ASSESSMENT REPORT 60

MOLYHIL TUNGSTEN/MOLYBDENUM PROJECT

THOR MINING PLC

ENVIRONMENTAL ASSESSMENT REPORT

AND

RECOMMENDATIONS

by the

ENVIRONMENT PROTECTION AGENCY PROGRAM

DEPARTMENT OF NATURAL RESOURCES, ENVIRONMENT AND THE ARTS

July 2007

epa northern territory program

Northern Territory Government
Department of Natural Resources, Environment and the Arts

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Glossary of Acronyms

AAPA	**Aboriginal Areas Protection Authority**
ARD	**Acid Rock Drainage**
AS	**Australian Standards – AS1940: *The storage and handling of flammable and combustible liquids'* and AS1692: *Tanks for flammable and combustible liquids'***
BOO	**Build own & operate**
CLC	**Central Land Council**
CO2-e	**Carbon dioxide equivalent**
DHCS	**NT Department of Health and Community Services**
DNRETA	**NT Department of Natural Resources, Environment and the Arts**
DPIFM	**NT Department of Primary Industry, Fisheries and Mines**
DRF	**Declared Rare Flora**
EL	**Exploration Licence**
EMP	**Environmental Management Plan**
EPA Program	**Environment Protection Agency Program**
EPBC Act	**Environment Protection and Biodiversity Conservation Act**
FIFO	**Fly In Fly Out**
HCS	**Heritage Conservation Services (NT Department of Natural Resources, Environment and the Arts)**
MEB	**Medical Entomology Branch**
ML	**Mining Lease**
MMP	**Mining Management Plan**
Mo	**Molybdenum**
Mt	**Million tonnes**
NPI	**National Pollutant Inventory**
NT	**Northern Territory**
PAF	**Potential Acid Forming**
PER	**Public Environmental Report**
RFDS	**Royal Flying Doctor Service**
RL	**Relative Level**
ROM	**Run Of Mine**
TPWS	**Territory Parks and Wildlife Service**
TPWC Act	**Territory Parks and Wildlife Conservation Act**
TSF	**Tailings Storage Facility**
Tpa	**Tonnes per annum**
W	**Tungsten**

WTF	**Waste Transfer Facility**
WRD	**Waste Rock Dump**

Executive Summary

This report assesses the environmental impact of a proposal by Thor Mining PLC (Thor) to develop a tungsten (W)-molybdenum (Mo) open pit operation at the Molyhil Project, 240km northeast of Alice Springs in the Northern Territory (Molyhil Project). The facility would produce scheelite and molybdenite concentrates for sale and approximately 300,000 tonnes of ore is expected to be treated annually at the mine. The project has an expected life of approximately 4 years.

This Assessment Report reviews the Public Environmental Report (PER) and public comments. Information, comments and advice provided by the Northern Territory Government agencies have also been used in the preparation of this report.

Environmental assessment is the process of defining those elements of the environment, which may be affected by a development proposal and of determining the significance, risk and consequences of the potential impacts of the proposal. Recommendations arising from the assessment address methods to mitigate these impacts.

Conclusions

While the Public Environmental Report lacked detail on some key issues of the proposal, and in some cases provided conflicting information, this lack of information did not prevent the overall assessment of the proposal. Based on the information provided and the assumptions made by the proponent, the EPA Program considers that the environmental issues associated with the proposal have been identified and the proposal can be managed in a manner that avoids unacceptable environmental impacts. However, this is dependent upon the proponent doing further work to address information gaps (assuming this work does not identify a potential 'show-stopper'); and, the environmental commitments, safeguards and recommendations detailed in this Assessment Report and in the final EMPs are implemented, with regular reporting, compliance auditing, monitoring and evaluation, and appropriate responses and adaptations to any issues identified through monitoring.

The PER lacks detail in several areas, specifically this includes; design details for the diversion channel and settling ponds, liner details for the Tailings Storage Facility and the Waste Rock Dump and the impact of the use of saline water for dust suppression. Additionally, management of the Tailings Storage Facility has largely been based on conceptual assumptions. In order for the project to proceed in an environmentally acceptable manner, the proponent needs to address all information gaps identified in this Assessment Report prior to commencement of works. It is acknowledged that there is potential that when undertaking the outstanding studies the proponent may identify a potential 'show-stopper' for the proposal, however this is considered unlikely. Any issue that is identified should be able to be managed or resolved through mitigation measures and design of the project.

Key areas that must be addressed prior to the commencement of any mining activity under the *Mining Management Act* for the development or operations include:

- Diversion dams;
- Settling ponds;
- Saline water for dust suppression;
- Liner details for Tailings Storage Facility
- Liner details for Waste Rock Dump; and
- Clarification of conflicting information.

The final environmental management plans for the proposal are to be subject to review to the satisfaction of the relevant Northern Territory Government agencies prior to their incorporation into a Mining Management Plan. The Management Plans would be working documents for the life of the project.

1 Introduction and Background

Thor is planning to mine tungsten and molybdenum from the Molyhil Project 240 km northeast of Alice Springs in the Northern Territory (Figure 1). The project involves the expansion of an existing pit. The main objective of the proposed facility would produce scheelite and molybdenite concentrates for sale. It is expected that approximately 300,000 tonnes of ore would be processed annually at the mine. Tailings would be pumped to the Tailings Storage Facility (TSF) and the areas would be rehabilitated during the project operations phase to reduce the work and costs at site closure. The project has an expected life of approximately 4 years.

The process plant would use a combination of magnetic separation, floatation and gravity separation processes to recover magnetite, molybdenite and scheelite respectively. The ore would be transported to the East Arm Wharf in Darwin Port via triple and double road trains.

Tailings would be produced as two separate tailings streams – pyrite concentrate and a combined magnetite concentrate and general plant tailings stream.

A history of previous mining and heavy grazing activity in the area has resulted in much of the Molyhil are being highly disturbed.

This Report assesses the environmental impact/risk of the Molyhil Project, which would consist of an open pit mine and processing plant. The Molyhil deposit lies within a mining lease on Jervois Station.

This Environment Assessment Report is based on a review of the Public Environmental Report (PER) and comments from the public and Northern Territory Government agencies on the PER.

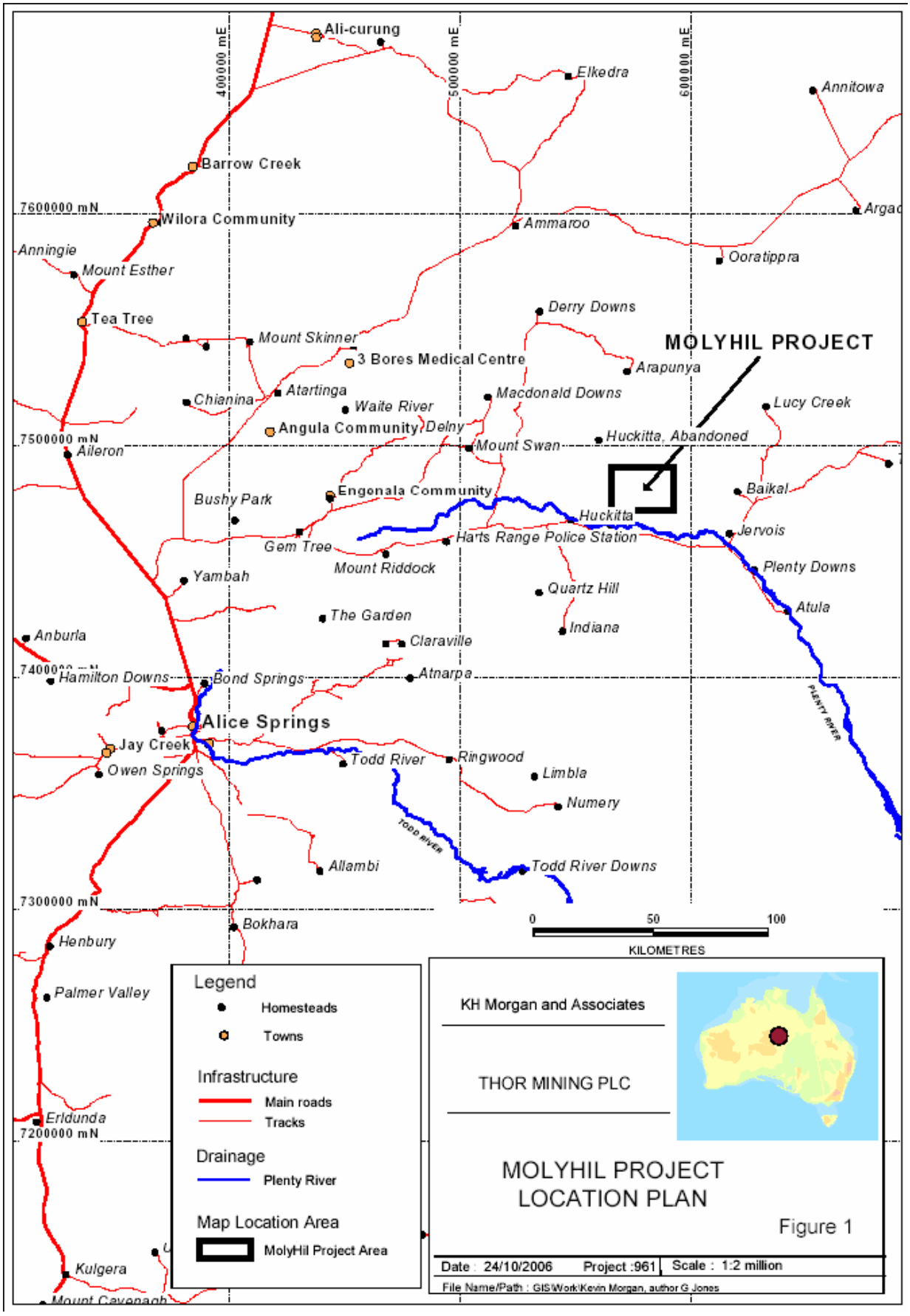

Figure 1 – Molyhil Project location plan

1.1 Environmental Impact Assessment Process

Environmental impact assessment is based on adequately defining those elements of the environment that may be affected by a proposed development, and on evaluating the significance, risks and consequences of the potential impacts of the proposal at both local and regional levels.

This Assessment Report describes the adequacy of the Public Environmental Report (PER) submitted by Thor in achieving these objectives. The report also evaluates the adequacy of the commitments and environmental safeguards proposed by the proponent in order to avoid or mitigate potential impacts in the assessment process.

The safeguards may be implemented at various levels within the planning framework of a project and include (among other approaches):

- Design and layout of buildings and other infrastructure on site;
- Management of construction activities;
- Management of processes used in operations of the facility (e.g. inputs and outputs);
- Rehabilitation methods; and
- Monitoring and evaluation.

A list of commitments made by the proponent in the PER in response to submissions from the public and NT Government is provided in Appendix 1. Additional safeguards are recommended in this Assessment Report where appropriate.

The contents of this Assessment Report form the basis of advice to the NT Minister for Natural Resources, Environment and Heritage.

1.2 Environmental Impact Assessment History

In December 2006, a Notice of Intent (NOI) for the Molyhil Project was submitted by Keith Lindbeck and Associates, Environmental Management Consultants, on behalf of the proponent Thor, to the Environment Protection Agency (EPA) Program, (NT Department of Natural Resources, Environment and the Arts) for determination under the *Environmental Assessment Act* 1982.

In March 2007, the NT Minister for Natural Resources, Environment and Heritage determined that the proposal would be assessed at the level of a PER.

Draft guidelines covering issues to be addressed in the PER were subject to a 14-day public review period, which concluded on 5 April 2007. The NT Minister for Natural Resources, Environment and Heritage then directed the proponent to prepare the PER addressing the matters set out in the final guidelines.

The PER was submitted on 18 June 2007 and placed on public review for 28 days from 25 June 2007 to 23 July 2007. During the public exhibition period, the PER was also circulated to NT Government advisory bodies for review and comment. Sixteen (16) submissions, including NT Government agencies were received within the review period.

The PER and comments from the public and NT Government agencies have been taken into account in the preparation of this Assessment Report.

1.3 Regulatory Framework

The proposed Molyhil tungsten-molybdenum project is wholly within the land borders of the NT. The NT government has jurisdiction over environmental and other legislation relating to the siting, construction and operation of the proposal. Environmental assessment for this project is being

undertaken in accordance with the requirements the NT E*nvironmental Assessment Act (1982)*. Approval for the proposed Molyhil tungsten-molybdenum project is also required under the *NT Mining Management Act (2001)*.

2 Project Description

Thor proposes to mine tungsten (W) and molybdenum (Mo) via an open pit operation at the Molyhil Project located 240km northeast of Alice Springs in the Northern Territory. The main objective of the proposed facility would produce scheelite and molybdenite concentrates and approximately 300,000 tonnes of ore is expected to be treated annually at the mine for four years. The current pit model has estimated probable reserves of 1.094Mt at 0.21% (Mo) and 0.62% (W). The ore is destined for export from the East Arm Port in Darwin.

The proposed development for the Molyhil Project involves the re-opening and expansion of an existing pit that ceased operation in 1982. The proposed development is a stand alone project and is not a stage or component of a larger action.

Molyhil Mine is located on the former Jinka Station, which was first developed for pastoral production following lease issue in 1960 and incorporated into Jervois Station in about 1968. Vegetation and surface soils around and within the mine lease area have been disturbed by the concentration of livestock watering at the nearby dam established in mid 1970 for Molyhil mine.

The mine lease area is approximately 1km^2 with the mining project being approximately 74 hectares in area. It is proposed that open pit mining techniques would be used to extract the ore deposit (Figure 2).

