high content of iron oxide (182,450 tonnes). This mineral production is estimated to be 22 times the size than the company’s combined Lethbridge Bay operations.

The dune field at Kilimiraka is composite barchan style with units of different age ï barchan dunes are solitory crescent dunes formed on a flat, hard ground with limited supplies of sand and vegetation (e.g. Figure 4). Each individual sand deposit is separated by lateritised sandstone which forms headlands along the beach. These individual sand deposits have been named according to their position. The primary division is West and East which has been subdivided further into the four zones according to the headlands separating the dunes (see Table 2 and Figure 3).

The project will involve the development of roads, ancillary infrastructure, and a transport facility (which may be transhipping using a barge landing facility or development of a port facility on Bathurst Island opposite Port Melville). The processing facility is currently in use at Lethbridge South (on Melville Island). Some of the existing components will be transported to the proposed project location, pending approvals. It is proposed that the camp and associated facilities will be established close to the mining area, however the exact location has not yet been decided and will depend on field surveys and also discussions with representatives of the Tiwi Land Council.

The dunal nature of the deposit makes the project suitable for dozer trap mining. This differs from the mine plan adopted at Andranangoo, Lethbridge West and Lethbridge South operations which used a slot mining method. The dozer trap mining method will utilise a bulldozer, front end loader, and excavator to push ore down the sand dune into a hopper called a “dozer trap”. The remainder of the process will mirror the plan used at Lethbridge West where the excavated ore will be placed in a portable slurry unit and pumped to the process plant to remove the HMC. The remaining sand (98.4%) will be returned to the mining area to reinstate the dune formation as close to its original pre-disturbance structure. With the approximate mining rate of 700 tonnes per hour, the Kilimiraka resource can underpin an 8-10 year mining operation.

<table>
<thead>
<tr>
<th>Primary Division</th>
<th>Secondary Division</th>
<th>Tiwi Name</th>
<th>Tonnes (Mt)</th>
<th>%HM</th>
<th>% Zircon in HM</th>
<th>Tonnes HM</th>
</tr>
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<tbody>
<tr>
<td>West</td>
<td>West 1</td>
<td>Tutuyangu</td>
<td>14.7</td>
<td>1.6</td>
<td>10.4</td>
<td>231,800</td>
</tr>
<tr>
<td></td>
<td>West 2</td>
<td>Punnari</td>
<td>4.7</td>
<td>2.3</td>
<td>16.5</td>
<td>109,300</td>
</tr>
<tr>
<td></td>
<td>West 3</td>
<td>Tingati</td>
<td>6.3</td>
<td>1.5</td>
<td>9.1</td>
<td>92,600</td>
</tr>
<tr>
<td></td>
<td>Total for Western Deposit</td>
<td></td>
<td>25.6</td>
<td>1.7</td>
<td></td>
<td>433,700</td>
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<tr>
<td>East</td>
<td>Total for Eastern Deposit</td>
<td></td>
<td>30.6</td>
<td>1.5</td>
<td>9.0</td>
<td>460,000</td>
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<tr>
<td>Total for Kilimiraka Project</td>
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<td></td>
<td>56.2</td>
<td>1.6</td>
<td></td>
<td>893,700</td>
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Figure 3: Location of the four target dunes at Kilimiraka

Figure 4: Photograph of the Tingati Dune looking east (June 2012)
2.1 Key Operations

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<th>Scope of works</th>
<th>Criteria</th>
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<tbody>
<tr>
<td>Site preparation</td>
<td>- Ecological surveys&lt;br&gt;- Access road construction to Kilimiraka prospect&lt;br&gt;- Local access to each deposit&lt;br&gt;- Clear area for process plant&lt;br&gt;- Installation of process plant&lt;br&gt;- Identify temporary pipeline routes to and from process plant</td>
</tr>
<tr>
<td>Mining</td>
<td>- Refer to Section 2.4 and 2.5</td>
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<tr>
<td>Rehabilitation Activities</td>
<td>- Seed collection from local flora species (dry screening trash)&lt;br&gt;- Return sand to mining area&lt;br&gt;- Removal of infrastructure/facility, all wastes and hazardous substances&lt;br&gt;- Re-contour of rehabilitation zone&lt;br&gt;- Re-spread of top soil, logs and debris&lt;br&gt;- Seed dispersal&lt;br&gt;- Tube stocking</td>
</tr>
<tr>
<td>Monitoring</td>
<td>- Water monitoring (surface and ground waters)&lt;br&gt;- Rehabilitation Audits&lt;br&gt;- Erosion and Sediment Control&lt;br&gt;- Sea Turtle Surveys</td>
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<tr>
<td>Reporting</td>
<td>- Annual Mining Management Plan&lt;br&gt;- Erosion and Sediment Control Plan&lt;br&gt;- Rehabilitation and Mine Closure Plan</td>
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2.2 Project Components and Timing

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<tr>
<td>Proposed Construction Commencement</td>
<td>Late 2013</td>
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<tr>
<td>Proposed Operation Commencement</td>
<td>Mid 2014</td>
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<tr>
<td>Life of Mine</td>
<td>8-10 years</td>
</tr>
<tr>
<td>Estimated Year of Decommissioning</td>
<td>2024</td>
</tr>
<tr>
<td>Operating Hours</td>
<td>24 hours a day</td>
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<tr>
<td>Size of Ore body</td>
<td>56 million tonnes</td>
</tr>
<tr>
<td>Ore Type</td>
<td>Heavy Mineral Concentrate in sand</td>
</tr>
<tr>
<td>Ore Mining Rate (pa)</td>
<td>5,600,000 tonnes</td>
</tr>
<tr>
<td>Overburden Mining Rate (pa)</td>
<td>NIL</td>
</tr>
<tr>
<td>Estimated Total HMC Production</td>
<td>893,700 tonnes</td>
</tr>
<tr>
<td>Strip Ratio</td>
<td>N/A</td>
</tr>
<tr>
<td>Number of Pits</td>
<td>N/A</td>
</tr>
<tr>
<td>Depth of Pits</td>
<td>Less than 3m (in 30m dunes that are up to 60m ASL)</td>
</tr>
<tr>
<td>Estimated Recoverable Topsoil</td>
<td>5 cm</td>
</tr>
<tr>
<td>Processing Rate</td>
<td>700tph</td>
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<tr>
<td>Ore Grade</td>
<td>1.6% Heavy Mineral</td>
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<tr>
<td>Estimated Total Disturbance Footprint</td>
<td>325ha</td>
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<tr>
<td>Workforce</td>
<td>40</td>
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</table>
2.3 Mineral Sand Resources

The Kilimiraka Mineral Sands Project consists of a large heavy mineral deposit located across four separate dunes (see Figure 3). The exploration drilling program in 2011 completed a total of 847m of shell augering with an average depth of 7.1m at a range of 2-13.5m. Resource modelling and ID2 grade interpolation on 249 samples, collected from 0.5m to 8.0m, confirmed a large heavy mineral deposit at Kilimiraka.

Average mineral content was determined from the composite samples made from the sink fraction of the selected 29 samples. The mineral suite and its estimated average proportion is provided in Table 3.

The dunes sit above the van Diemen Sandstone which approximates the land surface behind the dunes. The heavy mineral resource lies wholly and only within the sand and may be concentrated towards the base of the dunes.

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Western Deposits</th>
<th>Eastern Deposit</th>
<th>Average Mineral Proportion</th>
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<tbody>
<tr>
<td></td>
<td>Tutuyangu</td>
<td>Punnari</td>
<td>Tingati</td>
</tr>
<tr>
<td>Ilmenite (FeTiO₃)</td>
<td>37.625</td>
<td>44.66</td>
<td>36.9</td>
</tr>
<tr>
<td>Goethite (FeO(OH))</td>
<td>25.075</td>
<td>10.1</td>
<td>27.45</td>
</tr>
<tr>
<td>Leucoxene (Fe₂O₃, TiO₂, TiO₂)</td>
<td>14.2</td>
<td>14.5</td>
<td>10.05</td>
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<td>Zircon (ZrSiO₄)</td>
<td>10.375</td>
<td>16.48</td>
<td>9.1</td>
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<td>Rutile (TiO₂)</td>
<td>6.05</td>
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<td>6.05</td>
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<td>Mag Others</td>
<td>3.825</td>
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<td>4.1</td>
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<td>Aggregates</td>
<td>1.775</td>
<td>1.12</td>
<td>3.4</td>
</tr>
<tr>
<td>Non Mag Others</td>
<td>1.175</td>
<td>0.94</td>
<td>2.95</td>
</tr>
</tbody>
</table>

2.4 Mining Process

The mineral sand mining methodology used at Andranangoo, Lethbridge West, and Lethbridge South will be modified for Kilimiraka to account for local conditions. The development of the mineral sand mining operation will use open pit mining techniques. The previous mine sites on Melville Island used a mining method known as "slot mining" however the topographic conditions and location of ore in the dune profile at Kilimiraka has justified the use of "dozer trap mining". The choice of this technique is aimed at minimising the excavation footprint, environmental impact, and costs. It also allows for progressive rehabilitation.

The mining process will involve stripping and stockpiling the soils and overburden, mining the ore using dozer trap, ore screening, processing, and transporting to loading facility for shipment.

A schematic of the proposed mining method for Kilimiraka Project is provided in Figure 5.

The ore will be mined progressively, starting from the far western deposit, moving east in 200 m blocks.
2.4.1 Step 1 – Topsoil Removal
The sand dunes targeted for mineral extraction are mostly void of woody vegetation, therefore the need to remove and stockpile topsoil is unlikely to benefit the rehabilitation program. Nonetheless, all existing vegetation and topsoil (to a depth of 50 mm) will be stockpiled for later spreading and use as brush cover and seed bank during the rehabilitation process.

2.4.2 Step 2 – Ore Removal
Large bulldozers will be used to feed extracted sand to a buried hopper (dozer trap) that will be positioned at the base of the dune, beachside. Ancillary equipment, frontend loaders, excavators, and graders will be utilised to aid in sand extraction. The ore body will be mined in sections of 100m radius, which is the economic pushing distance of a bulldozer. The dozer trap will therefore be periodically moved once each section is completed to enable progression of the mining face along the dunal system.

There are four target zones separated by headlands of lateritised sandstone that will be mined during the Kilimiraka project. Mining will occur in progression from west to east, which allows for progressive rehabilitation of mined locations.

2.4.3 Step 3 – Ore Screening
The sand from the dozer trap will be fed by conveyor into a rotating trommel screen to remove any rock >2mm and organic material such as tree roots. A road will be established along the edge of the mineralised zone to the trommel screen, which aims to minimise the mining footprint. The oversize removed during screening, may contain organic matter and some seed. The oversize will be stockpiled for use in rehabilitation after topsoil replacement to assist with soil binding and surface stabilisation.

2.4.4 Step 4 – Treatment and Ore Processing
Screened sand (<2mm) will be passed into a feeder hopper from the screen via poly pipes and will be mixed with water to an approximately 35% solid slurry. The resulting slurry will be fed to the gravity spiral separators (spirals) at the Wet Concentrate Plant (WCP). The WCP will be a larger version of the plant that has been used successfully in Matilda Zircon’s three previous operations on Melville Island. The spirals will separate the mined sand into a heavy mineral concentrate and silica sand tailings utilising wet gravity
separation. This separation process does not require any chemicals and will use the recycled water for the separation of sand and Heavy Mineral Concentrate (HMC). The WCP will have five stages of spiral separators to ensure good recovery of heavy minerals to the HMC. The HMC will be pumped from the concentrator to a dewatering hydrocyclone where the water will be recovered for re-use in the processing plant. The HMC will pass from the bottom discharge of the dewatering hydrocyclone onto a temporary stockpile.

This processing facility will allow for production treatment rates of around 700 tonnes of ore per hour.

2.4.5 Step 5 – Product Stockpile and Shipping

HMC will be stored near the process plant as a stockpile ready for transport off the island. The stockpiled HMC, containing a significant proportion of ilmenite, goethite, leucoxene, zircon and rutile (with minor trash elements such as staurolite), will remain moist after separation, thereby reducing the risk of wind or rain impact erosion and loss of product. The stockpiles will not be greater than 3 metres in height and will be stored for a maximum of 7 days prior to transfer to a loading facility.

