

2.1 Construction works and clearing

2.1.1 Andranangoo Creek West

The proposed mineral sands mining operations at Andranangoo will require clearing of approximately 2 ha of native vegetation for the mining camp, mining area and the haul road. Of this, an area of 60 m x 40 m has already been cleared for construction of the exploration camp and a helipad, under the Exploration Licence.

It is anticipated that full construction of the mining camp and processing plant will take approximately one week. The preliminary works required to establish the mining operations, including placement of fuel tanks and generators and power connection, and placement of sand slurry feeder and pipelines, will also take a week, and can be conducted concurrently with the camp construction.

The proposed camp and plant layout at Andranangoo is shown in Figure 2.1.

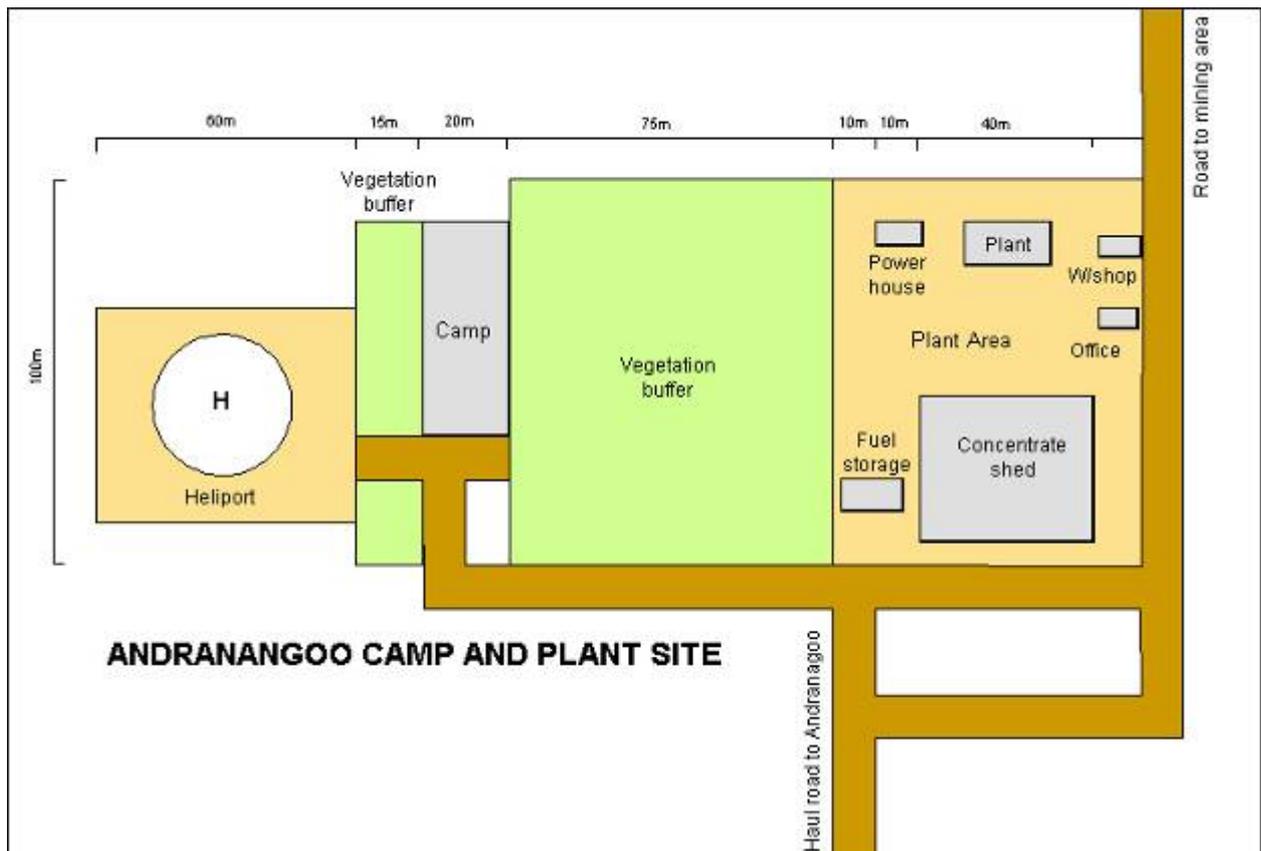


Figure 2.1: Andranangoo Camp and Plant Site Layout

None of the vegetation communities that require clearing have declared conservation status. However *Cycas armstrongii*, listed as Vulnerable (under NT Legislation *TPWC Act 2000*), has been recorded at the Andranangoo site (Metcalf 2005a). Where possible, facilities will be moved to avoid the need to clear areas where *Cycas armstrongii* occur, however if there is a need to remove any of this species, a Permit to Take or Interfere with Wildlife will be obtained from the Northern Territory Parks and Wildlife Service.

The proposed areas of disturbance for the construction of the Andranangoo camp and mine comprise a total of approximately 0.45 km² (45 ha). This is approximately 0.006% of the total area of the Tiwi Islands. The habitats to be disturbed are predominately *Melaleuca* woodland for the mining operations with approximately 2 ha of *Eucalyptus* open woodland for the camp facilities.

The haul road which has been widened to improve access to the existing exploration leases and camp at Andranangoo, is a linear disturbance of 60 km in length. The width of the previous 4WD access track was increased from about 2 to 6 m wide, which equates to an approximate area of disturbance of 0.24 km², or 24 ha. The haul road passes through predominantly *Eucalyptus* woodland.

