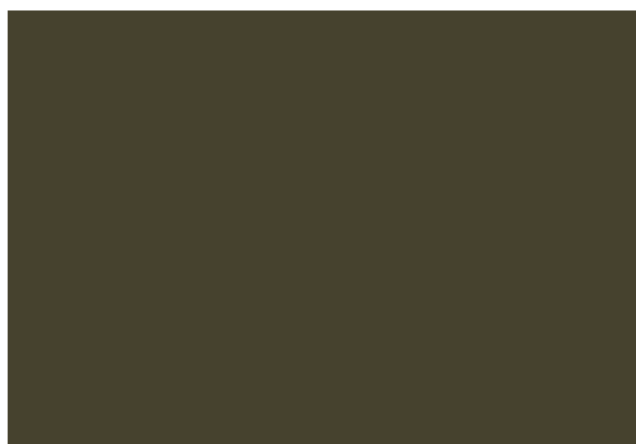


Wonarah Phosphate Project

Environmental Impact Statement Supplement

March 2010



ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

Wonarah Phosphate Project

March 2010

CR 9014_17_v3



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2	Dust Monitoring Results – June 2008 to January 2010
3	Greenhouse Gas Emissions and Alternative Energies

Environmental Impact Statement Supplement
Wonarah Phosphate Project

1. INTRODUCTION

1.1 Background to this Report

Minemakers Australia Pty Ltd (Minemakers) initiated the environmental approvals process for the Wonarah Phosphate Project (the project) with the submission of a Notice of Intent to the Northern Territory Government on 10 March 2009. The Notice of Intent (Coffey, 2009a) was evaluated by the Northern Territory Government and it was determined that the Wonarah Phosphate Project required assessment under the *Environmental Assessment Act* via the preparation of an Environmental Impact Statement (EIS). Assessment under the Environmental Assessment Act is the responsibility of the Minister for Natural Resources, Environment and Heritage, assisted by the Department of Natural Resources, Environment, the Arts and Sport (DNRETAS).

The Draft EIS (Coffey, 2009b) was prepared by Minemakers and was placed on public exhibition over the period 21 November to 21 December 2009. Advertisements were placed in the NT News, the Tennant & District Times and The Centralian Advocate notifying interested parties of the public display period and directing them to locations where the Draft EIS could be accessed. These locations were the:

- Environment, Heritage and the Arts Division, DNRETAS, Darwin.
- Minerals and Energy Information Centre, Department of Resources¹, Darwin.
- Darwin City Council Library, Darwin.
- Tennant Creek Public Library, Tennant Creek.
- Arid Lands Environment Centre, Alice Springs.
- Barkly Shire Council, Tennant Creek.
- Barkly Roadhouse, Barkly Tableland.

Copies of the Draft EIS were also provided direct to the Central Land Council (CLC), the Northern Land Council and the Wunara Community and were available for purchase from Minemakers. The Draft EIS was also accessible from the DNRETAS and Minemakers websites.

The Environment, Heritage and the Arts Division of DNRETAS provided to Minemakers copies of the 11 submissions that it received during the public exhibition period, including those from various government agencies and DNRETAS itself.

This EIS Supplement addresses these submissions and, together with the Draft EIS, forms the final EIS that will be assessed by DNRETAS. A copy of the EIS Supplement will be provided to DNRETAS and each of the parties who made a submission. The EIS Supplement does not have a public exhibition period.

Once DNRETAS has completed its assessment, a report with recommendations for refusal or approval with conditions will be provided to the Northern Territory Minister for Natural Resources, Environment and Heritage for his final decision.

¹ Formerly the Department of Regional Development, Primary Industry, Fisheries and Resources (DRDPIFR).

1.2 The Decision-making Process and the EIS

The EIS and its public review is a major component in the overall process of environmental planning and assessment, and represents the definition of the project to the point where:

- Environmental factors have been identified.
- The project has been planned and conceptually designed to accommodate those factors.
- The residual environmental impacts can be discussed.
- The priorities for management and monitoring can be identified.