Matilda Zircon is undertaking feasibility studies for ore transport options, one being a transhipment from Port Hurd (near the Barra Base tourist enterprise) to an offshore anchorage, and the other being direct shipping from Interview Point within the Apsley Strait (opposite Port Melville) (see Figure 6). Both options will be explored as part of the Environmental Approval Process to determine environmental, economic, social, and cultural impacts of the operation.

The Port Hurd option would require a barge landing facility in Maand Creek (associated infrastructure such as a shed, bunded fuel storage, and laydown pad), a road upgrade (~18 km), and a transhipping agreement off the west coast of Bathurst Island.

The Interview Point option would involve construction of a wharf (maximum 50m), a road upgrade (~80 km), construction of a laydown pad and storage shed, bunded fuel storage, and a direct shipping agreement for the Apsley Strait. Up to ten road train trips per day are estimated for this operation.

Ten thousand tonne shipments are planned to occur approximately once per month. Haul trucks will operate during daylight hours only.

2.4.6 Step 6 – Rehabilitation

From the WCP the silica sand tailings will be pumped back to the mined pit area via hydrocyclones and poly pipes. The hydrocyclones dewater the tailings allowing the mined dunes to be re-established and built up to their original landform. Water will be recovered from the tailings via the hydrocyclones and recycled into the screening and separation process. Stockpiled topsoil will be placed on the re-contoured area, as will oversize material from the screening process, to provide natural seed bank and soil stabilisation. Depending on seasonal requirements, further methods of stabilisation will be employed. Infill planting of local native species will be undertaken if necessary.

Matilda Zircon has had success rehabilitating their previous mining operations at Andranangoo and at Lethbridge West. Methodology used in these areas will be modified for use in rehabilitating the Kilimiraka operation.
Figure 6: Ore Transport Options for the Kilimiraka Project
2.5 Mine Design

The indicative footprint for the Kilimiraka Mineral Sands Project is approximately 313 hectares, which includes the mining areas, process area, offices, mine camp, airstrip, and barge landing facility (Figure 7). The haul road, barge facility, and camp are all located within previously cleared area to minimise direct loss of habitat in the area. This is also the case for several of the proposed access roads, however these areas are currently single lane 4WD tracks that will need widening to service mining vehicles. The process area is estimated to be 10 ha and includes a process water dam that will be used to store and recycle water to create the mineral sand slurry mixture require for the Wet Concentrator Plant.

Table 4: Estimated Area Statistics for the Kilimiraka Mineral Sands Project

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Area</th>
<th>Area of clearing required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Deposits</td>
<td>265 ha</td>
<td>265 ha</td>
</tr>
<tr>
<td>Process Area</td>
<td>10 ha</td>
<td>10 ha</td>
</tr>
<tr>
<td>Haul road (widen existing road by 10 m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Option A (18 km)</td>
<td>27 ha</td>
<td>18 ha</td>
</tr>
<tr>
<td>Option B (80 km)</td>
<td>120 ha</td>
<td>80 ha</td>
</tr>
<tr>
<td>Airstrip (1800 m x 100 m) (unless current airstrip is used)</td>
<td>18 ha</td>
<td>18 ha</td>
</tr>
<tr>
<td>Camp</td>
<td>2 ha</td>
<td>1 ha</td>
</tr>
<tr>
<td>Miscellaneous access tracks</td>
<td>1 ha</td>
<td>1 ha</td>
</tr>
<tr>
<td>Barge Landing Facility</td>
<td>1 ha</td>
<td>0 ha</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>324 (417) ha</strong></td>
<td><strong>313 (375) ha</strong></td>
</tr>
</tbody>
</table>

Figure 7: Proposed Mine Infrastructure Layout for Kilimiraka Mineral Sands Project
2.5.1 Infrastructure

The infrastructure and major equipment required for the Kilimiraka project is listed in Table 5. A large proportion of this infrastructure is stationary and will remain in place for the life of the mine. The dozer trap, trommel screen, and conveyor will be relocated as mining progresses along the ore bodies. The trommel will pump ore slurry via a flexible pipeline to the wet concentrating plant. The WCP will not move throughout the mining operation. The HMC stockpile will be adjacent to the WCP. HMC will be trucked from the HMC stockpile to Interview Point or Port Hurd for shipping. These reduced requirements for mobility around the site will lower the overall impact on the immediate and surrounding region of the Kilimiraka prospect.

Table 5: Infrastructure Required in the Mining Process

<table>
<thead>
<tr>
<th>Mining Area</th>
<th>Surface Infrastructure, Transport System and Ancillary Operations</th>
</tr>
</thead>
</table>
| **Excavation Zone**    | • Bulldozer  
                       | • Excavator  
                       | • Front-end loader  
                       | • Grader  
                       | • Dozer trap  
                       | • Rotating trommel screen  
                       | • Pipe lines (both to the plant and returning tailings to the pit)  
                       | • Pumps to transfer water and slurry around the site (via the pipelines) |
| **Process Plant Zone** | • Wet concentrating plant  
                       | • Trucks  
                       | • Front-end loader  
                       | • Product stockpile  
                       | • Offices and ablution area  
                       | • Workshop  
                       | • Process Water Dam |
| **Barge or Wharf Area**| • Front end loader  
                       | • Trucks  
                       | • Lay down area  
                       | • Barge loading facilities  
                       | • Barge landing area  
                       | • (Wharf)  
                       | • Barge |

2.5.2 Bore Field

Matilda is currently preparing a scope of works for a groundwater study so as to determine the potential and availability of water for this project. Existing mapping identifies potential resources that will at least supply the potable requirements of staff on site. Salt water is used for processing of similar deposits elsewhere and will be investigated if a freshwater resource is not available.

2.5.3 Transportation

Current vehicle access to Kilimiraka is from the Wurrumiyanga-Ranku Road for 40km and then 30km along the Cape Fourcroy road. Internal roads will be required to link individual sand deposits to the Mine Operation Centre (MOC) and the mine pit to the processing facility.
An airstrip is proposed for development close to the existing Barra Farm airstrip (which requires significant upgrade and is not aligned correctly (i.e. preferred SE to NW orientation due to prevailing winds). However, if scope to upgrade the existing airstrip is feasible, that will be used as primary airstrip location to reduce vegetation clearing and impact on native flora and fauna. If decommissioned, the existing airstrip may be utilised for other purposes so as to reduce the requirement for new clearing.

The MOC will be located adjacent to the sand deposits, minimising the distance the ore will be hauled to the screening unit.

Local access will be established through the native bush, avoiding any significant impact on native flora and fauna habitat (i.e. Dry Monsoon Forest vegetation community will be avoided). Local access will maintain a suitable buffer from the freshwater swamps that tend to occur in depressions within the landward dune swales. This will reduce impact on the swamp habitats and also keep the roads trafficable and more easily managed (i.e. reduce water logging, boggy areas etc.).

While accurate numbers of vehicle movements have not been determined, the following is anticipated:

- Mobilization of all plant and machinery to site for construction;
- A bulldozer will move ore from the dunes to the dozer trap;
- Haul trucks will move the stockpiled HMC product from near the processing plant to Interview Point or Port Hurd;
- Supply trucks will bring industrial supplies such as mechanical parts, tools and equipment;
- Fuel trucks will deliver diesel fuel on a regular basis;
- Waste oil removal trucks will remove waste oil, oily filters, and other hydrocarbon contaminated waste from the site on an as needs basis; and
- Light vehicles will be used to move personnel between the accommodation village and their working area as well as during day to day activities.

### 2.5.4 Operational Facility

Following site preparations, some of Matilda Zircon’s operational facilities at Lethbridge South (on Melville Island) will be moved to Kilimiraka. The process plant will require a maximum of 1.5 ha. The most suitable location for the process plant will be determined after on-site ecological surveys, and liaisons with Traditional Owners and other stakeholders.

A pipeline to pump ore from each of the mining areas to the processing plant and return tailings to the pit will be installed directly adjacent to the proposed local access. This pipeline will lie on the surface and will be removed immediately after the mining operation. This arrangement will reduce impact on the existing environment and will also provide easy access to the pipeline for maintenance purposes. The WCP will be moved once when mining moves from the western to the eastern deposit.

### 2.5.5 Accommodation Camp

A permanent accommodation village will be established for an operational workforce of approximately 40 personnel. The mine camp area will be approximately 2 ha. As the project has an 8-10 year lifespan, the camp will be more substantial than previous operations at Lethbridge West and Andranangoo. This project will also aim for a greater level of employment of Tiwi Islanders.

Note that agreement on siting the camp is yet to be finalised with the local Traditional Owners and the Tiwi Land Council. Matilda Zircon is flexible and is keen to establish a camp in a location that will be useful for future use by Traditional Owners. The anticipated location of the camp is to the north of the mining zone within Eucalyptus woodland that is common throughout Bathurst Island (see Figure 7). This area has been selected due to its close proximity to the proposed airstrip and mining zone, good chance of viable potable water supply, and is also located in a scenic location that may be useful for future tourist opportunities by the
Tiwi islanders. Ecological field studies and consultation with the TLC and NT Government will determine final location of camp and airstrip.

All camp buildings will be of a demountable, modular type with steel frames to provide termite resistance and will be equipped with air-conditioning. All buildings will be designed to comply with the cyclone code rating for the area.

The accommodation camp will include the construction of the following infrastructure:

- Offices
- First aid room
- Meeting room
- Accommodation units
- Ablutions
- Sewerage storage and treatment
- Raw water supply and storage
- Water treatment and potable water storage
- Power generation and fuel storage
- Laundry
- Kitchen
- Dry mess
- Wet mess
- Access roads
- Internal roads
- Light vehicle car park
- Communications
- Heavy vehicle car park
- Sporting and recreational facilities
- Emergency cyclone shelter

2.5.6 Final Product Transport

There are two main final product transport options for the Kilimiraka project; these include direct shipping from Interview Point, in the Aspley Straight opposite Port Melville, or transhipment from Port Hurd using a barge landing facility in Maand Creek. Matilda Zircon are currently undertaking feasibility studies to determine which of these options is most suitable in regards to water depth (hydrography), flora and fauna, social, cultural, future land use of the infrastructure, and economic factors.

Both options will require major onsite works, and these are summarised below:

**Interview Point Direct Shipping Option**

- Upgrade 80 km of existing roads to be suitable for road trains.
- Clearing of vegetation for laydown pad and storage shed.
- Installation of a bunded fuel facility (isocontainer).
- Construction of a 50m (maximum) wharf.

**Port Hurd Transhipment Option**

- Upgrade 18 km of existing roads.
- Construction of laydown pad and storage shed (no vegetation clearing required at this site).
- Installation of a bunded fuel facility (isocontainer).
- Construction of barge landing facility in Maand Creek at the end of the existing Barra Base airstrip.

2.5.7 Waste Rock Dumps (WRD)

Waste rock dumps will not be required during the Kilimiraka operation.

The direct replacement of sand tailings back at the mining area does not impose any threat to the groundwater quality or other surface water bodies due to non-involvement of any chemical in the ore processing. Heavy mineral sand processing only requires water to separate the heavy mineral concentrate
from the main body of sand, and therefore the waste produced is only medium to fine-grained sands. All wastes are returned to the mining area as a part of the rehabilitation process.

2.5.8 Landfill

The project will require an on-site landfill to dispose the domestic and putrescibles waste from the accommodation village and MOC. This landfill will conform to relevant health standards and be constructed and operated so as to have minimal impact on the environment. Recycling will occur where possible.

2.5.9 Services

Potable Water

Potable water will be sourced for the site operational facility and camp from a local water supply bore. Groundwater studies will determine best location for the potable water bore.

The daily average water consumption is estimated to be 12 kL, assuming consumption of 300 L per person per day.

Mining Process Water Requirements

The project water requirement is estimated at 2 GL per annum, and will therefore require a bore field and process water dam at the site.