According to Woinarski *et al.* (2003) 1:100,000 Vegetation map:

- There are 60.8 km² and 16.3 km² respectively of *Melaleuca* open forest and low woodlands on the Tiwi Islands. The total area proposed to be disturbed by mining at Andranangoo 45 ha (0.45 km²). Of this 43 ha is *Melaleuca* woodland which represents approximately 0.6% of the total distribution of *Melaleuca* vegetation communities on the Tiwi Islands.
- There are 5,725.1 km² of *Eucalyptus* forests and woodlands on the Tiwi Islands. The total area proposed to be disturbed for the camp and haul road at Andranangoo is about 26 ha, or approximately 0.26 km², which represents approximately 0.0045% of the total distribution of *Eucalyptus* forests and woodlands vegetation communities on the Tiwi Islands.

2.1.2 Lethbridge Bay West

Similar to Andranangoo, the proposed mineral sands mining operations at Lethbridge will require clearing of native vegetation for the mining camp, mining area and the haul road. None of the vegetation communities or plant species that require clearing for the mineralised areas and mine camp and processing area have declared conservation status (Metcalf 2005a). Upgrading of the road into Lethbridge will require the disturbance of *Cycas armstrongii* (Metcalf and Crawford 2005). A Permit to Take or Interfere with Wildlife will be obtained from the Northern Territory Parks and Wildlife Service.

The construction works for the camp will be similar to the Andranangoo site, and the layout for Lethbridge would be similar to that of Andranangoo (Figure 2.1). The camp will take a week to clear and construct. The preliminary works for mining will also take a week and can be conducted concurrently with the camp construction.

The proposed areas of disturbance for the construction of the Lethbridge camp and mine comprise a total of about 0.20 km² (20 ha), which is approximately 0.003% of total area of the Tiwi Islands. The habitats

to be disturbed are predominantly *Melaleuca* woodland and minor areas of coastal vine thicket (Metcalf 2005a). Approximately 2 ha of *Eucalyptus* open woodland will be disturbed for the camp.

The haul road is estimated to be a linear disturbance of 50 km in length. The width of the existing 4WD access track will need to be increased from about 2 to 6 m wide, which equates to an approximate area of disturbance of 0.20 km², or 20 ha. The haul road passes through predominantly *Eucalyptus* woodland.

It is estimated that the *Melaleuca* vegetation communities represent 90 % of the vegetation communities to be impacted upon by the proposed mining operations. The remainder falls largely within the coastal vine thicket vegetation type.

According to Woinarski *et al.* (2003a), 1:100,000 Vegetation map:

- There are 60.8 km² and 16.3 km² respectively of *Melaleuca* open forest and low woodlands on the Tiwi Islands. The total area proposed to be disturbed by mining at Lethbridge is 0.162 km², or 16.2 ha, which represents 0.21% of the total distribution of *Melaleuca* vegetation communities on the Tiwi Islands.
- There are 132 km² of coastal vine thicket vegetation communities on the Tiwi Islands. The total area proposed to be disturbed by mining at Lethbridge is 0.018 km², or 1.8 ha, which represents 0.014% of the total distribution of coastal vine thicket vegetation communities on the Tiwi Islands.
- There are 5,725.1 km² of *Eucalyptus* forests and woodlands on the Tiwi Islands. The total area proposed to be disturbed for the camp and haul road at Lethbridge is 22 ha, or 0.22 km², which represents approximately 0.004% of the total distribution of *Eucalyptus* forests and woodlands vegetation communities on the Tiwi Islands.

2.2 Mining, processing and tailings disposal

Mining method

The mineral sands mining method to be used at both Andranangoo and Lethbridge is a form of slot mining, which will minimise the excavation footprint at any one time. Mining will be undertaken by use of a 45 t excavator, which will load into 35 t articulated 6-wheel drive trucks. The excavator will dig to the base of mineralisation or as deep as practicable without the need to dewater. A continuous rehabilitation program will follow close behind the mining face.

The mining face will progress at a typical rate of about 8 to 10 m per day, depending on the depth of the mineralised material. The width of the mining face will also vary according to the nature of the deposit being mined, but will typically be about 80 m across.

A visual description of the full mining method, water recycling, tailings disposal and rehabilitation schedule is provided in Figure 2.2. A plan and side elevation figure of the mining process is provided at

Figure 2.3. The mining technique proposed is aimed at minimising environmental impact and also costs (Matilda, 2004a).