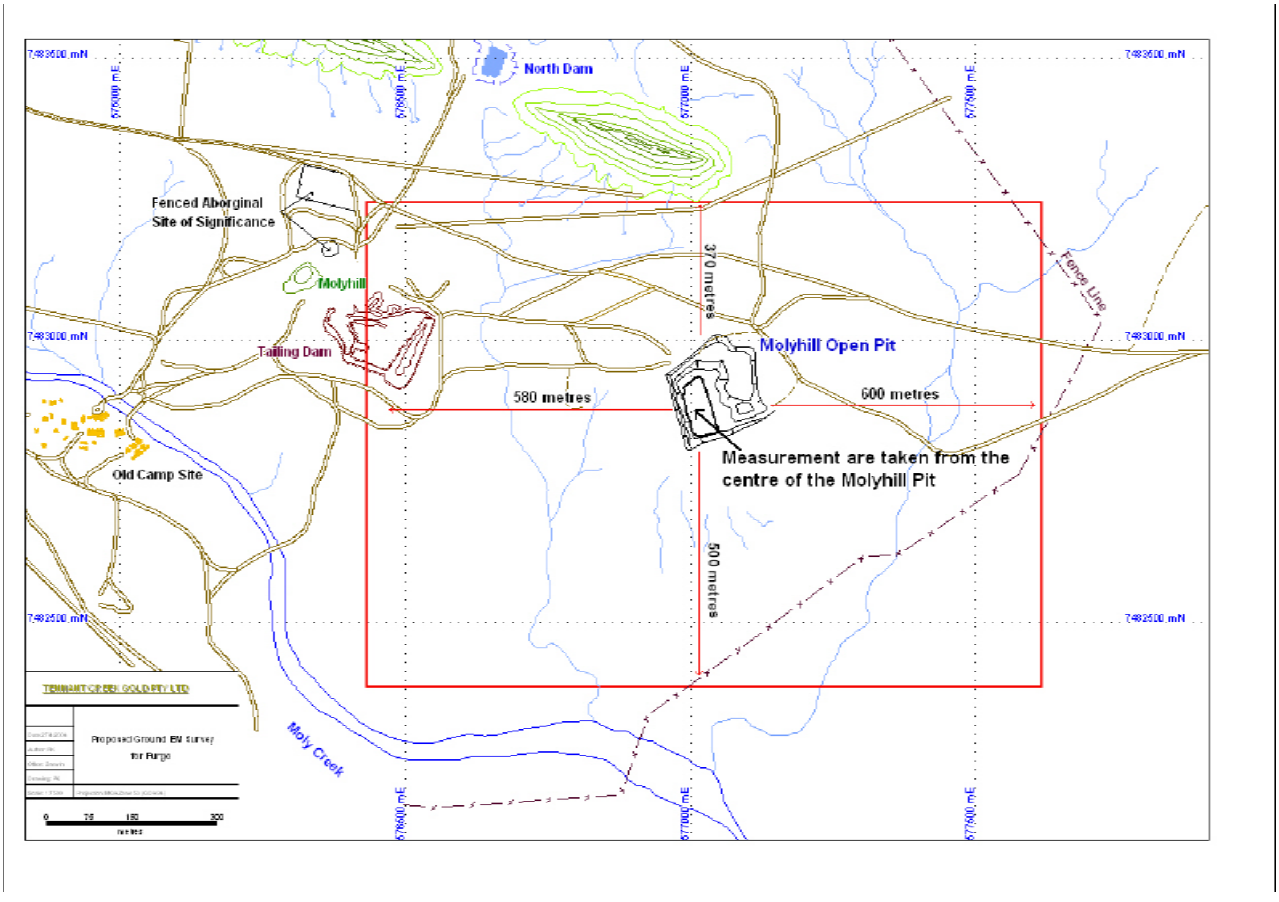

Figure 2 – Molyhil mine lease application area (PER, App 4)

It is anticipated that sulfidic waste rock would not be generated by the proposed mining operation as only minor traces of sulfides have been identified in the waste (PER, 2007).

A summary of the key characteristics of the proposed project is provided in Table 1

Table 1: Summary of the key characteristics of the proposed project

Component	Proposed Project
Mine Life	4 years
Mining method	Conventional truck and shovel operations
Surface RL	410mRL
Top level of orebody	400mRL
Lowest level of orebody	290mRL
Dept of pit	120m (floor elevation 290mRL)
Water table depth	~ 7.3 metres
Area of disturbance (including access)	74 ha
Ore processing rate • Maximum	 300,000 tonnes per annum
Solid waste rock materials • Maximum	 8.2 Mt
Water supply • Source	 Borefield
Processing	Magnetic separation, flotation and gravity separation
Product	Scheelite and molybdenite
Waste Rock Management	Benign waste rock generated from the mining of the open pit would be used to construct the ROM pad, the TSF and possibly also for road base/sheeting materials. Waste rock in excess of requirements would be contained in waste rock dumps located to the east and south of the open pit surrounding the TSF, particularly the northern side.
Power source	Diesel fired power station

The footprint of the proposed project is shown overleaf Figure 3

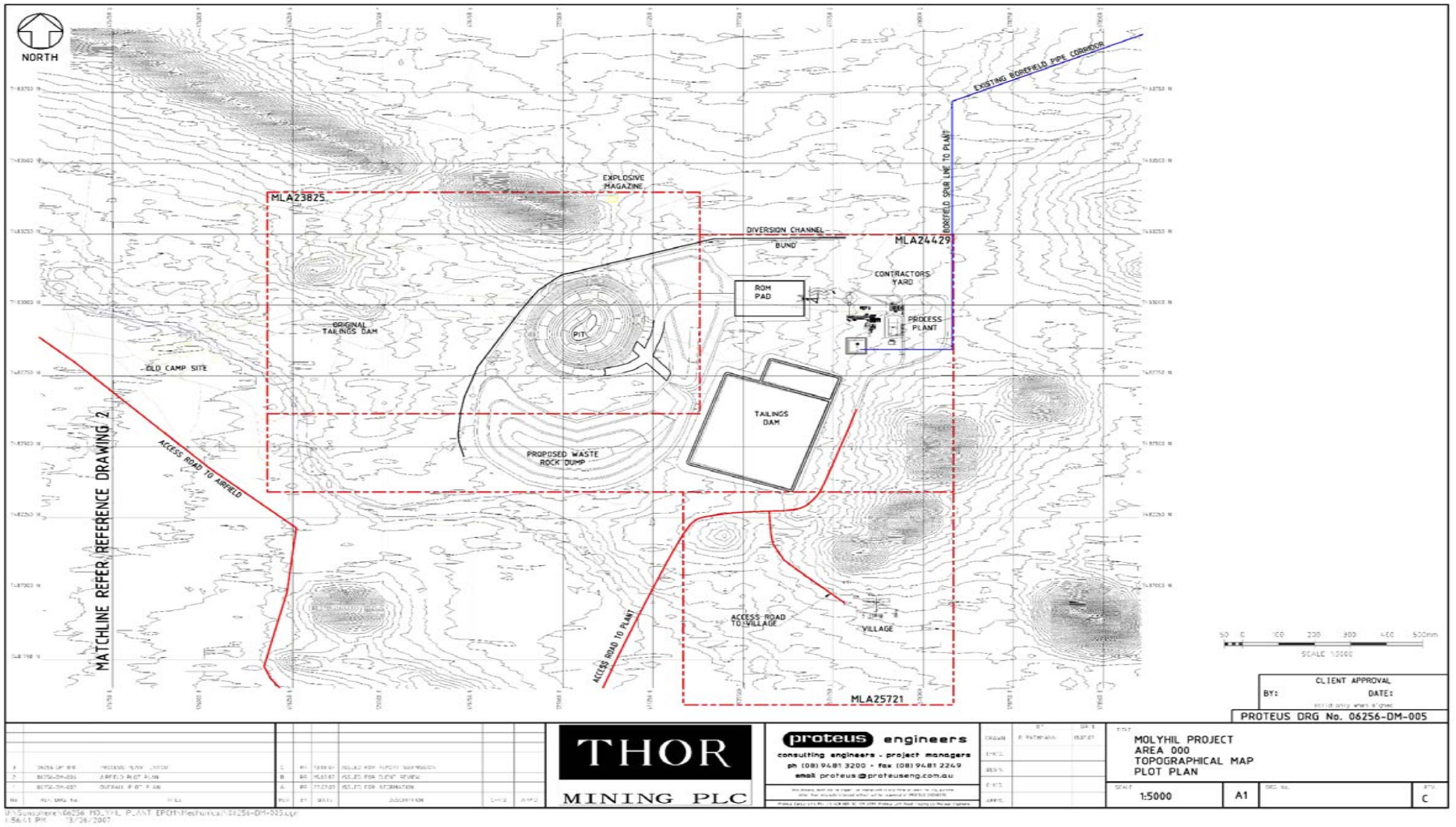

Figure 3: Site layout of the Molyhil Project (PER)

2.1 Site Preparation

Earthmoving activities are planned to commence in 2008, at the commencement of the dry season. Earthmoving contractors would undertake site preparation works.

The access roads across the Plenty and Marshall Rivers would require some upgrade to enable them to be used by road trains. Construction of borrow pits is not expected to be required as waste material from the open pit would be suitable for construction of access road, ROM pad, and pads for plant, workshops, offices and the tailings dam. However in the event that there is a shortfall in the fill volumes, the intention would be to open up an external borrow pit, with the location adjacent to the creek to the west of the proposed plant site (Golder Associates, 2007).

2.2 Mining of Ore Deposit

The two-staged pit (which is the recommended design) would provide 201,621 tonnes of ore grading 0.26% (Mo) and 1.28% (W) in Stage 1 and 892,237 tonnes of ore grading 0.20% (Mo) and 0.47%(W) in Stage 2 and waste rock totalling 8.2 million tonnes.

Approximately 75 hectares of land would be disturbed for the open pit and infrastructure associated with mining operations. The disturbance area at Molyhil is shown in Table 3.

Table 2: Disturbance area at Molyhil Project

DISTURBANCE	AREA (ha)
Pit	9.6
Waste dump	22.0
TSF	20.0
Access road	7.5
Camp	1.0
Admin/offices/workshops	6.25
ROM	5.0
Pipeline	3.5
TOTAL	**74.85**

The proposed mine requires the following:

- Expansion of the existing pit on site;
- Construction of two waste rock dumps located east and south of the open pit;
- Construction of a Tailings Storage Facility (TSF) approximately 0.4 km east-south east of the open-cut pit;
- Construction of a creek diversion channel immediately north of the pit, waste dump and TSF;
- Installation of workshops, explosives magazine, offices and accommodation; and
- Upgrading of existing roads, tracks and airstrips for access and ore haulage.

Ore would be extracted by drilling and blasting and then processed on site. Some dewatering of the pit would be required once mining takes place at depths of greater than 30m below surface.

Reagents and dangerous goods utilised in ore processing and concentrate production are: lime, frother (DSF001/IF50), sulfide collector, oxide collector depressant and diesel. All hazardous substances would be contained within a concrete bunded facility and would be built in accordance with the Australian Dangerous Goods Code and AS1940: The storage and handling of flammable and combustible liquids and AS1962: Tanks for flammable and combustible liquids. Diesel would be contained within self - bunded, double-skinned storage tanks.

The existing open pit, from previous operations has approximate dimensions of 150 X 120 m and is approximately 13 metres deep.

Anecdotal information indicates that some potential acid generating waste material was mined. It is believed that this material has been encapsulated within the waste rock dump during the rehabilitation phase in 1999. It is possible that the existing, small waste rock dump may be re-treated through the new (proposed) processing plant. If this is the case, any potential sulfidic waste would be identified and either relocated or treated through the plant. If the existing waste dump is not reprocessed, then a watching brief would be maintained on the waste rock dump to identify any acidic seepages that may be generated from the dump.

2.2.1 Run Of Mine and old camp

The previously used Run of Mine (ROM) located immediately north of the existing pit, has an average height of four meters with a total surface area of 1.5 hectares. The 1998 site inspection by Fawcett Mine Rehabilitation Services estimated that 6500m^3 of ore stockpile is contained in the ROM and stockpiles.

The old campsite, located one kilometer southwest of Molyhil, was rehabilitated in 1998. All buildings and associated infrastructure and waste material were removed. The concrete slabs are all that remain.

2.3 Project Description

2.3.1 Existing Site Layout

Portions of the Molyhil Project area have been subject to disturbance from previous mining activities. The site was rehabilitated in 1998 with all infrastructure, scrap metals, water tanks and machinery and rubbish removed from site. General site rehabilitation was undertaken in 1998, including backfilling of the rubbish bunker, collection and disposal of all scrap, machinery, drums, reshaping of the pad immediately north of the processing plant, direct seeding and fertilizing where required and capping of all drill holes.

The site was decommissioned in 1999 with final rehabilitation to the satisfaction of the NT Government.

2.3.2 Mining Reserves and Schedule

The Ore Reserve estimate has been established through a series of mine optimisations and mine designs. The current pit model has estimated probable reserves of 1.094Mt at 0.21% (Mo) and 0.62% (W) (See Table 3, overleaf).

Table 3 - Mining Stage 1 and 2 summary statistics

	Pit Design Stage 1	Pit Design Stage 2
Ore Tonnage (t)	201,621	892,237
Waste Tonnage (t)	1,622,361	6,576,683
Mo Grade (%)	0.26	0.20
W Grade (%)	1.28	0.47
Mo Contained Metal (t)	515	1,802
W Contained Metal (t)	2,576	4,220
Stripping Ratio (waste t :ore t)	8.0:1	7.4:1

Processing of Stage 1 ore is scheduled over months 1 to 8 and Stage 2 ore from months 9 to 44. Stage 1 could be undertaken on a 'stand alone' basis.

2.3.3 Mining Methods

Mining would be undertaken by conventional truck and shovel operations under contract mining arrangements. Principal mining equipment includes a 100t hydraulic excavator and three 90t trucks.

All material would be drilled and blasted (except previously mined waste rock that is contained within the footprint of the proposed pit).

2.3.4 Run Of Mine (ROM)

The ROM pad would be constructed during the initial stages of mining. Construction material is proposed to be the benign material sourced from the waste rock from the pit.

The ROM pad would be located approximately 100 metres west of the process plant and in close proximity to the pit to minimise the haul distance. It would have a profile of 250m long by 200m wide and 6m high and contain approximately 300,000m^3 of material. The ROM would provide storage and blending capability for at least one month's supply of ore feed.

2.3.5 Ore Processing

The process plant comprises a crushing circuit and fine ore stockpile, milling and classification, flotation plant for molybdenum recovery, gravity plant comprising spirals and tables for tungsten recovery, concentrate filtering, drying and handling facilities and associated infrastructure.

A mobile crushing plant would be installed during construction to process the existing waste stockpiles to generate material for road construction.

2.3.6 Waste Rock Disposal

Benign waste rock generated from the mining of the open pit is proposed to be used to construct the ROM pad, the TSF and possibly also for road base/sheeting materials.

The project is expected to produce a maximum of 8.2Mt of solid waste rock materials.

Waste dumps have been designed to accommodate waste from the Stage 1 and Stage 2 pits and is proposed to be located east and south of the open pit. Waste would be dumped along the inside faces advancing towards the pit starting with the longest hauls first while accessing the upper material.

The final Waste Rock dump would extend a further 500m to within 50m of the main Molyhil Creek.

2.3.7 Mine Dewatering

Some ground water flows may be expected once mining takes place at depths of greater than 30m below surface. Inflows are expected from geological structures exposed in the walls.

The proponent anticipates that groundwater inflows (and rainfall) would be low in volume and high in salinity (based on previous mining information) and would be collected in in-pit sumps before being directed to a small settling basin to maximise the removal of suspended solids prior to being pumped into the plant process water system or used for dust suppression purposes.

2.3.8 Tailings Storage Facility

The project is currently expected to generate approximately 1.2Mt of tailings over a four year period (3000,000t annually) as two separate tailings streams, pyrite concentrate (7.6%) and a combined magnetite concentrate (25.2%) – general plant tailings (67.3%) stream.

Approximately 300,000 t of magnetite would be produced during the design life of the project. The concentrate, which is understood to be inert, is proposed to be watered at the plant and transported by truck or conveyor to the separate storage area adjecent to the northern wall of the TSF.

The magnetite concentrate tailings and the general plant tailings would be combined at the plant and pumped to the TSF as slurry at the design solids content of 34% by mass. The combined tailings are to be deposited into the conventional, rectangular shaped paddock-type (above ground) TSF.

The pyrite concentrate disposal area is proposed to be located adjacent to the combined magnetite and general plant tailings TSF.

The proposed site for the combined TSF and the magnetite concentrate stockpile area lies approximately 0.4 km east south east of the existing open-cut pit and approximately 0.2 km to the south-south west of the proposed plant site.

The previously used TSF located southeast of Molyhil, covers an area of one hectare and has a height of four meters. Inspection of the landform by a consultant in 1998 indicated that the tailings dam walls are stable and show no signs of erosion. Rehabilitation work undertaken on the tailings dam in 1998 included: leveling of the surface, covering of the surface with 400mm of oxide material sourced from the rock stockpiles, direct seeding and fertilizing and construction of a stock-proof fence around the tailings dam. Rehabilitation is deemed to be effective and there is minimal sign of leakage from the tailings dam or gully erosion into the surrounding landscape.

