

Wonarah Phosphate Project

ASSESSMENT REPORT 64

MINEMAKERS AUSTRALIA PTY LTD

Environmental Assessment Report and
Recommendations

Prepared by the
Environment, Heritage and Arts Division
DNRETAS

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Glossary

AMD	Acidic and/or Metalliferous Drainage
ASX	Australian Stock Exchange
CLC	Central Land Council
DNRETAS	Department of Natural Resources, Environment, the Arts and Sport (NT Government)
DOR	Department of Resources (NT Government)
Draft EIS	Draft Environmental Impact Statement
DSO	Direct Shipping Ore
<i>EA Act</i>	<i>NT Environmental Assessment Act (1982)</i>
EHA Division	Environment, Heritage and Arts (EHA) Division, of DNRETAS.
EIS	Environmental Impact Statement, consisting of the Draft EIS and the Supplement (to the EIS)
EMP	Environmental management plan
<i>EPBC Act</i>	<i>Australian Environment Protection and Biodiversity Conservation Act (1999)</i>
FiFo	Fly-in, fly-out
LPG	Liquefied Petroleum Gas
MAK	Minemakers Australia Pty Ltd ASX code
Minemakers	Minemakers Australia Pty Ltd
the Minister	NT Minister for Natural Resources, Environment and Heritage
MMP	Mining Management Plan
NLC	Northern Land Council
NOI	Notice of Intent
NT	Northern Territory
PAF	Potentially Acid Forming
Phosphorite	Phosphorite, phosphate rock or rock phosphate is a non-detrital sedimentary rock which contains high amounts of phosphate bearing minerals. The phosphate content of phosphorite is at least 20% which is a large enrichment over the typical sedimentary rock content of less than 0.2%. Phosphorous at Wonarah is in the form phosphorus pentoxide P ₂ O ₅
the Project	Wonarah Phosphate Project
Responsible Minister	NT Minister for Primary Industry, Fisheries and Resources
ROM	Run of mine
Supplement	Supplement to the Environmental Impact Statement
TPWC Act	<i>NT Territory Parks and Wildlife Conservation Act (2000)</i>
WRS	Waste Rock Storage(s)

Units/Symbols

/yr	Per year
ha	Hectares
kL/d	Kilolitre per day (Thousand Litres per day)
km	Kilometres (thousand metres)
L	Litre
ML/d	Megalitres (Million Litres) per day
Mt	Mega tonne (Million tonnes)
Mt/yr	Mega tonne per year
MW	Megawatt (Million watts) of power
P	Phosphorous
P ₂ O ₅	phosphorus pentoxide
ppm	Parts per million
t/yr	Tonnes per year

Executive Summary

This report assesses the environmental impact of the Wonarah Phosphate Project by Minemakers Australia Pty Ltd who propose to mine two adjacent phosphate deposits, 'Arruwurra' and 'Main Zone', in the Barkly Tableland for Phosphorite, or Rock Phosphate. The Project has been segregated into two stages. Stage 1 is the subject of this Environmental Impact Statement (EIS) and assessment, and involves removal of higher grade (direct shippable) ore using a combination of strip and open-cut mining. Stage 1 involves only mechanical processing (blending, crushing and screening) prior to haulage by road train to the railway at Tennant Creek. Stage 1 is currently projected to last approximately 10 years, and involve a workforce of 50 to 120 staff based at the mine-site, plus up to 180 drivers and support staff for the road haulage operations, based near Tennant Creek. Vegetation clearing required for the Project will be in the order of 2326 hectares (ha) (approximately 23km²) of which 596 ha will become legacy pits of varying depths, and between 713 and 1376 ha will become waste rock storages, depending on the degree of pit backfilling. Waste Rock Storages will be up to 20m high.

Stage 2, if pursued, would involve an expansion of the mining and processing operations to develop the lower grade ore, and may extend operations beyond the current Mineral Lease. Stage 2 would be the subject of a separate *Notice of Intent* and assessment process when a decision is made by Minemakers to proceed with this development.

Major Issues

The major issues associated with the proposal are:

- The proposed clearing of 2326 ha of native vegetation, with associated issues including:
 - Loss of biodiversity and local abundance of flora / fauna;
 - Topsoil loss and degradation, including reduced viability of the contained seed bank, reducing potential for re-establishment of native flora and fauna;
 - Potential for introduction and spread of weeds and feral animals;
 - Greenhouse gas emissions;
 - Dust generation in a hot, dry, windy environment;
 - Revegetation challenges in a semi-arid environment;
- Positive and negative socio-economic impacts to the region;
- Impacts of the road haulage operation upon road safety, road condition, local fauna, and greenhouse gas emissions.
- Potential for effects on groundwater reserves from bore-water extraction for the mine; and
- Legacy landscape of the mine, and loss of amenity and land values to traditional owners.

Conclusions

The Minemakers draft EIS and Supplement demonstrated a systematic, comprehensive, high quality approach to impact identification, analysis, reduction, mitigation (and in some cases offsets), that have generally left stakeholders and government satisfied that potential issues have been appropriately identified and addressed. It is now critical to the achievement of acceptable environmental outcomes that the mitigation measures and commitments / recommendations proposed by Minemakers and this assessment report are followed through to implementation.

Based on its review of the draft EIS, Supplement and responses submitted to the assessment process, the Environment Heritage and Arts (EHA) Division of the Department of Natural Resources, Environment, the Arts and Sport (DNRETAS) considers that the project can be managed without unacceptable environmental impacts. This is provided that the project as proposed, including all proposed management mechanisms, environmental commitments and recommendations detailed in the draft EIS, the Supplement, this Assessment Report and in the final management plans, are implemented and managed under the Mining Management Plan for the Project, and are subject to regular reporting and compliance auditing to the Department of Resources.

List of Recommendations

Recommendations are not stand alone statements, and this summary should be interpreted in the context of the associated sections in the main body of this assessment report, and with reference to information, proposed management of issues and commitments already presented in the draft EIS and the Supplement.

Recommendation 1

Minemakers shall ensure that the proposal is implemented in accordance with the proposed environmental management measures, environmental commitments and safeguards identified in the Wonarah Phosphate Project Draft Environmental Impact Statement, Supplement, and in this Assessment Report (No. 64).

All safeguards, mitigation measures, and commitments outlined in the draft Environmental Impact Statement and Supplement are considered as commitments of Minemakers and are to be incorporated into the Mining Management Plan.

Recommendation 2

Minemakers 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

Minemakers shall continue to refine the mine plan and sequencing over the mine life to identify potential increases in backfilling and commit to backfilling where possible.

Minemakers shall demonstrate maximisation of backfilling by providing detail of developments of the mine plan and sequencing, to be reported into the Mining Management Plan for the Project.

Recommendation 4

Minemakers shall explore options to create natural profiles to the legacy waste rock storages and pits, to maximise visual amenity of legacy mine landscape.

Consultation with a landscape designer is recommended.

Creation of a 3-dimensional model of the proposed legacy landscape is recommended, to facilitate consultation discussions of legacy landscape profiles.

Recommendation 5

Minemakers shall continue to consult with the Central Land Council and traditional owners to fully account for and minimise to the greatest extent possible all negative environmental legacies and loss of amenity from the Project to current and future generations of traditional owners.

The results of consultations shall be incorporated into mine closure and rehabilitation planning, and the Mining Management Plan for the Project.

Recommendation 6

Minemakers shall establish an on-site nursery, to optimise practical revegetation logistics and Project rehabilitation trials, and to facilitate Indigenous

employment. Details shall be presented in the Mining Management Plan for the project.

Recommendation 7

Minemakers shall create an auditable plan and timeline for rehabilitation trials, including seed bank investigations and testing of seed viability, for inclusion into the Mining Management Plan for the project.

Recommendation 8

Minemakers shall follow the Guidelines:

- ☐ *Native seed storage for revegetation* (Florabank, 2010), with regard to storage of seed; and
- ☐ *Weed Management on Mine Sites* (DoR, 2010) with regard to weed management planning.

Recommendation 9

Minemakers shall establish Best Practice treatments to prevent erosion and control drainage of Waste Rock Storage slopes, appropriate to the semi arid environment. These shall be included in the Mining Management Plan for the Project.

Recommendation 10

As a component of rehabilitation trials, Minemakers shall analyse whether topsoil seed banks to be applied to surfaces particularly vulnerable to erosion, such as Waste Rock Storage slopes, contain sufficient appropriate seed types to provide a quick stabilising role to protect topsoil and underlying soil profiles from erosion from the first heavy Wet season rains.

Minemakers shall propose in the Mining Management Plan, contingency stabilising rehabilitation works to be applied in the absence of sufficient species being present within seed banks to stabilize soil profiles.

Recommendation 11

Minemakers shall develop the Erosion and Sediment Control Plan (ESCP) for the Project in consultation with the Land Management Unit of DNRETAS (as per Section 4.7.4 of the Supplement), prior to inclusion of the ESCP into the Mining Management Plan.

Recommendation 12

Minemakers shall be aware of potential necessity for a rehabilitation, revegetation and monitoring program spanning a number of decades to meet all post-closure outcomes agreed to in Minemakers consultations with traditional owners. Calculation of environmental securities should reflect potential long-term requirements for monitoring and maintenance.

Recommendation 13

Minemakers shall present details of the proposed timing and frequency of routine surveys for near threatened and data deficient flora species in the Mining Management Plan.

Recommendation 14

Minemakers shall develop appropriate survey schedules for flora species of conservation significance, including data deficient species, in consultation with the threatened species officer and Herbarium DNRETAS. Details shall be provided in the Mining Management Plan for the Project.

Pre-clearance procedures shall be developed for threatened and data deficient flora species in consultation with the Herbarium DNRETAS.

Recommendation 15

Minemakers shall undertake regional and seasonal studies of data deficient flora species which may be present on-site, to better understand their regional / seasonal context within the Project Area.

Survey results shall be included in the MMP, and supplied to Biodiversity Conservation DNRETAS in appropriate digital format.

Recommendation 16

Minemakers shall explore potential for minimising (such as overlapping) statutory and non-statutory vegetation clearing corridors required for the various utilities to be placed beside proposed roads.

Prompt revegetation of corridors shall occur where continued vegetation clearance is not required.