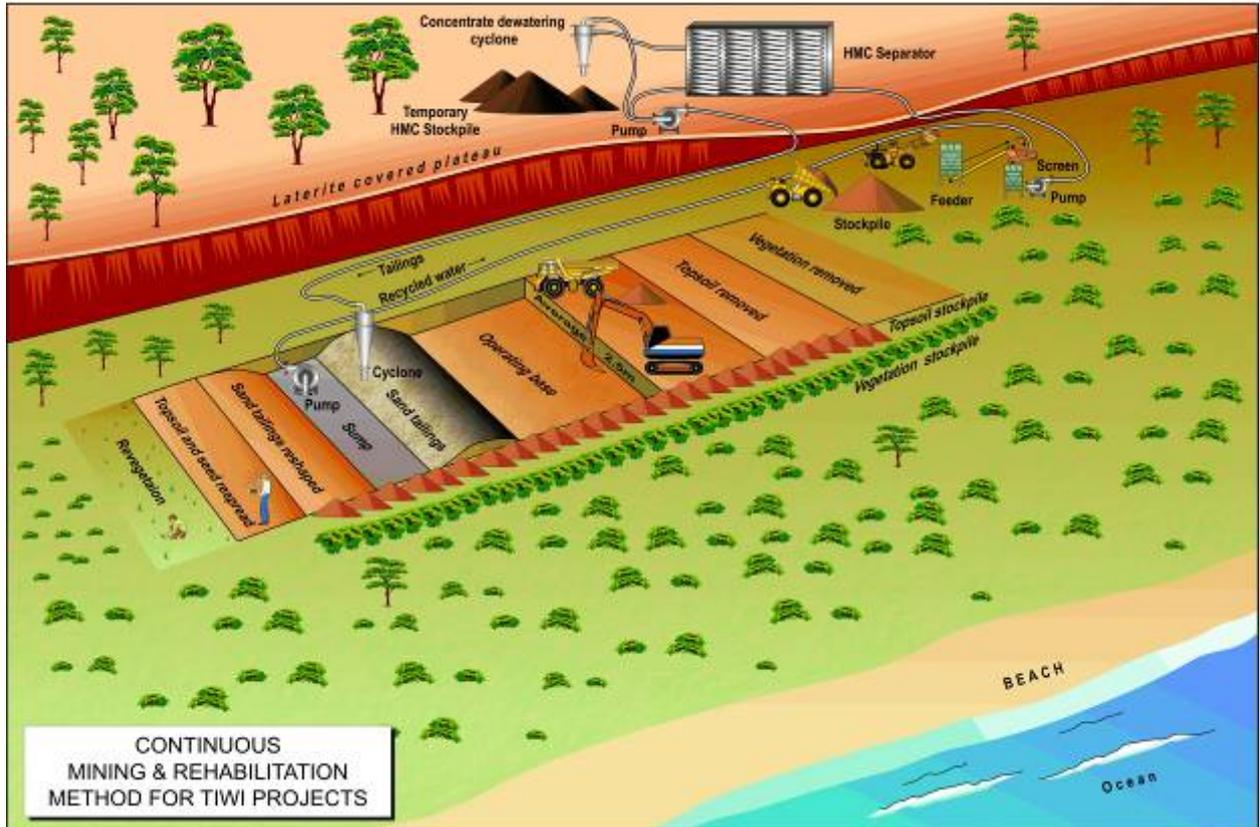


Figure 2.2: Diagram of Mining Method

The depth to which the ore is extracted in the area to be mined depends on the depth and grade of mineralised material, with other factors being the watertable level in that particular area and prevalent climatic conditions. Matilda will schedule to mine areas of the deposit where the water table is lowest during the wet season, and areas of the deposit where the water table is closest to the surface during the dry season.

In addition areas of particular environmental sensitivity, such as surface fresh-water areas, will be avoided. Also, in general a minimum buffer zone of 200 m will be maintained between the mining operations and the Spring High Water mark of beaches where turtles may nest, and 50 m from other areas of sensitivity such as mangroves or rivers.

The excavator and trucks will run only day shift, with the feeder and associated loader operating 24 hours per day. This will assist in alleviating potential problems with lights in the areas closer to the coast and the potential for affecting nesting turtles.

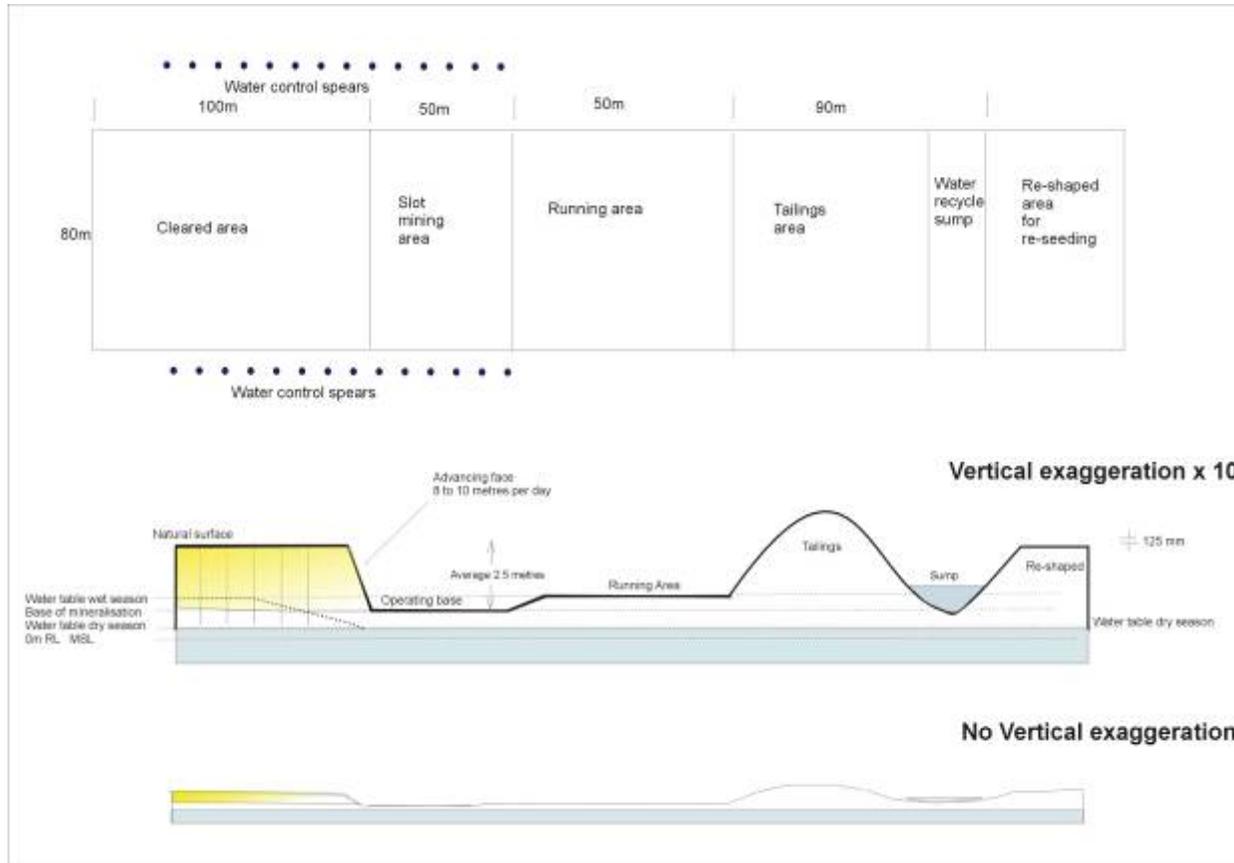


Figure 2.3: Plan and Elevation of Mining Method

Vegetation and topsoil management

Prior to the mining face progressing, vegetation and a minimum scraping of 50 mm top soil will be pushed separately to one side (Figure 2.2) for later spreading and use as a brush cover and seed bank in the site rehabilitation. Organic or fibrous material screened by the trommel will also be separated out and stockpiled for later respreading for rehabilitation purposes.