Traditional owners require that the rehabilitated dam is not disturbed now that it has been rehabilitated. This is partly due to its proximity to a sacred site at Molyhil.

The new TSF would have a footprint area of approximately 12.8 hectares and functional storage area of approximately 9.9 hectares. The perimeter starter embankment would be raised periodically to provide a life of mine storage for approximately 890,000 tonnes of pyrite and general plant tailings.

2.3.9 Diversion Channel

A permanent diversion channel is proposed to be constructed immediately north of the pit, waste dump and TSF to divert water from an ephemeral creek that runs between the waste dump and TSF.

The diversion would be constructed with substantial bund walls between the channel and the pit and would be permanent. The diversion would direct the water back to Molyhil creek via Dam creek.

2.3.10 Supply Transportation

The access road to the mine site coming in from the Plenty Highway would require upgrading to an 8m wide all weather road that can accommodate double and triple road trains which are proposed to use this

road for construction access as well as ongoing supplies of diesel fuel, stores and also the shipment of concentrates.

The existing access road (which is proposed to be widened for access/haulage to site) crosses two main rivers, Plenty River and Marshall River. These rivers are ephemeral with flows following heavy rains associated with a quick rise in water level followed by days or weeks of reduced flow.

At these creek crossings, the running surface would to be sheeted with road base material that is to be placed at the level of the river bed (to avoid silting). A stockpile of road base material is proposed to be located in close proximity to the creek crossings, and ongoing maintenance with the use of a loader/grader to remove sediment and reinstate the creek crossing (with stockpiled road base material) following heavy rains would be undertaken by Thor.

Molybdenum and tungsten concentrate would be placed in one tonne bulker bags and transported by road train from the mine site to the Port of Darwin for export. The trucks would use the Plenty and Stuart Highways to and from the mine.

It is anticipated that there would be three trucks every two weeks loaded with concentrate leaving the site for Darwin Port. It is proposed to use these concentrate trucks to backload reagents and general freight to the site, thus reducing the number of trucks going to Molyhil on the Plenty Highway.

2.3.11 Support Facilities

Power to the Accommodation Camp, Process Plant and associated facilities is proposed to be supplied from a Build Own and Operate (BOO) Power Station operating on diesel fuel. The power station would consist of a number of independent generating sets connected to a common 3.3 kV bus bar.

2.3.12 Water Requirements

Raw water would to be sourced from four production bores: Prices Bore, TMRC037, TMRC040 and TMRC042 that are located approximately 6-7 km north-east of the plant site.

A six kilometre, 160mm diameter HDPE pipeline is proposed to be constructed from Prices Bore to the plant. Pipelines from bores TMRC037, 040 and 042 would consist of a 90mm HDPE pipeline which would feed the main pipeline. The pipeline is proposed to be placed in a v-trench for ease of inspection and would run predominantly along an existing track.

Raw water would be delivered via a raw water transfer system to the plant raw water tank, which is proposed to provide water to the process plant and to a dedicated reverse osmosis unit for production of potable water. The potable water requirements for the camp and general-purpose workshop have been estimated at 5,600 m^3 per annum. Potable water quality would comply with the National Health and Medical Research Council Australian Drinking Water Guidelines.

Process water would also be returned to the process from the tailings dam via a decant water pump installed in a decant well at the tailings dam. The quantity of process return water from the tailings dam has been estimated at 100,000 m^3. Decant water is returned to the plant process water tank.

The water requirements for the Molyhil project are shown below.

Table 4 - Water requirements for the Molyhil Project

USE	**AMOUNT (m^3 per annum)**
Process	403,000
Potable	5,600
Dust suppression	Sourced from pit dewatering
TOTAL	**408,600**

2.3.13 Rehabilitation and Decommissioning

Whenever possible, progressive rehabilitation of the Molyhil site would occur as disturbed sites no longer required become available. Apart from reshaping these sites, direct placement of topsoil removed from a newly disturbed area would be placed over the area ready for top-soiling. This would ensure that viable plant propagules would be utilised to re-vegetate these rehabilitated areas.

2.3.14 Post Mining Land use

2.3.14.1 Objective

The objective of the rehabilitation program at the Molyhil Project would rehabilitate the affected areas to ensure that soil erosion and subsequent sedimentation is minimised and endemic plant species are re-established.

It is anticipated that the rehabilitation program would result in establishment of a self-sustaining vegetation complex into which local fauna would be able to return and re-establish. It is planned to return the site to seasonal cattle grazing after closure, which is the current land use.

The site is isolated from human habitation and it is not envisaged that any other land use would be suitable or achievable.

2.3.14.2 Waste Rock Dump

As decommissioning approaches, waste rock would continue to be stockpiled on the top surface of the waste dump in sufficient volume to be used to cover the TSF surface to the designed depth. The waste rock dump is anticipated to contain blocky competent rock with few fines. Therefore, the dump is anticipated to be quite porous with large voids. The outer slopes of the dump would be shaped to an angle of less than 20^{o} from the horizontal.

Initially, no topsoil would be applied to the side slopes of the dump but would be applied to the top surface if fine material has consolidated and filled the voids. However, if topsoil does remain after all other sites are rehabilitated, remnant topsoil would to be applied to the waste dump side slopes commencing with the western and then the southern followed by the remaining sides.

Any available stockpiles of vegetation removed during the clearing process would be spread back over the waste rock dump.

2.3.14.3 Tailings Storage Facility

The TSF embankments would be constructed using downstream techniques, utilising non-acid forming (NAF) mine waste. Topsoil removed from the tailings storage facility prior to construction would be redeployed on downstream slopes of the final embankments of the facility to assist with rehabilitation. Any remaining topsoil would be stockpiled in an adjacent location for use in later rehabilitation.

At completion of the processing operation and after consolidation of the tailings material, heavy earthmoving equipment would push waste rock over the surface to cover the tailings material. If sufficient fines are available and the rock voids are closed, then topsoil would be spread over the rock cover and seeded with local native plant species.

Similarly to all other disturbed areas being rehabilitated, all stockpiled vegetation removed during the clearing phase would be re-spread over the surface and walls of the TSF.

2.3.14.4 Processing Plant and Accommodation Camp

All buildings and structures are proposed to be removed, all concrete footings and concrete bunded areas broken-up and buried and all surface cables and pipelines removed. With removal of the crusher and mills, the large concrete footings of these structures would be covered to a minimum depth of 1.0 m with benign waste material from the ROM pad.

The western side of the ROM is proposed to be contoured and blended into the waste dump at approximately RL 420. The outer faces would be shaped to a gradient of 18 degrees to stabilise and minimise soil erosion during significant rainfalls.

The plant area would be sampled (where required) for the presence of hydrocarbon contamination and if present, the contaminated soil would be removed and treated in a bioremediation area set aside on the surface of the waste rock dump.

All plastic liners in ponds and bunded areas would be removed and buried and the walls pushed in. All electric power lines, transformers and poles would be removed. The area would then be reshaped, deep ripped, seeded and any stockpiled vegetation (removed during the clearing phase) re-spread.

Disturbed areas would be contoured to restore natural drainage and the surface ripped to alleviate compaction and encourage re-growth of native vegetation, and seeded with local provenance species.

Where required, the disturbed areas would be reshaped by dozer to return the site to near the original contours. All disturbed areas would be deep ripped on the contour; top soiled and seeded with local provenance seeds.

2.3.14.5 Other Disturbed Areas

Local native (provenance) seed is proposed to be collected and used for all revegetation purposes at Molyhil. All hardstand or compacted areas or other disturbed areas no longer required would be deep ripped and direct seeded.

All drill holes not previously rehabilitated would be plugged below ground level using a gypsum or concrete plug. All trenches and holes directly caused by this project are proposed to be filled in, reshaped (if necessary) and seeded.

All tracks would be deep ripped and seeded when necessary. Where required, soil erosion control banks would be constructed on tracks and roads or other large bare areas where excess runoff may concentrate and there is a potential for soil erosion.

3 Regional Setting

3.1 Land Tenure

An exploration licence EL22349 covers the project area. Three mineral lease applications, MLA23825, MLA24429 and MLA25721 cover the area around the Molyhil deposit. The Molyhil deposit lies on MLA23825, which lies within EL22349.

3.2 Climate

The climate of the area is semi-arid with the average rainfall between 1966 and 2003 being 299.6 mm per annum. Approximately 70% of rain is received between November and April and the annual evaporation averages about 3000mm. The strong seasonality of rainfall results in relatively wet humid conditions for 3-6 months of the year and progressively drier conditions through winter and spring, except for occasional winter rainfall depressions. Rainfalls in the wet season can exceed 200mm resulting in locally inundated depressions, which could be a problem for several sections along the haul road.

3.3 Landform features

Molyhil is at an elevation of approximately 400m above sea level near the Dulcie and Urea Ranges, a series of small hills with skeletal soils and linear outcrops. There are numerous ephemeral creeks in the project area and the existing access road crosses two main rivers, the Plenty and Marshall Rivers. Land systems are defined as an area in which there is a recurring pattern of climate, geology, topography, soils and vegetation. Five land systems are present within the Molyhil project and associated infrastructure: Dinkum, Jinka, Hann, Singleton and Sandover.

3.4 Surface Water

The creeks located in the project area are all ephemeral and only flow after heavy rainfall in the upper catchments.

The access road from the Plenty Highway to site crosses the Plenty and Marshall Rivers. These arid-zone rivers flow into the Simpson Desert. They are ephemeral with flows following heavy rains associated with a quick rise in water level followed by days or weeks of reduced flows.

3.5 Groundwater

Keith Morgan Geological Consultants Pty Ltd completed a groundwater study of the project area in October 2006. A full copy of the report is provided in the Molyhil project PER Appendix 5.

Groundwater depends on storage in the oxidation transition zone and in wider distributed fractured and leached zones associated with fault and fracture zones within the non-oxidized bedrock. As a consequence, groundwater storage is restricted to the limit of these structures. The development of groundwater resources is therefore dependent on storage in structures with access to recharge.

The probability of recharge in these structures is associated with stream flow resultant from intensive rain events.

3.6 Vegetation

Environmental surveys were undertaken in 2004 and 2006-2007 by Low Ecological Services Pty Ltd to record baseline flora data for the Molyhil Project. A copy of the full report is provided in the Molyhil tungsten-molybdenum PER Appendix 4.

There are three habitats present within the mine lease: sand plain, alluvial riparian and rocky hill slope habitat. Heavy grazing of grasses, forbs and small shrubs in the understorey as well as clearing during previous mining activity has resulted in much of the Molyhil area being highly disturbed.

The dominant vegetation associations are open Gidgee (*Acacia georginae*) woodland over short grass and open Ironwood (*A estrophiolata*) woodland over short grass. Also present are *Senna* and *Acacia* shrubs and heavily grazed Buffel Grass (*Cenchrus ciliaris*), *Calotis hispidula* and *Fimbristylis dichotoma* in the ground layer (App 4 PER).

Riparian zones were dominated by River Red Gums (*Eucalyptus camaldulensis*) in the overstorey, a tall shrub layer of Mimosa bush (*A. farnesiana*) and a ground layer of Buffel Grass and *Zygochloa paradoxa*.

Vegetation within the bore fields was dominated by Spinifex (*Triodia basedowii* and *t. pungens*).

A search of the EPBC Act (1999) website listed no threatened species known in the area. Similarly, none of the species identified are listed in the Northern Territory list of threatened species.

Culturally significant tree species found within the Molyhil Mine lease area are; Gidgee (*Acacia georginae*), Bloodwood (*Corymbia opaca*), Ghost Gum (*Corymbia aparrerinja*) and River Red Gum (*eucalyptus camaldulensis*). The Central Land Council (CLC) have defined culturally significant trees as having diameters of 15.2 cm (6 inches) or higher and may require approval by Traditional Owners for removal. Whilst other tree species, such as Ironwood and Wild Orange, are not culturally significant species, mature individuals of such species have significant ecological value and should be retained.

The saline pit water discharge into Dam Creek has caused approximately 200 tree mortalities so far and continues to impact the riparian/creekline habitats by impeding regeneration. Of the three habitats present within the lease area (sand plain, alluvial riparian and rocky hill slope) riparian habitat covers the least area within the mine lease. It also provides important ecological value to local fauna species, including the listed Rainbow Bee-eater and therefore all attempts should be made to protect the remaining riparian vegetation (River Red Gum woodlands).

3.7 Weeds

Currently, Buffel Grass is the main introduced species throughout the area and region. Control of this widespread exotic species is not viable.

An abundance of ruby Dock at Molyhil Mine was observed in June 2006. This ‘outbreak’ was a resultant climax population from significant rainfall in preceding months. It is expected that this population would probably persist and would reappear following suitable late-summer rainfall.

Paddy melon (*Citrullus colocynth)* also exists in the existing mine pit.

3.8 Fauna

A total of 84 species were recorded during fauna surveys in 2004 and 2006-2007. This included:

- 16 mammals (three feral)
- 20 reptiles; and
- 48 bird species

Seven species of bat were also recorded.

No threatened species listed under the TPWC Act or the NT Fauna Atlas records were recorded during the surveys or have been recorded in literature searched.

One threatened species listed under the EPBC Act (1999), the Rainbow Bee Eater (*Merips ornatus*) was recorded during the survey.

Two threatened species listed under the EPBC Act (1999) could potentially occur in the area:

- Mulgara (*Dasycercus cirsticauda*); and
- Black-footed Rock Wallaby (*Petrogale lateralis* MacDonnell Ranges race)

Although no record of these species have occurred within the mine lease area, it would be expected that Black-footed Rock Wallabies would have and may still occupy the nearby ranges. No evidence of current occupation of either of these species was recorded during the surveys.

The main conclusions of the Low Ecological draft Landscape, Flora and Fauna Survey 2007 report are:

- The Molyhil mine lease area is largely in a disturbed condition due to previous mining activity and current grazing activity. The flora and fauna species recorded during the survey have a widespread distribution and their continued persistence is not dependent on this site;
- The persistence of plant and animal species within the mine lease area is conditional on retaining the existing undisturbed habitat, particularly woodland areas; and
- Enough cleared land should be available for installation of most mining infrastructure such as roads, water tanks, tailings dam and other processing infrastructure that would minimise the need for further disturbance.

3.9 Socio-economic

3.9.1 European Heritage

Molyhil is located on the former Jinka Station which was first developed for pastoral production following lease issue in 1960 and incorporated into Jervois Station in about 1986. Vegetation and surface soils around and within the mine lease have been disturbed by the concentration of livestock watering at the nearby dam established in mid 1970 for Molyhil mine.

Mining has operated on the site since 1978 by various operators. During this time the site has been upgraded and improved. Although production records are incomplete, it is estimated that approximately 900,000 tonnes of material (ore and waste) has been extracted from the open pit. Mining at the site ceased in 1982 and the leases placed on care and maintenance.

3.9.2 Aboriginal Heritage

There are a number of Aboriginal communities identified in the maps of the region and cultural sites are present in the mining lease. Little information is provided or known about the population of the communities or availability of potential employees. Each of the communities appears to have populations too small to be listed as towns in Australia Bureau of Statistics data so it is presumed that the population is counted for the Alice Springs region.

Traditional owners have been regular visitors to the site to discuss their sites and concerns and their input has been included into the design phase of the project. Accordingly, at the request of the TO's, identified sites of significance would be avoided by the development and protected from any or further disturbance or damage. This includes; the Molyhil area, significant trees and the buildings and soak at Jinka Homestead.