The project water requirements are estimated at:

- 100 kL per day for dust suppression (water for dust suppression is not expected to be required between November and March);
- 5000 kL per day for water addition (water addition is not expected to be required between November and March);
- 29,600 kL per day (2.3 kL per tonne of ore) to separate the HMC from the ore. A minimum 80% water recovery is estimated to occur through the dewatering cyclones unit, which will reduce the water consumption to run the processing plant; and
- 1 kL per day for wash-down activities.

An initial bore field feasibility study will be conducted directly to the north of the dune field in areas where the Van Diemen Sandstone layer is 40 to 60m thick (see Figure 8).

Power Supply

A series of diesel generators will be required to meet the energy requirements of the bore field, process plant and associated infrastructure (see Table 6).

The estimated power requirement is in order of 2.1 MW.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Quantity and Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processing plant unit</td>
<td>4 x 1000kW</td>
</tr>
<tr>
<td>Camp</td>
<td>1 x 200kW, 1 x 100kW spare</td>
</tr>
<tr>
<td>Water Bore</td>
<td>2 x 37kW</td>
</tr>
<tr>
<td>Potable Water Bore</td>
<td>8.5 kW</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2100 kW</strong></td>
</tr>
</tbody>
</table>
Fuel Requirements

Fuel and oils required for the Kilimiraka project will be sourced from Australian Fuel Distributers. Storage containers currently in use at the Lethbridge South operation will be utilised for the Kilimiraka project. Based on fuel consumption at Lethbridge West mine, it is estimated that approximately 5195 kL/year will be required for the Kilimiraka project.

The preferred situation will be to barge fuels to a barge loading facility (BLF) at the Barra Base airstrip (or somewhere similar). The average fuel usage is estimated to be equivalent to 1.7 fuel isotainers per week. Therefore, a minimum of self-bunded fuel isotainers will be stored onsite to provide continuous fuel supply to run the operations for at least two weeks. Two of the isotainers (120 kL of fuel) will be located at the BLF, three at the powerhouse (each 60 kL of fuel), and one at the camp site (12kL capacity).

The BLF isotainers will be primarily only used as a transfer point. They will be filled upon delivery of fuel and the contents transferred to the powerhouse over the subsequent days. In the event of a storm surge or cyclone, the BLF isotainers would be emptied and tied down to prevent them washing away. The camp site isotainer, will provide the camp powerhouse with continuous fuel supply. These isotainers will be checked daily as a part of the Matilda Zircon’s operational monitoring program to detect any leakage or damage.

All fuel requirements are summarised in Table 7.

Figure 8: Van Diemen Sandstone thickness in the vicinity of Kilimiraka Project
Table 7: Annual Estimated Fuel Consumption for the Mineral Sands Mining Operations

<table>
<thead>
<tr>
<th>Item</th>
<th>kL/annum</th>
<th>Hours/day/year</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four Generators</td>
<td>3600</td>
<td>24/7/365</td>
<td>0.50 L/kWh</td>
</tr>
<tr>
<td>Mining Loader</td>
<td>82</td>
<td>6/7/365</td>
<td>38 L/hr</td>
</tr>
<tr>
<td>Concentrate Loader</td>
<td>83</td>
<td>6/7/365</td>
<td>38 L/hr</td>
</tr>
<tr>
<td>Bulldozer</td>
<td>972</td>
<td>24/7/365</td>
<td>110 L/hr</td>
</tr>
<tr>
<td>Excavator</td>
<td>120</td>
<td>11/7/365</td>
<td>30 L/hr</td>
</tr>
<tr>
<td>Trucks x 2</td>
<td>240</td>
<td>11/7/365</td>
<td>30 L/hr each</td>
</tr>
<tr>
<td>Grader</td>
<td>92</td>
<td>11/7/365</td>
<td>23 L/hr</td>
</tr>
<tr>
<td>Light Vehicles</td>
<td>6</td>
<td>4/7/365</td>
<td>8 L/hr</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5195</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Communications**

The accommodation camp and office site will be installed with the telecommunication facilities (including satellite phone and broadband internet), two-way radios, and a television broadcasting system.

**Storage, Transport and Handling of Dangerous Goods**

Dangerous goods used onsite will include fuels, oils and herbicides. These products will be handled, transported, and stored onsite in accordance to the relevant Acts, listed below:

- Dangerous Goods Act;
- Dangerous Goods Regulations;
- Dangerous Goods (Road and Rail Transport) Act; and
- Dangerous Goods (Road and Rail Transport) Regulations.

Grease and oil for vehicles and generators will be stored undercover in drums in a bunded area as per Matilda Zircon’s Hydrocarbon Management Guidelines. The management guidelines are based on the following guidelines:

- Australian Standard 1940-1993;
- Australian Standard 3780-1994; and

Currently on Lethbridge South mine Matilda Zircon has contracted Australia Fuel Distributors (AFD) to collect and dispose of the waste oil over the life of the mine, and this arrangement is expected to continue on Kilimiraka prospect, subject to satisfactory operation.

The processing of the ore is a chemical-free process, with the separation being a physical (centrifugal) process only. Therefore, only small quantities of chemicals, to be used for hygiene and other related purposes, will be required to be shipped, trucked and stored by Matilda Zircon at any one time. General chemicals will be stored as per the manufacturer’s specifications.

All substances transported and stored onsite will be done so in accordance with the appropriate international standards. Employees of Matilda Zircon will work under conditions stipulated by Worksafe NT where appropriate.
2.6 Workforce

Approximately 50 personnel will be employed at the Kilimiraka operation; of this approximately 30 personnel will be employed on site at any particular point in time.

Matilda Zircon will employ personnel associated with the processing and management of the operation. Earthmoving and catering operations will be the responsibility of specialised contractors.

Matilda Zircon actively promotes the employment and training of local personnel within their operations and promote the use of local labour among their contractors. The company is currently in the process of entering into a training charter with the Pickertaramoor College.

Matilda Zircon liaises with the Tiwi Land Council and will utilise their resources on an ad hoc basis.

2.7 Mine Closure and Rehabilitation Program

A strategic Rehabilitation and Mine Closure Plan (RMCP) will be set out in the environmental approvals process and will be updated on an annual basis as part of the Mining Management Plan Process. This plan will be refined to take into account the detailed project design, stakeholder consultation, and investigations and studies as they become available.

The primary objectives of the plan will be to leave the site in a safe condition that is physically and geochemically stable, and to ensure that the area is re-vegetated and does not become a source of wind or water-borne erosion or sediment.

Matilda Zircon proposes to undertake rehabilitation in a progressive manner where areas not required for ongoing operations will be soon rehabilitated. Rehabilitation will occur close behind the mining front as tailings (sand) separated from the heavy mineral fraction are pumped back to the mining area.

Matilda Zircon has already achieved rehabilitation and revegetation success at the Andranangoo and Lethbridge West mines, which has helped them to establish a conceptual model for the company to reinstate and rehabilitate the Kilimiraka deposits following the mining operation.

Matilda Zircon will submit a conceptual closure plan to Department of Resources (DoR) for the project. This plan will follow the lessons learned by Matilda Zircon at Andranangoo and Lethbridge West, as well as at sand dune mining operations elsewhere in Australia. It will also align with several guidelines and codes of practice to guide the structure and content of the closure plan. The guidelines and codes of practice that will be considered include:

- Department of Resources Mine Close Out Objectives (February 2008)
- Association of Mining and Exploration Companies Mine Closure Guidelines (AMEC, 2000)
- Australian Mining Industry Council (1989), Mine Rehabilitation Handbook
- The Commonwealth Guidelines for Mine Closure and Completion (March 2009)
- The Commonwealth Guidelines for Mine Rehabilitation (October 2006)

Matilda Zircon rehabilitation and closure objectives for the project are to:

- Minimise the area of land disturbed and cleared at a time, and to progressively rehabilitate mined areas as soon as practicable possible;
- Minimise erosion and sedimentation effects related to vegetation clearing and topsoil removal;
- Maximise the re-use of topsoil for rehabilitation;
- Ensure that the post-mining landform is consistent with the pre-mining landform and the surrounding
undisturbed area wherever possible; and
- Comply with all applicable legislation form the Northern Territory.

The conceptual closure plan would include management strategies for the implementation of progressive rehabilitation and closure for the project, including:

- Closure consultation;
- Closure criteria;
- Rehabilitation strategies and methods;
- Closure strategies;
- Closure cost estimates; and
- Post-closure monitoring.

Mining areas will be progressively rehabilitated in the following manner:

- All wastes will be restored into the mining area;
- Topsoil (if available) will be re-spread over the adjusted landform;
- Cleared vegetation if any will be placed over the landform to provide habitat for fauna; and
- Initial revegetation of the landform will rely on seed stored in the topsoil. An assessment of the success of revegetation will be made following the Wet season. If required, the landform will be supplemented by the seed of local provenance and nursery-grown seedlings from the local seed/cuttings.

**2.8 Timing of Actions**

Matilda Zircon plan to perform ecological, hydrological, and other baseline studies during 2012, and aim to submit approvals documentation during 2013 see Table 8.

It is anticipated that site preparation will take place in 2013-14, operation and progressive rehabilitation will occur from 2014-23, and decommissioning from 2023 until rehabilitation is complete. Throughout the entire process monitoring, reporting and auditing will be undertaken.
Table 8: Proposed Schedule of Activities for the Kilimiraka Mineral Sands Process

<table>
<thead>
<tr>
<th>Kilimiraka Mineral Sands Project - Environmental Approvals Schedule (EIS)</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main Documents and Surveys</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EIS (submitted to NT Government under a bilateral agreement)</td>
<td>Submit</td>
<td></td>
</tr>
<tr>
<td><strong>Social</strong></td>
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<td></td>
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<tr>
<td>AAPA Certificate</td>
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<tr>
<td>Archaeological Surveys</td>
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<tr>
<td>TLC and Community Consultations</td>
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<td></td>
</tr>
<tr>
<td>Social Impact Study</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Flora &amp; Fauna</strong></td>
<td></td>
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</tr>
<tr>
<td>Environmental Desktop Review</td>
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<td></td>
</tr>
<tr>
<td>Sea Turtle Surveys (baseline)</td>
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<td></td>
</tr>
<tr>
<td>Vegetation Mapping &amp; Threatened Flora Surveys (Wet &amp; Dry season)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fauna Surveys (Wet &amp; Dry season), including aquatic</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rehab &amp; Erosion</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rehabilitation Investigations (literature review and possible trial plots)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil Mapping (for Erosion and Sediment Control Plan)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Water</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Water Monitoring (baseline)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Balance Modelling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrography Mapping (for barge landing and port facility)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Hydrology Study</td>
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<td>Groundwater Assessment</td>
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<td><strong>Geo</strong></td>
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<tr>
<td>Radiation Surveys (baseline)</td>
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<tr>
<td>Contour Survey</td>
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<td>Geotechnical Survey</td>
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<td><strong>Other</strong></td>
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<tr>
<td>Noise Monitoring (baseline)</td>
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<tr>
<td>Dust Monitoring (baseline)</td>
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<tr>
<td>Site Visit for EHD/SEWPAC</td>
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<tr>
<td><strong>Public Review Period</strong> (minimum 28 days)</td>
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<tr>
<td>Matilda Zircon receives feedback from the EIS</td>
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<tr>
<td><strong>EIS Supplement</strong> (submitted to NT Government under a bilateral agreement)</td>
<td>Submit</td>
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<tr>
<td>Prepare EIS Supplement to respond to all public comment on the project</td>
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<tr>
<td><strong>Final NT Government Assessment Report</strong></td>
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<tr>
<td>Commonwealth Government Assessment Report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mining Management Plan</td>
<td>Submit</td>
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</tr>
</tbody>
</table>
3 Existing Environment

3.1 Climate

The project area is located on the Tiwi Island, which falls within Northern Australia. The Tiwi Island region is characterised by wet summers with high rainfall (the Wet season) and cooler dry winters (the Dry season). Average maximum temperatures are approximately 30°C in the Wet season, while annual rainfall averages between 1600 and 1800mm (the majority of which falls between October and April) — see Figure 9. The Tiwi Islands have the highest average annual rainfall in the Northern Territory.