Detailed surveys of the mining area will be undertaken prior to vegetation removal, to ascertain species diversity and numbers, in order to assist in defining the revegetation requirements and also to provide input to the rehabilitation monitoring program.

When active mining of an area is complete, all tailings will be placed back into the mined areas and the landform will be reconstructed to the original profile. It is anticipated that the resultant profile, over the original mineral sand bearing zone, will be approximately 150 mm lower than the pre-existing profile due to the extraction of the HM content of the sands.

The stockpiled organic material and cleared vegetation (brush cover) will then be respread and reseeded, using seed collected from the area to ensure that the flora provenance is preserved.

Excavated sands

Within the active mining area the excavated sands will be transported via the articulated trucks up to 1.5 km to a stockpile located at the end of the mineralised area. The stockpiled sand will then be fed into a vibrating screen by a front end loader, to remove debris. From the screen the sands will pass into a feeder and mixed with water to approximately a 25% solids slurry, and pumped to the wet concentrator plant. Water will be sourced from production bores for use in the processing circuit as described in the Water Management Section.

The screen and feeder will be located on a central area on the Quaternary sands below the escarpment and processing plant, within approximately 800 m of the processing plant.

The debris removed by the trommel screen will be returned to the rehabilitation area at the rear of the mining area, and spread with the topsoil to assist in soil binding.

Processing plant

From the feed hopper the slurry will then be fed via 180 mm Class A polypipes to the HM processing plant, which will be located on the escarpment. The HM processing plant will separate the final product of HM concentrate from the sand via a spiral centrifugal separation process. Specifically, the slurry that is piped to the plant will be fed into a series of water irrigated spirals that separate the sand into the heavy minerals and sand tailings, by use of splitters. The splitters divert the sand tailings to a hopper, and the heavy mineral concentrate to a wash hopper.

The separation process does not require any chemicals, and will utilise recycled water for the separation of sand and HM concentrate. The method is a well established and proven method of chemical-free separation and is also utilised by Cable Sands in South Western Australia.

As noted previously, the processing plant, which is in four sections, has been transported to the island and is currently stored at Pickertaramoor. This plant will be transported in sections to the mine site when operations begin, and assembled on site. Assembly of the processing plant takes about one day. The concentrator plant spirals section is shown in Plate 2.1, and the fully assembled concentrator plant is shown in Plate 2.2.



Plate 2.1: Concentrator Plant Spirals Section



Plate 2.2: Fully Assembled Concentrator Plant

Tailings

From the tailings hopper the tailings are pumped back to the pit area via dewatering cyclones and 180 mm Class A polypipes. Water is reused in the feed hopper, and the tailings are stockpiled at the rear of the mining area for re-shaping into the natural landform for later rehabilitation.

Concentrate

The concentrate is pumped from the concentrator wash hopper to a dewatering cyclone, where the water is recovered for re-use in the processing plant. The HM concentrate passes from the bottom discharge of the dewatering cyclone to a temporary stockpile, from where it is periodically transferred to the storage shed (Figure 2.1), awaiting trucking to the port terminal. The HM concentrate storage shed will incorporate a bunded (1 m high) concrete pad.

Any excess water from the concentrate dewatering cyclone is discharged to the area behind the active mining zone, from where it would rapidly seep back into the watertable.

Movement of concentrator and mobile plant

The HM concentrator plant will be located in the camp and plant area on the upland *Eucalyptus* woodland on a semi-permanent basis (Figure 2.1). The concentrator will not move during mining operations at each

prospect. The feeder is mobile and will be moved so that disturbance from mining traffic will be minimised. The dump truck that will supply the feeder extracted ore will follow the edge of the mineralised zone back to the feeder to further minimise the mining footprint.

Access roads within the mining area and to and from the camp and plant will be cleared as needed through the *Eucalyptus* woodland along the mineralised zones where possible. A continual approach to revegetation of the access tracks as they become redundant will also be adopted. Previous unneeded tracks will be ripped and seeded when decommissioned to allow continued establishment of the native vegetation, unless otherwise notified by the TLC, who may wish some tracks to remain for local access.

2.3 Water management

Potable water

The potable water used in the mining camp facility for human consumption and sanitary purposes will be sourced from a groundwater bore separate to the production bores in close proximity to the camps (Figures 2.4 and 2.5). This water will be tested for compliance with the NHMRC/ARMCANZ (1996) Australian Drinking Water Guidelines, and if necessary will be treated to ensure that the standards are met.