A Tripartite Deed exists between Thor, Central Land Council (CLC) and the Traditional Owners that forms a mining agreement between all parties at the Molyhil Project.

3.9.2.1 Socio-economic

The Northern Territory economy accounts for 1.2% of Australia's Gross Domestic Product (GDP) and 1% of nation wide employment. The structure of the economy is distinctive; with a high reliance on export markets and a large percentage of the workforce employed in the defence and Government sectors. The economy is extremely sensitive to economic impacts such as recent resource and infrastructure investment projects.

The towns and communities in the region of the Molyhil mine site are all small and quite remote. The communities situated on Aboriginal Land are comprised of people of Australian Aboriginal descent. The nearest town is Alice Springs, approximately 240 km north east of the Molyhil mine site.

Medical services in the region are provided through the Alice Springs hospital, which is the district hospital for the surrounding regions. To augment the services provided by the Alice Springs Hospital, community centres also act as health clinics and a base for doctors and nurses who visit from Alice Springs. These health services are not equipped to service more than the local population.

Alice Springs is also the base for educational centres, with the bulk of educational needs in the region serviced through the education centres or carried out via correspondence.

3.10 Project Benefits

The Molyhil tungsten-molybdenum project area is 240km northwest of Alice Springs, which is the nearest large population centre Alice Springs is located on the Stuart Highway, 1300 km south of Darwin.

The potential impact on this community includes:

- Direct employment for 100 people during construction and 62 during operation;
- The supply of goods and services would be extended to local businesses;
- Increased traffic movements;
- Contribution to the Federal and Northern Territory economies due to royalties and taxes;
- Increased business opportunities for local businesses; and
- Temporary change of land use from pastoral to mining.

4 Environmental Impact Assessment

4.1 Introduction

The main purpose of this Assessment Report is to evaluate the environmental protection measures of the project proposal and to determine whether the proposal can proceed without unacceptable environmental impacts. This is achieved by identifying any potential environmental impacts associated with the project and evaluating the corresponding safeguards or prevention measures suggested by the proponent. Where the proposed safeguards are considered insufficient, or where a safeguard is significantly important, recommendations are made in this Report to add to or emphasise those commitments made by the proponent.

The environmental acceptability of this project is based on consideration of the following from the PER:

- Adequacy of information outlining the proposal (particularly which structures or activities are likely to impact the environment);
- Adequacy of information on the existing environment (particularly environmental sensitivities);
- Adequacy and information on the range and extent of potential impacts; and
- Adequacy of the proposed safeguards to avoid or mitigate potential impacts.

While the Public Environmental Report lacked detail on some key issues of the proposal, and in some cases provided conflicting information, this lack of information did not prevent the overall assessment of the proposal. Based on the information provided and the assumptions made by the proponent, the EPA Program considers that the environmental issues associated with the proposal have been identified and the proposal can be managed in a manner that avoids unacceptable environmental impacts. However, this is dependent upon the proponent doing further work to address information gaps (assuming this work does not identify a potential 'show-stopper'); and, the environmental commitments, safeguards and recommendations detailed in this Assessment Report and in the final EMPs are implemented, with regular reporting, compliance auditing, monitoring and evaluation, and appropriate responses and adaptations to any issues identified through monitoring.

The PER lacks detail in several areas, specifically this includes; design details for the diversion channel and settling ponds, liner details for the Tailings Storage Facility and the Waste Rock Dump and the impact of the use of saline water for dust suppression. Additionally, management of the Tailings Storage Facility has largely been based on conceptual assumptions. In order for the project to proceed in an environmentally acceptable manner, the proponent needs to address all information gaps identified in this Assessment Report prior to commencement of works. It is acknowledged that there is potential that when undertaking the outstanding studies the proponent may identify a potential 'show-stopper' for the proposal, however this is considered unlikely. Any issue that is identified should be able to be managed or resolved through mitigation measures and design of the project.

Key areas that must be addressed prior to the commencement of any mining activity under the *Mining Management Act* for the development or operations include:

- Diversion dams;
- Settling ponds;
- Saline water for dust suppression;
- Liner details for Tailings Storage Facility
- Liner details for Waste Rock Dump; and
- Clarification of conflicting information.

The final environmental management plans for the proposal are to be subject to review to the satisfaction of the relevant Northern Territory Government agencies prior to their incorporation into a Mining Management Plan. The Management Plans would be working documents for the life of the project.

Each recommendation (in **bold**) is preceded by text that identifies concerns, suggestions and undertakings associated with the project. For this reason, the recommendations should **not** be considered in isolation.

Subject to decisions that authorize / permit the project to proceed, the primary recommendations of this assessment are:

Recommendation 1

The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- **Identified in the Molyhil tungsten-molybdenum Public Environmental Report; and**
- **Recommended in this Assessment Report (No. 60)**

All safeguards and mitigation measures outlined in the Public Environmental Report are considered commitments by Thor and are to be included in the Mine Management Plan.

Recommendation 2

The proponent shall advise the Minister of any changes to the proposal in accordance with clause 14A of the Administrative Procedures of the *Environmental Assessment Act,* for determination of whether or not further assessment is required.

For the purposes of this Assessment Report, 'works' is defined as any tasks which would require/cause any physical disturbance for the purposes of achieving an objective for the mining project and this could include; bore water extraction, pit extension, sewerage treatment plant, diversion channel etc.

4.2 Biological

4.2.1 Vegetation

The Molyhil mine lease area is largely in a disturbed condition due to the previous mining activity and current grazing activity. The flora and fauna species recorded during the survey have a widespread distribution and their continued persistence is not dependent on this site. No threatened plant species were recorded during surveys undertaken in 2004 and 2006/7 or were found to occur through literature searches (EPBC Act 1999, TPWC Act 2000; NT Fauna Atlas records). However complex ecosystems with varied habitat types and high biodiversity of native species have been observed within the bore fields and proposed campsite in contrast to the immediate mining vicinity. Important habitats that should be retained include Gidgee and Ironwood woodlands, riparian woodland of River Red Gum, rocky ridges with caves and crevices and spinifex dominated sand plains.

The Flora and Fauna Assessment (App 4, PER) undertaken by Low Ecological Services undertaken in 2007, reports that "enough cleared areas should be available for installation of most mining infrastructure such as roads, waste rock dump, water tanks, tailings dam and other processing infrastructure that would minimise the need for further disturbance to habitats". Development of the camp site in its proposed location would require clearance of predominantly undisturbed habitat that supports higher species diversity than found at disturbed sites. Development of the proposed camp site and access road would require removal of mostly undisturbed vegetation dominated by spinifex grassland with Witchetty/Blue Mallee overstorey (*Acacia kempeana/Eucalyptus gamohpylla*) (See

Photos, Appendix 3). The retention of vegetation where possible can assist in minimising soil erosion, offer refuge to wildlife and provide shade and shelter.

The EPA Program recognizes that Thor has committed to:

- minimise disturbance to, and encourage regrowth of, vegetation;
- avoid or minimise impacts to areas of significant vegetation. Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities; and
- retain larger trees and shrubs whenever possible.

In light of the Flora and Fauna Assessment (App 4 PER) undertaken by Low Ecological Services, the EPA Program expects that site design and layout will ensure that further clearing or disturbance to existing, remaining stands of native vegetation will be minimal. The EPA Program acknowledges that this will probably require an alternative site for the accommodation camp. Any clearing that occurs is to be undertaken in accordance with the Northern Territory Land Clearing Guidelines.

Recommendation 3

It is recommended that the proponent ensures that the mine site design and layout exclude further clearing of remnant vegetation in recognition of the findings of the Flora and Fauna Assessment undertaken by Low Ecological Services.

4.2.2 Fauna

The fauna species recorded during surveys conducted in 2004, 2006/7 have widespread distribution and it is likely their continued persistence is not dependent on the Molyhil lease area. Thor have presented a commitment to fauna protection by using existing cleared areas, plugging bores, prohibiting pets, firearms and traps, rehabilitating of habitat and monitoring of the TSF for trapped fauna.

One threatened species listed under the Environment Protection and Biodiversity Conservation Act, the Rainbow Bee-eater, (*Merops ornaius)* was recorded during the survey.

Two species classified as threatened could potentially inhabit the area. These are the:

- Black-footed Rock Wallaby *(Petrogale lateralis* MacDonnell Ranges race*)* listed under the EPBC Act 1999; and
- Mulgara *(Dasycercus cristicauda)* listed as vulnerable under the TPWC Act and EPBC Act 1999.

In light of this, the proponent should consider referring its application to the Australian Department of Environment and Water Resources.

Protection of any native fauna is best achieved through protection of habitat and potential habitat areas rather than action in response to whether a particular species is present or not. Along with vegetation and fauna protection measures including the commitments proposed in Table 1 of the PER, there is a need to create an awareness of native fauna species and their needs in the area. Education through staff induction provides this opportunity and the increased awareness may enhance fauna management objectives particularly where rare species may occur.

Recommendation 4

In addition to the commitments made by the proponent the Environmental Management Plan should include measures with respect to flora and fauna management: -

- **A site induction procedure is to include a flora and fauna component that ensures all Molyhil site personnel are aware of flora and fauna management on the site and can demonstrate this awareness;**

- **Identification, mapping and management strategies for remnant vegetation;**
- **Monitoring and management measures of the threatened species – the Rainbow Bee-eater, the Black-footed Rock Wallaby and the Mulgara; and**
- **Strategies to prevent vegetation decline from saline water use and discharge (refer Section 4.4.2.)**

4.2.3 Introduced plant species

Three introduced plant species have been recorded in the proposed project area. Buffel Grass (*Cenchrus ciliaris*) is the main introduced species throughout the area and region. Control of this widespread exotic species is seen as unviable by Thor. To a lesser extent Ruby Dock (*Acetosa vesicaria*) occurs at sites scattered across the existing waste rock dump. This species has the potential to be an invasive weed at the site. Paddy Melon (*Citrullus colocynth*) occurs in the existing mine pit area.

Another source of potential weed material is the exotic trees and shrubs that may be planted at the camp during construction and operation as suggested in the PER. Many exotic species have the ability to become weeds when out of their natural environment. In addition many exotic species used in landscape plantings have high water needs.

Any exotic planting needs to be managed to ensure their spread into the surrounding environment does not occur beyond the life of the mine. The need for managing exotic species into the future can be excluded if introduction of exotic species was avoided.

The EPA Program notes that Thor commits to instigating control methods early in the construction phase and through operations to control Ruby Dock.

Recommendation 5

The Draft Weed Management Plan (Appendix 8, PER) should be amended to include the following measures with respect to weed control:

- **A commitment that the proponent and contractors would comply with the Northern Territory *Weed Management Act*;**
- **A final weed control and monitoring program to be undertaken at closure and rehabilitation until vegetation is established in rehabilitated areas;**
- **A requirement that all contractors operating at the site shall comply with the Weed Management Plan; and**
- **A commitment to avoid exotic plant species to landscape the site to ensure their spread into the surrounding environment is prevented.**

4.3 Water Management

The availability of adequate water for operations, potable supplies and dust suppression activities is not clear in the PER. There is a lack of information with regard to the sustainable harvest of groundwater from the existing bores and calculations are conflicting and presented in several ways such as kLh, ML/yr and m3.

It is proposed that the groundwater would be used for dust suppression and would be processed for potable water supply and that a Reverse Osmosis desalination plant would be installed to provide potable drinking water, however no details are provided on how the saline discharge water would be managed. It is also proposed that the saline ground water would be used for dust suppression. The EPA

Program has concerns that the use of saline water in the environment may impact on vegetation and revegetation. The Low Ecological report in Appendix 4 of the PER states that areas of vegetation have been killed by saline water discharge during previous mining activities at the site.

4.3.1 Water Quantity

Mining and petroleum activities are exempt from needing a groundwater extraction licence, however, the Controller of Water Resources requests the proponent provide groundwater extraction data, through a formal agreement, should the combined extraction from the bores tested be greater than 15L/s.

The proponent states that preliminary assessment of mine water abstraction indicates that the aquifer would not be depleted or impacted on by the program given the minimal quantities of groundwater abstracted and that groundwater levels are expected to recover within a short period following mining.

Groundwater Investigations (PER App 3) of the project, estimate the project to require approximately 400 000 tpa of water to process 300 000 tpa of ore over a mining and processing life of between three to five years. This requirement equates to a maintained groundwater supply of 12.7L/s.

The Groundwater investigation report suggests that a supply of approximately 6.5m3.h-1 [56ML/year] of potable quality water is required, however Table 4 of the PER provides an estimate of 5600m3 per annum. Given that the PER estimates the workforce to be 62 full time equivalent [2 weeks on, 1 week off, fly in, fly out] the data provided in the Groundwater Investigations appears to be more accurate.

Prices Bore is located approximately 6 km northeast from the Molyhil pit. Test pumping data suggests that, theoretically, the bore can be pumped at a minimum of $13.5m^3h^{-1}$. This bore is currently in a poor condition and requires redrilling and reconstruction to be a reliable water source.

Recommendation 6

A formal agreement is to be established with the Controller of Water Resources under the *Water Act* to provide for the presentation of groundwater extraction data should extraction exceed 15L/s.

A project Water Management Plan is to be prepared and included in the Environmental Management Plan which demonstrates that water needs can be met and the use of the groundwater resource is sustainable. The Plan should include (but not be limited to) the following:

- **The Groundwater Investigation Report recommendations;**
- **Implementation of a monitoring program to determine the effects on groundwater and ground water dependent ecosystems in the locality; and**
- **Reporting mechanisms to present information to the Department of Natural Resources Environment and the Arts.**

This plan should be prepared before the commencement of activities associated with this proposal.

4.3.2 Water Quality

Mining operations have the potential to impact on both surface water and groundwater chemistry. Mobilisation of sediment and minerals need to be thoroughly examined and mitigation measures put into place where risks to the water quality have been identified. Geochemical characteristations can provide the necessary data to determine the potential impacts of the mining operation on water chemistry; geochemical characterisation can provide the necessary data to make assessment on the impacts and the receiving environment.

Given the arid zone location and industry best practice design standards the EPA Program expects the mining operation to be managed to have zero wastewater discharge. All wastewater discharges can be retained on site. Fulfillment of this requirement negates the need for a Waste Discharge License (WDL). All wastewater would be kept on site or processed for reuse during operations.

Information provided in the PER indicates that the existing pit is currently at a depth of approximately 20m with a final depth expected to be approximately 120m. The proponent states that 'some groundwater flows may be expected once mining takes place at depths of greater than 30m below the surface'. The likely consequences of mine dewatering, including possible impacts on adjacent users of the regional groundwater resource, should be monitored during operation up to and including decommissioning.

It is noted that raw water is proposed to be sourced from four production bores located approximately 6-7 km north east of the production plant. These bores are required to be constructed according to minimum standards and registration information, including driller logs, lodged with the Water Management Branch of NRETA.

The Low Ecological Services Report (App 4 PER) states that the saline pit water discharge into Dam Creek has caused approximately 200 tree mortalities so far and continues to impact the riparian/creek line habitats by impeding regeneration. From this evidence it would seem that the saline water from bores and hyper saline wastewater from the reverse osmosis plant are a significant threat to the environment. The report indicates that the previous damage to vegetation has not been rectified and it is likely that this damage would be long term, with lost ability for regeneration. Prevention of any further impacts of this nature is essential. Management of salinity impacts must include monitoring and management strategies in order to evaluate the effectiveness of mitigation actions. The EPA Program would not accept any further vegetation damage as a result of saline water use or waste water discharge by the proponent.