In effect, the approach that underpins the EIS is that the project is sufficiently well defined to be assessed by stakeholders in terms of key environmental and social issues, conceptual responses by the proponent and notional impacts. Draft management plans for the project are also outlined within the EIS. The EIS, however, is not intended to describe detailed engineering aspects of the project.

1.3 Report Structure

The format of the EIS Supplement, which comprises eight chapters, is:

- Chapter 1 of the EIS Supplement (this chapter) provides an introduction to the preparation of the EIS Supplement.
- Chapter 2 provides a summary of the interested parties that made a submission and the general content of submissions that were received.
- Chapter 3 presents a summary of the issues raised by interested parties in relation to the project description and the response to each of these issues.
- Chapter 4 presents a summary of the issues raised in relation to the existing environment, potential impacts and management of those impacts presented in the Draft EIS. The response to each of those issues follows each summary.
- Chapter 5 presents a summary of the issues raised in relation to the mine closure and rehabilitation planning and the response to each of these issues.
- Chapter 6 provides a conclusion summarising the salient aspects of the EIS Supplement.
- Chapter 7 includes the bibliographic details of each reference used in the EIS Supplement.
- Chapter 8 provides an explanation of abbreviations and technical terms used in the EIS Supplement.

The approach adopted for the preparation of this document reflects the fact that a range of issues, comments and questions were common across a number of submissions. Where similar issues were received, these have been grouped to provide an efficient mechanism by which Minemakers can respond to the concerns of the various parties. Appendix 1 'EIS Submissions Cross-reference' details each individual submission issue, including who made the submission, and where each of these issues have been addressed within the EIS Supplement.

This EIS Supplement contains a number of appendices additional to those appended to the EIS, as listed in Table 1.1.

Table 1.1 Appendices to the EIS Supplement

Appendix No.	Title/Subject	Author
1	EIS Submissions Cross-reference	Coffey Environments
2	Dust Monitoring Results – June 2008 to January 2010	Coffey Environments
3	Greenhouse Gas Emissions and Alternative Energies	ACIL Tasman

The EIS Supplement should be read in conjunction with the Draft EIS and its attachments and appendices.

Environmental Impact Statement Supplement
Wonarah Phosphate Project

2. SUMMARY OF SUBMISSIONS

Submissions on the Draft EIS were received from government agencies, statutory authorities and one non-government organisation. No submissions were received from the general public.

Submitters were the:

- Aboriginal Areas Protection Authority.
- Central Land Council.
- Department of Business and Employment.
- Department of Health and Families.
- Department of Lands and Planning.
- Environment Centre NT.
- Environment, Heritage and the Arts Division, DNRETAS.
- Land Management Division, DNRETAS.
- Northern Land Council.
- Northern Territory Police, Fire and Emergency Services.
- NT WorkSafe.

From these 11 submitters a total of 152 individual issues were raised. Issues raised by submitters ranged 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. A number of the submissions commented on the comprehensive nature of the Draft EIS and the high quality of the document.

Appendix 1 details each of the 152 submission issues and links each issue to the submitter and where it has been addressed in the EIS Supplement. A summary of issues contained in the submissions is provided in Table 2.1.

Table 2.1 Summary of submitters and main issues contained in submissions

Submitter	Name	Subject of Issues Raised
Aboriginal Areas Protection Authority	Dr B. Scambary, Chief Executive Officer	<ul style="list-style-type: none"> • Cultural heritage.
Central Land Council	J. Stoll, Senior Mining Officer	<ul style="list-style-type: none"> • Environmental approvals. • Deposit geochemistry. • Water use. • Traffic and transport of ore. • Greenhouse gas emissions. • Socio-economic impacts. • Mine closure and rehabilitation. • Stakeholder consultation.
Department of Business and Employment	G. Symons	<ul style="list-style-type: none"> • Socio-economic impacts.
Department of Health and Families	A. Warchot, Advice Control Officer Medical Entomology	<ul style="list-style-type: none"> • Mosquito management.
Department of Lands and Planning	G. Fischer, Road Corridor Land Manager	<ul style="list-style-type: none"> • Transport logistics. • Road infrastructure.