![Figure 9: Temperature and Rainfall Averages from Point Fawcett Weather Station (BOM 2011)](image)

The Tiwi Islands are prone to cyclonic conditions and tropical storms during the monsoon period (typically between November to April). Based on the statistics provided by the Bureau of Meteorology (BOM), the average annual frequency at Kilimiraka is estimated to be approximately 0.8 to 1.2 cyclones per year (BOM 2011) (Figure 10). The potential impact of each cyclone can be devastating and varies according to many factors such as its track, intensity, rainfall volumes, and size.

![Figure 10: Average Annual Occurrence of Tropical Cyclones (BOM 2011)](image)

Storm surge events typically generated under the cyclonic conditions could result in water incursion into near shore environments, which may impact and delay some operational activities.
Matilda Zircon is aware of the risks that result from monsoon weather conditions. The recent exploration program at Kilimiraka (early 2011) was interrupted by two cyclones (Bianca and Carlos), by king tides, and two significant tropical lows which resulted in three evacuations from the field camp and about three weeks work to re-establish the vehicle access to the site. Management of these risks will be incorporated into the Matilda Zircon's operational planning.

### 3.2 Land Tenure and Land Use

The Tiwi Islands consist of four main wards, Nguiu and Wurankuwu on Bathurst Island, and Milikapiti and Pirlangimpi on Melville Island. The Tiwi people's ownership of the islands has been recognised under the Aboriginal Land Rights Act, which is vested in the Tiwi Land Trust and managed by the Tiwi Land Council as directed by the traditional Aboriginal owners (Figure 11). The Tiwi people also formed the Tiwi Islands Local Government in 2001 to conduct local services and represent the interests of the Tiwi people (TLC 2004).

The indigenous groups of the Tiwi Islands utilise the lands in a variety of ways, including for traditional purposes. Hunting and fishing are a large part of this traditional lifestyle and this has been continued after European settlement on the Island. The Tiwi Islands were also used for a major commercial buffalo-harvesting industry between 1890 and 1915. Forestry has subsequently played a significant part in the Tiwi Islands with Great Southern Plantations (now Tiwi Plantations) having a large impact on the local economy, as well as the social and natural environment. Mining has been the most recent addition to the major land uses on the Tiwi Islands. Other commercially significant industries booming within the region include tourism, pearl farming, and other aquaculture operations (Forsci et al. 1999).

The land included in the project area has been historically used for hunting and fishing by indigenous people. More recently, the land has been exposed to the mineral exploration program of Matilda Zircon.

![Figure 11: Indigenous Land Ownership Boundaries on the Tiwi Islands](image)

### 3.3 Soils, Land Systems and Geology

#### 3.3.1 Soils

The soils of the proposed project area are highly leached, nutritionally poor sands with an occasional minor humic surface horizon (the topsoil). The exposed coastal sand dunes (parabolic) are subject to continual wind erosion and deposition.
Major soil type mapping for the Northern Territory (1:2M scale) indicates that Kandosols occur in the Kilimiraka project area (NRETAS digital data agreement 933). The Kandosol soil order accommodates those soils which lack strong texture contrast, have massive or only weakly structured B horizons, and are not calcareous throughout (CSIRO 2006).

The Australian Soil Resource Information System (CSIRO 2006) identifies that it is unlikely that Acid Sulfate Soils (ASS) occur within the Kilimiraka project area.

Soil mapping to a scale of 1:25,000 is proposed to occur as part of environmental approvals process, and descriptions will be based on the Land Capability Assessment of the Tiwi Islands (Hollingsworth 2003).

3.3.2 Land Units and Land Systems

A land system is defined as an area or group of areas throughout which there is a recurring pattern of topography, vegetation and soils (NRETAS http://www.nt.gov.au/nreta/natres/soil/extents.html). The land system study for the project area is covered within the Land Systems of the Northern Part of the Northern Territory (1:250,000). Five land systems occur in the vicinity of the project area (Table 9 and Figure 12).

The targeted Kilimiraka mineral sands ore bodies fall within the Wangiti land system, which is coastal parabolic dunefields, sandplains, beach ridges, and beaches. Associated infrastructure will likely occur on the Pickertaramoor and Melville land systems. Land systems in the surrounding region include Littoral 1 and Aliu.

A land unit is mapped at a finer scale than land systems, and is defined as an area with uniform landform, soil, and vegetation. This generally provides insight into land management attributes within the resolution of the mapping scale. Land Units to a scale of 1:50,000 (or finer) have also been described for the Tiwi Islands as part of the Land Capability Assessment of the Tiwi Islands (Hollingsworth et al. 2003), however this information will be ground-truthed and presented during the environment assessment process.

Table 9: Land System Descriptions of the Kilimiraka Project Area

<table>
<thead>
<tr>
<th>Land System</th>
<th>Class</th>
<th>Class Description</th>
<th>Erosion risk</th>
<th>Drainage</th>
<th>Acid Sulphate Soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wangiti</td>
<td>Coastal dunes</td>
<td>Coastal parabolic dunefields, sandplains, beach ridges and beaches; sandy soils</td>
<td>Moderate risk - wind</td>
<td>-</td>
<td>No occurrence</td>
</tr>
<tr>
<td>Melville</td>
<td>Lateritic plains</td>
<td>Plains and rises associated with deeply weathered profiles (laterite) including sand sheets and other depositional products; sandy and earth soils</td>
<td>Moderate risk - gently inclined slopes or level areas with erodible soils</td>
<td>-</td>
<td>No occurrence</td>
</tr>
<tr>
<td>Pickertaramoor</td>
<td>Sandstone plains and rises</td>
<td>Plains and rises mostly on sandstone and siltstone; commonly shallow soils with surface stone and rock outcrop</td>
<td>High risk - moderate to steep slopes and gently inclined slopes with erodible soils</td>
<td>-</td>
<td>No occurrence</td>
</tr>
<tr>
<td>Littoral 1</td>
<td>Tidal flats</td>
<td>Tidal mudflats and coastal floodplains with channels and estuaries; subject to tidal inundation; poorly drained clays and muds</td>
<td>High risk - flooding</td>
<td>Very poor</td>
<td>Common occurrence</td>
</tr>
<tr>
<td>Aliu</td>
<td>Alluvial floodplains</td>
<td>Alluvial floodplains, swamps and drainage depressions; seasonally inundated; sandy, silty and clay soils on quaternary alluvium</td>
<td>High risk - flooding</td>
<td>Poor</td>
<td>No occurrence</td>
</tr>
</tbody>
</table>
3.3.3 Geology

The project area is located within the Tiwi Coburg bioregion. This bioregion predominantly features strongly weathered and lateritised Cretaceous and Tertiary sandstone plateaux (Haig et al. 2003). The geology within the region of Kilimiraka is consistent with that of the Tiwi Island region. The project area is located on the south-west coast of Bathurst Island supports two formations at the surface, these include Van Diemen Sandstone layer and the Wangarlu Mudstone member (Haig et al. 2003) (see Figure 13 and Figure 14). It is suspected that Bathurst Island has a similar geological profile as identified at the "south coast" label on Figure 14.

The surface geology as provided by 1:250K Northern Territory Geological Survey (see Figure 15) (under DDA from NRETAS) indicates that the mineral sand target zones are located on quaternary estuarine and delta deposits (map symbol Qe) with a lithology description of mud regolith. This mapping also indicates that Van Diemen Sandstone formation (map symbol Czcv) of the Middle Eocene is also located in the vicinity of the project area and this has a lithology description of sedimentary siliciclastic sandstone/siltstone. Preliminary inspection of Kilimiraka indicate that the Van Diemen Sandstone formation may be more wide spread than indicated on the 1:250K mapping presented in Figure 15.

The process plant and camp infrastructure are located on quaternary colluvium (map symbol is Qrc) with a lithology description of sand regolith.

The Tiwi Islands geology includes the Bathurst Island Formation—a thick sequence of cretaceous aged sediments on top of the oldest basement layer consisting igneous and metamorphic rocks. A sequence of layers formed in the Cretaceous period involves three members;
1. **Mullaman Beds (klm):** The base of Bathurst land formation is represented by Mullaman Beds (klm). These are 600-750m below ground and are never exposed on the Tiwi Islands.

2. **Wangarlu mudstone member (kuw):** The oldest cretaceous aged sediment that outcrops is the Wangarlu mudstone member (kuw). This member underlies all of Bathurst Island from approximately sea level to a depth of about 500 metres, and is comprised of mudstone and siltstone.

3. **Moonkinu member** lying between Wangarlu and Van Diemen is limited in range to the north coast and was not formed at the south coast.

The predominant superficial layer of Tertiary-aged Van Diemen sandstone was deposited as a result of the weathering and erosion of cretaceous aged sediments. This sandstone contains fine quartz grains and covers the coastal areas dominated by stream flow and tidal action. More recent Quaternary-aged sediments such as sand and alluvium have originated from the Van Diemen Sandstone and have been sculpted into high dune systems (Haig *et al.* 2003).

The dune field at Kilimiraka is composed of 20 separate barchan-style dunes that are sitting on top of lateritised clay (Wangarlu Mudstone member). Four main deposits are separated by the headlands of lateritised sandstone. The dune field represents units of different age. Older dunes are partially lateritised producing pink or orange sand, whereas the younger ones are grey or white (Baxter 2011).
Figure 13: Seepage Zone of the Van Diemen Sandstone (Beachward Side of the Dunes)

Figure 14: Typical Geological Cross-section of Tiwi Islands (Haig et al. 2003)
Figure 15: Surface Geology
### 3.4 Ground water

There are two regional aquifers on the Tiwi Islands:

1. Shallow & unconfined within the saturated zone of the Van Diemen Sandstone; and
2. Deep and confined within the Sandy Horizon of the Moonkinu Mudstone.

The geological cross-section in Figure 14 indicates the approximate location across the Tiwi Islands, and suggests that no deep groundwater resources exist in the Kilimiraka area due to the absence of the Moonkinu Mudstone geological feature.

Groundwater reserves in the project area are thought to be dominated by the shallow unconfined aquifer system of the Van Diemen Sandstone. The water from the shallow aquifer is considered to be of good quality, with electrical conductivities of less than 50 micro Siemens per centimetre and Total Dissolved Solids of less than 70 milligrams per litre, imposing no salinity hazard (Haig et al. 2003).

The homeland supply from this aquifer is regarded as having a moderate to high success rate (>0.5L/s and <10L/s). The success rate and final production yield of bores is highly dependent on the thickness of the Van Diemen Sandstone. The Van Diemen Sandstone thickness at the site is estimated to be 20 to 30 metres in the target area which is likely to supply the moderate production potential at rate of <5L/s (Figure 16). There are thicker sections of Van Diemen Sandstone on the road to Cape Helvetius which will be the target area for establishment of a bore field for the project. Test bores are planned to confirm the yield of the aquifers within the project area, and this data will form part of the overall water balance for the project.

There is a possibility that groundwater dependent ecosystems may exist within the project area (i.e. Melaleuca dominated swamps and dry monsoon coastal vine-thickets). These will be investigated during the ecological assessment and groundwater studies will determine possible impact on these ecosystems.

![Figure 16: Shallow Unconfined Aquifer Potential](image)
### 3.5 Surface Water

Bathurst Island has been separated into nine small catchment areas based on the larger river systems (Haig et al. 2003) (Figure 17). The catchment in the Kilimiraka project area is known as the Southern Bathurst catchment which simply groups all of the small creeks flowing for a short distance (<5kms) south. This drainage flows for a considerable duration due to the inputs from the Van Diemen Sandstone in the region. The perennial flow in this catchment has led to the formation of semi-permanent to permanent swamp bodies in the dune swales. There are three swamps located within the proposed Kilimiraka project (refer to Figure 18 for a recent photograph of one of the swamp systems).

The surface water features on the island include soaks, springs, streams/rivers, billabongs, swamps, and waterholes (Schmid 2003). Flows in rivers and creeks are highest during the Wet season. Surface flow at the end of the Wet season comes from springs and the drainage of the shallow aquifer along the course of waterways (Schmid 2003).