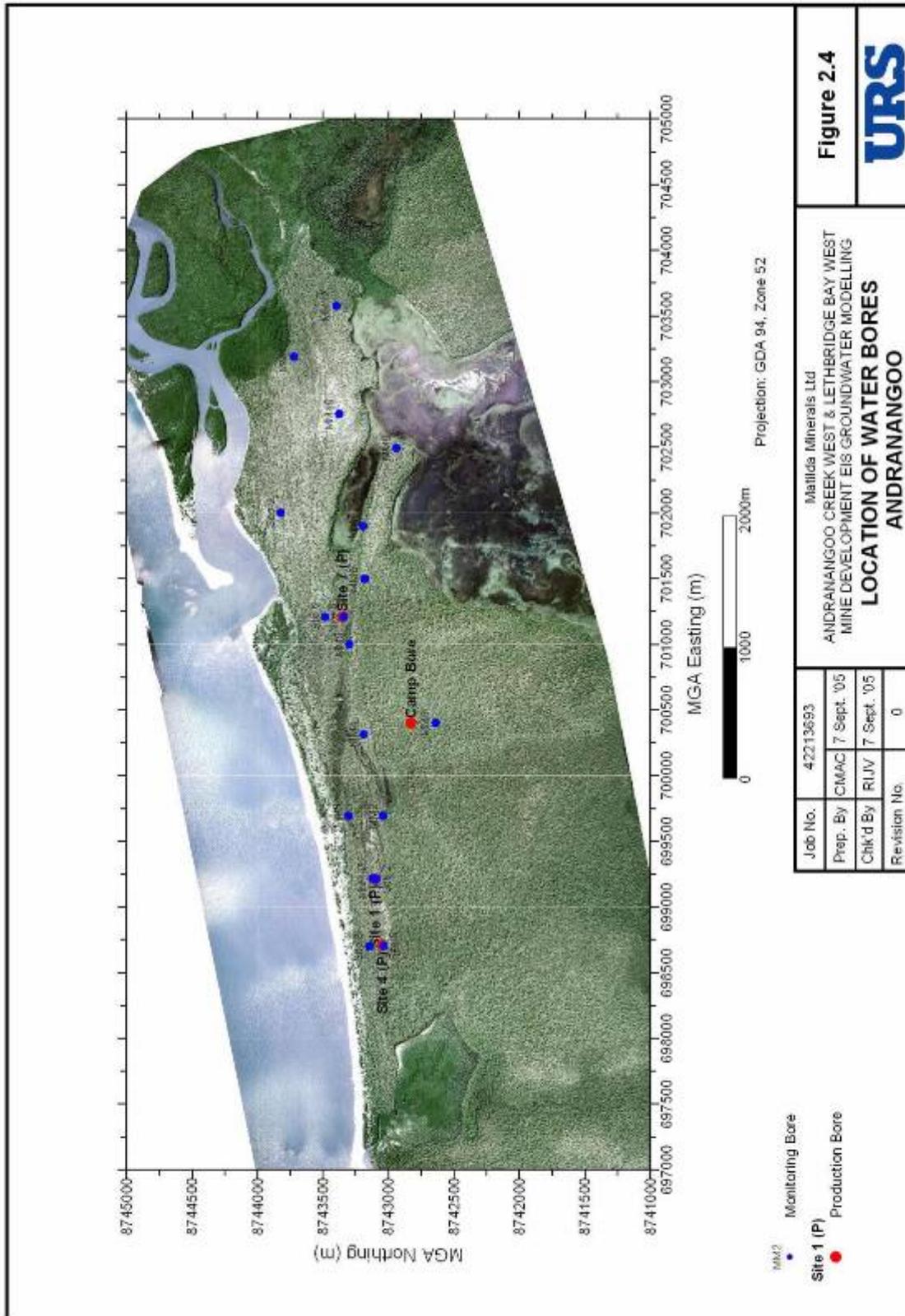
A water monitoring program, also based on the NHMRC/ARMCANZ (1996) Australian Drinking Water Guidelines, will also be developed to monitor the quality of this water.

Potable water will be pumped from the potable water bore using a 40 kW generator through polypropylene pipes to the camp site, to a 5,000 kL polytank. The total consumption rate of water at the village is anticipated to be approximately 1.1 ML per year. This is based on an estimated workforce of 12-20 people at any one time

Untreated water

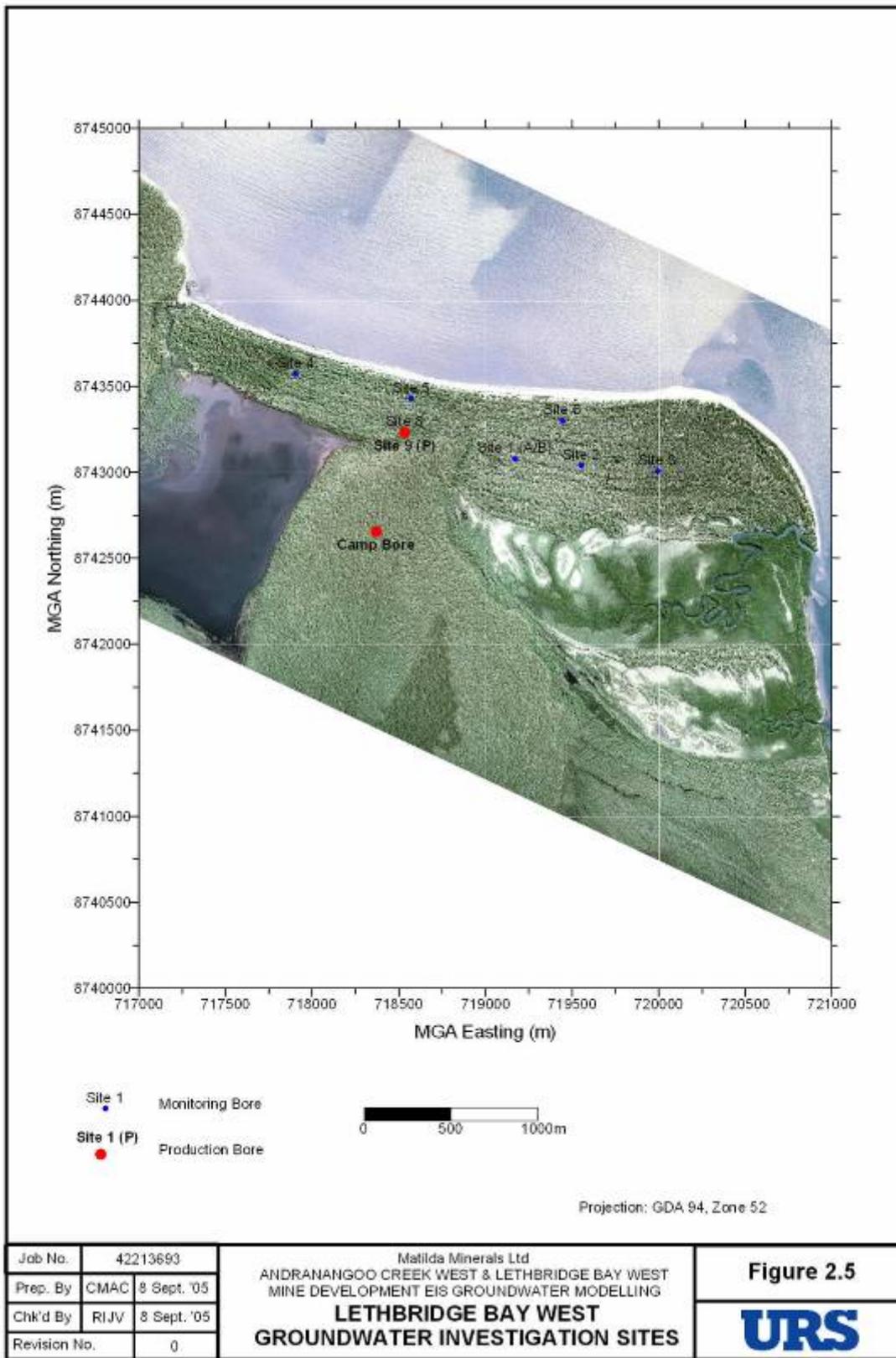
Untreated groundwater (raw water) from production bores will be used for non-potable purposes such as mining, processing, irrigation, fire fighting and dust suppression. It is proposed that two production bores would be used at each of the Andranangoo and Lethbridge sites, located away from the mining areas, and in areas of minimal impact to environmentally sensitive areas. The actual number of production bores required will be determined following bore yield tests. The untreated groundwater bore locations are shown in Figures 2.4 and 2.5.