Recommendation 17

Minemakers shall revise proposed standard operating procedures for management of fauna road-strikes to fully address animal-welfare and safety objectives, including:

- ☐ Risk of leaving large animal carcasses on the road, which presents risks of causing further accidents for other road users, particularly at night, on un-lit highways.
- ☐ Risk of attracting scavenger fauna, such as eagles, and kites onto the highways risking further fauna strikes, and further accidents for other road users.
- ☐ Avoiding preventable fauna deaths by providing effective procedures for rescue of injured wildlife, and /or recovery and care of orphaned wildlife that may still be present in the pouch of a freshly killed or injured parent.

Recommendation 18

Minemakers shall inspect all vehicles, equipment, goods and machinery transported from Northern Queensland on entry to the mine-site to ensure no mosquito larvae are present in any open reservoirs or pockets containing water.

Any mosquitoes found breeding in transported machinery etc. shall be sent to Medical Entomology, Department of Health and Families for identification. The water holding receptacle is to be subsequently treated with a 10% chlorine solution or residual insecticide such as lambda-cyhalothrin.

Recommendation 19:

Minemakers shall continue to seriously consider measures to reduce greenhouse gas emissions from the Project through identification of further opportunities to improve energy efficiency and utilise alternative, lower emission energy options.

Minemakers shall consult with DNRETAS on opportunities to offset greenhouse gas emissions in the Northern Territory.

Recommendation 20

Minemakers shall identify measureable auditable outcomes for the Industry Participation Plan (IPP), and include these in the Mining Management Plan for the Project.

Recommendation 21

Minemakers shall formulate a traffic management plan, identifying risks, potential scenarios, monitoring and contingency management measures to be applied.

Minemakers shall consult with Road Network Division, Department of Lands and Planning to resolve any road related issues associated with the project. Consultation should clarify appropriate:

- ☐ Procedures for responding to significant traffic incidents;
- ☐ Procedures for reporting of significant incidents;
- ☐ Detail for the Traffic Awareness Program, prior to its delivery to members of Indigenous communities;
- ☐ Liability for repairs or preventative maintenance of road degradation;
- ☐ Requirements for, and design of any upgrades of road infrastructure, such as lighting of intersections;
- ☐ Safe interaction of the haul trucks with tourist traffic, such as slower vehicles towing caravans, or vehicles wishing to overtake;
- ☐ Management of driver fatigue and distraction; and
- ☐ Any other road or traffic related issues for the Project.

Minemakers shall include the Traffic Management Plan in the Mining Management Plan for the Project.

Recommendation 22

Minemakers shall include a commitment to maintaining groundwater quality, and include details of the groundwater monitoring program in the Mining Management Plan for the Project.

Minemakers shall commit to ongoing evaluation of groundwater quality and depth data, and verification / refinement of the existing groundwater model for the Project area.

Recommendation 23

Minemakers shall prepare a formal biennial report and review the groundwater monitoring program every two years with particular consideration to the comparison of modeled and observed data. The report shall be included as part of the Mining Management Plan and forwarded to Water Resources DNRETAS. The report shall include as a minimum: monitoring data, data analysis and updates of model predictions of drawdown and recharge.

Recommendation 24

If groundwater extraction impacts on other groundwater users, Minemakers shall provide another water supply by one or more of the following:

- ☐ Deepening existing bores
- ☐ Providing additional bores
- ☐ Determining a new area suitable for groundwater extraction
- ☐ Trucking adequate water supplies to affected parties
- ☐ Piping adequate water from its bores to a location required by affected bore user

Recommendation 25

Minemakers shall investigate opportunities to maximise the efficient use of water on site including reusing treated effluent; minimising sources of dust generation to reduce requirements for dust suppression; and using any stored water in pits as a seasonal supplement. Proposed measures are to be included in the Mining Management Plan for the Project.

Recommendation 26

Minemakers shall report to the Department of Resources all incidents of overtopping of sediment ponds and release of water.

Water quality of discharge water shall be monitored, and reported. Discharges from water holding structures travelling off the Mining Lease may potentially require a waste discharge licence, and must be reported to Environmental Operations section of DNRETAS, and to the Department of Resources.

1 Introduction and Background

This report assesses the environmental impact of the Wonarah Phosphate Project (the Project) by Minemakers Australia Pty Ltd (Minemakers), who propose to mine two adjacent phosphate deposits, 'Arruwurra' and 'Main Zone', in the Barkly Tableland (Appendix 1: Fig.1). Resource for the Project is estimated to be at least 399 Mt of 21% Phosphorite¹ (P₂O₅).

The Project is planned to be developed over two discrete stages. Stage 1 would mine the deposits for Direct Shipping Ore (DSO), which is of a quality that requires minimal processing to meet market requirements. The phosphate ore would be transported by road to Tennant Creek and then transported by rail to the Port of Darwin. Mining during Stage 1 is projected to occur for at least ten years, and commence in mid 2010.

Stage 2 of the project involves the expansion of mining and processing operation to treat the lower grade ore, and will be subject to a separate *Notice of Intent* and environmental assessment.

This Environmental Assessment Report is based on a review of the Draft EIS, Supplement and comments submitted as part of the EIS assessment process. The Draft EIS, Supplement and other assessment documents can be viewed on the DNRETAS website at: <http://www.nt.gov.au/nreta/environment/assessment/register/wonarah/>

1.1 Environmental Impact Assessment Process

One of the major objectives of environmental impact assessment is to fully define those elements of the environment that may be affected by a proposed development and to determine the significance, risks and consequences of the potential impacts of the proposal. The potential impacts are considered at both local and regional levels.

This Assessment Report evaluates the adequacy of undertakings and environmental safeguards proposed by the proponent to avoid or mitigate the risks of potential impacts identified in the assessment process. The safeguards may be implemented at various levels within the planning framework of a project and include:

- Design and layout of buildings and other infrastructure on the site/s;
- Management of construction activities;
- Management of processes used in operations of the facility (e.g. inputs and outputs); and
- Design, management, monitoring and implementation of rehabilitation and closure plans.

A list of commitments made by the proponent in the Draft EIS and Supplement is provided in *Appendix 2 – Table of Voluntary Commitments*. Additional safeguards are recommended in this Assessment Report where appropriate.

¹ 'Phosphorite', 'phosphate rock' or 'rock phosphate' is a non-detrital sedimentary rock which contains high amounts of phosphate bearing minerals. The phosphate content of phosphorite is at least 20% which is a large enrichment over the typical sedimentary rock content of less than 0.2% (www.wikipedia.org_ accessed 18 April 2010). The phosphate is present in the form of phosphorus pentoxide (P₂O₅).

1.2 Regulatory Framework

This environmental assessment was undertaken in accordance with the requirements of the Northern Territory *Environmental Assessment Act (1982)*. The project was referred for assessment under the Australian *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and was determined to not be a controlled action. The Bilateral agreement therefore does not apply to the assessment process for this Project. The contents of this Assessment Report form the basis of advice to the NT Minister for Natural Resources, Environment and Heritage (the Minister) on the environmental issues associated with the project, and informs the decision as to whether or not the project should proceed, and if it is to proceed, with what conditions. The Minister is required to make comment and/or recommendations with regard to the proposal to the Minister for Primary Industry, Fisheries and Resources (the Responsible Minister).

The Responsible Minister will then make a determination as to whether or not an 'Authorisation to Operate' will be issued to Minemakers, to operate the Wonarah Phosphate Project under the *Mining Management Act 1990*. Preceding authorisation under this Act, the proponent must submit a Mining Management Plan (MMP), which is the principal administrative document for the management of mine sites and can incorporate environmental conditions created through the environmental approval process. A number of environmental management plans (EMPs) prepared by the proponent will be included as part of the MMP.

Minemakers has chosen to consult with the traditional owners of the project area and surrounds through the Central Land Council (CLC)².

1.3 Environmental Impact Assessment History

On 10 March 2009, Minemakers submitted a Notice of Intent (NOI) (Coffey, 2009a) for the Project to the Department of Resources (as the Department of Regional Development, Primary Industry, Fisheries and Resources). The NOI was referred to the EHA Division on 17 March 2009, for assessment under the *Environmental Assessment Act*. On 5 May 2009, the Minister determined the project required formal assessment at the EIS level. On 21 May 2009 advice was received from the Australian Government that the project was not a controlled action under the EPBC Act and draft EIS Guidelines were prepared. The draft Guidelines were advertised on 16 June 2009 and underwent a two week public exhibition period. Final EIS Guidelines (DNRETAS, 2009) were issued to the proponent on 11 July 2009.

Minemakers submitted the Draft EIS (Coffey, 2009b) for the Project to NT Government and distributed it for public exhibition from 21 Nov 2009 to 21 Dec 2009. The Supplement (Coffey, 2010) was lodged with the EHA Division (of DNRETAS) on 22 March 2010. The Supplement was circulated amongst Government agencies for comment until 1 April 2010. The EHA Division has summarised findings of the environmental assessment process in this Assessment Report, and provided the report to the Minister. The Minister is required under the NT *Environmental Assessment Administrative Procedures (1984)* to issue final advice and recommendations on the Project to the Responsible Minister by 26 April 2010, being 35 days after receipt of the Supplement.

² The Barkly Highway represents the border of jurisdiction between the Northern Land Council (to the North) and the Central Land Council (to the south). The Project has components to the north (northern borefields) and south (mining operations) of the Barkly Highway, with the main operations to the south. For clarity, interests of traditional owners in the area of the mine would be best served consulting through a single representative body, rather than two. The Central Land Council was selected.

2 The Proposal

2.1 The Proponent

Minemakers is an Australian company and has been listed on the Australian Stock Exchange (ASX) since October 2006 (ASX code: MAK). Along with the Wonarah Phosphate Project, the company owns, or has options over, mineral projects and prospects located in the Northern Territory, Tasmania, Western Australia and Namibia.

2.2 Historical mining activities

The Wonarah phosphate deposit was originally identified in 1967 by the North American industrial minerals and chemicals group, IMC Development Corporation (IMC). Between 1967 and 1970, IMC conducted regional mapping, geophysical drilling and testing activities and described a resource of 307 Mt at 18.98% P₂O₅. During the mid-1980s, CRA Exploration Pty Ltd carried out further exploration activities to the south of the Wonarah deposit, however, they withdrew their interest in the deposit due to low phosphate prices and lack of infrastructure in central Australia at the time.