Surface water quality will be tested prior to any onsite disturbance to gain a baseline quality measure for future comparisons.

![Figure 17: Surface Water Catchments within Bathurst Island (Haig et al. 2003)](image-url)
3.6 Biodiversity

The Tiwi Islands are recognised as significantly important site for biodiversity conservation at a National and International level. The national conservation significance of the site is represented by several endemic species. Eleven plant taxa, five subspecies of birds and two subspecies of mammals are recognised as endemic to the Tiwi Islands. High conservation values on an international scale are supported by the threatened species occurring in the region and the coastline that offers the important nesting sites for marine turtles, internationally significant seabird records, and some major aggregations of migratory shorebirds (Woinarski et al. 2002; Woinarski et al. 2003a; Woinarski et al. 2003b; Harrison et al. 2009).

The Tiwi Islands support a distinctive biota because of their isolation from the mainland and being exposed to high rainfall. The region features an extensive area of well-developed Eucalypt forests on sandy and lateritic plains and rises, with about 1300 rainforest patches fed by perennial freshwater springs. Other main vegetation types present on the island include Eucalypt woodland, sedgeland, grassland, paperbark forest, mangroves, coastal dunes, and saltmarsh. Species richness is relatively high in the Tiwi Islands, with about 1082 plant species and at least 542 fauna species. Of these, 37 species (20 flora and 17 fauna) are listed as threatened at national or state level (Woinarski et al. 2002; Woinarski et al. 2003a; Woinarski et al. 2003b).

A desktop study was performed to determine which species or protect habitat have potential to occur within the project area and surrounds (result discussed below). Databases included:

- NT Flora and Fauna Atlas (NRETAS)
- Atlas of Living Australia
- EPBC Act protected matters search (SEWPAC)
- Holtz database (NT Herbarium)

3.6.1 Vegetation Communities

There is 1:250K vegetation mapping for the Tiwi Islands (dataset provided by NRETAS under digital data agreement 993). This identified two broad vegetation types within the Kilimiraka project area. Eucalyptus open forest/woodland (1b) and dry rain forest / semi-deciduous rainforest (Figure 19 and Figure 20). The dune systems themselves are spinifex grasslands with a sparse Acacia shrub layer (which is not identified by the dataset due to the broad mapping scale).

Onsite vegetation mapping surveys to a scale of 1:25,000 will be undertaken to confirm vegetation communities and distributions at Kilimiraka project area.
Spinifex covered dunes, sparse Acacia

Dry semi-deciduous rainforest

Eucalyptus open forest/woodland

Figure 20: Photographs of Typical Vegetation Types within the Kilimiraka Project Area.
3.6.2 Flora Species

NRETAS database searches indicate that 588 plant species (559 native species and 29 introduced species) have been previously recorded within the project area and surrounds. This includes five threatened, eight near threatened, eight data deficient, and 29 introduced species under the TPWC Act (Figure 21). Four of the threatened species are also listed as vulnerable or endangered under the EPBC Act. Threatened species recorded in the area are listed and briefly described in Table 10 along with preferred habitat and probability of occurrence in the Kilimiraka project area. Seven of the introduced species are declared weeds under the NT Weed Management Act:

- *Hypotis suaveolens* (Class B/C)
- *Sida acuta* (Class B/C)
- *Sida cordifolia* (Class B/C)
- *Mimosa pigra* (Class A/B)
- *Cenchrus echinatus* (Class B/C)
- *Pennisetum polystachion* (Class B/C)
- *Lantana camara* (Class B/C)

Class A - to be eradicated; Class B - spread to be controlled; Class C - not to be introduced to the NT

Figure 21: Existing Flora Records and Status within the Kilimiraka Project Area (NRETAS 2011)
Table 10: Threatened Flora Species Potentially Occurring in the Vicinity of the Kilimiraka Project  

<table>
<thead>
<tr>
<th>Threatened Species</th>
<th>Status (TPWC &amp; EPBC)</th>
<th>Habitat &amp; Previous Record</th>
<th>Likelihood of presence</th>
</tr>
</thead>
</table>
| *Burmannia sp. Bathurst Island Burmannia | TPWC | Endangered EPBC | Habitat: Wet spring-fed rainforests.  
Distribution: Only known from five rainforest patches in the north of Bathurst Island. | On-Site: Unlikely Regional: Known |
| Cynchos armstrongii Armstrong’s Cycad | TPWC | Not Listed EPBC | Habitat: Open grassy woodland on yellow and red earths.  
Distribution: Western Top End & Tiwi is. | On-Site: HIGHLY likely Regional: Known |
| *Dendromyza reinwardtiana Dendromyza | TPWC | Vulnerable EPBC | Habitat: Wet rainforest.  
Distribution: Only recorded from three sites on Bathurst Island and four sites on Melville Island. | On-Site: Unlikely Regional: Known |
| *Elaeocarpus miegei Blue Quandong | TPWC | Critically Endangered EPBC | Habitat: Wet rainforest.  
Distribution: Tiwi Islands only. | On-Site: Unlikely Regional: Known |
| *Endiandra limnophila Native Walnut | TPWC | Not Listed EPBC | Habitat: Wet rainforest.  
Distribution: Far north of Cape Yorke and the Top End, including the Tiwi Is. | On-Site: Unlikely Regional: Known |
| *Freycinetia excelsa Narrow Leaf Climbing Pandan | TPWC | Vulnerable EPBC | Habitat: Wet lowland rainforest.  
Distribution: A few isolated locations across the Top End. | On-Site: Unlikely Regional: Known |
| *Freycinetia percostata Climbing Pandan | TPWC | Vulnerable EPBC | Habitat: Wet rainforest  
Distribution: Bathurst Island and east Arnhemland only. | On-Site: Unlikely Regional: Known |
| Hoya australis subsp. Oranicola Tiwi Islands Waxflower | TPWC | Vulnerable EPBC | Habitat: Dunes or red laterite covered by the coastal monsoon rainforest.  
Distribution: Only found on the Tiwi Islands. | On-Site: Likely Regional: Known |
| *Mapania macrocephala Mapania | TPWC | Vulnerable EPBC | Habitat: Wet rainforest  
Distribution: Tiwi Islands and east Arnhemland only. | On-Site: Unlikely Regional: Known |
| *Mitrella tiwiensis Mitrella | TPWC | Vulnerable EPBC | Habitat: Rainforest  
Distribution: Tiwi Islands only. | On-Site: Unlikely Regional: Known |
| *Thrixspermum congestum Epiphytic Orchid | TPWC | Vulnerable EPBC | Habitat: Rainforest and mangroves.  
Distribution: Queensland and the Tiwi Islands. | On-Site: Unlikely Regional: Known |
| Typhonium jonesii Typhonium | TPWC | Endangered EPBC | Habitat: Very little is known - have been found on rocky or lateritic hills and Eucalyptus woodland.  
Distribution: Only known from one locality on Bathurst Island and two on Melville Island. | On-Site: Possible Regional: Highly likely |
| *Xylopia monosperma Xylopia | TPWC | Endangered EPBC EPBC | Habitat: Wet rainforest.  
Distribution: Only known from two localities on Bathurst Island and three on Melville Island. | On-Site: Unlikely Regional: Known |

* These species occur in wet and/or spring-fed rainforests. Small patches of this habitat exist in the west of Bathurst Island, but preliminary vegetation mapping does not reveal any such habitat in proximity to the project. Flora field survey work to confirm.  

(NB: Regional refers to Tiwi Islands)
3.6.3 Fauna Species

Preliminary review of NRETAS database search results indicate that 266 fauna species have been previously recorded in the vicinity of the Kilimiraka Project area, including 33 fish species, 11 amphibian species, 66 reptile species, 128 bird species, and 28 mammal species.

NRETAS fauna atlas records indicate that twelve fauna species recognised as threatened under the TPWC Act (refer to Figure 22 and Table 11) may potentially utilise habitat within the vicinity of the Kilimiraka project area. In addition, two other sea turtle species whose status is proposed to be upgraded to threatened are included.

![Figure 22: Existing Fauna Records and Status within the Kilimiraka Project Area (NRETAS 2011)](image)
### Table 11: Threatened Fauna Species Potentially Occurring in the Vicinity of the Kilimiraka Project

(Source: http://www.nretas.nt.gov.au/plants-and-animals/animals/home/specieslist)

<table>
<thead>
<tr>
<th>Threatened Species</th>
<th>Status (TPWC &amp; EPBC)</th>
<th>Habitat &amp; Previous Record</th>
<th>Likelihood of presence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIRDS</strong></td>
<td></td>
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<tr>
<td>Red Goshawk</td>
<td>TPWC i Vulnerable</td>
<td>Habitat: Tall open eucalypt forest and riparian areas.</td>
<td>On-Site: Possible Regional: Known</td>
</tr>
<tr>
<td><em>Erythrotriorchis</em></td>
<td>EPBC i Vulnerable</td>
<td>Distribution: Occurs across much of northern Australia, from the Kimberley to south-eastern Queensland. More common on the Tiwi Islands than anywhere else.</td>
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<tr>
<td>radiatas</td>
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<tr>
<td>Partridge Pigeon</td>
<td>TPWC i Vulnerable</td>
<td>Habitat: This ground-dwelling pigeon feeds on seeds, mostly of grasses. Found mainly in eucalypt tall open forest (dominated by Eucalyptus miniata, E. tetrodonta and E. nesophila).</td>
<td>On-Site: Possible Regional: Known</td>
</tr>
<tr>
<td><em>Geophaps smithii</em></td>
<td>EPBC i Vulnerable</td>
<td>Distribution: Occurs across the Kimberley and Top End, including Tiwi Islands.</td>
<td></td>
</tr>
<tr>
<td>Hooded Robin</td>
<td>TPWC i Endangered</td>
<td>Habitat: Little known - most likely to be associated with the treeless plains and with Eucalypt open forests in which frequent fine-scale fires result in patches with little grass cover.</td>
<td>On-Site: Not likely Regional: Not likely</td>
</tr>
<tr>
<td>Melanodryas</td>
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<tr>
<td><em>cucullata melvillensis</em></td>
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<tr>
<td>Masked Owl</td>
<td>TPWC i Endangered</td>
<td>Habitat: Mostly eucalypt tall open forests, but also monsoon rainforests and open vegetation types.</td>
<td>On-Site: Likely Regional: Known</td>
</tr>
<tr>
<td>(Tiwi Islands' subsp.)</td>
<td>EPBC i Endangered</td>
<td>Distribution: Endemic subspecies to the Tiwi Islands.</td>
<td></td>
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<tr>
<td><em>Tyto novaehollandiae</em></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><em>melvillensis</em></td>
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<tr>
<td><strong>MAMMALS</strong></td>
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<tr>
<td>Brush-tailed Rabbit-Rat</td>
<td>TPWC i Vulnerable</td>
<td>Habitat: Eucalypt tall open forest.</td>
<td>On-Site: Highly likely Regional: Known</td>
</tr>
<tr>
<td><em>Conilurus penicillatus</em></td>
<td>EPBC i Vulnerable</td>
<td>Distribution: Only known from Cobourg Peninsula, Tiwi Islands, Groote Eylandt, and a small area within Kakadu National Park.</td>
<td></td>
</tr>
<tr>
<td>Northern Brush-tailed Phascogale</td>
<td>TPWC i Vulnerable</td>
<td>Habitat: Little known - has been found in Eucalypt tall open forest.</td>
<td>On-Site: Possible Regional: Known</td>
</tr>
<tr>
<td><em>Phascogale pirata</em></td>
<td>EPBC i Not Listed</td>
<td>Distribution: Isolated locations across the Top End.</td>
<td></td>
</tr>
<tr>
<td>Butler's Dunnart</td>
<td>TPWC i Vulnerable</td>
<td>Habitat: Little known - has been found in Eucalypt tall open forest.</td>
<td>On-Site: Possible Regional: Known</td>
</tr>
<tr>
<td><em>Sminthopsis butleri</em></td>
<td>EPBC i Vulnerable</td>
<td>Distribution: Only known from Melville and Bathurst Islands (very limited records).</td>
<td></td>
</tr>
<tr>
<td>Water Mouse</td>
<td>TPWC i Data Deficient</td>
<td>Habitat: Mangrove forests, freshwater swamps and floodplain saline grasslands</td>
<td>On-Site: Possible Regional: Known</td>
</tr>
<tr>
<td><em>Xeromys myoides</em></td>
<td>EPBC i Vulnerable</td>
<td>Distribution: In the NT it is known only from ten records at six sites, including two on Melville Island.</td>
<td></td>
</tr>
<tr>
<td><strong>REPTILES</strong></td>
<td></td>
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</tr>
<tr>
<td>Loggerhead Turtle</td>
<td>TPWC i Endangered</td>
<td>Habitat: Tropical and temperate waters off the Australian Coast</td>
<td>On-Site: Unlikely Regional: Unlikely</td>
</tr>
<tr>
<td><em>Caretta caretta</em></td>
<td>EPBC i Endangered</td>
<td>Distribution: No breeding is known to occur in the NT but feeding animals have been sighted in NT waters.</td>
<td></td>
</tr>
<tr>
<td>Threatened Species</td>
<td>Status (TPWC &amp; EPBC)</td>
<td>Habitat &amp; Previous Record</td>
<td>Likelihood of presence</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>----------------------</td>
<td>--------------------------------------------------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Leatherback Turtle <em>Dermochelys</em> <em>coriacea</em></td>
<td>TPWC i Vulnerable EPBC i Vulnerable</td>
<td>Habitat: Globally distributed with most nesting records in tropical waters and feeding records in temperate areas. Distribution: In the NT, no records have been discovered at Tiwi Islands.</td>
<td>On-Site: Unlikely Regional: Unlikely</td>
</tr>
<tr>
<td>Olive Ridley <em>Lepidochelys</em> <em>olivacea</em></td>
<td>TPWC i Data deficient EPBC i Endangered</td>
<td>Habitat: Tropical and subtropical waters throughout the world. Distribution: The vast majority of the nesting population has been recorded in the Northern Territory from Melville Island to Groote Eylandt.</td>
<td>On-Site: Possible Regional: Known</td>
</tr>
<tr>
<td>Flatback Turtle <em>Natator</em> <em>depressus</em></td>
<td>TPWC i Data Deficient EPBC i Vulnerable</td>
<td>Habitat: Restricted to tropical waters of Australia and New Guinea Distribution: Recorded around the NT coastlines, including breeding locations on Bathurst Island.</td>
<td>On-Site: Known Regional: Known</td>
</tr>
<tr>
<td>Mertens' Water Monitor <em>Varanus</em> <em>mertensi</em></td>
<td>TPWC i Vulnerable EPBC i Not listed</td>
<td>Habitat: Riverine. Distribution: Across the far north of Australia.</td>
<td>On-Site: Possible Regional: Known</td>
</tr>
<tr>
<td>Yellow-spotted Monitor <em>Varanus</em> <em>panoptes</em></td>
<td>TPWC i Vulnerable EPBC i Not listed</td>
<td>Habitat: Variety of habitats. Distribution: Across the far north of Australia and most of Queensland.</td>
<td>On-Site: Possible Regional: Known</td>
</tr>
</tbody>
</table>