Sections 5.7 and 5.9 of the PER discuss operational impacts of the proposed mine on groundwater and surface water. Thor has provided management actions for minimising impacts on water quality from potential Acid Rock Drainage (ARD). A full list of commitments is at Appendix 1.

The EPA Program is satisfied that management actions for minimising impacts on water quality from potential ARD is to be implemented through the MMP.

The main water quality concerns are the issues arising from saline water use for processing and dust suppression activities and lack of information on discharge from the Reverse Osmosis plant. This is of special significance due to the large number of deaths of established trees and groundcover from previous saline discharge from mining activities at the site. The impact of saline water being discharged onto soils or clay liners of the TSF also needs to be considered.

Raine and Loch (No date) list some of the effects of saline soils in disturbed sites as including; high water run-off and erosion rates, difficulty with vegetation establishment and reduced vegetation growth due to low water holding capacity and root penetration. In addition Rengasamy (2007) says the dispersive potential of a soil has been found to influence soil structural features such as hydraulic conductivity and tensile strength. Clay mineralogy and dispersive potential is affected by salinity, soil pH and organic matter.

Recommendation 7

The EPA Program recommends that the mining operation be managed to have a zero waste water discharge. All waste water discharge is to be retained on site or processed for reuse during operations.

If any waste water discharge is proposed to leave the site, a Waste Discharge License is required.

Recommendation 8

A Saline Water Management Plan should be prepared and included in the EMP. The Plan must include detailed measures, based on analyses of all wastewater sources and receiving

environments, to prevent or mitigate further degradation of watercourses and associated flora around the site. It should also demonstrate that any disposal of saline water to the Tailings Storage Facility would not impact on the encapsulation liner and cause it to degrade.

4.4 Geochemical Characterisation

Geochemical characterisation is necessary to determine whether leachate from waste rock, tailings or ore is likely to contain environmentally unacceptable concentrations of major ion solutes and metal irrespective of whether it is acidic or not.

Prediction of the geochemical properties of the various materials to be mined from a site should commence during the exploration phase of the project. Ore should not be overlooked in a characterisation program. Ore (especially low grade ore) can remain in stockpiles for extended periods of time and seepage and runoff from ore stockpiles may occur. There is the potential for concentration of sulfide minerals in waste streams produced by gravity concentration or pre-flotation of gangue sulfides, including pyrite. There is the potential for tailings to contain higher concentrations of reactive sulfides than waste rock.

Recommendation 9

The EPA Program recommends that the proponent undertakes geochemical characterization of the waste rock and tailings throughout the life of the mine and revise waste rock management strategies as required.

4.4.1 Historic Mining Activities

Anecdotal information indicates that some potential acid generating material was mined as waste material at the site in the 1990's. It is believed that this material has been encapsulated within the waste rock dump during the rehabilitation phase in 1999. The location of the encapsulation cell, the type of cell and the volume of material is unknown. No evidence of acid rock drainage was identified during a site assessment undertaken in 1998 or has been identified since.

4.4.2 Waste Rock Characterisation

Thor states that it is anticipated that sulfidic waste rock would not be generated by the proposed mining operation as only minor traces of sulfides have been identified in the waste. It is possible that the existing, small waste rock dump may be retreated through the new (proposed) processing plant. If this is the case, any potential sulfidic waste that would be identified and either relocated or treated through the plant.

Thor Mining have stated that if the existing waste dump is not retreated, then monitoring is to be maintained on the waste rock dump to identify any acidic seepages that may be generated from the dump.

The proponent has committed to encapsulate any PAF rock identified during mining activities in the waste dump (PER, App 5) and to undertake regular monitoring of the monitoring bores located around the perimeter of the TSF to detect any impacts on groundwater. A contingency plan is to be in place to ensure that appropriate materials are available for encapsulation of PAF material if identified and the waste dump is designed appropriately for the environmental conditions of the site in this event.

The Department of Primary Industry, Fisheries and Mines (DPIFM) recommend the use of 0.3% as a cut off for “not unusually reactive” materials with regard to ARD (PER, App 2) as opposed to 0.5% as advised by the proponent in the PER. Waste rock with a sulfur level in excess of 0.3% should be considered as having the potential to generate acid drainage and should be treated accordingly. This figure is consistent with the cut off proposed for the tailings material.

The EPA Program expects that the commitments indicated by the proponent to monitor for the presence of PAF would be implemented through the MMP.

Recommendation 10

It is recommended that:

- **Thor adopts the findings of the Tailings Characterization Report (Appendix 2, PER) on Acid Rock Drainage as 0.3% as a cut off for 'not unusually reactive' materials;**
- **Prior to the use of waste rock for Run Of Mine and/or road construction activities, the waste rock should be assessed for Potential Acid Forming qualities; and**
- **Details are to be provided in the Mine Management Plan of monitoring and response strategies for any acid seepage that may occur from the Tailings Storage Facility or Waste Rock Dump.**

4.4.2.1 Tailings Storage Facility

The project is expected to generate approximately 1.2 Mt of tailings over a four year period. Tailings would be produced as two tailings streams - pyrite concentrate and a combined magnetite concentrate-general plant tailings stream. The magnetite concentrate tailings would be Potentially Acid Forming (PAF) at a very low sulfur concentration.

The TSF is designed (App 1 PER) on projected site and tailings characteristics rather than the actual data contained in the report. App 1 is marked as 'draft' and indicates that the TSF modelling and assessment is incomplete and the document does not contain the figures and appendices on which the draft assumptions are based. Appendix 2 of the PER does contain the report on the geotechnical and geochemical characterisation of the tailings solids and liquor, however, these details have not been integrated into the TSF design.

A minimal total freeboard of 300mm is to be provided within the ponding water of the TSF that allows for a 1 in 100 year, 72 hour duration rainfall event falling in the catchment of the TSF itself.

Appendix 1 of the PER makes reference to the Australian National Committee on Large Dams (ANCOLD) (1999) and the 1:100 annual exceedance probability recommendation of the Operating Base Earthquake (OBE) for the TSF. Industry best practice design standards for all mining structures (pit, WRD, TSF) are based on an average recurrence interval (ARI) of 1:200 with respect to climate variables. Design standards for all other mine facilities (roads, parking, buildings etc) should be ARI 1:10 with respect to climate variables. ANCOLD 1:100 standard, relates to structures containing potable water. Higher risk wastes may require more stringent design standards. Tailings material appears denser than water.

Information in Appendix 1 also, indicates that in the absence of detailed geochemical data on the tailings solids and liquor, it has been considered prudent to include provision for the installation of a liner system and underdrainage recovery system. The provisional design allows for the placement of an initial 300 mm layer of sand/clay as a bedding layer for a synthetic liner. Water collected in the underdrainage system would be discharged to a small sump located at the south western corner of the TSF from where the water would be pumped back into the TSF.

Appendix 1 of the PER discusses the option of installation of a liner system and underdrainage recovery system, in the absence of detailed geochemical data on the tailings solids and liquor. Appendix 1 also discusses deposition of tailings into an unlined TSF at a later stage. Clarification about the installation of a liner for the TSF should be clearly defined in the MMP to ensure that issues would be addressed. It is considered best practice by the EPA Program and the mining industry to install designed liners for site specific situations in TSF.

The proponent has stated that if evidence of seepage is identified, they would consider installing abstraction bores to reduce the groundwater levels and reduce potential for contamination. It should be noted that a strategy for monitoring groundwater and applying a set of contingencies in the event of accidental seepage does not compensate for a lack of rigour (hard data) in the TSF modelling and assessment process.

Recommendation 11

Thor is to provide the following details in the Mine Management Plan with regard to Tailings Storage Facility management:

- **Projected characteristics of the Tailings Storage Facility, taking into account the actual site and tailings data (Appendix 1, PER);**
- **Liner system design information;**
- **Management of the 27kL/annum modeled leachate -including potential recharge of local shallow/deep groundwater;**
- **A description of the predicted Acid/Neutral drainage contaminants in the predicted solute plume;**
- **Depth of soil wetting/drying potential;**
- **Contingency for not meeting the decant return water volumes as specified in Table 15 of the Tailings Storage Feasibility report (Appendix 1, PER);**
- **Identification of whether the underlying rock mass is fractured and the potential for the preferential flow of seepage through the underlying rock mass;**
- **Assessment of the erosion hazard/threat to the final rehabilitated Tailings Storage Facility;**
- **Identification and explanation of potential toxicants and concentrations of the tailings solution;**
- **Demonstration that the encapsulation design and material (such as clay) would not be degraded as a result of the saline water or wastes being stored in the Tailings Storage Facility;**
- **Monitoring activities during operations up to and including decommissioning for possible leachate contamination of surface water and/or groundwater;**
- **Detailed evidence to support the assertion that the Tailings Storage Facility decommissioning plan would adequately isolate PAF tailings from the surrounding environment must be included; and**
- **Rehabilitation design that ensures that the final surface of the Tailings Storage Facility is free draining.**

4.4.2.2 Tailings Streams

The PER states that Tailings is proposed to be produced as two separate tailings streams, pyrite concentrate (7.6%) and a combined magnetite concentrate (25.2%) - general plant tailings (67.3%) stream.

The Magnetite concentrate management discussion in Appendix 1 'Tailings Storage Facility Report' and Appendix 2 ‘Tailings Characterisation’ of the PER states: 'Tailings is proposed to be produced as three separate tailings streams, pyrite concentrate (7.6%), magnetitie concentrate (25.2%) and general plant tailings (67.3%) and ‘At the time of commencing this study, the Magnetite-Concentrate was to be produced as a dry by-product for on-site containment. However, it is understood that the flow-sheet for

the project has changed since, and that now the Magnetite-Concentrate is to be handled as slurry (Appendix 2 PER). This also changes the nature and risks of disposal and containment of the magnetite. One possibility is to co-dispose the slurry of Magnetite-Concentrate with the slurry of General-Plant-Tailings, as alluded to above.

Statements within the PER and supporting documents should be consistent to allow accurate assessment of the project and its related activities.

Recommendation 12

Thor is to provide clarification of the tailings stream processing in the Mine Management Plan. The proponent should address the following matters in detail:

- **Implications (if any) of the magnetite concentrate being produced as a slurry rather than a dry by-product; and**
- **Implications (if any) of the co-disposal of the magnetite slurry with the general plant tailings.**

4.4.2.3 Waste Rock Dump

Waste Rock Dumps (WRD) at the site have been designed to accommodate waste from the Stage 1 and Stage 2 pits and are to be located east and south of the open pit.

Thor indicates that the dump is proposed to be constructed in stages and this would allow any potential acid generating waste to be temporarily encapsulated within a specific part of the dump. Thor has committed to encapsulating any Potential Acid Forming (PAF) rock identified during mining activities in the waste dump.

The PER lacks information on the design details of liner systems for the WRD and identification of the potential for groundwater contamination from PAF solutes. Monitoring of the WRD can identify any acid seepage and allow timely responses should a problem arise.

Clarification about the installation of a liner for the WRD is to be addressed in the MMP and should be clearly defined. It is considered best practice by the EPA Program and the mining industry to install designed liners for site specific situations in WRD.

Recommendation 13

The proponent should provide the following details in the Mine Management Plan with regard to the Waste Rock Dump:

- **Results of Net Acid Producing/Net Acid Drainage testing on waste rock;**
- **Design details of a liner system ;**
- **Management of any potential neutral drainage or Potential Acid Forming solutes to groundwater or surface waters;**
- **Details of existing groundwater under the Waste Rock Dump;**
- **Details of how Potential Acid Forming/neutral drainage relevant material is proposed to be kept out of the Waste Rock Dump or managed to prevent leakage to groundwater;**
- **Predicted characterisation of solute contaminants and concentrations;**
- **Description of placement or management of waste placed in the Waste Rock Dump to minimise or prevent neutral or acid solute leaching; and**

- **Details of monitoring and response strategies for any acid seepage that may occur from the Tailings Storage Facility or Waste Rock Dump.**

4.5 Erosion and Sediment Control

Managing erosion and sediment transport throughout the Molyhil Mine area is important to prevent soil loss and sedimentation of the drainage lines and creeks. Disturbance to the soil profile, as a result of construction and earth works can result in wind and water erosion.

Although the surface soils at Molyhil are both physically and chemically infertile and the surface horizons sandy and highly erosive, the regional flora is well adapted to those conditions. Maintaining undisturbed vegetation cover and re establishing vegetation as soon as possible after disturbance can be an effective method of minimising soil lost through erosion.

Where areas are proposed to be disturbed and exposed for extended periods during the operation of the mine and transport routes, erosion control methods would need to be in place to minimise water and wind erosion. Due to the nature of rainfall events in the region, it could be expected that significant water erosion would occur at some point during the life of the project. The appropriate design of road drainage and run off management is important to prevent sediment deposition in creeks and rivers. Surface hydrology should be considered in the design and implementation of any drainage works.

Recommendation 14

An Erosion and Sediment Control Plan is to be developed as part of the project Environmental Management Plan, to the satisfaction of Natural Resources, Environment and The Arts prior to the commencement of on-ground works.

4.6 Energy Management

Energy use is the dominant source of greenhouse gas emissions in Australia, contributing 69 per cent in 2004 of the nation's total emissions. The Australian Greenhouse Office, within the Australian Government's Department of Environment and Water Resources, is implementing a range of programmes designed to reduce emissions from the energy sector while meeting the needs of the community for ecologically sustainable energy services.

The PER estimates that the proposal would generate 13 190 tonnes CO_2-e annually, mostly from the use of diesel oil. In addition, the proposal would generate 1889.7 tonnes CO_2-e from land clearing, waste disposal and camp activities. Average annual emissions of the project would represent a 0.03% increase in the Northern Territory's emissions based on 2005 data.

The PER includes commitments to several actions to minimise greenhouse gas emissions. These include regular servicing of vehicles and machinery, and encouraging employees to adopt energy efficiency practices. All employees are to be encouraged to adopt energy efficient practices that can be used in their daily activities and site induction is to include a section on this issue. Opportunities for the operator to show stewardship in the area of energy consumption by incorporating innovative ways to improve energy efficiency occur at this operation.

Recommendation 15

It is recommended that Thor join the Commonwealth Government's Greenhouse Challenge Plus program and investigate the Northern Territory Renewable Energy Rebate Program as a framework for continuous improvement in energy efficiency and greenhouse gas reductions.

Recommendation 16

Thor should consider alternatives to the use of a diesel fuel generated power station. In particular the following matters should be addressed:

- **Renewable energy technologies should be advocated for energy supply to the accommodation camp, such as solar power for hot water systems and the sewerage treatment plant;**
- **Feasibility of using alternative energy should be discussed and a strategy developed for reducing greenhouse gas emissions over the period of the life of mine; and**
- **Contractors should be selected that are capable of delivering the goals of reducing greenhouse gas emissions.**

4.7 Sewage Treatment Plant

The Sewage Treatment Plant proposed for the project is a membrane bioreactor unit, which has a natural biological process and requires no chemicals other than chlorine to treat effluent. The treated effluent is recoverable from these systems and is available for irrigation or other non-potable uses. It is possible that this water can be recovered for dust suppression activities. As groundwater, pit water and process water is to be also be sourced/recovered for dust suppression and the EPA Program expects that the project would be zero waste discharge; the treated sewage water should also be used for dust suppression. This may assist in reducing the salinity levels of the process water and thus reducing the impacts on the surrounding environment.