The project was acquired by AKD Limited (currently Indo Mines Limited) in 1998 from Rare Earths and Minerals Pty Ltd and Pilbara Chemical Corporation NL who had applied for licences over the area in 1997. The exploration leases within which the Wonarah deposit lies were granted to Indo Mines Limited and to a joint venture between Indo Mines Limited and Rio Tinto in 1998 and 2000, respectively. During the joint venture, lasting from March 1999 to December 2002, Rio Tinto, as manager and operator of the tenements, continued exploration activities. The joint venture ended after a prefeasibility study in January 2000 recommended that Rio Tinto not proceed with development of the project.

The current Substitute Exploration Lease SEL26452 is a consolidation of former Exploration Licences EL9976, EL22168, EL24562 and EL26394. Minemakers purchased these leases from Indo Mines Limited in October 2006. The consolidated SEL26452 was registered in September 2007.

2.3 Project description

Stage 1 of the project will involve the mining of DSO from up to 23 open pits (four in the Arruwurra deposit and up to 19 in the Main Zone, two mobile crushing and screening plants and associated mine infrastructure (Appendix 2: Figures 2, 3 and 4). The cut-off grade for DSO is at least 30% P₂O₅ and the location of the open pits reflects the areas of the deposit containing the highest proportion of DSO.

Based on currently defined resources Stage 1 has a mine life of around 10 years and will produce approximately 19.9 Mt of DSO; however, exploration currently underway may extend the mine life even further. The ore will initially be mined at a rate of 0.5 Mt/yr, increasing to 3 Mt/yr after about two and a half years.

The Arruwurra and Main Zone deposits will be developed using conventional shallow open pit and strip mining methods, which will allow, to varying extents, for progressive rehabilitation of some disturbed areas to occur. A number of pits will be operated concurrently to allow blending of ore types to achieve optimum blends for market requirements. Pits will be between 10 and 30 m deep in the Arruwurra deposit and between 20 and 60 m deep in the Main Zone deposit.

The phosphate produced at the mine will be transported by road to Global Port Solutions multiuser hub north of Tennant Creek, and then transported by rail to the Port

of Darwin, where it will be stored in a shed and then loaded onto ship for export. The construction and operation of these two purpose-built facilities will be approved separately to the mine development and are outside the scope of this EIS and assessment.

Table 1. Summary of Wonarah Phosphate Project

Item		Description
Project location		240 km east of Tennant Creek, Northern Territory
Mineral Lease		ML27244, 10 846 ha in size
Project footprint (excluding support infrastructure, i.e., road haulage worker accommodation village at multi-user hub)		2325.6 ha
Mining method		Shallow open pit and strip mining methods
Mining inventory	Arruwurra deposit	2.6 Mt
	Main Zone deposit	17.3 Mt
	Total	19.9 Mt
Mine life		10 years, commencing in Q2 2010
Mining rate		0.5 Mt/yr initially, building to 3 Mt/yr after 2.5 years
Processing method		Conventional crushing and screening
Crushing and screening throughput		Initial capacity of each crushing and screening plant will be 0.5 Mt/yr , will be expanded over mine life to meet marketing and mining requirements
Operating hours		Continuous operation, 24 hours per day, 7 days per week
Power source		Dual fuel power station on site
Power requirement		4 MW
Raw water source		Groundwater (northern borefield)
Raw water requirement		Average 7.7 ML/d, peak 9.6 ML/d
Accommodation on site		120 persons
Employees at 3 Mt/yr production	Mining	Construction: 50 to 100 people Operations: approximately 120 positions (Minemakers and contractors) Nominal two weeks on, one week off fly-in, fly-out (FIFO) roster. FIFO will be from the aerodrome at the mine site to respective home cities.
	Road Haulage	Operations: 180 positions Nominal two weeks on, one week off fly-in, fly-out (FIFO) roster. FIFO will be from the Tennant Creek Airport to respective home cities.
Capital expenditure		\$107 million

2.4 Mining method and treatment of ore

Mined ore will be transported via haul trucks to the Run of Mine (ROM) stockpile adjacent to each of the mobile crushing and screening plants located at Arruwurra and Main Zone. Non-DSO stockpiles will store lower-grade material adjacent to each pit for later treatment as part of Stage 2. If Stage 2 does not proceed, these stockpiles will be rehabilitated as part of the waste rock stockpiles.

Treatment of ore for the project will be a simple process and no chemicals will be involved. A primary crusher will reduce the size of the ore to 75 mm; the crushed product will be screened and then fed into a secondary crusher to reduce the size of the ore to less than 2 mm. Once ore has passed through the crushing and screening process, it will be stockpiled ready to be transported to market.

Blending will occur by mixing material from two or more different mining faces within a single pit or from different pits. Blending may be for phosphate grade but could also be to reduce the level of deleterious elements such as Iron and Aluminium, which have a negative impact on downstream processing and therefore attract a penalty from buyers.

Geochemical characterisation testwork has shown that waste rock and ore material will not generate acid rock drainage. No special waste rock management measures are therefore required for the waste rock storages or non-DSO stockpiles.

Elevated radiation levels are sometimes associated with phosphate rock deposits. Results of testwork demonstrate that uranium is present at background levels only, usually less than 20 ppm, and up to a maximum of 75 ppm. The EIS states that this is typical for normal weathered and leached sedimentary rocks.

2.5 Project Water Use and Management

Peak water requirements are anticipated to approximate 9.6 ML/d for all purposes including dust suppression and potable water for domestic use. Total water demand during construction is estimated to peak at 15 L/s during the final phase of construction. Water will be required during the operational phase of the project for dust suppression on roads and mining areas, water for the crushing and screening plant operations and potable water demand. Peak water demand during the operational phase, while construction continues to be completed, is estimated to be 67 L/s. Once construction is complete, operational water demand is expected to vary between 60 L/s during the Dry season and 32 L/s in the Wet season.

A borefield to the north of the Mineral Lease will provide the long-term raw water supply to the project via a 30 km pipeline. While the northern borefield is being constructed (approximately three months), raw water will be sourced from a borefield located at Arruwurra. Modeling of the northern borefield suggests that by using the combined production of the borefield an overall production rate of 75 L/s over the 10 year mine life is readily achievable.

Treating borewater in a reverse osmosis plant will produce potable water. The potable water will be reticulated to the crushing and screening plants, administration offices, contractors' offices and workshops and the accommodation village. Water storage will comprise a main tank of approximately 20,000 L capacity and a 0.5 ML water pond.

Project design and ongoing water management methods have been based on the principals of minimising water consumption and maximising water recycling. Site water management will include a combination of flood protection berms, sediment basins, drains and oily water separators to protect the downstream fauna and habitats from impacts from mining activities and to protect mine infrastructure and operations from flooding, particularly at Arruwurra.

2.6 Infrastructure

The main features of infrastructure to be developed for the project can be summarised as:

- A 4 MW power station fuelled by diesel (and potentially natural gas).
- Northern borefield. (initially borefield will be located at Arruwurra).
- A reverse osmosis plant for potable water treatment at a rate of approximately 27 kL/d.
- A sewage treatment plant located northeast of the accommodation village for domestic wastewater treatment.
- An office complex comprising site reception, administration, technical services, meeting and training rooms will be located adjacent to the site access road.
- A permanent accommodation village will be constructed to accommodate approximately 120 workers.
- An aerodrome will be constructed southwest of the accommodation village.
- A designated waste landfill for disposal of putrescible and domestic waste.

2.7 Road Access and Transport

Mineral Lease road access and transport will be by:

- A new all-weather (unsealed), heavy-vehicle road from the Barkly Highway.
- Site roads to provide access to project infrastructure components within the Mineral Lease.
- Haul roads to connect each pit to the nearest ROM stockpile and workshop and office areas.
- Ore will be transported by road trains from the Mineral Lease via the Barkly and Stuart Highways to the multi-user hub located outside and north of Tennant Creek. Transport of ore will be carried out 24 hours per day, 365 days per year. Truck movements will gradually increase from 32 round trips per day at 1 Mt/yr to 91 round trips per day at 3 Mt/yr; this equates to approximately one truck every 46 minutes increasing to one truck every 16 minutes (in one direction).

2.8 Workforce and Accommodation

Minemakers will preferentially employ local people during the construction and operation of the project. The construction workforce will peak at about 100 people, who will be initially housed in the existing exploration camp. The operations workforce will peak at approximately 120 people, who will be housed in the accommodation village on site. Most contractors and employees will travel to site by charter aircraft.

The road haulage workforce will peak at approximately 180 people. An accommodation village will be constructed by the haulage contractor close to the multi-user hub outside and north of Tennant Creek to accommodate the road haulage workforce; this infrastructure component is outside the scope of this EIS.

3 Regional Setting

3.1 Physical

The physical setting of the project can be characterised as relatively flat, open grasslands / woodland which are common across the Barkly Tableland.

The landform of the project area has a general low relief, although small rocky outcrops are locally common. Across the Barkly Tableland there is generally only a very gentle relief, which varies less than 50 m in elevation from the highest to lowest point.

Soils within the project area have been classified into four major soil classifications: Kandosols, Vertosols, Calcarosols and Rudosols. Kandosols and Rudosols dominate the sand plains within the project area, while Vertosols and Calcarosols are restricted to areas subject to inundation such as ephemeral lakes and calcareous plains, respectively.

3.1.1 Hydrological Setting

The project area is located in a semi-arid environment where evaporation far exceeds rainfall. The majority of rainfall in the Barkly Tableland region falls during January and February, with the mean annual rainfall average around 360 mm. Tropical cyclones can bring heavy rains to the Barkly region; but are erratic and relatively infrequent.

No significant watercourses traverse the project area, with the closest watercourses being the ephemeral Ranken River approximately 60 km to the east and ephemeral Playford River 87 km to the north. The drainage in the project area flows to several large shallow lakes, very few of which are permanent; however, some lakes are known to retain water for extended periods after rain. Seasonally flooded swamps occur in the southwest of the project site, around Arruwurra.