(NB: 'Regional' refers to Tiwi Islands)
3.7 Air and Noise

3.7.1 Air and Greenhouse gases

The air quality in the Tiwi Islands varies between the Wet and Dry seasons. Savannah burning and dust emission during the dry period dramatically degrade the air quality. The islands become covered with an extensive smoke cloud at the time of vegetation burning. These occur typically in the Dry season to control and manage hot fire risks, as part of the traditional land management practices. The airborne dust level also increases on dry and windy days.

The significant proportion of greenhouse gases likely to be present in the air includes water vapour, carbon dioxide, methane and nitrous oxide. The potential sources of greenhouse gas emission are:

- Monsoonal conditions leading to high water-vapour level;
- Savannah burning releasing gases such as methane and nitrous oxide;
- Incomplete combustion of fuel in motor vehicles, generators and machinery; and
- Wood burning.

Background levels of CO₂ and other non-savannah burning greenhouse gases on the Tiwi Islands are expected to be relatively low due to the small population. The project area is located 50km south-west of Wurrumiyanga and 28km south-west of Wurankuwu community, therefore the only pollutant likely to be present at significant concentrations is particulate matter from wind-blown dust and bushfire smoke during the Dry season.

The project area is 100km north-west of Darwin and may receive windblown pollutants from Darwin during the Dry season when south-easterly winds predominate.

3.7.2 Noise

The existing noise levels of the Tiwi Islands are typical of a remote rural area with low ambient noise levels. The only significant noise emission is concentrated in the urban living areas. Some intermittent noise comes from the ports and airports, as well as road noise (particularly associated with logging trucks). Low background (or ambient) noise level is associated with the natural events like wave motion and wind storm.

Background noise levels around the Kilimiraka Project are expected to be low.

3.8 Cultural and Heritage Sites

The Tiwi Islands are home to one of Australia’s most remarkable Aboriginal groups, whose isolation over thousands of years has helped them preserve their unique language and culture. The first evidence of foreigners coming to the Tiwi Islands was perhaps in the early 1600s when the Macassans sailed from the Indonesian island of Sulawesi in search of the sea cucumber (Alford 2005). In 1941 the Tiwi Islands were declared an Aboriginal Reserve and in 1978 title deeds for their land were handed back to the Tiwi people by the Minister for Aboriginal Affairs. The Tiwi people now have a land council, local government, and traditional groups. Access to the island is provided under the provision of the Northern Territory Aboriginal Act 1980 by Tiwi Land Council, which requires all visitors to obtain access permits.

Tiwi people have specific cultural values linked to their traditional land. The Tiwi lands traditional ownership is possessed by the eight aboriginal groups; Malawu, Wurankuwu, Jikilaruwu, Mantiyupi, Munupi, Marrikawuyanga, Wulirankuwu and Yimpinary (Haig et al. 2003). The Kilimiraka project is located within the area of the Jikilaruwu tribe (see Figure 23).
An Aboriginal Areas Protection Authority check has identified recorded sacred sites within the mining area (see Figure 24). 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 Northern Territory Aboriginal Sacred Sites Act 1989 (NT). These sites will be investigated further by a formalised AAPA survey as part of the environmental approvals process. All sacred sites (and recorded sites) will be protected by appropriate and agreed buffer zones.
Figure 24: Sacred Sites within the Project Area
3.9 Socio-economic Environment

The Tiwi region is sparsely populated and consists of three main communities:

- Wurrumiyanga (previously known as Nguiu) on Bathurst Island;
- Pirfangimpi on Melville Island; and
- Milikapiti on Melville Island.

There is also a small outstation of Wurankuwu at approximate 60 km north-west of Wurrumiyanga (Nguiu) on Bathurst Island.

The population of the Tiwi Islands in 2010 was estimated at 2534 with slightly more males (52.1%). Wurrumiyanga has the highest population of around 1500. The Tiwi people are mostly a young population, with 81% of people under the age of 45. In 2010 11.4% of the population were unemployed (126 persons). (All data from Australian Bureau of Statistics, 2010).

Aquaculture, forestry, tourism, and arts and crafts are the major industries in the region. The Tiwi Island also supports large high and low grade mineral deposits, which have drawn the attention of mining companies, particularly Matilda Zircon. Melville Island has been exposed to the mining operations at Andranangoo and Lethbridge Bay, but no mine has yet been developed on Bathurst Island. If realised, this project to develop a mine at Kilimiraka will lead to employment and economic benefits to the locals.
4 Legislative Requirements

4.1 Commonwealth Legislation

4.1.1 Environment Protection and Biodiversity Conservation Act 1999

Assessment under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is required for actions that are likely to have a significant impact on a matter of national environmental significance, or on the environment in general by Commonwealth agencies, or on Commonwealth land.

The matters of national environmental significance are:

- World Heritage properties
- National Heritage places
- Wetlands of international importance (Ramsar wetlands)
- Threatened species and ecological communities
- Migratory species
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)

The Australian Government Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) administers the Act and has established a formal referral and assessment process. If SEWPaC determines a project will likely significantly impact a matter of national significance it is declared a "controlled action" and is required to undergo assessment and approval under the EPBC Act. In the Northern Territory this will be through the bilateral agreement between the Northern Territory and Australian governments. If the project is not a controlled action, assessment will proceed under the Northern Territory legislative approvals process.

The Tiwi Islands have been recognised as important areas for biodiversity conservation due to their separation from the Northern Territory mainland, extremes of temperature (high rainfall), and the coastlines that offer feeding and roosting sites for migratory shorebirds and nesting sites for marine turtles. The islands also feature high species richness, threatened species and endemic species. Desktop studies have revealed the potential for 24 threatened species to occur within the proposal site. The target area may also support 43 listed migratory species and 8 endemic species that have not been recorded anywhere in the Northern Territory.

4.1.2 Aboriginal Land Rights (Northern Territory) Act 1976

The Aboriginal Land Rights (Northern Territory) Act 1976 provides for the granting of inalienable freehold title to traditional Aboriginal owners of land in the Northern Territory, the establishment of Land Councils, and the establishment and management of Land Trusts to hold the Aboriginal land for the benefit of traditional owners of the land. The Act also regulates exploration and mining on Aboriginal land and sets out the processes to be followed when negotiating with Traditional Owners (TOs) for access to and leases over Aboriginal land. An exploration license cannot be granted in relation to Aboriginal land without the consent of the relevant Land Council (for the traditional owners) and the Minister. A mineral lease cannot be granted unless an agreement has been entered into under the Act.

The Kilimiraka Project occurs within the Tiwi Aboriginal Land Trust area.
4.1.3 Native Title Act 1993

The Native Title Act 1993 provides legal recognition of the rights and interests of the Aboriginal people over land and water possessed under their traditional laws and customs. The Act sets out basic principles regarding native title in Australia and establishes a regulating and governing body, the National Native Title Tribunal.

The Act also sets out processes by which native title rights are established, protected and compensation determined. Another important function of the Act is through facilitating Indigenous Land Use Agreements (ILUA’s) between native title parties and other interest holders.

In 1941, the Tiwi Islands were declared an Aboriginal Reserve and in 1978 title deeds for their land were handed back to the Tiwi people.

4.2 Northern Territory Legislation

Environmental permitting of mining activities is regulated in the Northern Territory by both the Mining Management Act 2001 and the Environmental Assessment Act 1994.

A decision on the appropriate permitting route for new mining proposals in the Northern Territory is initiated by the proponent’s submission of an NOI (i.e. this document) to the Northern Territory Government through the Minerals and Energy Referral Assessment branch of the Department of Resources (DoR). If assessment under the Environmental Assessment Act is thought to be required, the NOI is referred to the Minister for Natural Resources, Environment and Heritage through NRETAS for determination of the appropriate level of assessment.

Following completion of the assessment and approval process under the Environmental Assessment Act the Minister for Natural Resources, Environment and Heritage provides a recommendation to the Resources Minister, who then uses that information to approve or not approve the project.

4.2.1 Environmental Assessment Act 1994

The Environmental Assessment Act and the Environmental Assessment Administrative Procedures establish the framework for the assessment of potential or anticipated environmental impacts of development, and provide for protection of the environment. The Northern Territory Minister for Natural Resources, Environment and Heritage is responsible for administering the Act. The Minister also determines the appropriate level of assessment for new developments or material changes to existing operations, based on the sensitivity of the local environment, the scale of the proposal and its potential impact upon the environment.

This NOI is informing the administrators of the Environmental Assessment Act of the proposed activity so that a determination as to the level of assessment required to properly assess the potential impacts of the project can be addressed and therefore the project can be appropriately assessed.

4.2.2 Mineral Titles Act and Mining Management Act

The Mineral Titles Act 2011 and the Mining Management Act 2001 are the principal legislation for the regulation of mining proposals in the Northern Territory, both of which are administered by Department of Resources.

The Mineral Titles Act establishes the framework within which activities to explore for and mine mineral resources can occur. The Act sets out the administrative processes for authorising these activities through the granting of a title.