Recommendation 17

The proponent is to consult the Environmental Health section of the NT Department of Health and Community Services with regard to the proposed Sewage Treatment Plant and the proposed usage of treated waste water for irrigation

4.8 Diversion Channel

Mining activities have the capacity to harm stream flows. Surface water diversion channels built across creeks will reduce and alter the downstream flow regime. Where it is necessary to divert a creek around mine workings into an adjacent creek, discharges increase into the receiving creek and again alter the downstream flow regime. Flow regime changes will alter the stream bed and bank erosion behaviour and the creek's ability to transport sediment.

A diversion channel/bund is to be constructed immediately north of the pit, waste dump and TSF to divert water from an ephemeral creek that runs between the waste dump and TSF. The diversion is proposed to be permanent and would direct the water back to the Molyhil Creek via Dam creek.

The proponent also states that part of this bund may double as the abandonment bund at pit closure.

The PER lacks detail on a number of issues associated with the diversion channel. Information on the impacts on riparian communities due to disturbance and altered drainage regimes has not been considered. The design of the diversion channel and details of the proposed bund, erosion prevention measures/structures and identification of potential impacts flood events have not been offered.

Recommendation 18

The proponent should provide the following details in the Mine Management Plan with regard to the diversion channel:

- **Design details of the bund and diversion channel, including;**

- **A map clearly showing Molyhil creek and associated water courses;**
- **Water flow volumes expected to be diverted by this channel;**
- **Erosion control measures to be in place for water egress back to Molyhil Creek;**
- **Impact of the diversion on the ephemeral creek and any associated groundwater dependent flora species;**
- **Evidence that the diversion channel would not impact upon sacred sites; and**
- **A statement of reasons why the diversion is to remain in place after mine closure.**

4.9 Borrow Pit

The proponent indicates in the PER that the construction of borrow pits is not required as waste material from the open pit would be suitable for construction of access road, ROM pad and pads for plant, workshops, offices and the tailings dam, provided that geochemical testing indicates it is safe for use. It is also indicated that material borrowed from within the TSF paddock area would provide the sand/clay upstream zone of the perimeter embankment. It is expected that the required volume of material would be available.

However further information provided in Appendix 1 of the PER indicates that, in the event that there is a shortfall in the fill volumes, the intention would be to open up an external borrow pit. This potential borrow pit is adjacent to the creek to the west of the proposed plant site. Creek beds have potential archaeological and cultural heritage sites and also have higher biodiversity values due to availability of water. Disturbance of creek beds or adjacent areas can cause erosion when rainfall occurs.

The PER does not provide information on the actual location, design or operation of the potential borrow pit.

Recommendation 19

If the external borrow pit is to be developed, the proponent is to consult with local Traditional Owners, Central Land Council, Aboriginal Areas Protection Authority and the Heritage Conservation Services and Natural Resource Management divisions of Natural Resources Environment and The Arts prior to the commencement of any construction works.

The proponent is to provide the outcomes of its consultation in the Mine Management Plan and include further details of the borrow pit design and construction including erosion management measures.

4.9.1 Settling Basin

Dewatering is a commonly used method of coping with groundwater seepage from mining operations. Dewatering can affect the natural biota within and external to the site; contain high solids load or a high concentration of contaminants. If discharge of water can be avoided or if it can be used on site, the environmental impact may be minimised.

Groundwater inflows (and rainfall) to the mine is anticipated to be low in volume and high in salinity (based on previous mining information) and is to be collected in in-pit sumps before being directed to a small settling basin to maximise the removal of suspended solids prior to being pumped into the plant process water system or used for dust suppression purposes.

The proponent has failed to provide specific design and location details of the settling basin in the PER. No details are provided with regard to management of the solid saline waste, potential seepage, impact on the receiving environment or rehabilitation of the settling basin.

Recommendation 20

Thor should include the location and design details of the settling basin in the Mine Management Plan. Design of the settling basin should follow Industry Best Practice for sediment basins on mine sites.

4.10 Transport

The roads affected by the proposal are the Plenty Highway and Jinka access road (4km) which are Northern Territory Government maintained roads. The balance of the access beyond Jinka homestead is a private road, constructed and maintained by the proponent. Both the Jinka access road (4km) and the Plenty Highway/Jinka access road intersection is proposed to require upgrading as part of this proposal.

4.10.1 Dust Control

All gravel roads would generate dust, which contributes to safety concerns for road users. Dust suppression is proposed and would be undertaken using water from either the pit dewatering processes or from identified bores. It is also proposed to reuse water where possible. Reuse of treated water from the sewerage treatment plant could also contribute to dust suppression activities.

Bore water in the area is saline and issues associated with discharge of this water killing native vegetation over a substantial area have occurred in the past. Any residual salt will accumulate in the soil profile of the roads, airstrip and other disturbed areas where water is used as dust suppressant. Arid zone vegetation is fragile and takes a long time to recover from disturbance, therefore management of saline dust suppression water to minimise impacts beyond the transport areas is essential. Road drainage can be designed to prevent saline deposits from draining into vegetated areas by creating sumps at the end of the drainage channels to allow water to pool when run off occurs. Any saline deposits following evaporation could then be managed as proposed in the PER.

The use of saline water could greatly reduce the success of revegetation and rehabilitation works should run off carry salt to the rehabilitation areas. The use of saline dust suppression water should be avoided during the latter stages of waste dumping and during topsoil spreading operations.

The EPA Program notes that the proponent commits to removal of any salt contamination on haulage roads. Roads will be ripped and contamination disposed of by encapsulation in the WRD.

Recommendation 21

It is recommended the proponent manage saline discharge from dust suppression activities to prevent runoff from entering the surrounding vegetation.

4.10.2 Plenty Highway

Access to the Molyhil site is via an existing access road from the Plenty Highway. Double and triple road trains are proposed to access the Plenty Highway for ongoing supplies of diesel fuel, stores and the shipment of concentrates. It is anticipated that there would be three trucks every two weeks loaded with concentrate leaving the site for Darwin Port. Thor has stated that there would be increased traffic on the Plenty Highway coming from light vehicles as well as supply trucks.

Transport of product from the mine site would significantly increase heavy vehicle use of the Plenty Highway, affecting approximately 150 kilometers of single lane bitumen road and approximately 100 kilometers of unsealed road. The safety of other road users and road maintenance is of significant concern to residents of the region.

The impacts on the condition of the roads from the increased road use have not been identified. Throughout the life of the mine, the condition of the road would be expected to deteriorate. Other road users may be disadvantaged and additional regular maintenance activities may be required.

Recommendation 22

The proponent is to consult with the Road Network Division of the Northern Territory Department of Planning and Infrastructure with regard to road upgrade requirements.

Recommendation 23

Road drainage design and erosion and sediment control structures should form part of the Erosion and Sediment Control Plan required in Recommendation 14.

4.10.3 Access Road

The access road to the mine site coming in from the Plenty Highway will require upgrading to an 8m wide all weather road so it can accommodate double and triple road trains which will use this road for construction access as well as ongoing supplies of diesel fuel, stores and the shipment of concentrates.

The 8 metre width of the site access road allows for a six metre running surface, passing bays which will be established at regular intervals and windrows.

The Traditional Owners have requested a change in the access route to the mine/village site to avoid the sacred site at Molyhil, which has been fenced at the request of the Traditional Owners. In light of the issues identified by Traditional Owners regarding sacred sites, heritage and cultural matters should be considered where any additional disturbance near roads is proposed and clearances obtained where necessary. The appropriate consultation and certification agencies would need to be involved.

Recommendation 24

The proponent is to consult with the Aboriginal Areas Protection Authority with regard to any further alterations of the access road.

4.10.4 Airstrip

An existing airstrip, 2km northwest of the pit is proposed to be used to transport staff to and from the mine. The airstrip was last used in 1981 and is proposed to be upgraded as necessary to meet requirements acceptable to charter aircraft operators and the Royal Flying Doctor Service (RFDS) for the fly in fly out (FIFO) operation and emergency services. The use of the airstrip would reduce the number of vehicles traveling on the Plenty Highway.

The PER does not provide information on the proposed upgrade of the airstrip, which was last used 26 years ago. Meeting the requirements of charter aircraft operations and RFDS may involve further clearing in the area, the use of fill material to improve the base of the airstrip and appropriate drainage management. There may also be requirements for equipment and fuel storage associated with operating the airstrip.

Recommendation 25

The proponent is required to provide the following information about the airstrip in the Mine Management Plan;

- **Airstrip ownership;**
- **Agreement of the owner for the proposed upgrade works and usage of the airstrip and any associated infrastructure;**
- **Details of the airstrip upgrade standards;**

- **Types of aircraft proposed to use the strip; and**
- **Who would be responsible for maintaining the strip during the life of the mine.**

4.10.5 Dangerous goods and hazardous substances

The proponent indicates in the PER that the major materials to be utilised in ore processing and concentrate production are: lime, Frother, Sulfur collector, oxide collector and depressant. Bulk reagent storage of 21 days has been allowed for. The PER does not provide information on quantities of fuel to be stored, especially if sufficient back up quantities will be required in the event of floods cutting off supply from Alice Springs. The EPA Program expects that all fuels and hazardous substances will be managed in compliance with Australian standards and legislative requirements.

Dangerous goods and hazardous chemicals are proposed to be stored in a purpose built structure. Spill contingency plans and spill response kits should be available at all times and located in appropriate readily accessible areas of the mine site. The EPA Program expects that these requirements would be included in the MMP and be subject to regulation through DPIFM.

Recommendation 26

It is recommended that the proponent organize security and licensing arrangements for Security Sensitive Ammonium Nitrate and outline these details in the Mine Management Plan.

4.11 Cultural Heritage

Molyhil is a sacred site and as such is protected under the *Heritage Conservation Act* 1991 and the NT *Aboriginal Sacred Sites Act*. The different provisions of these Acts provide a framework that protects Aboriginal Cultural heritage places under one or both of these Acts dependent on the nature of the place or object.

The proponent reports that the Molyhil site would be fenced off at the request of the Traditional Owners to prevent access however, the PER fails to mention the *Northern Territory Aboriginal Sacred Sites Act* when discussing these matters. Also, at the request of the Traditional Owners, the proponent asserts there would be a change to the access route to the mine/camp to avoid the sacred site at Molyhil.

The Traditional Owners have also requested a minor variation of the access road (of a few metres) to avoid some significant trees at the creek crossing near the village on the new main access road. The Traditional Owners have also requested that all the Gidgee trees removed from the southern waste rock dump be stockpiled and made available for traditional uses. The proponents have agreed to make these trees available.

It should be noted that sacred sites and archaeological sites are not the same thing as indicated by the proponent. It is quite possible for archaeological material to exist within the lease area outside of the boundaries of the sacred sites. The *Heritage Conservation Act* provides a system for the identification, assessment, recording, conservation and protection of places and objects of prehistoric, protohistoric, historic, social, aesthetic and scientific value. Heritage Conservation Services maintains an Archaeological Sites Register and Heritage Register, which lists sites of Heritage value prescribed under the *Heritage Conservation Act.*

It is noted that the proponent is seeking an Aboriginal Areas Protection Authority certificate for this site and would fulfill the conditions of such a Certificate. This certificate must be included as an amendment in the Aboriginal Heritage section of the Draft Environment Management Plan.

Recommendation 27

The Aboriginal Heritage section of the Draft Environmental Management Plan should be amended to include:

- **An Archaeological Survey. This survey should include:**
  - **Details of protection of archaeological and cultural sites, including sacred sites undertaken in conjunction with the Heritage Conservation Services section of Natural Resources Environment and The Arts, Central Land Council and Aboriginal Areas Protection Authority;**
  - **Location of any prescribed archaeological places or objects;**
  - **Methodology of site identification;**
  - **Impact of proposed activity on places/objects; and**
  - **Mitigation measures to prevent loss.**
- **Employee and contractor induction addressing matters relating to the cultural environment and specifically, prescribed archaeological places and objects protected under the NT *Heritage Conservation Act*;**
- **Engagement of Traditional Owners with regard to closure or rehabilitation of roads to reduce uncontrolled access; and**
- **Commitment that the fence erected to protect the Molyhil sacred site will be maintained during construction and operation of the mine. Clarification is also to be provided as to whether the fence would remain in place following decommissioning of the mine.**

Thor is to ensure that the access route variation is undertaken to the satisfaction of the Traditional Owners and Aboriginal Areas Protection Authority.

Thor should undertake discussions with the Traditional Owners to discuss the need to close or rehabilitate nearby roads to reduce the likelihood of uncontrolled access.

4.12 Socio economic

Thor has identified the following potential social and economic benefits from the project:

- Direct employment for 100 people during construction and 62 people during operation;
- Prioritisation of sourcing labour from the local area and then from within the national mining industry;
- Encouragement of economic development of the Northern Territory and the local Alice Springs community in particular, and experienced personnel employed would be involved in a structured training programme in order to develop a competent operation and maintenance team;
- Supply of goods and services is proposed to be extended to local businesses; and
- Contributions to the economy of the Federal and Territory government through tax and royalties generated from the project.

In anticipation of the potential socio-economic impacts of the Molyhil Project, Thor would need to engage in mechanisms that keep stakeholders informed of operational plans, in particular employment opportunities for an indigenous workforce. The EPA Program notes that the proponent has been in discussions with the CLC and is considering employment opportunities for local indigenous workers.

Recommendation 28

Thor should engage the services of the Indigenous Mining and Enterprise Taskforce and the Economic Development Committee [administered by the Department of Business, Economic and Regional Development] to assist with managing employment opportunities for indigenous workers.

4.13 Rehabilitation and Decommissioning

Planning for rehabilitation should be undertaken in the early stages of project development and should be developed in the context of the overall site closure objectives. During mining, research and site trials enable the rehabilitation program to be modified to reflect site-specific parameters. The most important elements of the rehabilitation program following closure are the refinement of the success criteria and the establishment of a long-term monitoring program. The objective would demonstrate that rehabilitated areas are trending towards stable and sustainable ecosystems consistent with the defined completion criteria (DOTAR, 2007).

The post mining land use of the Molyhil mine site is planned for its return to seasonal livestock grazing by cattle after closure which is the current land use.

Thor provides brief outlines of plans for rehabilitation and mine closure in the PER. Information provided tended to lack sufficient detail on how activities would be undertaken and outcomes would be achieved. General approaches to rehabilitation and closure have been outlined in the Draft Environmental Management Plan (Appendix 5, PER) for Vegetation and Flora and a draft Weed Management Plan (Appendix 8, PER). A twelve month-rehabilitation plan and life of mine decommissioning and closure plan are being developed and would be submitted as part of the MMP, however no objectives for this plan have been provided.

The proponent anticipates that the rehabilitation of the mining area would result in establishment of self sustaining vegetation complex into which local fauna would be able to return and re-establish and the use of local provenance seed is proposed to be collected. Thor commits to supervising clearance operations to ensure the correct stock piling of vegetative material and topsoil and has developed a draft Vegetation Clearing Management Plan (Appendix 7 of the Draft EMP (PER, App 5). These activities are planned to assist to minimise the areas requiring revegetation at mine closure.

Revegetation in arid zones can be difficult due to soil and climatic conditions. Recovery of native vegetation following even slight disturbance such as driving over or crushing can take many years. A twelve month rehabilitation plan may not be sufficient to ensure the achievement of rehabilitation objectives. It is important that an ongoing monitoring program and response strategies should be included in the Mine Rehabilitation and Closure Plan being developed by the proponent.