Groundwater offers the only source of reliable water within the region, with the main aquifers on the Barkly Tableland comprising cavernous zones that are commonly weathered and fractured, within calcareous units of the Wonarah Formation and Camooweal Dolomite. Groundwater recharge is predominantly from rainfall infiltration. Groundwater quality over the tableland is generally fresh to brackish and groundwater levels in the region are extremely variable, ranging from about 25 to over 100 m below ground level. Groundwater levels at the Mineral Lease vary from 3 to 63 m.

3.2 Biological

3.2.1 Flora

The distribution and composition of vegetation within the project area is influenced by soil types. Field surveys identified five vegetation communities within the project area:

1. Sand plains supporting Eucalyptus and Acacia open woodland over hummock grassland.
2. Black soil and clay pans supporting coolibah low open woodland over grassland.
3. Calcareous plains supporting supplejack low open woodland over open grassland.
4. Ephemeral lakes supporting coolibah low open woodland over grassland.
5. Rocky rises supporting Acacia and mallee shrubland over hummock grassland.

The project lies within the Davenport Murchinson Ranges bioregion; the vegetation communities listed above are widespread and common across this bioregion.

None of the vegetation communities present in the project area are listed under the EPBC Act or the *Territory Parks and Wildlife Conservation Act* (TPWC Act). Of the 144 flora species recorded in the project area none are listed under the EPBC Act. However, 13 flora species listed under the TPWC Act have been recorded in the region, with 4 of these being recorded in the project area: two near threatened species, *Bergia barklyana* and *Hibiscus brachychlaenus*; and two data deficient species, *Distichostem barklyanus* and *Heliotropium pulvinum*. Forty-four flora species of Indigenous utilitarian, cultural or mythical significance were recorded during the field surveys.

One record of *Sporobolus latzii* is listed in the NT Parks and Wildlife Flora Atlas within an Indigenous cultural exclusion zone adjoining the Mineral Lease. This is the only known collection site of this species in Australia. Although targeted searches for this species were performed as part of the field surveys no specimens were identified.

No weed species listed under the Northern Territory *Weeds Management Act* 2001 have been identified in the Mineral Lease. However, two environmental weed species, *Cenchrus ciliaris* (buffel grass) and *Aerva javanica* (kapok bush) were recorded during the field surveys.

3.2.2 Fauna

The NT Parks and Wildlife Fauna Atlas identifies 163 species within the project area and surrounds. Twelve of these species are listed under the EPBC Act and eight are listed under the TPWC Act. Two species (both listed under TPWC Act as near threatened) have been recorded in the project area, *Rattus villosissimus* (long haired rat) and *Aspidites ramsayi* (woma python). Two species of conservation significance were recorded during the field surveys, *Ardeotis Australia* (Australian bustard) (listed as vulnerable under the TPWC Act) and *Onychogalea unguifera* (northern nail-tailed wallaby) (listed as near threatened under the TPWC Act). The field surveys identified no habitats of listed ecological importance.

No species listed under the EPBC Act were recorded during the field surveys, despite targeted searches for such species. An ephemeral lake is located approximately 15 km to the northwest of the Arruwurra deposit within an Indigenous cultural exclusion zone, and may offer suitable habitat for EPBC Act-listed migratory birds during periods of high rainfall. The lack of suitable ephemeral waterbodies within the project area makes the ongoing presence of these species unlikely.

Traditional owners identified local fauna of cultural significance for their utilitarian values. Larger fauna species such as kangaroo, Australian bustard, sand goanna and other large dragons are still hunted by the traditional owners. Ephemeral lakes within cultural exclusion zones are considered an important hunting ground as they provide seasonal refuge to larger species. Traditional owners consulted during field surveys identified no species of mythical significance.

Five introduced fauna were recorded within the project area during field surveys: camels, cattle, donkeys, cats and foxes. Cats and foxes are likely to be in low abundance in the area.

3.3 Socio-economic

The socioeconomic setting of the region can be characterised as being sparsely populated, remote and heavily dependant on Tennant Creek and Mount Isa for services and employment. Within the project area there are no residents or existing infrastructure, apart from a Minemakers exploration camp in the main zone.

The closest populated community to the project is Wunara, a small Aboriginal settlement located approximately 10 km from the Mineral Lease boundary, adjacent to the Barkly Highway. The population residing in the community fluctuates from two to 30 people according to the season. Members of the Wunara Community are traditional owners of the land subject to the Mineral Lease. The project is also surrounded by a number of pastoral properties.

Traditional owners use the Mineral Lease and surrounds for hunting and gathering and for accessing culturally significant sites. While the Mineral Lease area is suitable for grazing beef cattle, no pastoral activities currently occur on the land. The borefield area to the north of the Barkly Highway is used for grazing beef cattle.

3.4 Cultural/Historical

The project area is located within the region associated with the Arruwurra people. The project area and surrounds are known to contain sites of mythological and archaeological significance. Through the CLC, in consultation with traditional owners, six sacred sites were identified close to the Mineral Lease. These sites have consequently been incorporated into the Indigenous cultural exclusion zones and are located outside of the Mineral Lease; no infrastructure or activities related to the project will occur in these areas. A search of the Aboriginal Areas Protection Authority (AAPA) Heritage Database identified two registered sites to the north of the Barkly Highway.

An archaeological survey identified six low density silcrete knapping areas across the Mineral Lease. Of these, one (lying outside of the Mineral Lease) is of moderate scientific significance and the remaining five (four of which are inside the Mineral Lease) are of low scientific significance.

A search of the Australian Heritage Database and the NT Heritage Register identified no sites of non-Indigenous cultural heritage within the project area.

4 Environmental Impact Assessment

4.1 Introduction

The main purpose of this Assessment Report is to identify the potential environmental risks and impacts associated with the proposed project, and evaluate the environmental protection measures proposed to mitigate those risks/impacts, to determine whether the proposal can proceed without unacceptable environmental impacts. Based on this analysis, this Assessment Report provides recommendations to inform decision-making by the proponent and government regulators to ensure that the proposal can proceed in an environmentally acceptable manner.

The environmental acceptability of the project is based on the following considerations:

- 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, legacy issues);
- Adequacy of information on the range and extent of potential impacts; and
- Adequacy of the proposed safeguards to avoid or mitigate unacceptable environmental impacts.

The Draft EIS and Supplement (to the EIS) together constitute the EIS. The EIS described in detail the Proposed Project, its setting / existing environment; its potential for impacts and hazards and proposed management of these; mine closure and rehabilitation, and public consultations.

Eleven submissions on the Draft EIS were received from government agencies, the Northern Land Council and Environment Centre NT. No submissions were received from the general public.

Minemakers then submitted a Supplement to the EIS containing responses to comments made on the Draft EIS. The EHA Division sought further feedback from commenters as to whether Minemakers had adequately addressed the concerns they had raised. Comments submitted in response to the Supplement identified residual concerns with the Project. Discussions which follow will focus primarily on residual concerns (Section 4.3).

The Minemakers EIS demonstrated a systematic, comprehensive approach to impact identification, analysis, reduction, mitigation, and in some cases offsets, that have generally left stakeholders and government satisfied that potential issues have been appropriately identified and addressed.

The outcome of the environmental impact assessment for this proposal is that the EHA Division concludes that the project can proceed without unacceptable environmental impacts where the operation proceeds according to the recommendations of this Assessment Report.

Subject to decisions that permit the project to proceed, the primary recommendation of this assessment is:

Recommendation 1

Minemakers shall ensure that the proposal is implemented in accordance with the proposed environmental management measures, environmental commitments and safeguards identified in the Wonarah Phosphate Project Draft Environmental Impact Statement, Supplement, and in this Assessment Report (No. 64).

All safeguards, mitigation measures, and commitments outlined in the draft Environmental Impact Statement and Supplement are considered as commitments of Minemakers and are to be incorporated into the Mining Management Plan.

Recommendation 2

Minemakers 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.

4.2 Summary of Issues

4.2.1 Main Impacts from the Project

The major issues for the Wonarah Phosphate Project include:

- The environmental impacts of clearing 2326 hectares of native vegetation, and alteration of topography to include multiple pits and high waste rock storages up to 20m high. Potential exists for impacts upon:
 - Flora and fauna, included threatened and data deficient species, habitats and ecosystems;
 - Erosion and sediments;
 - Surface water drainage patterns and downstream water quality;
 - Groundwater levels;
 - Dust levels and air quality;
 - Greenhouse gas emissions;
 - Fire regimes;
 - Visual amenity of the site;
 - Traditional owners' access, uses and values of the site, whether for hunting / collecting, cultural practices, use of sacred sites, etc;
 - Weeds, feral animals, cane-toads, flies and mosquitoes numbers on-site.
- Transporting of up to 3Mt/yr of Phosphate ore by road to Tennant Creek, averaging up to a road train passing in either direction approximately every 8 minutes, 24 hrs /day, 365 days/yr. Potential exists for impacts en-route upon:
 - Road surfaces and road infrastructure;
 - Traffic levels, highway speeds and other road users;
 - Frequency / severity of traffic accidents;

- Roadside residents, businesses, campsites for travelers;
- Roadside biodiversity, especially fauna vulnerable to road strikes;
- Tennant Creek township accommodation and businesses;
- Local Indigenous communities and pastoral properties;
- Socio-economic impacts (positive and negative) on local and regional communities, including the Wunara community, Barkly Roadhouse, Tennant Creek township, the Northern Territory, and global phosphate markets. Impacts may include:
 - Employment and business opportunities;
 - Increased population, especially of Fly-in, fly-out (FiFo) workers; and
 - Changes in phosphate availability for fertilizer production, with downstream effects on global agriculture, etc.
- Progressive and post-closure rehabilitation and final landform configuration will impact on post-mining uses and values of the site by traditional owners and others.

4.2.2 Submissions on the Draft Environmental Impact Statement

From the 11 submissions on the Draft EIS, a total of 152 individual issues were raised, ranging from specific technical aspects of the development of the project and its environmental impacts, to broader community issues such as employment and social infrastructure needs.