Prior to any activities taking place on a granted Mineral Lease, an authorisation to carry out mining activities under the Mining Management Act must be obtained. The objectives of the Mining Management Act are to
ensure that the development of mineral resources is in accordance with the best practice health, safety and environmental standards and to protect the environment and health and safety of all persons on mining sites.

Under the **Mining Management Act**, an application for an authorisation to carry out mining activities must be accompanied by a Mine Management Plan (MMP). A MMP includes information relating to the description of mining activities, the management system to be implemented for the management of health, safety and environmental aspects, costing of closure activities and particulars of organisational structure. Plans of any existing or proposed mine workings and infrastructure must also be included. The MMP is required to be reviewed at intervals specified in the authorisation to carry out mining activities.

### 4.2.3 Northern Territory Aboriginal Sacred Sites Act 1989

The **Northern Territory Aboriginal Sacred Sites Act 1989** recognises the need to preserve and enhance Aboriginal cultural tradition in relation to certain land in the NT and Aboriginal self-determination. The Act provides for the protection and registration of sacred sites by the traditional owners of the sacred sites or the custodians who have the responsibility for protecting a sacred site in accordance with Aboriginal tradition.

The Aboriginal Areas Protection Authority (AAPA) is responsible for administering the Act and records and maintains a sacred sites register. Custodians may apply to the AAPA to have a sacred site included in the Register and may also include, amongst other things, restrictions on activities that may be carried out on or in the vicinity of the sacred site.

Unauthorised entry on to a sacred site is an offence under the Act and penalties are prescribed accordingly. A person or entity may apply to the Authority to issue an Authority Certificate to allow a person or entity to undertake work on or in the vicinity of a sacred site. Again, unauthorised entry to undertake work on or in the vicinity of a sacred site is an offence under the Act and penalties are prescribed.

The Minister may issue a Minister’s Certificate for work to be undertaken on or near a sacred site when an Authority Certificate has not been issued. Whilst a Minister’s Certificate has the same effect as an Authority Certificate, in the event of variance the Authority Certificate will have no force or effect.

The Act provides for the preservation of proprietary rights of owners of land comprised in a sacred site. Proprietary owners may enter and remain on that land and do anything on that land for the normal enjoyment of that owner's proprietary interest in the land.

An AAPA certificate will be sought for the proposed Kilimiraka Project, contained in EL24329.

### 4.2.4 Territory Parks and Wildlife Conservation Act 2000

The **Territory Parks and Wildlife Conservation Act** (TPWC) is administered by the Parks and Wildlife Services division of NRETAS and makes provision for and in relation to the establishment of Territory Parks and other Parks and Reserves and the study, protection, conservation and sustainable utilisation of wildlife.

### 4.2.5 Water Act 1992

The **Water Act 1992** is administered by the Water Resources Branch of NRETAS and provides for the investigation, allocation, use, control, protection, and management of surface water and groundwater resources, as well as the administrative process for licensing these activities. The Act allows the enforceable allocation of water to various declared beneficial uses including; agriculture, aquaculture, public water supply, riparian and industry, while ensuring that adequate provisions are made to maintain cultural and environmental requirements.

Water Control Districts are declared in areas where it is recognised that increasing development and demand for water have the potential to cause degradation to water quality and reduce flows required to maintain water dependent ecosystems in the region.
The Tiwi Islands are not within a declared Water Control District. Instead the Tiwi Land Council (TLC) and the Northern Territory Government (NTG) are working together to develop a Tiwi Islands Water Resource Strategy which will, amongst other things, describe the regulatory measures for the Tiwi Islands (Schmid, 2010).

4.2.6 Other Relevant Legislation

Other Northern Territory legislation relevant to the project includes the following acts and their associated amendments and regulations:

- Aboriginal Land Act 2004
- Bushfires Act 1980
- Control of Roads Act 2011
- Crown Lands Act NT 2009
- Dangerous Goods Act 1998
- Dangerous Goods (Road and Rail Transport) Act 2011
- Environmental Offences and Penalties Act 1996
- Heritage Conservation Act 2008
- Miscellaneous Acts Amendment (Aboriginal Community Living Areas) Act 2000
- Planning Act 1989
- Public Health Act 1952
- Soil Conservation and Land Utilisation Act 2009
- Traffic Act 2011
- Waste Management and Pollution Control Act 1998
- Water Act 1992
- Water Supply and Sewage Act 1983
- Weeds Management Act 2001
- Workplace Health and Safety Act 2001
5 Potential Impacts and Management

5.1 Surface Water

5.1.1 Potential Impacts

- Contamination of surface runoff, such as hydrocarbons;
- Altered surface water flow patterns; and
- Reduced condition of perched freshwater swamps in terms of water quality and quantity.

5.1.2 Management

- Drainage structures will be designed and constructed to ensure minimal alteration to existing surface drainage patterns;
- Pre-existing access tracks will be used to minimise interference to natural drainage;
- Drainage areas and settling basins will be suitably designed to minimise contamination of surface water;
- Surface water diversion structures will be designed, installed, and managed that enable non-contaminated water to be directed around disturbance areas;
- Erosion and sediment control structures will be installed downstream of disturbance areas if deemed necessary;
- Where surface water is present, vegetation removal on adjacent areas of relief will be delayed as long as possible to avoid erosion and sedimentation;
- Topsoil will be stockpiled away from watercourses and in discrete stockpiles to avoid any interference to surface flows;
- Contaminated water from work areas will be kept separate from clean stormwater;
- Water interfacing with work areas will be directed to oil/water separators; and
- Chemicals and hydrocarbons will be stored in bunded areas in accordance with relevant legislation and standards.

5.1.3 Further Investigations

- Baseline surface water quality testing of freshwater swamps and other surface water bodies identified on-site (sampling results will be presented in environmental approvals process).
- Surface water quality program will be developed to assess potential impacts on surface water features in the vicinity of the project area (the program will be presented in environmental approvals process).
- Modelling of existing surface water levels in the two freshwater swamps at the site.
5.2 Ground water

5.2.1 Potential Impacts

- Disturbance to natural ground water flow patterns resulting from bore field activities;
- Contamination of the near marine environment from mining activities; and
- Degradation and contamination of ground water sources from hydrocarbon or chemical spills.

It is not anticipated that groundwater will be intercepted during the mining operation. Therefore, impacts to ground water are focused on bore field water extraction and the risk of contamination through accidental hydrocarbon spills.

5.2.2 Management

- Ground water Extraction Licences will be administered under the Water Resources Branch of NRETAS will be sought prior to any ground water extraction activities;
- Ground water abstraction rates will be recorded to ensure compliance with ground water licenses;
- Ground water in the vicinity of the Kilimiraka project will be monitored to ensure that contamination is identified quickly and remedial action taken as soon as practicable;
- All vehicles and storage vessels will be properly maintained to prevent failure and leakage;
- The mine will be designed to ensure the safe storage and handling of hazardous materials to prevent contamination; and
- All excavated pits will be backfilled to above the ground water level.

5.2.3 Further Investigations

- Further studies will be required to determine the depth to ground water, water quality, water supply/flow rate, and best location for water supply bores. Initial focus will be in the thicker sections of Van Diemen Sandstone directly to the north of Kilimiraka.
- Mine water balance modelling based on ground and surface water studies, to determine potential impact on ground and surface water conditions at the site.

5.3 Soil

5.3.1 Potential Impacts

- Disturbance to the stable soil layer from the machinery or vehicle movement;
- Contamination of the topsoil from hydrocarbon or chemical spill; and
- Soil erosion and sediment loss resulting from the construction of tracks through bush.

5.3.2 Management

- Minimise vegetation clearing activities;
- A Soil Erosion and Sediment Control Plan accommodating the layout of tracks and mine design will be created and applied to minimize the impacts;
- Tracks will be hidden from view from the road so no further access from unauthorised vehicles may occur; and
- Heavy machinery will enter the sand dunes and drive to each site just once to minimise the impacts.
5.3.3 Further Investigations

- Soil Mapping to a scale of 1:25K.

5.4 Flora and Fauna

5.4.1 Potential Impacts

Impacts to flora and fauna will be primarily caused through land clearing.

- Loss of threatened flora and ecological communities;
- Habitat fragmentation and reduced connectivity;
- Impacts on vegetation communities and flora due to changes in surface water hydrology;
- Mortality of small and sedentary fauna that are unable to move out of the area prior to clearing;
- Loss of biodiversity and ecological function;
- Change in community structure due to the negative response of wildlife to new stimuli;
- Increase in feral predator numbers leading to increased predation rates on native animals;
- Possible disruption to migratory bird roosting locations;
- Impact on turtle breeding and nesting sites;
- Increased weed species may contribute to a decline in overall species richness, canopy cover or frequency of native species;
- Increased likelihood of vehicle strikes to native fauna;
- Open voids such as mining areas, uncapped drill holes and steep sided bunded areas can trap fauna species; and
- Localised reduction in ecological function can be expected as a result of habitat loss, fragmentation, traffic, noise, and pollution.

5.4.2 Management

- NRETAS will be consulted regarding the management of any potential rare, priority, and significant flora and fauna species;
- Disturbed areas that are no longer required will be rehabilitated with local species that provide suitable habitat for native fauna;
- Mining will not take place within 200 metres of the high tide mark on any beach areas identified as turtle nesting areas to reduce any impact to turtle nesting;
- A buffer will be maintained 50 metres from the surface water bodies and 100 metres from the sensitive habitat like rainforest patch;
- A visual barrier will be constructed to limit artificial light spill onto any beach areas identified as turtle nesting areas, therefore minimising the impact to nesting turtles and hatchlings;
- Turtle nests will be protected, where necessary, from predation through the use of cages;
- Any holes and trenches not required to be open will be covered, fenced, bunded or otherwise capped to prevent fauna entrapment. Where appropriate fauna egress matting will be installed;
- Native fauna will not be captured, taken or fed without the appropriate permits;
- Haul trucks will not drive at night to minimise reduce road-kill (especially of Masked Owl).
- Appropriate measures will be undertaken to ensure Cane toad quarantine.
- Vehicle speed limits on site will be set and enforced;
- Any injuries or fatalities to fauna will be reported to the Site Environmental Manager as an environmental incident;
- All personnel will be provided with training to assist in their general awareness and understanding of native flora and fauna species, as well as identification of weeds and feral fauna;
• Fires will not be permitted on site without appropriate approvals and safety precautions;
• Vehicle inspections will be carried out particularly when leaving areas with a high occurrence of weed species and into areas with low weed numbers or significant species/habitat;
• Site personnel will be provided with training to raise awareness, particularly with regard to identification of Weeds of National Significance; and
• Pre-clearance surveys of the proposed haul roads will identify habitat trees, conservation areas, and locations where weed management measures will be required. Where possible, habitat trees will be retained.

5.4.3 Further Investigations
• Vegetation mapping to a scale of 1:25K
• Flora surveys (targeting threatened flora species identified in Section 3.5.2)
• Fauna surveys (targeting threatened fauna species identified in Section 3.5.3)
• Marine Turtle monitoring in association with the Bathurst Marine and Land Rangers
• Freshwater aquatic surveys in the two freshwater perennial swamps

5.5 Air Quality

5.5.1 Potential Impact
Local air quality may be affected by the dust produced during the mining operation which may, in turn, cause minor impact to human health, vegetation, and visual amenity.

There is potential for dust emissions to arise during:

• Construction of the camp and processing plant;
• Upgrade/installation of the haul roads;
• On-going clearance and rehabilitation activities for mining operations;
• Mobile plant movement, in particular during excavation, loading, and transportation of the sand via a six-wheeled truck along the mineralised zone to the feeder (and return);
• Haulage by road trains of the mineral sands concentrate to the port facilities;
• During storage and loading activities at the BLF; and
• Other vehicle usage, including around the mining area, for transportation of personnel and materials to and from the mine site.

Also, the emission of fuel combustible products such as carbon monoxide (CO), sulphur dioxide (SO₂), nitrogen dioxide (NO₂) and particulate matter from the machinery supporting the mining work may cause minor adverse impacts to the local air quality.