The main use of production water will be as make up in the spiral separation and slurring processes, and also for irrigation of rehabilitation areas. The water used in the separation process will be recycled as much as possible (Figure 2.2).



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Figure 2.4.c1



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Figure 2.5.rst

Any excess water would be discharged behind the active mining zone, from where it would rapidly seep back into the watertable. Water discharge areas will be located in areas where the potential for environmental impact is minimised. It is anticipated that approximately 7 ML per year will be required for processing and mining activities.

Water will also be utilised for dust suppression along the haul road, by use of a water tanker truck. The water truck would be used as necessary, particularly during dry and windy weather. On the basis of the water truck carrying 20 kL and wetting down the haul road and other access tracks twice per day, for six months per year, it is estimated that dust suppression will consume approximately 7.3 ML of water per year.

2.4 Fuel, oils, chemicals and consumables

All fuel for mine operations including mining, processing, generators and light vehicles will be purchased from PenSyl, a joint venture between Pentarch and Sylvatech (now Great Southern Plantations Ltd), who operate the wharf facilities at Port Melville. The fuel will be trucked to the camp facility where it will be stored in 26 kL fuel isotainers in the workshop area. The isotainers fuel would comprise a fuel storage tank contained within a sealed isotainer, which would provide secondary containment.

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

- Australian Standard 1940-1993
- Australian Standard 3780-1994
- Australian Standard / New Zealand Standard 4452:1997.

Fuel and oils required for haulage trucks will be sourced from the existing Sylvatech facilities at Maxwell Creek and Port Melville (displayed in Figure 1.3).

It is estimated fuel consumption will be approximately 3,099 kL/year. All fuel requirements are summarised below in Table 2.1. Based on these figures, the average fuel usage is estimated to be equivalent to 2.3 fuel isotainers per week. It is anticipated that a maximum of five fuel isotainers (130 kL of fuel), sufficient for approximately two weeks operation, will be stored at the mine site at any one time.

Table 2.1: Annual Estimated Fuel Consumption for the Tiwi Islands Mineral Sands Mining Operations

Item	kL/annum	Hours/day/year	Usage
Five generators, total 820 kW	1,796	24/7/365	0.25 L/kWh
Mining Loader	330	24/7/365	38 L/hr
Concentrate Loader	83	6/7/365	38 L/hr
Excavator	120	11/7/365	30 L/hr
Dump Trucks x 2	240	11/7/365	30 L/hr each
Grader	92	11/7/365	23 L/hr
Road Train	432	24/7/300	1.5 L/km
Light Vehicles	6	4/7/365	8 L/hr
Total	3,099		

Waste oil disposal is currently contracted to Australia Fuel Distributors (AFD) for collection and disposal on the Australian mainland, and arrangement is expected to continue, 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 at any one time. General chemicals will be stored as per the manufacturer's specifications. All chemicals will be shipped to the island via the Tiwi Barge Service. Chemicals will be trucked from the port to camp along the haul road.

All consumables for the camp and mine will be shipped from the mainland via the Tiwi Barge Service Pty Ltd or Perkins Shipping Pty Ltd and trucked from Port Melville to the camp via the haul road. Any perishable or frozen foodstuffs will be transported in refrigerated containers and stored in refrigerators at the camp. All dry materials will be packed in sealed containers and stored at the camp in a cool dry area.

All general waste from consumables will be disposed of at the appropriate sanitary landfill sites on the Tiwi Islands.

2.5 Infrastructure

2.5.1 Roads

Access from Port Melville to the minesite will be via an existing road network that consists of haul roads currently utilised by Sylvatech, existing public roads and upgraded 4WD access tracks where these haul roads finish.

The access roads will be built to be suitable for access by a double road train of capacity 60 t. It is expected that, during periods leading to the loading of ore from Port Melville, a double road train of capacity 60 t would make four round trips per day (two per shift). The haulage distance from Andranangoo to Port Melville is 153 km.