4.2.3 Supplement Comments

Comments submitted in response to the Supplement indicated residual concerns with regard to issues of:

- Legacy landscape – acceptability to traditional owners of proposed degree of pit backfills, and waste rock storage heights;
- Environmental maintenance and stewardship post-closure – period required;
- Groundwater - implementation and ongoing evaluation of proposed monitoring;
- Alternative energy sources - comparison of costs and benefits to include evaluation of natural gas for on-site power generation;
- Economic multipliers to estimate scale of contribution from the project to the community;
- Road intersection upgrades on the Stuart and Barkly Highways;
- Borrow pits – total area and location;
- Near threatened and data deficient flora species - timing/frequency of surveys;
- Biodiversity offset plan;
- Timing of the Industry participation plan;
- Establishment of various proposed actions as commitments from Minemakers;

4.3 Discussion of Main Issues

4.3.1 *Legacy Landscape*

Pit backfilling

Minemakers stated in the Draft EIS that its intent with mine closure and rehabilitation is to return the land to as close as is reasonably possible to its pre-disturbance condition, suitable for use by traditional owners and as habitat for flora and fauna. Pits are proposed to be backfilled where economically feasible. Final pit voids are proposed to remain as a permanent feature in the landscape, surrounded by constructed abandonment bunds to prevent inadvertent public access. Infrastructure not requested to remain in place by traditional owners will be removed for sale and used elsewhere or disposed of.

The Draft EIS identified that up to 596 ha will be disturbed for pits and between 713 and 1376 ha will be disturbed for waste rock storages depending on the percentage of pits that are backfilled. This contributes up to 1972 ha (approximately 20km²) of the total disturbance area for the project. Legacy Waste Rock Storages and pits would represent up to 85% of the total 2326 ha (approximately 23km²) to be disturbed by the Project, but less than 0.3% of the total land owned by and available to the Arruwurra Aboriginal Corporation (approximately 611 051 ha or 611km²).

Waste Rock storages are proposed to be built to a height of 20m.

While strip mining does typically lend itself to backfilling, Minemakers stated it will still result in large final voids at mine closure.

Minemakers stated in the Draft EIS that the degree of backfilling proposed for each pit is based upon the mining sequence, size and relative locations of pits. The mine plan and schedule currently indicates that up to two thirds of the mine voids will be backfilled. These figures will continue to be refined.

Discussion

Minemakers has committed to backfill where possible, but apparently only within the confines of refinement of its mining schedule, due to costs associated with any rehandling of waste material or transport over large distances. The cost of backfilling all pits (returning all waste rock to pits) has been estimated in the EIS at more than \$250 million, and is considered by Minemakers to not be economically viable. No dollar value is given for the difference between backfilling individual pits nor how 'economic viability' has been determined. Legacy issues, such as loss of intrinsic landscape values for future generations, and potential longer term monitoring and rehabilitation requirements, have not been valued or accounted for by Minemakers in its determinations of 'economic viability'.

All proposed final Waste Rock Storage (WRS) locations are immediately adjacent to pits, so costs of double-handling, rather than long haul distances, are likely to be the key costs Minemakers is avoiding by not committing to return waste rock to pits, post-mining. Partial backfilling or selective filling of some pits post-mining, necessarily involving double-handling of waste rock, has not been discussed.

Sustainable mining practices require proponents to minimise negative legacy footprints of their projects upon landscapes and ecosystems, and include valuation (i.e. costs) of legacy issues in project accounting. Degraded land and ecosystem values, loss of amenity of a mine-site and reduced access will be external costs borne by local environments, communities, traditional owners, and particularly future generations of these groups long after any economic benefits have disappeared. Lack of regulation by

Governments of the time does not excuse proponents from taking full responsibility for the legacy from their projects and minimising costs to future generations, who have not benefited from, or approved the project.

In comments on the Draft EIS, traditional owner representative groups NLC and CLC both requested a greater extent of pit backfilling, to minimise legacy devaluation and loss of amenity of the site. The CLC also suggested WRS heights should be limited to 15m, as has occurred in Tanami mining operations, to minimise impacts on visual amenity of the site. In the Tanami, 15 m was considered the maximum height over which the cultural landscape could still be viewed. Twenty metre heights were considered to hide culturally significant views.

The NT Government generally requires as a minimum that waste rock storage and voids are physically and chemically stable and safe and have a landscape function and vegetation coverage that is resilient, self-sustaining and comparable with the surrounding areas. Minemakers has committed to achieving this. NT Government authorisations generally do not require proponents to backfill waste rock into pits.

Presence of Potentially Acid Forming (PAF) material in waste rock is commonly cited as a reason to prefer in-pit disposal of waste-rock, especially if the in-pit disposal would result in PAF material becoming submerged for the long term under the water table, to slow oxidation processes and production of Acidic and/or Metalliferous Drainage (AMD). No geochemical risk has been identified associated with waste rock or ore from the Wonarah Phosphate Project, nor any potential to contain PAF material or form AMD.

Waste rock storages will be vulnerable to erosion and sediment mobilisation in the short and long term by wind and seasonal rains. A query was raised on the Draft EIS whether soluble phosphate present in the waste rock and mobilised by stormwater runoff could cause downstream nutrient enrichment and eutrophication of waterbodies. Minemakers stated that the form of phosphate present in waste rock is insoluble, and eutrophication of water supplies as a result of rock phosphate entering surface water storages would be highly unlikely.

Minemakers has committed to continue to consult with the CLC, traditional owners and NT Government throughout the life of the mine to determine an appropriate post-mine landform and land use, and to incorporate the results of this consultation into mine closure and rehabilitation planning. Given the suggested costs involved, however, it appears uncertain that Minemakers would agree to significant backfilling of pits where double-handling of waste rock would be required, although optimisation of mine sequencing to maximise backfilling outcomes is a commitment of Minemakers.

The WRS's and pits would presumably be the main aspects of the mine least amenable to being returned to a visual amenity state similar to their pre-mining state. The areas of disturbance are unavoidably large, for example waste rock storages will cover 7-13 km², which explains Minemakers reluctance to consider double-handling of all waste rock. The Barkly Tableland region is characterised by particularly flat, lightly undulating plains, so final contouring of the waste rock storages has high potential to be conspicuous by contrast, such as when viewed from the highway. Incongruous geometric landforms are likely to maximise visual contrast, and loss of visual amenity of the legacy mine landscape. A focus by Minemakers on refining this aspect, to create a relatively natural looking landscape of hills and valleys, rather than engineered shapes and pits, will reduce legacy impacts from the mine, without requiring full return of waste rock to pits. Safe alternatives to steep walled pits surrounded by abandonment bunds should be sought where possible, such as profiling of pit walls to reduce slopes, to a degree in keeping with WRS wall slopes.

The presentation by Minemakers of three dimensional representations of the proposed legacy landscape to traditional owners would provide a basis for a better informed ongoing consultation process and improved outcomes. Consultation with a landscape designer may also be beneficial.

Recommendation 3

Minemakers shall continue to refine the mine plan and sequencing over the mine life to identify potential increases in backfilling and commit to backfilling where possible.

Minemakers shall demonstrate maximisation of backfilling by providing detail of developments of the mine plan and sequencing, to be reported into the Mining Management Plan for the Project.

Recommendation 4

Minemakers shall explore options to create natural profiles to the legacy waste rock storages and pits, to maximise visual amenity of legacy mine landscape.

Consultation with a landscape designer is recommended.

Creation of a 3-dimensional model of the proposed legacy landscape is recommended, to facilitate consultation discussions of legacy landscape profiles.

Recommendation 5

Minemakers shall continue to consult with the Central Land Council and traditional owners to fully account for and minimise to the greatest extent possible all negative environmental legacies and loss of amenity from the Project to current and future generations of traditional owners.

The results of consultations shall be incorporated into mine closure and rehabilitation planning, and the Mining Management Plan for the Project.

Revegetation.

The recovery of vegetation cover, ecosystems and biodiversity post mining will be significant components of the mining legacy that will affect long-term land values and site amenity for current and future generations of traditional owners. A degraded landscape, with weed and feral animal infestations and low biodiversity would represent loss of amenity of the legacy sites to traditional people, who have relationship with, value, utilise and depend on healthy local ecosystems, food webs, individual species and landforms.

Minemakers propose to progressively rehabilitate and revegetate areas no longer required for mining, to maximise chances of revegetation success and minimise rehabilitation bond requirements. Challenges and limitations will apply to revegetating disturbed areas in a semi-arid environment, such as trying to grow a vegetation cover without rain. Multi-faceted challenges for the project will include control of weeds, and maintenance of topsoil, subsoil and seed banks. Fires, animal grazing and erosion have potential to detract from revegetation outcomes.

Average annual rainfall in the region is in the range of 300 to 400 mm, with the majority falling during January and February. The total rainfall recorded at the project area during May 2008 to July 2009 was 280 mm, with over half of this (180 mm) falling during a single event in January 2009. Evaporation for the region exceeds rainfall during all months of the year except January and February.

The Draft EIS notes that the quality and quantity of topsoil available for use in rehabilitation will be a contributing factor in the success of rehabilitation. Procedures

are proposed for stripping, stockpiling, storing, handling and preparing topsoil which aim to minimise the impact on the soil's structural and biological properties. Rehabilitation trials will include investigation of measures to maximise seed bank viability.

The Draft EIS stated that generally soil would be stripped to a depth of 40 cm. This was revised in the Supplement to state that Minemakers would adapt stripping depths to reflect the actual topsoil present in the area to be disturbed, and maximise the amount of topsoil available for rehabilitation. A detailed plan for topsoil removal will be a component of mine planning, which will also prioritise areas where the topsoil is to be used to ensure its most effective use.

Seed collection, in conjunction with relevant data recording will be instigated prior to the disturbance of an area. Seeds of uncommon flora species will be especially targeted for nursery propagation to potentially replace species that fail to reappear from the stockpiled / respread topsoil seed banks, for direct seeding or nursery propagation for later tube stock planting.

Placement of topsoils and flora will be undertaken in consideration of the specific land unit they originate from, to help minimise impacts to biodiversity and species of conservation significance. Revegetation will occur in all areas disturbed by mining, including the slopes of waste rock storages.

Pre-disturbance photos will be taken of all areas that will be cleared, and detail recorded with the photographs to help provide a baseline / benchmark for later comparison to demonstrate when closure criteria have been met.