The main mine related emissions will be generated from:

• Diesel generators for power generation;
• Combustion engines in machinery and light vehicles; and
• Haulage vehicles.

5.5.2 Management
The mine is situated in a remote location. The nearest town centre occurs 50 km east to the proposed operational area and therefore issues associated with air are likely to be very local in nature.

Management will be continuously refined and strengthened in response to any workforce or community concerns, including:
• Minimisation of vehicle movements and duplication of activities to reduce cost, greenhouse gas emissions and increase efficiency;
• Dust suppression measures will be used, such as water trucks as required;
• Speed limits will be set and enforced;
• The extent of exposed areas susceptible to wind erosion will be minimised;
• Rehabilitation will be undertaken in cleared areas no longer required to minimise exposed soil;
• High dust-generating activities will be limited during adverse weather conditions;
• Design of construction and operations to incorporate methods to minimise vehicle movements and duplication of activities to reduce cost, greenhouse gas emissions and increase efficiency; and
• Environmental Incidents to be recorded in the Incident Register.

5.5.3 Further Investigations
• Baseline dust monitoring will be conducted to gain an understanding of the degree of potential impacts and management plans developed as required. This monitoring will be focused on the mine camp, local communities (dependant on haul road route), and port facility (dependant on final location decision).

5.6 Noise

5.6.1 Potential Impacts
At the time of mine operation, the potential noise sources onsite will be excavator, trucks, feeder and trommel, pumps, the processing plant and generator sets. The combined noise from these activities will cause an increase in noise levels in an area with a low noise background. Haul truck activity will result in an increase to the existing noise levels on the road between the port and the proposed mining operations. The handling and loading of concentrate onto ships at the loading facility will also result in an increase in noise emissions.
• Nuisance noise to local communities, fisherman, and staff at the mine camp; and
• Fauna species moving away from noisy areas or altering their behaviour.

5.6.2 Management
• All vehicles will be required to stay on defined tracks and roads unless otherwise authorised, as per current Matilda management plans;
• Regular inspection and maintenance of mobile and stationary equipment will be carried out to maximise energy and fuel efficiency; and
• Respond to any noise complaints.

5.6.3 Further Investigations
• Baseline noise monitoring will be conducted to gain an understanding of the degree of potential impacts and management plans developed as required. This monitoring will be focused on the mine camp, local communities (dependant on haul road route), and port facility (dependant on final location decision).
5.7 Cultural and Heritage Sites

5.7.1 Potential impacts

- Direct destruction or damage of sites of indigenous or cultural heritage significance of through mining activities; and
- Mining infrastructure preventing access by traditional owners and interested parties.

5.7.2 Management

Matilda Zircon will consult closely with local indigenous groups and interested parties to determine strategies to minimise impacts by the project to cultural and heritage values of sites. Matilda Zircon will seek to maintain good working relationships with those who hold cultural value to the area. In addition, all personnel will be made aware of the management actions which will uphold the identified values in the proposal area and its surrounds, as per current Matilda management plans.

Matilda Zircon will seek input from stakeholders regarding access to areas and, where appropriate, their involvement or employment in future activities.

5.7.3 Further Investigations

- Consultation with TLC and other stakeholders (such as Department of Defence)
- AAPA surveys and certificate of approval
- Archaeology survey of all components of the project that will require clearing of previously undisturbed vegetation.

5.8 Socio Economic Environment

5.8.1 Potential Impacts

The Kilimiraka project has the potential to impact on the local communities and the tourism industry by providing better infrastructure and employment opportunities.

Visual impact may be reduced for the immediate mining zone, however rehabilitation will be undertaken in a progressive manner to reduce the visual impacts on the area at any one time.

There is also the potential for the Kilimiraka project to generate income for the local community and to present employment opportunities to locals either directly or indirectly through provision of goods and services. The community will be given the opportunity to retain infrastructure after mine closure, particularly roads, if these are seen to be of benefit to the local community.

5.8.2 Management

Matilda Zircon will undertake community consultation to determine the needs of the local people and address any issues that may be raised. Matilda Zircon will endeavour to establish good communication based on open sharing of information with all stakeholders and Tiwi Island peoples.
6 Environmental Management

6.1 Environmental Management Plans

Management commitments will be developed and finalised throughout project planning and through the development of the project Environmental Management Plan (EMP) and Mining Management Plan (MMP). The EMP will be developed within the framework of an Environmental Management System (EMS) based on ISO14001 criteria. Matilda Zircon will organise a number of baselines environmental studies of the proposed site as project planning progresses and project scope is finalised. The environmental studies will include vegetation mapping, flora and fauna, soil mapping, land unit ground-truthing, surface water, ground water, dust, noise, greenhouse gas emission, and cultural and heritage sites.

A central component of the EMP is to identify those activities that may have a significant risk to the natural environment and develop management strategies to:

- Completely avoid the impact if possible;
- Substitute with a lesser impact;
- Design rehabilitation and engineering solutions to reduce the degree and risk of impact; and
- Design operational controls and emergency response around reduction of impact.

In assessing the significance of environmental impacts potentially resulting from this proposal, Matilda Zircon will consider relevant legislation, standards and guidelines; ecological assessments of the project area and input from government and stakeholders.

A risk-based EMP will be developed for the project to:

- Document project commitments;
- Document potential impacts, management measures, key performance indicators, and monitoring and reporting requirements;
- Document conditions of approval resulting from the environmental approval process; and
- Provide the basis for the development of environmental guidelines and work procedures to be prepared by the construction contractor.

The EMP will include objectives and management strategies that address:

- Surface water management
- Groundwater management
- Vegetation and flora management
- Fauna management
- Dust management
- Greenhouse gas emissions management
- Noise management
- Weed management
- Fire management
- Hydrocarbon and chemical management
- Aboriginal heritage management
- Rehabilitation planning and management
- Topsoil management
- Closure planning
6.2 EMP Implementation

Information contained within the EMP will be distributed to each employee to ensure they understand their role in ensuring that Matilda Zircon conducts operations in an environmentally sound manner.

The objectives of communicating environmental issues include:

- Providing access to information for all Matilda Zircon employees;
- Ensuring that employees are aware of, and understand, their accountabilities for environmental management;
- Facilitating internal auditing and reporting;
- Enabling regulatory reporting;
- Encouraging employee involvement in continuously improving environmental systems and procedures;
- Providing information on Matilda Zircon’s environmental performance to the broader community; and
- Addressing environmental concerns of local communities.

Communication on environmental issues can take on many forms and be to a variety of audiences. Various methods of communication will be pursued both internally and externally (i.e. to government and land council authorities). In addition to this, new employees will undergo an induction and training which will include detail on the Matilda Zircon’s environmental systems and procedure. Management plans will be made available to the public.

Elements of the EMP will be continuously updated to incorporate further information, new techniques, and relevant legislative requirements and adaptations resulting from monitoring results. Implementation strategies will be directed to achieving the performance criteria set out in the EMP and any statutory requirements.

6.3 Environmental Monitoring

Monitoring of environmental changes is a crucial part of an environmental management system. Monitoring should focus on threats, pressures and opportunities. Matilda Zircon will develop an environmental monitoring program, as part of the EMP, and will include:

- Identification and monitoring of trends and threats;
- Identification and monitoring of potential long term impacts and patterns;
- Identification and exploration of emerging opportunities;
- Monitoring of both direct and indirect impacts;
- Strategies for assessing and measuring effectiveness of policies and/or projects; and
- Provision for updating policies, plans, strategies and projects.

If monitoring indicates that the desired level of protection is not being met, improved techniques or management methods will be initiated to guarantee the standard of protection expected by stakeholders and the general public.
7 Stakeholder Consultation

7.1 Stakeholder parties

Stakeholders are parties with an interest in the project who can potentially influence, or are influenced by its development.

Table 12 is an indicative list of stakeholders for the Kilimiraka project. Unfavourable responses to the project may arise from stakeholders including community groups, individuals, landholders, government bodies, indigenous groups and traditional owners, decision-making authorities, and non-government agencies.

Concerns raised by stakeholders might include:

- Availability of resources (e.g. water, infrastructure);
- Employment opportunities;
- Infrastructure capability and suitability;
- Impacts on turtle nesting sites;
- Impacts to migratory species;
- Local economic issues;
- Cultural impacts including disturbance to unidentified heritage areas;
- Greenhouse gas emissions;
- Changes to biodiversity;
- Habitat destruction and clearing of native vegetation;
- Groundwater and sea water impacts; and
- Weed/disease introduction/spread.

Community consultation and outcomes will focus on raising awareness of the project, employment and future employment opportunities that might exist, and developing an engagement and participation strategy.

Consultation will be ongoing throughout the life of the project.

7.2 Timing of Consultations

Matilda Zircon has commenced consultation with interested parties and will continue this through the life of the project. During the project development phases, consultation will take place at regular intervals (quarterly). Once production commences this will take place on an annual basis. This will enable Matilda Zircon to make informed decisions that will enhance community consent and support for continued exploration, development, construction, and the ongoing operation of the Kilimiraka project. Continual consultation will also facilitate ongoing business and employment opportunities within the community.
<table>
<thead>
<tr>
<th>Interest Group</th>
<th>Stakeholder Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Territory Government</td>
<td>Minister for Natural Resources, Environment and the Arts</td>
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<tr>
<td></td>
<td>Minister for Resources</td>
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<tr>
<td></td>
<td>Department of Construction and Infrastructure</td>
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<tr>
<td></td>
<td>Aboriginal Areas and Protection Authority</td>
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<td></td>
<td>Environmental Protection Authority</td>
</tr>
<tr>
<td>Australian Government</td>
<td>Department of Sustainability, Environment, Water, Population and Community</td>
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<tr>
<td></td>
<td>Federal Environment Minister</td>
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<td></td>
<td>Department of Families, Housing, Community Services and Indigenous Affairs</td>
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<tr>
<td>Indigenous Groups and Landowners</td>
<td>Tiwi Land Council</td>
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<tr>
<td></td>
<td>Traditional Owners</td>
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<tr>
<td>Local Community</td>
<td>Local Community and residents</td>
</tr>
<tr>
<td></td>
<td>Recreational fishermen</td>
</tr>
<tr>
<td></td>
<td>Tourism groups</td>
</tr>
<tr>
<td>Media</td>
<td>Local, regional, NT and national</td>
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<tr>
<td>Industry</td>
<td>Minerals Council of Australia</td>
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<td></td>
<td>AusIndustry</td>
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<td></td>
<td>The Australian Institute of Mining and Metallurgy</td>
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<td></td>
<td>Northern Territory Industry Capability Network</td>
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<tr>
<td></td>
<td>Matilda Zircon shareholders and employees</td>
</tr>
<tr>
<td></td>
<td>NT Chamber of Commerce</td>
</tr>
</tbody>
</table>
8 Acronyms

AAPA  Aboriginal Areas Protection Authority
ASS   Acid Sulfate Soils
AFD   Australia Fuel Distributors
ABS   Australian Bureau of Statistics
BoM   Bureau of Meteorology
NRETAS Department of Natural Resources, Environment, the Arts and Sport
DoR   Department of Resources
SEWPAC Department of the Environment, Water, Heritage and the Arts
EL    Exploration Lease
EPBC  Environment Protection and Biodiversity Conservation Act
FIFO  Fly In Fly Out
FEL   Front End Loader
HMC   Heavy Mineral Concentrate
IUCN  International Union for the Conservation of Nature
Matilda Zircon Matilda Zircon Limited
MMP   Mining Management Plan
MOC   Mine Operation Centre
ML    Mining Lease
NVIS  National Vegetation Information System
NGO   Non-Government Agencies
NOI   Notice of Intent
pa    Per Annum
RMCP  Rehabilitation and Mine Closure Plan
TIS   Title Information System
TSF   Tailing Storage Facility
TPWC  Territory Parks and Wildlife Conservation Act
WRD   Waste Rock Dumps
9 References


NRETAS 2011. Land Systems of the Northern Part of the Northern Territory (1:250,000), Provided by NT Government, Sep 2011.