Table 2.1 Summary of submitters and main issues contained in submissions (cont'd)

Submitter	Name	Subject of Issues Raised
Environment Centre NT	M. Bradley, Policy Officer	<ul style="list-style-type: none"> • Waste management. • Power supply. • Greenhouse gas emissions. • Water use. • Flora. • Mine closure and rehabilitation.
Environment, Heritage and the Arts Division, DNRETAS	M. Darcey, Executive Director	<ul style="list-style-type: none"> • Mine life. • Economic benefits. • Waste generation and disposal. • Deposit geochemistry. • Mining method. • Power supply. • Greenhouse gas emissions. • Groundwater resources. • Surface water management. • Water use. • Air quality and dust monitoring. • Flora and fauna. • Traffic and transport of ore. • Mine closure and rehabilitation. • Third party infrastructure.
Land Management Division, DNRETAS	B. Sparrow, Acting Manager Land Resources South	<ul style="list-style-type: none"> • Surface water management structures.
Northern Land Council	K. Hill, Chief Executive Officer	<ul style="list-style-type: none"> • Cultural heritage and landscapes. • Surface water management. • Traffic and transport of ore. • Mine closure and rehabilitation.
Northern Territory Police, Fire and Emergency Services	J. Russell, Director	<ul style="list-style-type: none"> • Road safety.
NT WorkSafe	D. McDonald	<ul style="list-style-type: none"> • Legislation.

3. PROJECT DESCRIPTION

3.1 General

3.1.1 Legislation

Issues Raised in Submission

One submission identified that the Draft EIS incorrectly referred to the *Mining Management Act* as having a role in the regulation of the health and safety on mine sites. The submission stated that this role has now been taken over by the *Workplace Health and Safety Act* and that mining operations are identified as a 'hazardous activity' for which a risk management plan is required.

One submission also identified that the Public Health (General Sanitation, Mosquito Prevention, Rat Exclusion and Prevention) Regulation is the relevant statutory instrument pertaining to the control of mosquitoes.

Response

Section 2.2.5 of the Draft EIS identifies the objectives of the Workplace Health and Safety Act and the requirement to prepare a risk management plan to be approved by NT WorkSafe. In relation to the Draft EIS incorrectly referring to the Mining Management Act as having a role in the regulation of health and safety on mine sites, Section 2.2.1 (which discusses the Northern Territory mining legislation) makes no reference to this topic. The Notice of Intent that was submitted to the Department of Natural Resources, Environment, the Arts and Sport (DNRETAS) on 10 March 2009 to commence the EIS process did make reference to the health and safety provision being included in the Mining Management Act. This was corrected in the Draft EIS.

As recommended by a submission, the following dot point is added to Section 2.2.5 of the Draft EIS:

- *Public Health Act* – this act relates to the management of environmental aspects of maintaining public health and through associated regulations, has statutory requirement for the management of mosquitoes.

3.1.2 Mine Life and Future Development

Issues Raised in Submission

Three submissions raised issues in relation to the proposed mine life and future development of Stage 2 of the project. The submissions generally related to questions concerning what approvals would be required if either the mine life was extended beyond the 10 years stated in the Draft EIS or if a decision to proceed with Stage 2 was made. One submission questioned if recent exploration activities had increased the 10-year mine life.

Response

If a decision is made to proceed with Stage 2 of the project Minemakers will initiate a separate approvals process under the *Environmental Assessment Act*. This process will mirror that of the Stage 1 approvals process and will likely be initiated by the preparation of a Notice of Intent.

Recent exploration activities have not extended the mine life for Stage 1 beyond the current 10 years presented in the Draft EIS. If the mine life for Stage 1 were to be extended once the mine was operating, this would be addressed in the Mining Management Plan for the operation.