The mine closure and rehabilitation plan will be regularly reviewed and revised as necessary during the life of the project. A final decommissioning plan will be developed in consultation with regulatory authorities and traditional owners during operations and as part of the closure process.

Discussion

The EHA Division supports Minemakers proposed approach to rehabilitation and revegetation of the Wonarah mine-site. The following comments are offered to assist Minemakers' operation and rehabilitation / revegetation / closure planning.

On-site nursery

On-site nurseries have been reported in rehabilitation literature to have been significant factors in the success of revegetation of mining disturbance in other Australian arid environments. Further factors to success have included fencing, to exclude feral animals, and shade structures against prevailing wind and heat to aid moisture retention.

Ongoing revegetation trials should inform and refine rehabilitation techniques appropriate to the site. Trials could also support re-establishment of rare / uncommon species.

Recommendation 6

Minemakers shall establish an on-site nursery, to optimise practical revegetation logistics and Project rehabilitation trials, and to facilitate Indigenous employment. Details shall be presented in the Mining Management Plan for the project.

Seed Storage

No timeframes or details have been provided regarding the seed bank investigations or testing of seed viability as part of the proposed rehabilitation trials.

Recommendation 7

Minemakers shall create an auditable plan and timeline for rehabilitation trials, including seed bank investigations and testing of seed viability, for inclusion into the Mining Management Plan for the project.

Guidelines with regard to storage of seed to be used in revegetation are available at: *Native seed storage for revegetation*, (Florabank, 2010). Note guidance that seeds from certain native species cannot be stored long-term at room temperature.

Weeds

The Department of Resources, NT Government, has recently released a weed management guidance note: *Weed Management on Mine Sites*, (DoR, 2010) which may assist Minemakers weed management planning.

Recommendation 8

Minemakers shall follow the Guidelines:

- ***Native seed storage for revegetation*** (Florabank, 2010), with regard to storage of seed; and
- ***Weed Management on Mine Sites*** (DoR, 2010) with regard to weed management planning.

Erosion and Sediment Control

Vulnerability of mine structures to erosion by wind and water has implications for the legacy landscape, in terms of loss of topsoil, potential for vegetation cover, sedimentation of drainage lines and gradual reshaping of landforms. Topsoil and drainage lines will be most vulnerable in the first Wet season prior to establishment of vegetation cover. As a limited resource, the maintenance of the position and integrity of transferred topsoil and the protection of drainage structures will be pivotal to revegetation success.

The conceptual diagram of a typical proposed WRS provided in the Supplement indicates sides sloping at 18 degrees. No description is provided of slope treatments to prevent erosion of topsoil by seasonal rains, such as contour ripping, or 'scaloping' (DIR, 2006). No drainage structures are indicated.

The EIS presents an Erosion and Sediment Control Plan, which states that runoff from the WRS's is likely to generate sediment-laden stormwater. Bench widths are proposed to be minimised and inter-bench heights limited on stockpiles to limit sediment generation. Benches will also be back-graded to minimise potential overtopping and gully erosion establishing on slopes. This proposed treatment will assist topsoil retention within bench contours, but will not keep topsoil in place on the 18 degree slopes between benches.

Minemakers has proposed to ensure that all on site works area carried out in accordance with the Northern Territory Government's *Erosion and Sediment Control Guidelines*.

Recommendation 9

Minemakers shall establish Best Practice treatments to prevent erosion and control drainage of Waste Rock Storage slopes, appropriate to the semi arid environment. These shall be included in the Mining Management Plan for the Project.

Recommendation 10

As a component of rehabilitation trials, Minemakers shall analyse whether topsoil seed banks to be applied to surfaces particularly vulnerable to erosion, such as Waste Rock Storage slopes, contain sufficient appropriate seed types to provide a quick stabilising role to protect topsoil and underlying soil profiles from erosion from the first heavy Wet season rains.

Minemakers shall propose in the Mining Management Plan, contingency stabilising rehabilitation works to be applied in the absence of sufficient species being present within seed banks to stabilize soil profiles.

Recommendation 11

Minemakers shall develop the Erosion and Sediment Control Plan (ESCP) for the Project in consultation with the Land Management Unit of DNRETAS (as per Section 4.7.4 of the Supplement), prior to inclusion of the ESCP into the Mining Management Plan.

Monitoring and follow-up

Minemakers states in the Supplement an expectation that environmental maintenance and stewardship will be required for a period of between two to 10 years. After this time, expectation is stated that the landforms of the mine will be physically and chemically stable and the vegetation within the project area will be self-sustaining, thereby no longer requiring intervention.

Comments on the EIS questioned the likelihood of environmental maintenance and stewardship post-closure only being required for 2-10 years. The dry climate and potential difficulties in revegetating the post-mined landscape, may readily require a long-term (e.g. 10-20 + years) post-mining commitment to active rehabilitation effort. A longer commitment is likely to be reflected in the bond requirement for the project, in that a third party would also potentially need to operate over many years to be able to achieve successful rehabilitation / revegetation of the legacy site.

Recommendation 12

Minemakers shall be aware of potential necessity for a rehabilitation, revegetation and monitoring program spanning a number of decades to meet all post-closure outcomes agreed to in Minemakers consultations with traditional owners. Calculation of environmental securities should reflect potential long-term requirements for monitoring and maintenance.

4.3.2 Biodiversity Impacts

Land clearing has been recognised throughout the world as a principal cause of biodiversity loss, and is listed under the *EPBC Act* as a threatening process causing or accelerating biodiversity decline (DNRETAS 2010). The clearing of 2326 ha (approximately 23km²) of native vegetation for the Project will be the principal cause of biodiversity loss due to the Project. Clearing will directly reduce the number of species present locally, and reduce the distribution, dispersal and genetic diversity of species in the region. Abundance of threatened species in the area of disturbance may be reduced, with consequent impacts to populations of threatened species at local, territory or national levels. Clearing will fragment and reduce the area of habitat

available for dependent fauna species. Soil previously covered by vegetation and no longer bound by roots and protected by vegetative matter will be more prone to wind (and water) erosion, leading to loss of topsoil and contained seed bank.

Secondary Project impacts may exacerbate clearing impacts and cause further loss of habitat and species diversity. Secondary impacts include:

- Disturbance and mixing of soil horizons through excavation and/or burying of topsoil layers, removing potential of the seed bank to emerge;
- Introductions and/or spread of weed species within the project area, particularly via the import of seeds or vegetative matter from outside the project area attached by project-related vehicles, machinery and equipment (especially earthmoving equipment).
- Deposition of dust generated during construction and operation of the project, reducing conditions favourable for plant growth;
- Grazing by animals attracted to increased levels of surface water and associated vegetation growth, or to young plants in revegetation areas; and
- Compaction of soils through project related traffic.

Minimising the required area of vegetated land to be cleared is the most direct way of reducing impacts to biodiversity and also the most cost effective way of reducing carbon emissions from the project. Minemakers has committed to minimise the area required for direct land clearing, and to only clear areas immediately prior to their development.

Minemakers have proposed a suite of management measures, monitoring and offsets of flora and fauna impacts, including impacts on threatened species that have generally been accepted as appropriate by relevant government agencies. Residual issues as expressed in comments on the Supplement are discussed below.

Surveys of threatened and data deficient flora species

Minemakers proposed to survey for near threatened and data deficient flora species as part of its routine flora surveys and provide the results of these surveys to DNRETAS. Details on the timing and frequency of these surveys were not presented.

Recommendation 13

Minemakers shall present details of the proposed timing and frequency of routine surveys for near threatened and data deficient flora species in the Mining Management Plan.

Surveys, by design, do not examine every square metre of a tenement, but only a number of representative samples. The surveys cannot be relied on to definitively rule out the presence of rare species on site, especially where historical records have recorded presence of that species on site.

The Draft EIS reported certain species of conservation significance that have been identified on the Arruwurra or Main Zone sites in historical flora surveys, but were not found in the recent site surveys.

The reported plant species of conservation significance that might still be present on the mining lease, according to the above criteria include:

- *Bonomia alatisemina*. Listed as data deficient. A single plant has been recorded in the NT Parks and Wildlife Flora Atlas within Arruwurra deposit. No specimens were recorded during site surveys.

- *Heliotropium ballii*. Listed as data deficient. A search of the NT Parks and Wildlife Flora Atlas identified one record of *H. ballii* just inside of the main zone deposit, alongside the Barkly Highway. No specimens were recorded during site surveys.
- *Heliotropium pulvinum*. Listed as data deficient. The NT Parks and Wildlife Flora Atlas records eight specimens of *H. pulvinum* in the project area surrounds. Records are scattered around the area with the closest record along the Barkly Highway. The March 2009 survey identified specimens within the Acacia shrubland.
- *Triumfetta deserticola*. Listed as data deficient. A single record of *T. deserticola* has been recorded within the proposed Arruwurra pit; however, no plants were recorded as part of the June 2008 or March 2009 surveys.

Data deficient species by nature lack sufficient records and knowledge to be able to adequately determine their conservation status, which may be rare or may be regionally common. Minemakers would benefit from undertaking regional and seasonal studies of data deficient species which have known increased potential to be present on-site in some form (e.g. seed). This will enable understanding of these species' regional context within the Project Area, and facilitate design of appropriate conservation management of these species.

Recommendation 14

Minemakers shall develop appropriate survey schedules for flora species of conservation significance, including data deficient species, in consultation with the threatened species officer and Herbarium DNRETAS. Details shall be provided in the Mining Management Plan for the Project.

Pre-clearance procedures shall be developed for threatened and data deficient flora species in consultation with the Herbarium DNRETAS.

Recommendation 15

Minemakers shall undertake regional and seasonal studies of data deficient flora species which may be present on-site, to better understand their regional / seasonal context within the Project Area.

Survey results shall be included in the MMP, and supplied to Biodiversity Conservation DNRETAS in appropriate digital format.

Minemakers state in the Supplement that it will consult with DNRETAS prior to construction commencing to develop procedures for the relocation of any threatened fauna found during pre vegetation clearance surveys. Commitment is made that suitably experienced and / or qualified staff and / or contractors will conduct all pre-clearing walkovers. These procedures will be documented in the Mining Management Plan.