As described in Section 1.4.3, the upgrading of the access road to Andranangoo from the existing road across Melville Island from Pirlangimpi to the east, a distance of 48 km (Figure 1.1), commenced with the approval of the TLC. The track was upgraded to enable access to the area for exploration purposes and also to provide improved access for the landowners, as a gesture of goodwill.

The road upgrade construction work was undertaken by the Tiwi Islands Local Government (TILG) in accordance with specifications outlined in a contract established by Matilda in consultation with the TILG Office. The construction methodology incorporated recommendations made by the TLC to minimise environmental disturbance. These recommendations included diverting the road from areas that were recognised as being environmentally sensitive, to minimise the impact associated with the widening of the existing track. Flora and fauna surveys were undertaken as part of the road widening project.

Design specifications for the road included a 6-m crowned pavement, 0.5-m shoulders, and V-shaped drains with a flat bottom. Shoulder and table drain batters were designed at a 4:1 ratio. A minimum of five lateral drains were provided per kilometre. The majority of the road was constructed from local natural surface material won from excavation of the table drains. The road will be sheeted prior to mining activities being commenced at Andranangoo.

At Lethbridge, the only work undertaken to date has been grading of the existing access track from the existing road across Melville Island from Pirlangimpi to the east. This access track would be upgraded to the same standard as above prior to mining activities being undertaken on site (approximately 2009).

Minor access roads around the camps including dump truck roads, access roads to the main haul road and light vehicle access will be cleared as needed. Rehabilitation of the minor access roads will be on a continual basis when each is decommissioned. Rehabilitation will consist of ripping and seeding of native species, unless the TLC notifies Matilda that the roads should be retained for local use.

2.5.2 Port facilities

HM concentrate hauled to Port Melville will be stored at the port in a dedicated shed on the PenSyl port area lease. The port facility will provide for storage of up to 20,000 t of concentrate. The ore will be stockpiled in a covered shed with a concrete floor and bunded raised edges to ensure that there is no release of concentrate during high wind and rainfall or cyclonic events.

Ore will be exported directly from Port Melville. Ore shipments would be in consignments of 4,000-8,000 t at a time, approximately every two months. The ore will be shipped directly to the end-user. At present all future production is contracted to Astron Ltd, in Shenyang, China.

The loading and unloading of goods and ore at Port Melville will be controlled by PenSyl Pty Ltd, and will be conducted under PenSyl's Management, Procedures and Guidelines. It is proposed that concentrate will be loaded into bins on trucks using a front-end loader. The concentrate will then be emptied directly from the bins into the ship by gravity.

For servicing vehicles, a demountable workshop and store for spare parts, tools and servicing requirements will be installed in the infrastructure area at Port Melville. An area for truck parking, fuel storage and truck re-fuelling will also be provided in the infrastructure area at Port Melville.

2.5.3 Communications

Telecommunications facilities on site will initially be via satellite phone. Following the commencement of mining operations, the telecommunications will be upgraded with a micro link back to Milikapiti, which will support landline facilities.

2.5.4 Camp

An area of approximately 2 ha of *Eucalyptus* open woodland will be disturbed for the camp infrastructure (Figure 2.1). It will be located on the plateau away from the beach, turtle nesting areas, high mosquito breeding areas and crocodile habitats. The camp will include: mess, sleeping quarters, and a site office, consisting of temporary mobile demountable buildings. Some of these facilities have already been installed for exploration purposes. The camp area includes a helicopter pad for emergency situations.

The facilities will be sufficient to accommodate from 8 to 15 employees and contractors.

The camp kitchen and ablution areas would be served by a septic tank system with associated soakage trench.

A bore would be installed nearby for potable camp water supply (Section 2.3). This bore would be powered by a 40 kW generator.

2.5.5 Infrastructure area

The infrastructure for the mine processing area will include a power house, plant, workshop, office, concentrate shed with bunded walls and a fuel storage area, which will accommodate up to five 26 kL isotainers (Figure 2.1).

The power house will contain a 450 kW mobile diesel-fired generator and would provide power for the camp and processing plant. An additional 250 kW generator will provide power to the mining area trommel and slurry pumps, and for lighting.

Each of the production bores would be equipped with a 40 kW generator to provide power to run the bore supply pumps (Section 2.3). The total generating capacity on site would be about 820 kW, including the two main generators and three 40 kW bore generators.

2.6 Materials transport

All consumables will be transported from the Australian mainland to Port Melville via the Tiwi Barge Service Pty Ltd or Perkins Shipping Pty Ltd. All goods will be unloaded at the port by PenSyl Pty Ltd and loaded onto trucks for transport to the mining leases via the haul roads.

All goods transported onto the islands will be subject to the necessary precautions to prevent the introduction of unwanted exotic species. This will include inspection of vegetative material and pre-wash down of any plant equipment that has the possibility of carrying seeds or unwanted animal hitchhikers including cane toads and ants.

Formal procedures have been put in place at both Tiwi Barge Services and Perkins Shipping to ensure that all equipment being transported to the Islands is inspected and signed-off by an Inspection Officer from the Department of Natural Resources, the Environment and the Arts (NRETA). Matilda will also put in place formal procedures for ensuring that quarantine procedures are followed.