Thor has indicated that wherever possible, progressive rehabilitation of the Molyhil site would occur as disturbed sites no longer required become available. Apart from reshaping these sites, direct placement of topsoil removed from a newly disturbed area would be placed over the area ready for top soiling. It is also noted that the proponent has committed to obtaining engineering and agronomic advice to assess the cover design options of the TSF.

4.13.1 Revegetation

Revegetation forms the major part of mine rehabilitation. Arid zones typically have rainfall specific triggers for germination of seeds and flowering and seed production on established vegetation. Arid zone soils are typically shallow with little organic matter. The use of fresh topsoil is the best known method of regeneration in these areas, particularly where spinifex (*Triodia)* occurs. Seed viability can rapidly decline in stockpiles and design principles must optimise seed stock protection.

Relationships between plants and fungi are also important in the germination and establishment process of rehabilitation. Mycorrhizal fungi are a natural component of all soil ecosystems. In disturbed native soils these fungi can be absent or very low due to drying of the exposed soil. Improved growth rates in

vegetation where the fungi occur as a result of increased uptake of phosphorous. Encouraging the retention or introduction of the fungi would ensure maximum plant diversity by increasing the opportunity for plants to become established.

Thor proposes in the PER that native seed sourced from surrounding areas is to be applied to top soiled, deep ripped surfaces. No indication is presented as to how or when seed collection activities would occur, what volumes of seed would be required or seeding densities.

Given the proponent's commitment to progressive rehabilitation wherever possible, the EPA Program considers such planning elements need to be presented and approved within the first EMP. Local seed collections should commence within the first year of the project, to allow for seasonality of fruiting and to ensure availability of sufficient local seed supplies. Given the disturbed nature of the local vegetation, seed collections may need to be from the broader lease area. Operation of an on-site or local nursery propagating indigenous tube-stock should be investigated, while rehabilitation and propagation trials should be continued through the mine's life to further refine rehabilitation plans. The storage and re use of vegetative material and topsoil for revegetation would need to be managed to maintain the viability of seed stock.

Investigation of local regeneration cycles are important to determine how plant species recolonise and self perpetuate in this location. The importance of macro invertebrates such as ants, termites and spiders as indicators of viable ecosystems should be included for future monitoring purposes. In the arid environment it is rainfall that triggers and drives regeneration, rather than time. Rehabilitation planning should attempt to coincide with rainfall events as should monitoring.

Collection of seed and growing trials would be best carried out in consultation with local conservation groups, such as; Greening Australia NT, NT Native Plant Society and traditional owners. This would provide positive opportunities for local indigenous employment.

Cattle from the adjoining pastoral properties frequent the dam to the north of the mining lease. As well as standard revegetation techniques, rehabilitation of degraded areas may need to include other measures such as reducing grazing, fire management, weed eradication and other techniques. Fencing off the mine lease area to exclude cattle would assist the rehabilitation and maintenance of the natural features within the mine lease area by reducing soil erosion and improving vegetation health and protected rehabilitated areas.

Recommendation 29

The proponent is to prepare and submit a comprehensive Rehabilitation Plan outlining proposed rehabilitation measures for all elements of the mining operations, including the Tailings Storage Facility, pit, Waste Rock Dump and mine camp. The Rehabilitation Plan is to include a comprehensive Revegetation Plan for review by the Department of Natural Resources, Environment and the Arts, which demonstrates the proponent's ability to successfully revegetate and rehabilitate the site.

4.14 Environmental Management

The PER contains a Draft Environmental Management Plan and a number of associated draft management plans which have been proposed through the course of the assessment process for the Molyhil mine project. All management plans and procedures developed for the project must be approved by, or developed to, the satisfaction of relevant Government agencies and stakeholders within specified timeframes. These approved plans and procedures will be one of the primary tools by which the proponent will implement management and monitoring commitments in the PER and the recommendations detailed in this Assessment Report.

It is vital to the performance of the project that the requirements in management systems, plans and procedures are incorporated into the proponent's tendering and contracting procedures and that all

contractors are fully aware of, and act in compliance with, relevant management pans. The information should be provided to all personnel as part of an induction process.

Recommendation 30

A revised Environmental Management Plan and associated documents for the project is to be submitted to the Department of Primary Industry Fisheries and Mines for approval prior to commencement of construction of the mine and ancillary infrastructure. The approved Environmental Management Plan is to be included as an appendix within the Mine Management Plan.

In preparing the Environmental Management Plan, the proponent will include any additional measures for environmental protection and monitoring contained in this Assessment Report, and recommendations made by the Northern Territory Government with respect to the project.

List of Recommendations

Recommendation 1

The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- Identified in the Molyhil tungsten-molybdenum Public Environmental Report; and
- Recommended in this Assessment Report (No. 60)

All safeguards and mitigation measures outlined in the Public Environmental Report are considered commitments by Thor and are to be included in the Mine Management Plan.

Recommendation 2

The proponent shall advise the Minister of any changes to the proposal in accordance with clause 14A of the Administrative Procedures of the *Environmental Assessment Act*, for determination of whether or not further assessment is required.

Recommendation 3

It is recommended that the proponent ensures that the mine site design and layout exclude further clearing of remnant vegetation in recognition of the findings of the Flora and Fauna Assessment undertaken by Low Ecological Services.

Recommendation 4

In addition to the commitments made by the proponent the Environmental Management Plan should include measures with respect to flora and fauna management: -

- A site induction procedure is to include a flora and fauna component that ensures all Molyhil site personnel are aware of flora and fauna management on the site and can demonstrate this awareness;
- Identification, mapping and management strategies for remnant vegetation;
- Monitoring and management measures of the threatened species – the Rainbow Bee-eater, the Black-footed Rock Wallaby and the Mulgara; and
- Strategies to prevent vegetation decline from saline water use and discharge (refer Section 4.4.2.)

Recommendation 5

The Draft Weed Management Plan (Appendix 8, PER) should be amended to include the following measures with respect to weed control:

- A commitment that the proponent and contractors would comply with the Northern Territory *Weed Management Act*;
- A final weed control and monitoring program to be undertaken at closure and rehabilitation until vegetation is established in rehabilitated areas;
- A requirement that all contractors operating at the site shall comply with the Weed Management Plan; and
- A commitment to avoid exotic plant species to landscape the site to ensure their spread into the surrounding environment is prevented.

Recommendation 6

A formal agreement is to be established with the Controller of Water Resources under the *Water Act* to provide for the presentation of groundwater extraction data should extraction exceed 15L/s.

A project Water Management Plan is to be prepared and included in the Environmental Management Plan which demonstrates that water needs can be met and the use of the groundwater resource is sustainable. The Plan should include (but not be limited to) the following:

- The Groundwater Investigation Report recommendations;
- Implementation of a monitoring program to determine the effects on groundwater and ground water dependent ecosystems in the locality; and
- Reporting mechanisms to present information to the Department of Natural Resources Environment and The Arts.

This plan should be prepared before the commencement of activities associated with this proposal.

Recommendation 7

The EPA Program recommends that the mining operation be managed to have a zero waste water discharge. All waste water discharge is to be retained on site or processed for reuse during operations.

If any waste water discharge is proposed to leave the site, a Waste Discharge License is required.

Recommendation 8

A Saline Water Management Plan should be prepared and included in the EMP. The Plan must include detailed measures, based on analyses of all wastewater sources and receiving environments, to prevent or mitigate further degradation of watercourses and associated flora around the site. It should also demonstrate that any disposal of saline water to the Tailings Storage Facility would not impact on the encapsulation liner and cause it to degrade.

Recommendation 9

The EPA Program recommends that the proponent undertakes geochemical characterization of the waste rock and tailings throughout the life of the mine and revise waste rock management strategies as required.

Recommendation 10

It is recommended that:

- Thor adopts the findings of the Tailings Characterization Report (Appendix 2, PER) on Acid Rock Drainage as 0.3% as a cut off for ‘not unusually reactive’ materials;
- Prior to the use of waste rock for Run Of Mine and/or road construction activities, the waste rock should be assessed for Potential Acid Forming qualities; and
- Details are to be provided in the Mine Management Plan of monitoring and response strategies for any acid seepage that may occur from the Tailings Storage Facility or Waste Rock Dump.

Recommendation 11

Thor is to provide the following details in the Mine Management Plan with regard to Tailings Storage Facility management:

- Projected characteristics of the Tailings Storage Facility, taking into account the actual site and tailings data (Appendix 1, PER);
- Liner system design information;
- Management of the 27kL/annum modeled leachate -including potential recharge of local shallow/deep groundwater;
- A description of the predicted Acid/Neutral drainage contaminants in the predicted solute plume;
- Depth of soil wetting/drying potential;

- Contingency for not meeting the decant return water volumes as specified in Table 15 of the Tailings Storage Feasibility report (Appendix 1, PER);
- Identification of whether the underlying rock mass is fractured and the potential for the preferential flow of seepage through the underlying rock mass;
- Assessment of the erosion hazard/threat to the final rehabilitated Tailings Storage Facility;
- Identification and explanation of potential toxicants and concentrations of the tailings solution;
- Demonstration that the encapsulation design and material (such as clay) would not be degraded as a result of the saline water or wastes being stored in the Tailings Storage Facility;
- Monitoring activities during operations up to and including decommissioning for possible leachate contamination of surface water and/or groundwater;
- Detailed evidence to support the assertion that the Tailings Storage Facility decommissioning plan would adequately isolate PAF tailings from the surrounding environment must be included; and
- Rehabilitation design that ensures that the final surface of the Tailings Storage Facility is free draining.

Recommendation 12

Thor is to provide clarification of the tailings stream processing in the Mine Management Plan. The proponent should address the following matters in detail:

- Implications (if any) of the magnetite concentrate being produced as a slurry rather than a dry by-product; and
- Implications (if any) of the co-disposal of the magnetite slurry with the general plant tailings.

Recommendation 13

The proponent should provide the following details in the Mine Management Plan with regard to the Waste Rock Dump:

- Results of Net Acid Producing/Net Acid Drainage testing on waste rock;
- Design details of a liner system ;
- Management of any potential neutral drainage or Potential Acid Forming solutes to groundwater or surface waters;
- Details of existing groundwater under the Waste Rock Dump;
- Details of how Potential Acid Forming/neutral drainage relevant material is proposed to be kept out of the Waste Rock Dump or managed to prevent leakage to groundwater;
- Predicted characterisation of solute contaminants and concentrations;
- Description of placement or management of waste placed in the Waste Rock Dump to minimise or prevent neutral or acid solute leaching; and
- Details of monitoring and response strategies for any acid seepage that may occur from the Tailings Storage Facility or Waste Rock Dump.

Recommendation 14

An Erosion and Sediment Control Plan is to be developed as part of the project Environmental Management Plan, to the satisfaction of Natural Resources, Environment and The Arts prior to the commencement of on-ground works.

Recommendation 15

It is recommended that Thor join the Commonwealth Government's Greenhouse Challenge Plus program and investigate the Northern Territory Renewable Energy Rebate Program as a framework for continuous improvement in energy efficiency and greenhouse gas reductions.

Recommendation 16

Thor should consider alternatives to the use of a diesel fuel generated power station. In particular the following matters should be addressed:

- Renewable energy technologies should be advocated for energy supply to the accommodation camp, such as solar power for hot water systems and the sewerage treatment plant;
- Feasibility of using alternative energy should be discussed and a strategy developed for reducing greenhouse gas emissions over the period of the life of mine; and
- Contractors should be selected that are capable of delivering the goals of reducing greenhouse gas emissions.

Recommendation 17

The proponent is to consult the Environmental Health section of the NT Department of Health and Community Services with regard to the proposed Sewage Treatment Plant and the proposed usage of treated waste water for irrigation

Recommendation 18

The proponent should provide the following details in the Mine Management Plan with regard to the diversion channel:

- Design details of the bund and diversion channel, including;
- A map clearly showing Molyhil creek and associated water courses;
- Water flow volumes expected to be diverted by this channel;
- Erosion control measures to be in place for water egress back to Molyhil Creek;
- Impact of the diversion on the ephemeral creek and any associated groundwater dependent flora species;
- Evidence that the diversion channel would not impact upon sacred sites; and
- A statement of reasons why the diversion is to remain in place after mine closure.

Recommendation 19

If the external borrow pit is to be developed, the proponent is to consult with local Traditional Owners, Central Land Council, Aboriginal Areas Protection Authority and the Heritage Conservation Services and Natural Resource Management divisions of Natural Resources Environment and The Arts prior to the commencement of any construction works.

The proponent is to provide the outcomes of its consultation in the Mine Management Plan and include further details of the borrow pit design and construction including erosion management measures.

Recommendation 20

Thor should include the location and design details of the settling basin in the Mine Management Plan. Design of the settling basin should follow Industry Best Practice for sediment basins on mine sites.

Recommendation 21

It is recommended the proponent manage saline discharge from dust suppression activities to prevent runoff from entering the surrounding vegetation.

Recommendation 22

The proponent is to consult with the Road Network Division of the Northern Territory Department of Planning and Infrastructure with regard to road upgrade requirements.

Recommendation 23

Road drainage design and erosion and sediment control structures should form part of the Erosion and Sediment Control Plan required in Recommendation 14.

Recommendation 24

The proponent is to consult with the Aboriginal Areas Protection Authority with regard to any further alterations of the access road.

Recommendation 25

The proponent is required to provide the following information about the airstrip in the Mine Management Plan;

- Airstrip ownership;
- Agreement of the owner for the proposed upgrade works and usage of the airstrip and any associated infrastructure;
- Details of the airstrip upgrade standards;
- Types of aircraft proposed to use the strip; and
- Who would be responsible for maintaining the strip during the life of the mine.

Recommendation 26

It is recommended that the proponent organize security and licensing arrangements for Security Sensitive Ammonium Nitrate and outline these details in the Mine Management Plan.

Recommendation 27

The Aboriginal Heritage section of the Draft Environmental Management Plan should be amended to include:

- An Archaeological Survey. This survey should include:
    - Details of protection of archaeological and cultural sites, including sacred sites undertaken in conjunction with the Heritage Conservation Services section of Natural Resources Environment and The Arts, Central Land Council and Aboriginal Areas Protection Authority;
    - Location of any prescribed archaeological places or objects;
    - Methodology of site identification;
    - Impact of proposed activity on places/objects; and
    - Mitigation measures to prevent loss.
- Employee and contractor induction addressing matters relating to the cultural environment and specifically, prescribed archaeological places and objects protected under the NT *Heritage Conservation Act*;
- Engagement of Traditional Owners with regard to closure or rehabilitation of roads to reduce uncontrolled access; and
- Commitment that the fence erected to protect the Molyhil sacred site will be maintained during construction and operation of the mine. Clarification is also to be provided as to whether the fence would remain in place following decommissioning of the mine.

Thor is to ensure that the access route variation is undertaken to the satisfaction of the Traditional Owners and Aboriginal Areas Protection Authority.

Thor should undertake discussions with the Traditional Owners to discuss the need to close or rehabilitate nearby roads to reduce the likelihood of uncontrolled access.

Recommendation 28

Thor should engage the services of the Indigenous Mining and Enterprise Taskforce and the Economic Development Committee [administered by the Department of Business, Economic and Regional Development to assist with managing employment opportunities for indigenous workers.

Recommendation 29

The proponent is to prepare and submit a comprehensive Rehabilitation Plan outlining proposed rehabilitation measures for all elements of the mining operations, including the Tailings Storage Facility, pit, Waste Rock Dump and mine camp. The Rehabilitation Plan is to include a comprehensive Revegetation Plan for review by the Department of Natural Resources, Environment and The Arts, which demonstrates the proponent's ability to successfully revegetate and rehabilitate the site.