Access and Haul Road Disturbance Area

The Supplement states that up to a 35m width of cleared vegetation is required to host an 8m wide access or haul road, as well as to allow for statutory clearances for water supply / reticulation and power lines. The 35m width would include shoulders and provision for drainage, and access for service vehicles along the route.

Although relatively minor in comparison to the Project's other clearing requirements, the general principal of minimising vegetation clearing should apply to these clearings for access, as much as to all other required clearing.

Recommendation 16

Minemakers shall explore potential for minimising (such as overlapping) statutory and non-statutory vegetation clearing corridors required for the various utilities to be placed beside proposed roads.

Prompt revegetation of corridors shall occur where continued vegetation clearance is not required.

Fauna road-strikes

With the increased amount of traffic from this project, increases in fauna road strikes will be likely and will need to be monitored to determine whether further action will be required. Mitigation measures have been proposed in the Supplement and are commended for their intent, although refinement is recommended. Minemakers proposes:

- a) A weekly search for road kill along the ore transport route. Any road kill found on the roadway will be dragged at least 10 m off the road, if safe to do so, to minimise the potential for the additional fatality of any carrion eaters and improve safety for all vehicles.
- b) The death of fauna of conservation significance are to be reported to DNRETAS as part of the annual MMP reporting requirements. In addition, records will be maintained that provide the GPS coordinates of the location where the animal was found. Drivers will be provided with basic threatened species identification skills as part of the induction process.
- c) Ensuring that all vehicles contain contact details for the local (Tennant Creek) wildlife rescue organisation and the Project environmental officer. If a collision with an animal occurs that does not result in a fatality, the environmental officer will be immediately contacted.

The proposal for a weekly sweep (measure 'a' above) fails to meet the required animal-welfare and safety objectives of the management measure, these being to:

- Remove risk of further accidents involving other road users, particularly at night, from having a carcass on an un-lit highway.
- Remove the risk of scavenger fauna, such as eagles, and kites, etc. presenting risk to themselves and to road users as they feed on carcasses on the road. (Consultation with Biodiversity Conservation DNRETAS suggested scavenging fauna would likely arrive at a road-kill site by the next morning, after a night-time road-strike.)
- Provide means for rescue of injured wildlife, and / or recovery and care of orphaned wildlife that may still be present in the pouch of a freshly killed or injured parent. Unless a driver stops, gets out of the truck/car and checks an animal immediately after a road accident, the need for rescue of either an injured animal (measure 'c') or its live young would never be detected, so could not be reported to the environmental officer (measure 'c') soon enough to effect a rescue. If the fauna was of a threatened species, identification (measure 'b') would not be possible unless a driver stopped and examined the stricken animal.

Further guidance on appropriate management of fauna road injuries is available from the Wildcare website at:

http://www.wildcarent.org.au/factsheets/doc/caring_for_wildlife_on_road.pdf

Recommendation 17

Minemakers shall revise proposed standard operating procedures for management of fauna road-strikes to fully address animal-welfare and safety objectives, including:

- **Risk of leaving large animal carcasses on the road, which presents risks of causing further accidents for other road users, particularly at night, on un-lit highways.**
- **Risk of attracting scavenger fauna, such as eagles, and kites onto the highways risking further fauna strikes, and further accidents for other road users.**
- **Avoiding preventable fauna deaths by providing effective procedures for rescue of injured wildlife, and /or recovery and care of orphaned wildlife that may still be present in the pouch of a freshly killed or injured parent.**

Mosquito checks of Queensland vehicles.

Dengue fever virus and its vector, the *Aedes aegypti* mosquito is present in Northern Queensland. Outbreaks have historically occurred as close as Camooweal, and at Tennant Creek. *Ae. aegypti* is a container breeding mosquito usually limited in distribution to areas within flight range of human habitation, breeding on water collections in artificial containers such as plastic cups, used tyres, broken bottles and flower pot bases.

Minemakers has committed as part of its Cane Toad management strategy that:

Equipment, goods and machinery that are transported from cane toad infested areas will be inspected to ensure no toads have inadvertently been carried to the project area.

Similar quarantine checks are recommended for vehicles, goods and equipment coming from Northern Queensland to ensure no mosquito larvae are present in any transported pockets of water, and to prevent introduction of this and other species to the mine-site. Any mosquito larvae found in transported machinery should be sent to Medical Entomology, Department of Health and Families for identification, and the receptacle emptied or treated to eradicate mosquito larvae before they emerge as adults.

Periodic draining, screening or removal of water holding containers will reduce the main breeding grounds for this species on-site. Existing commitments avoiding creation of mosquito breeding sites in water-collecting receptacles around the Project area, offices and accommodation village(s), and monthly checks of open water bodies, will help reduce mosquito abundance generally on-site.

Recommendation 18

Minemakers shall inspect all vehicles, equipment, goods and machinery transported from Northern Queensland on entry to the mine-site to ensure no mosquito larvae are present in any open reservoirs or pockets containing water.

Any mosquitoes found breeding in transported machinery etc. shall be sent to Medical Entomology, Department of Health and Families for identification. The water holding receptacle is to be subsequently treated with a 10% chlorine solution or residual insecticide such as lambda-cyhalothrin.

4.3.3 Sustainability of Operations

Greenhouse Gases and Energy

The Draft EIS provides an estimate of annual greenhouse gas emissions from the Project of 50 000 tonnes carbon dioxide equivalent (CO₂-e) when operating at full capacity. This is equivalent to 0.3% of total greenhouse gas emissions in the NT in 2007. Emissions are expected to be sourced from diesel consumption in vehicles, electricity generation, and from clearance of native vegetation.

The Draft EIS states that on-site power will be generated from diesel and natural gas. Minemakers intent here is unclear, as the EIS does not elaborate further on the natural gas component and greenhouse gas emission estimates are based solely on diesel consumption.

The estimated level of annual emissions from fuel combustion to produce energy is above the reporting threshold requiring facilities to report on greenhouse gas emissions, energy production and consumption under the *National Greenhouse and Energy Reporting Act 2007*.

The clearing of 2326 ha of native vegetation is estimated to generate net greenhouse gas emissions of approximately 161 481 tonnes CO₂-e after 5 years from clearing. This represents a rate of emissions of approximately 68 t CO₂-e per hectare. These calculations are based upon computer modeling of emissions by NRETAS using FullCAM, the Australian Government model for tracking the greenhouse gas emissions and carbon stock changes associated with land use and management.

This estimate is a revision to that reported in the Draft EIS (rate of emissions of 35 t CO₂-e per hectare), meaning that the total annual emissions from the Project are expected to be greater than that reported.

The estimated emissions from clearing represent approximately 7% of the Northern Territory's total annual emissions for deforestation, measured against emission levels in 2007. The estimated emissions from this general proposal are valued at approximately \$3 714 069, based on the projected price of greenhouse gas emissions within an Australian emissions trading scheme.

The actual level of emissions attributed to vegetation clearing will depend on the extent of revegetation achieved by Minemakers. Recommendations in this Assessment Report addressing revegetation and rehabilitation are expected to assist in optimising the success of revegetation efforts, which would minimise greenhouse gas emissions from clearing.

The Draft EIS commits Minemakers to a range of measures to manage and mitigate greenhouse gas emissions. These generally relate to ensuring efficient mining operations to reduce fuel and electricity use. Minemakers provided in the Supplement an analysis entitled Alternative energy and greenhouse gas implications, Information for the Wonarah Phosphate Project, which concludes that it is not considered economically feasible to install solar or wind power for the mine site without a large increase in the price of diesel fuel.

The analysis also found that over the currently assumed mine life, the ongoing fuel savings from using a mix of Liquefied Petroleum Gas (LPG) with diesel would justify additional upfront capital costs of up to \$150,000 associated with using LPG. Greenhouse gas emissions associated with the fuel combustion for on-site electricity generation are estimated to decrease by 7.6 per cent, or 368 t CO₂-e per year as a result of substituting 30% of the estimated diesel use with LPG. This appears to be a 'no regrets' option worth pursuing.

Minemakers has committed to:

- Considering further the installation of solar power, with diesel backup to power the northern borefield and reporting on progress in the MMP;
- Further investigating the extent to which solar and biodiesel energy production can be incorporated into the development of the project and reporting in the MMP; and
- Considering and reporting on reducing net emissions by using offsets.

It is the Australian Government's intent to introduce a Carbon Pollution Reduction Scheme as the primary national measure to reduce greenhouse gas emissions in Australia. If the CPRS proceeds under current design, the Project can be expected to attract liability given the scale of its energy-related emissions. The Project may also be faced with increased fuel costs as an indirect impact of the CPRS. This would provide greater economic incentive for Minemakers to pursue alternative energy options and offset opportunities.

Recommendation 19:

Minemakers shall continue to seriously consider measures to reduce greenhouse gas emissions from the Project through identification of further opportunities to improve energy efficiency and utilise alternative, lower emission energy options.

Minemakers shall consult with DNRETAS on opportunities to offset greenhouse gas emissions in the Northern Territory.

4.3.4 Socio-Economic impacts

Regional Socio-Economic Benefits

The Wonarah Project is considered an important project for the Northern Territory economy, with the associated positive socio-economic benefits from having a significant project in the Barkly Tablelands / Tennant Creek region. Associated regional business opportunities and services stimulated by the Project will multiply as benefits to the region.

Minemakers has committed to creating an Industry Participation Plan (IPP) in conjunction with CLC, to maximise participation and opportunities for traditional owners. Minemakers commits to contributing financially to local sporting communities and clubs, community based training providers and service groups.

Comments on the Draft EIS and Supplement queried the benefit multipliers used to estimate the Project's economic contribution to the region, due to the fly-in, fly-out (FiFo) nature of most of the workforce. In response, Minemakers showed that differences in recommended multipliers predicted fairly similar outcomes, and stated that multipliers used were based on advice from NT Government. Predictions however will eventually be overshadowed by actual outcomes. Minemakers has committed to maximise local and regional socio-economic benefits through its procurement and employment practices (preferring local suppliers and employees), as well as by its local sponsorships and training programs.

Comment on the Supplement queried funding and timing of the proposed Industry Participation Plan. Minemakers state in its commitment to the IPP that the plan is a (NT Government) requirement of major projects.