3.1.3 Development of a Sustainable Phosphorus Future

Issues Raised in Submission

One submission raised concerns about the sustainable development of phosphorous and the role of Minemakers and the Wonarah project in this, including the:

- Timeframe for the project and long term sustainable extraction and use of the resource.
- Management of the world's phosphate resources over a 50 to 100 year time frame.
- Efficient and sustainable end use of the product.

Response

The issue of a sustainable phosphorus future extends beyond Minemakers' influence and beyond the scope of the EIS. However, as a future supplier in the phosphate market Minemakers will develop the Wonarah Phosphate Project in a sustainable manner consistent with industry good practice and all regulatory conditions. Additionally, the development of the Wonarah Phosphate Project will broaden the world supply base for rock phosphate.

Minemakers has the following responsibilities that influence the timeframe for the project and the rates of phosphate mining for the Wonarah Phosphate Project:

1. To mine the phosphate resource, as holder of the Mineral Lease over Wonarah.
2. To maximise shareholder return on investment, as a publicly listed company. This involves selling the product into the world phosphate market, which like all commodity markets is driven by supply and demand.

If the project is not economically viable, it will not be developed.

Sustained long-term development of the Wonarah phosphate deposit is in Minemakers' best interest. Stage 1 of the proposed project has a 10-year mine life and will not exhaust the world-class phosphate reserves in the area. As discussed in the Draft EIS, further exploration is occurring which may lead to larger scale mining and a longer mine life. At present, exploration activities have indicated that potential phosphate reserves could sustain an operation for at least 50 years and perhaps longer. Should this eventuate, Minemakers will play a role in the long term supply of phosphate to the world market.

Minemakers is limited in its scope to influence end users (e.g., farmers) in their use of downstream products of rock phosphate in a sustainable and efficient manner as Minemakers will not be a finished fertilizer producer. However, Minemakers would like to see phosphate prices reflect the high agricultural/social value of the product and note that the higher costs generally drive more efficient consumption of resources.

3.2 Deposit Geochemistry

Issues Raised in Submission

One submission was interested in ongoing testing to determine if some areas contain more concentrated uranium (and radiation) than others.

Response

As stated in Section 5.3.4 of the Draft EIS, the geochemical tests of almost 300 samples across the Arruwurra and Main Zone deposits determined that the average uranium concentration found in the ore deposits was 18 ppm, with 75 ppm the maximum uranium concentration. Given this,

specific further testing to determine the uranium content of mine material is not warranted. However, uranium will be included in any future suite of analysis completed at the site.

3.3 Mining Process

3.3.1 Pits Disturbance Areas and Waste Rock Storages

Issues Raised in Submission

One submission queried why Main Zone pits 1 and 15 have remaining disturbance areas higher than total disturbance areas after they have been backfilled by 35% and 57% respectively (Table 5.5 of the Draft EIS).

One submission requested a conceptual diagram of the proposed generic waste rock storages.

Response

This discrepancy was due to an error in calculations. The correct remaining disturbance areas for Main Zone pits 1 and 15 are 25.4 ha and 6 ha, respectively.

Figure 3.1 shows the typical design of a waste rock storage for the project.

3.3.2 Backfilling and Final Voids

Issues Raised in Submissions

One submission requested that Figures 5.2 and 5.3 of the Draft EIS display where backfilling is to occur and the percentage of backfilling.