Recommendation 30

A revised Environmental Management Plan and associated documents for the project is to be submitted to the Department of Primary Industry Fisheries and Mines for approval prior to commencement of construction of the mine and ancillary infrastructure. The approved Environmental Management Plan is to be included as an appendix within the Mine Management Plan.

In preparing the Environmental Management Plan, the proponent will include any additional measures for environmental protection and monitoring contained in this Assessment Report, and recommendations made by the Northern Territory Government with respect to the project.

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Appendix 1

Table of Commitments by Thor for the Molyhil tungsten-molybdenum Mining Project.

ASPECT	COMMITMENT
PIT	Further work is planned by Thor to assess likely pit dewatering requirements.
	Pit dewater will be collected in in-pit sumps before being directed to a small settling basin to maximise the removal of suspended solids prior to being pumped into the plant process water system or used for dust suppression purposes
WASTE DUMP	The outer faces will be established first and contoured to a maximum slope of 18% to assist in early stabilisation and minimise erosion
	If PAF rock is identified during mining activities, it will be encapsulated in the waste dump.
	Benign waste rock generated from the mining of the open pit will be used to construct the ROM pad, the TSF and possibly also for road base/sheeting materials.
CONCENTRATE	The concentrate filter cake will be dried in a diesel fired fluidised bed drier and packaged into one tonne bulker bags.
	The facility to contain the pyrite concentrate will be constructed on the northern side of and attached to the TSF. It will be lined with plastic and will be designed to minimise the overall height of the structure to control runoff (and prevent scouring of the cover material).
TSF	A sediment collection trench, nominally 300 mm deep, will be excavated around the outer toe of the perimeter embankment to contain any material washed off the outer embankment slope.
	After allowing the water to pass through a sump to settle out most of the suspended solids, the water will be released into natural flow paths to the south and west of the TSF.
	Engineering and agronomic advice will be obtained to assess the cover design options.
	All roads will be gravel surfaced to a minimum construction standard consistent with Thor requirements for durability during and/or following wet weather.
	During the early stages of operation of the TSF, tailings deposition will be managed to obtaining early control of the released supernatant water, collect it into a single pond and move the pond towards the decant location.
	The area of pond should not exceed 15% of the storage area under normal conditions. However, a 15% area exceedance is likely to occur following major storm events. Under these circumstances, the water on the TSF will be drawn down as soon as practicable by reducing make-up water drawn from the borefield.

ASPECT	COMMITMENT
	A minimal total freeboard of 300mm will be provided within the ponding water of the TSF that allows for a 1 in 100 year, 72-hour duration rainfall event falling in the catchment of the TSF itself.
	A sediment collection trench/sump will be constructed around the outer wall to collect any runoff.
	A keyway will be excavated down into the compact weathered bedrock zone beneath the perimeter embankment of the TSF and will be backfilled with compacted low permeability material to reduce the potential for seepage movement at the base of the TSF.
	Regular monitoring of the monitoring bores located around the perimeter of the TSF will detect any impacts to groundwater.
	Tailings pipeline will be contained in a v-trench.
	To confirm estimations, kinetic testwork (weathering columns) is required to refine geochemical characterization. This work will be undertaken when tailings from the operating plant become available.
AIRSTRIP	The airstrip will be upgraded to meet requirement for charter aircraft and RFDS.
	A contour trench will be constructed on the northern side of the runway to minimise the flow of water onto the runway. The trench will direct the water to the creek south east of the runway.
WATER PIPELINE & BORES	Pipeline will be placed in a v-trench
	Flow meters will be fitted to production bores to enable monitoring of groundwater abstraction.
	Standing water levels will be recorded monthly for the duration of the project.
WASTE DISPOSAL	The waste disposal site will be within the waste dump and progressively buried as the waste dump is advanced.
	Any hydrocarbons such as waste oil will be collected in drums for collection by waste oil contractors and transported to Alice Springs for recycling.
	The landfill will contain only inert and putrescible waste materials
	No burning of refuse at any time
	No disposal of hydrocarbons or hydrocarbon contaminated materials
	No disposal of hazardous goods
	Thor will reuse and recycle construction materials, scrap metals, equipment and tyres to minimise disposal into the landfill.
	In accordance with the Mining Management Plan (MMP) all waste will be placed within a defined trench or within an area enclosed by earth bunds.
DANGEROUS GOODS	All hazardous substances will be contained within a concrete bunded facility (including a drain pipe and valve) and will be built in accordance with the Australian Dangerous Goods Code and AS1940: *"The storage and handling of flammable and combustible liquids"* and AS1692: "Tanks for flammable and combustible liquids".

ASPECT	COMMITMENT
	Spill containment kits will be provided at the workshops and areas where chemicals and hydrocarbons are stored.
	All hazardous and dangerous goods and materials will be transported by road and will be used and stored in accordance with the relevant statutory requirements
	Only those persons specifically trained in the storage, handling and use of any process plant hazardous materials will be permitted to handle that hazardous material.
	A register of all hazardous substances kept at site will be maintained by Thor.
	Waste oil and other hydrocarbons will be collected and stored, either in bulk or in 200-litre drums, prior to removal from site by contractor for re-use or other approved form of disposal.
	Oil-filters will be thoroughly drained of oil before disposal into a bin which will then be removed and transported to Alice Springs for disposal.
GREENHOUSE GASES	As part of the National Pollutant Inventory (NPI), quantities of air emissions will be estimated or measured and reported annually.
	All vehicles and machinery will be regularly serviced to minimise the emissions of combustion gases.
	All employees will be encouraged on energy efficient practices that can be used in their daily activities and the site induction will include a section on this issue.
TRANSPORT	All road base will be produced from crushed waste rock that will be sourced from the pit during mining.
	There will be minimal light vehicle usage of the highways because of the fly in-fly out program.
	It is proposed to use these concentrate trucks to backload reagents and general freight to the site, thus reducing the number of trucks going to Molyhil on the Plenty Highway.
	Signs will be erected at the turnoff to site off the Plenty Highway, advising that road trains are entering and leaving the site to travel on the Highway.
	Licensed road vehicles will be used for haulage and standard axle loadings will be complied with.
	Road train drivers will use radio communications to co-ordinate safe passing.
BITING INSECTS	All personnel will be advised of the relevant personal protective measures to protect themselves from biting insects.
	If mosquito populations cause a significant issue, Thor will liaise with the Medical Entomology Branch (MEB).

ASPECT	COMMITMENT
	The dam located north of the pit and the crossing across the Plenty highway will be regularly monitored to assess potential breeding sites and biting insect populations.
FIRE	Emergency drills will be conducted at a minimum of once every six months.
	Fire extinguishing equipment (extinguishers and hoses) available throughout the project area and regular maintenance of this equipment.
	Maintain firebreaks.
	A Mutual Aid Agreement shall be used in circumstances where the nature of an emergency, such as fire, is such that the resources immediately available may be insufficient to maintain an effective response.
	Maintain an effective communication system, incorporating a 'call-out' system.
	Maintain education of fire awareness.
CAMP	The operation of the camp will be in accordance with the Food Act 2004 and Food Safety Standards, AS 4674:"Design, Construction and Fit-out of Food Premises".
	The camp will be registered as a boarding house in accordance with the Public Health Act and Public Health (Shops, Eating Houses, Boarding Houses, Hostels and Hotels) Regulation
REHABILITATION & CLOSURE	Whenever possible, progressive rehabilitation of the Molyhil site will occur as disturbed sites no longer required become available
	Apart from reshaping these sites, direct placement of topsoil removed from a newly disturbed area will be placed over the area ready for topsoiling.
	It is planned to return the site to seasonal livestock grazing by cattle after closure.
DEWATERING	Further work is planned by Thor to assess likely pit dewatering requirements.
	Pit inflows will be collected in in-pit sumps and directed to a settling basin. Water will then be directed to the process plant or used for dust suppression.
ABORIGINAL	Thor will change the access route to the mine/camp to avoid the sacred site at Molyhil.
	Thor will amend the location of the creek crossing along the site access road as requested by the Traditional Owners.
	The Central Land Council and NRETA will notified immediately if sites of potential significance are discovered.
	Thor will make available to the Traditional Owners all gidgee trees that will be removed from the southern waste rock dump area.
	Thor will obtain an authorisation certificate from the AAPA prior to commencement of clearing works.
CLEARING	Earthmoving activities are planned to commencement of the dry season.
	Minimise clearing profile.

ASPECT	COMMITMENT
	Prior to clearing areas will be clearly defined.
	Clearing operations will be supervised.
	Protect vegetation outside clearing profile.
	Progressively rehabilitated disturbed areas as available.
	Cleaning down of machinery prior to arriving on site.
	Collect and stockpile all vegetation and topsoil for use in rehabilitation works.
	Top 300mm of topsoil removed and stockpiled for use in later rehabilitation works.
	These topsoil stockpiles will not exceed two metres to ensure viability of the topsoil.
	All rehabilitated landforms have been designed and will be controlled to minimise erosion.
	Larger trees and shrubs will be retained whenever possible.
	Only flora found in the local area will be used in rehabilitation programs.
WEEDS	Conduct inspection during construction and operation for potential weed establishment.
	Thor will train personnel in identification of problem weed species.
	Liaison with DRETA regarding weed control activities.
	Log to be kept of all vehicles and machinery entering site during construction to ensure all machinery has been blown down/cleaned.
	Use of approved control mechanisms if noxious weed species are identified.
	Rehabilitation with weed free soils.
FAUNA	existing cleared areas will be utilised for the mine,
	all bore holes being utilised will be securely capped to ensure that fauna do not become trapped
	unused bore holes will be permanently plugged below ground level,
	All personnel will be prohibited from bringing pets, firearms, or traps into the camp or project area.
	The rehabilitation program for the site will include fauna habitat reconstruction, including the replacement of dead timber, creation of rock piles and litter establishment.
	Regular monitoring of the TSF will occur to ensure no fauna become trapped.
SURFACE WATER DRAINAGE	A pit protection bund will be installed to protect the pit from flooding from a storm event. Part of this bund may double as the abandonment bund at pit closure.

ASPECT	COMMITMENT
	Open drains and pipe/culvert systems will control localised surface runoff around project infrastructure. All rainfall runoff falling on the plant structures will be collected and retained in bunds and pumped into the process system by sump (spindle) pumps.
	All hydrocarbons and chemicals will be stored in adequately bunded facilities.
	All mobile equipment and light vehicle servicing activities including wash down bays will be done on impermeable surfaces
	A washdown facility will be constructed with collection sumps. Any hydrocarbons and chemicals collected will be pumped into suitable containers for collection and sent of site to Alice Springs for disposal.
CREEK CROSSING	Running surface of the access road across these rivers will be sheeted with road base material that will be placed at the level of the river bed to avoid silting.
DUST	Dust generated during the construction and operations phases will be mitigated by regular water sprays from water truck(s)
	All vehicles will be limited to designated access tracks where dust control measures can be used.
	Fine mist sprays will be installed at the crusher and screens to reduce dust.
NOISE	All plant and equipment has been designed to meet occupational health noise standards and meet environmental noise standards.
	All mining equipment will be fitted with the required noise attenuation equipment.
	Hearing protection will be provided for all personnel.

Appendix 2

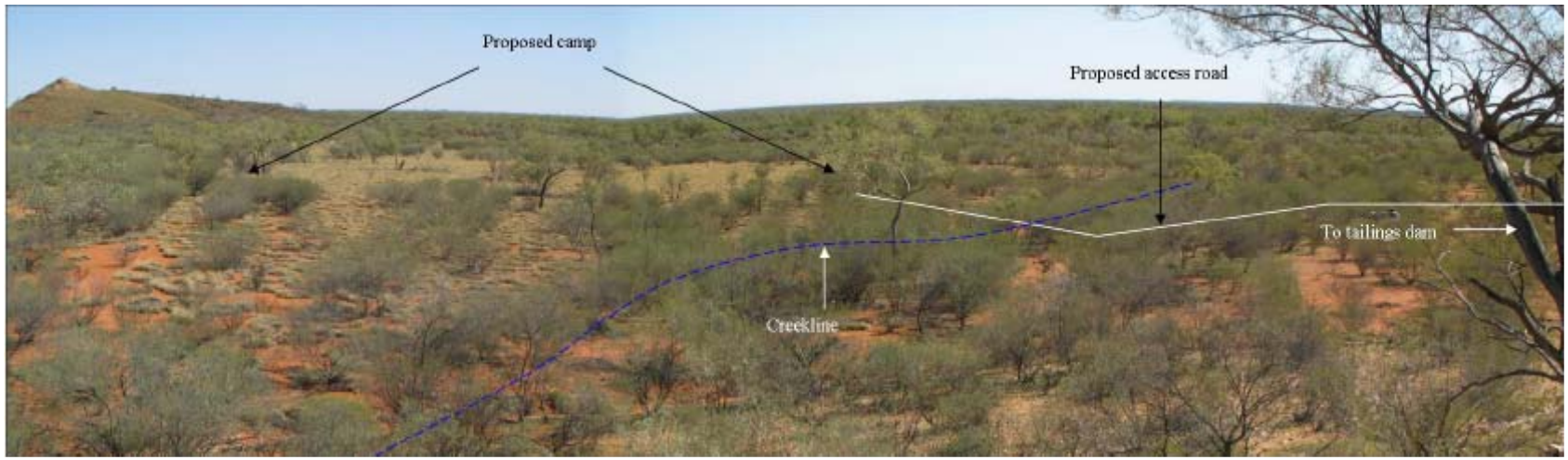

Photo 1: Perspective south-west over proposed camp access road (Molyhil Mine PER App 4, 2007)

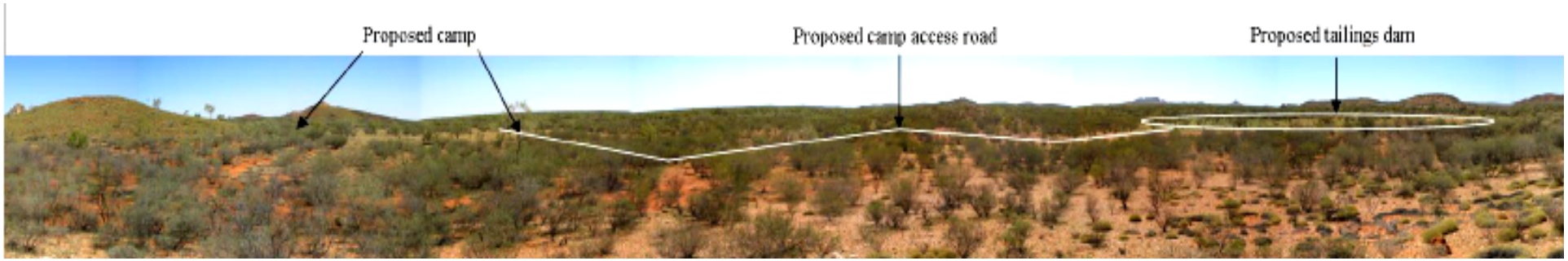

Photo 2: Perspective south over proposed camp site, access road and west to proposed tailings dam (Molyhil Mine PER, App 4, 2007)

Photo 3: Perspective south along haul road (Molyhil Mine PER App 4, 2007)

Photo 4: Perspective southeast over proposed tailings storage facility (Molyhil Mine PER, App 4, 2007)