Recommendation 20

Minemakers shall identify measureable auditable outcomes for the Industry Participation Plan (IPP), and include these in the Mining Management Plan for the Project.

Accommodation

Accommodation shortage issues may initially exist for the Project, however these are outside the scope of the assessment of this Project. The Supplement indicates a housing shortage exists in Tennant Creek, and that the Proponent of the Multi-user Hub will be responsible for building a purpose-built accommodation village adjacent to the Hub loading-facility. If the Hub fails to become operational in time to receive ore from the project, no contingency accommodation option is suggested for the approximately 80 person road-haulage workforce.

Workers will be employed for the Project on a two week on, one week off cycle. If Indigenous Project workers are drawn to the nearby Indigenous Wunarah community to work on the Project, accommodation shortage on the community for workers and their families may arise, particularly during worker's off-swings. The community may require additional accommodation and associated infrastructure, depending on its existing accommodation capacity and the number of extra people requiring accommodation.

Minemakers has committed to working with the CLC and traditional owners to establish mechanisms to ensure that the royalty flow from the Project provides a sustainable future for the traditional owners.

4.3.5 Road and Traffic Impacts

Concern has been expressed through the assessment process for impacts upon road users, road safety and road condition from Minemakers proposed road haulage operations, averaging up to one road train passing in either direction every 8 minutes, 24 hrs/day, 365 days/yr (route access permitting). Greenhouse gas emissions of this transport operation would be significant.

Rail Link

Comments at all stages of the assessment have requested review of the option of installing a railway line as an alternative to the proposed road haul operations. Minemakers have examined the rail option, and acknowledge that transporting ore to market by rail rather than road is preferred, and that this could reduce the potential risk to road users along the Barkly Highway. However, the cost of the rail link to Tennant Creek has been estimated at approximately \$500 million making the option economically prohibitive. Minemakers states that it has, and will continue to actively support the provision of a rail system between Tennant Creek and Mount Isa, funded through Infrastructure Australia.

Other phosphate projects in the region are in early planning stages, and potential may develop for Minemakers to step into Stage 2 of the Project at some point in the future. Such factors have potential to combine to make the rail link a feasible economic option for the region in the future, with Government funding.

Road Accidents, Road Degradation.

Minemakers has committed to:

- Review the road conditions of traffic accident hotspots on the Barkly Highway and determine if specific traffic management measures are required at these locations;
- Investigate road incidents, should they occur, to determine causes, and actions which will address causes and ensure the incident does not repeat; and
- Deliver a traffic awareness program to traditional owners and members of Indigenous communities along the Barkly Highway.

Discussion has not been presented in the EIS of appropriate management of issues such as haul truck driver fatigue, interactions with tourist traffic such as slow caravans, responses to accidents / injuries / fauna strikes, etc.

The commitments table indicated that a vehicular incident register will be kept, which will trigger investigation and potential management measures. Minemakers has not indicated what its contingency management might be of significant traffic incidents.

All proposals for intersection upgrades will be subject to consultation with, and approval of Road Network Division, Department of Lands and Planning.

NT regulations require that all vehicles will comply with legal vehicle requirements, and that permits must be obtained for any oversize / weight vehicles.

Recommendation 21

Minemakers shall formulate a traffic management plan, identifying risks, potential scenarios, monitoring and contingency management measures to be applied.

Minemakers shall consult with Road Network Division, Department of Lands and Planning to resolve any road related issues associated with the project. Consultation should clarify appropriate:

- **Procedures for responding to significant traffic incidents;**
- **Procedures for reporting of significant incidents;**
- **Detail for the Traffic Awareness Program, prior to its delivery to members of Indigenous communities;**
- **Liability for repairs or preventative maintenance of road degradation;**
- **Requirements for, and design of any upgrades of road infrastructure, such as lighting of intersections;**
- **Safe interaction of the haul trucks with tourist traffic, such as slower vehicles towing caravans, or vehicles wishing to overtake;**
- **Management of driver fatigue and distraction; and**
- **Any other road or traffic related issues for the Project.**

Minemakers shall include the Traffic Management Plan in the Mining Management Plan for the Project.

4.3.6 Groundwater / Surface water

Minemakers proposed a detailed groundwater monitoring program in the EIS. Minemakers has committed to ensuring that groundwater quality will not be reduced due to Project construction or operations, as measured by monitoring data. Performance would be indicated through the monitoring of production bores.

Comments on the Supplement suggested insufficient knowledge existed of groundwater characteristics on-site, which placed in doubt the conceptual groundwater model and predictions of drawdown and available yield. This uncertainty emphasizes the importance of ensuring that monitoring and data evaluation are undertaken.

Recommendation 22

Minemakers shall include a commitment to maintaining groundwater quality, and include details of the groundwater monitoring program in the Mining Management Plan for the Project.

Minemakers shall commit to ongoing evaluation of groundwater quality and depth data, and verification / refinement of the existing groundwater model for the Project area.

Recommendation 23

Minemakers shall prepare a formal biennial report and review the groundwater monitoring program every two years with particular consideration to the comparison of modeled and observed data. The report shall be included as part of the Mining Management Plan and forwarded to Water Resources DNRETAS. The report shall include as a minimum: monitoring data, data analysis and updates of model predictions of drawdown and recharge.

Alternative Water Supply

Recommendation 24

If groundwater extraction impacts on other groundwater users, Minemakers shall provide another water supply by one or more of the following:

- **Deepening existing bores**
- **Providing additional bores**
- **Determining a new area suitable for groundwater extraction**
- **Trucking adequate water supplies to affected parties**
- **Piping adequate water from its bores to a location required by affected bore user**

Surface Water

Dust suppression will be the major use of water on site and Minemakers has stated a commitment to use recycled water where possible for dust suppression. The use of treated effluent for this purpose is seen by Minemakers as the most beneficial use of the treated effluent and the greatest contributor to any reductions in groundwater extraction demands.

Recommendation 25

Minemakers shall investigate opportunities to maximise the efficient use of water on site including reusing treated effluent; minimising sources of dust generation to reduce requirements for dust suppression; and using any stored water in pits as a seasonal supplement. Proposed measures are to be included in the Mining Management Plan for the Project.

Should a 1 in 10 Average Recurrence Interval or higher runoff event occur, the sedimentation ponds will overtop and release water. This may result in the release of sediment-laden water downstream.

Recommendation 26

Minemakers shall report to the Department of Resources all incidents of overtopping of sediment ponds and release of water.

Water quality of discharge water shall be monitored, and reported. Discharges from water holding structures travelling off the Mining Lease may potentially require a waste discharge licence, and must be reported to Environmental Operations section of DNRETAS, and to the Department of Resources.

5 References:

- ACIL Tasman, (2010) *Alternative energy and greenhouse gas implications. Information for the Wonarah Phosphate Project Prepared for Minemakers Pty Ltd. 15 March 2010.* Initially provided as Appendix 3 to the Supplement to the EIS for the Wonarah Phosphate Project. Revised report incorporating LPG considerations subsequently supplied (version 9 April 2010)
- Coffey (2009b) *Wonarah Phosphate Project Draft Environmental Impact Statement.* Company Report 9014_7_v3. November. A report prepared for Minemakers Australia Pty Ltd by Coffey Environments Australia Pty Ltd Darwin, Northern Territory.
- Coffey (2010) *Wonarah Phosphate Project Draft Environmental Impact Statement Supplement.* Company Report 9014_17_v3. March 2010. A report prepared for Minemakers Australia Pty Ltd by Coffey Environments Australia Pty Ltd Darwin, Northern Territory.
- Coffey (2009a) *Wonarah Phosphate Project Notice of Intent.* Company Report 9014_3_v3. A report prepared for Minemakers Australia Pty Ltd. by Coffey Environments Australia Pty Ltd, Darwin, Northern Territory.
- DIR (2006). *Mining Environmental Management Guidelines - Mining in Arid Environments.* Department of Industry and Resources, Environment Division, Western Australian Government,
- DNRETAS (2009) *Guidelines for Preparation of an Environmental Impact Statement for the Wonarah Phosphate Project by Minemakers Australia Pty Ltd.* July 2009. Environment, Heritage and Arts Division / Department of Natural Resources, Environment, The Arts and Sport / Northern Territory Government. Darwin. Northern Territory.
- DNRETAS (2010) *Land Clearing Guidelines 2010 Updated Version.* Technical Report No. 20 / 2009D. Land Clearing Guidelines. First published 2002. Updated 2006, 2010. Department of Natural Resources, Environment, The Arts and Sport, Darwin. Northern Territory. Natural Resource Management Division. Accessed 08/04/2010 at: http://nt.gov.au/nreta/natres/natveg/guidelines/pdf/landclearingguidelines_2010.pdf
- DoR (2010) *Weed Management on Mine Sites, Minerals and Energy, Advisory Note #:AA7-017,* April 2010, Department of Resources, Northern Territory Government. Accessed 07/04/2010 at: http://www.nt.gov.au/d/Minerals_Energy/Content/File/Forms_Guidelines/AA7-017_Weed_Management_Advisory_Note.pdf

Florabank (2010) *Florabank Guideline 1 - Native seed storage for revegetation*.
Published by FloraBank with the assistance of Bushcare – a
program of the Commonwealth Government's Natural Heritage
Trust. The FloraBank partners are Greening Australia, CSIRO
Forestry and Forest Products through the Australian Tree Seed
Centre, and the Australian National Botanic Gardens.
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http://www.florabank.org.au/default.asp?V_DOC_ID=808

Appendix 1 – Tables and Figures

Figure 1 - Location of the Wonarah Phosphate Project

Figure 2 - Project area layout

Figure 3 - Main Zone mine layout

Figure 4 - Arruwurra mine layout

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Appendix 2 – Table of Voluntary Commitments

The following table was submitted by Minemakers upon request for a table listing all commitments of the Wonarah Phosphate Project.

While not all management measures proposed by Minemakers in the Draft EIS and Supplement have been detailed in this table, this assessment report concludes that all measures proposed in the Draft EIS and Supplement to address identified issues posed by the Project, along with the recommendations in this Assessment Report, and commitments made in the attached table, must be fulfilled by Minemakers for the project to be implemented in an acceptable manner. These commitments and proposed management measures are to be detailed in, and managed under the project's Mining Management Plan.