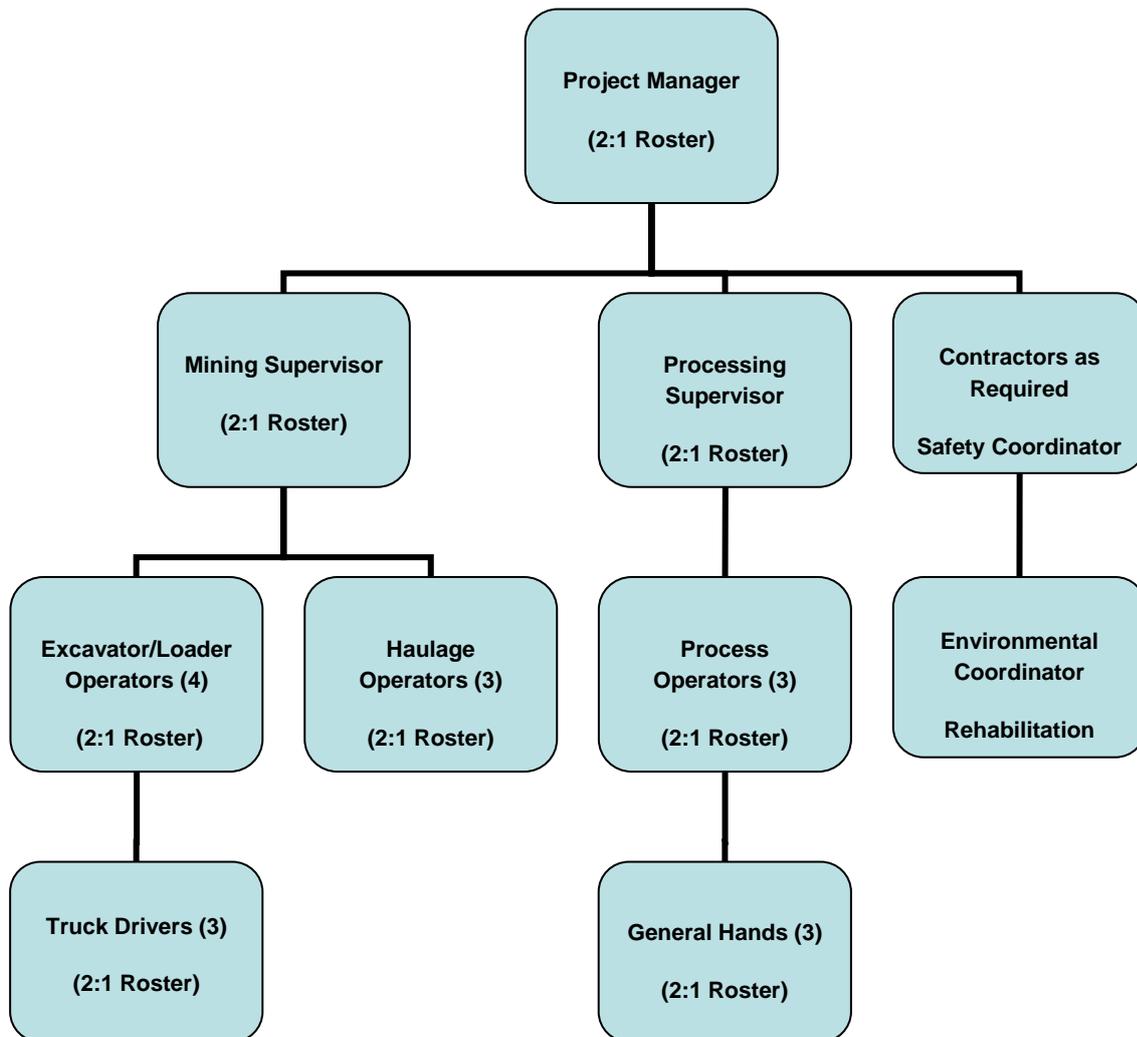
All consumable goods will be transported in sealed containers protected from the external conditions. All perishable or frozen foodstuffs will be transported in refrigerated containers at temperatures specified by the manufacturers. Any dangerous goods will be transported separately, with the relevant Material Safety Data Sheet (MSDS) information. All trucks will carry the required health and safety equipment for the goods carried.

2.7 Workforce and accommodation

Normal mining operations will require approximately 8 permanent workers on site with additional personnel requirements for short periods of rehabilitation work. Workers will work a 2 weeks on and 1 week off roster. The number of people on site at any one time will vary dependent upon management requirements and additional personnel might include contract maintenance personnel, geologists, hydrogeologists, surveyors, environmental scientists and drill rig crews, as well as supervisors and

operators. The camp accommodation can accommodate up to 15 personnel. Figure 2.6 displays the typical work force requirements for when the mine is operational.

Figure 2.6: Operational Personnel Requirements



Workforce accommodation will be at the mining camp located on the plateau in *Eucalyptus* woodland. The camp will include a mess, sleeping quarters, and a site office, consisting of temporary mobile demountable buildings. The camp area will be shielded from processing areas by a 75 m wide vegetative buffer zone (Figure 2.1).

All meals apart from lunch will be served at the mess. Lunch and tea breaks will be taken by employees each day.

2.8 Management, maintenance and administrative requirements

Site offices will be located in the minesite processing area. The offices will include the Project Manager, Mining Supervisor, Processing Supervisor and Environmental Coordinator. Each office will also be a First Aid Station and will contain the required first aid and health and safety equipment. Each office will be able to maintain communication with employees via two-way radio. The offices will also be able to maintain contact with relevant sources on the mainland.

All manuals, procedures, guidelines and management plans will be stored in the site offices. All documents will be available to workers when and if required. All relevant information, including for site safety and environment, will be displayed on a notice board in the office area.

The processing area will contain a workshop, comprising a 12 m (40 foot) shipping container, which will also hold consumables and spares. All minor repairs from the camp and processing area will be conducted in this workshop.

A demountable workshop for servicing vehicles, storing of spare parts, tools and other servicing requirements will also be installed at Maxwell Creek. This workshop will be used for all major repair and servicing requirements. As stated earlier, any hydrocarbons or waste oils stored at this facility will be stored in drums as per Matilda's Hydrocarbon Management Guidelines, and the relevant Australian Standards (Section 2.4).