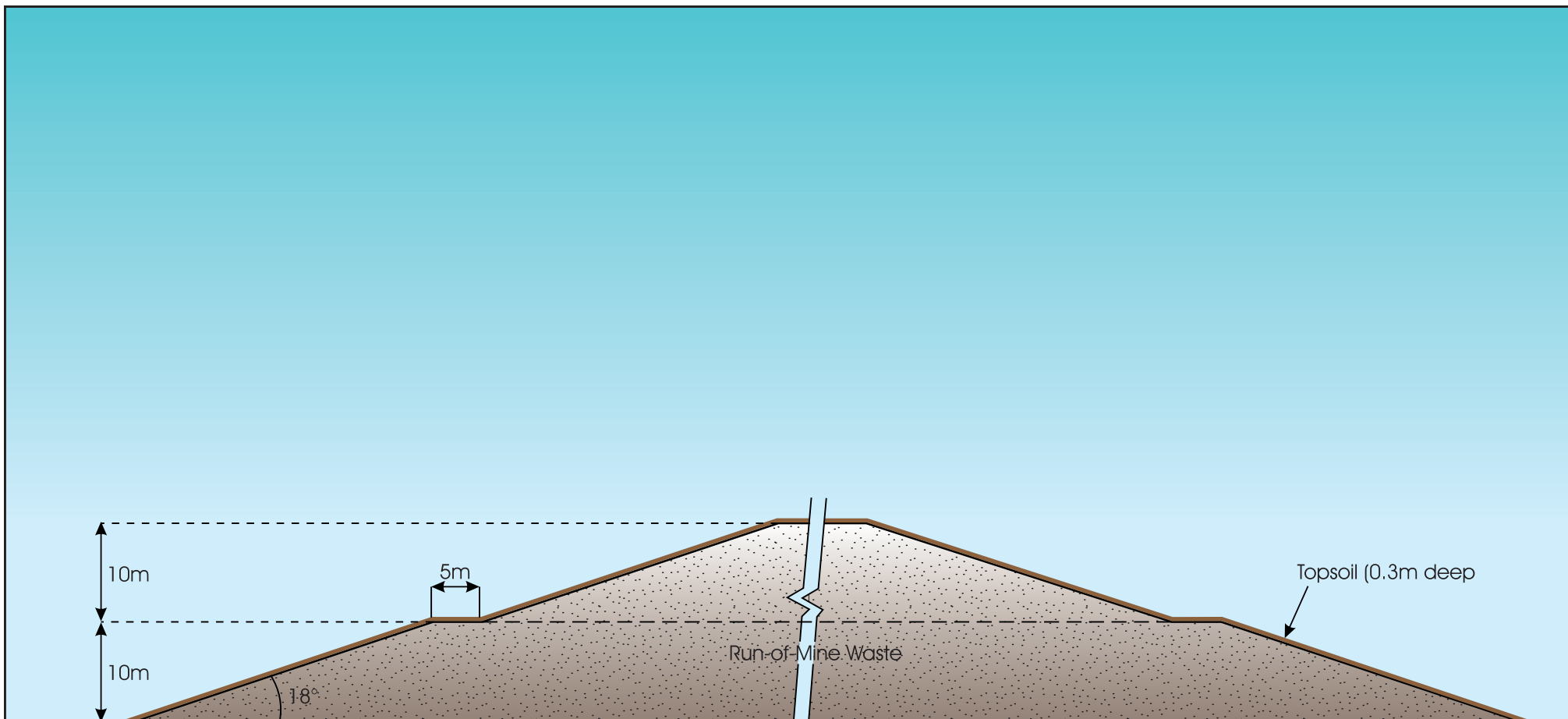
Three submissions were received in relation to the backfilling of pits and the retention of final voids. Issues raised in the submissions generally fell into three categories. These were the:

- Economic viability of the project if complete backfilling were to occur.
- Increased number of pits, waste rock storages and pit voids with the combination of conventional shallow open pit and strip mining methods.
- Mine closure and rehabilitation of waste rock stockpiles and voids.

Response

Figures 5.2 and 5.3 of the Draft EIS have been amended to show which pits will be backfilled and the percentage of backfilling proposed. These are presented as Figures 3.2 and 3.3, below.

As described in the Draft EIS, the degree or percentage of backfilling proposed for each pit is based upon the mining sequence, size and relative locations of pits. While the Draft EIS noted that the costs of backfilling the voids significantly effects the economics of the project, economics are not the only reason for the planned backfill schedule. The mine plan will involve the concurrent operation of multiple pits to allow for blending of the DSO. To backfill all pits will require extensive handling and rehandling of waste material over large distances and will still result in pit voids.



Natural Topography



Source:
Place names, roads and tracks from GEODATA 250k (optimum scale 1:250,000)
Mine layout from GHD and Minemakers
Proposed mineral lease from DMETIS

coffey
environments

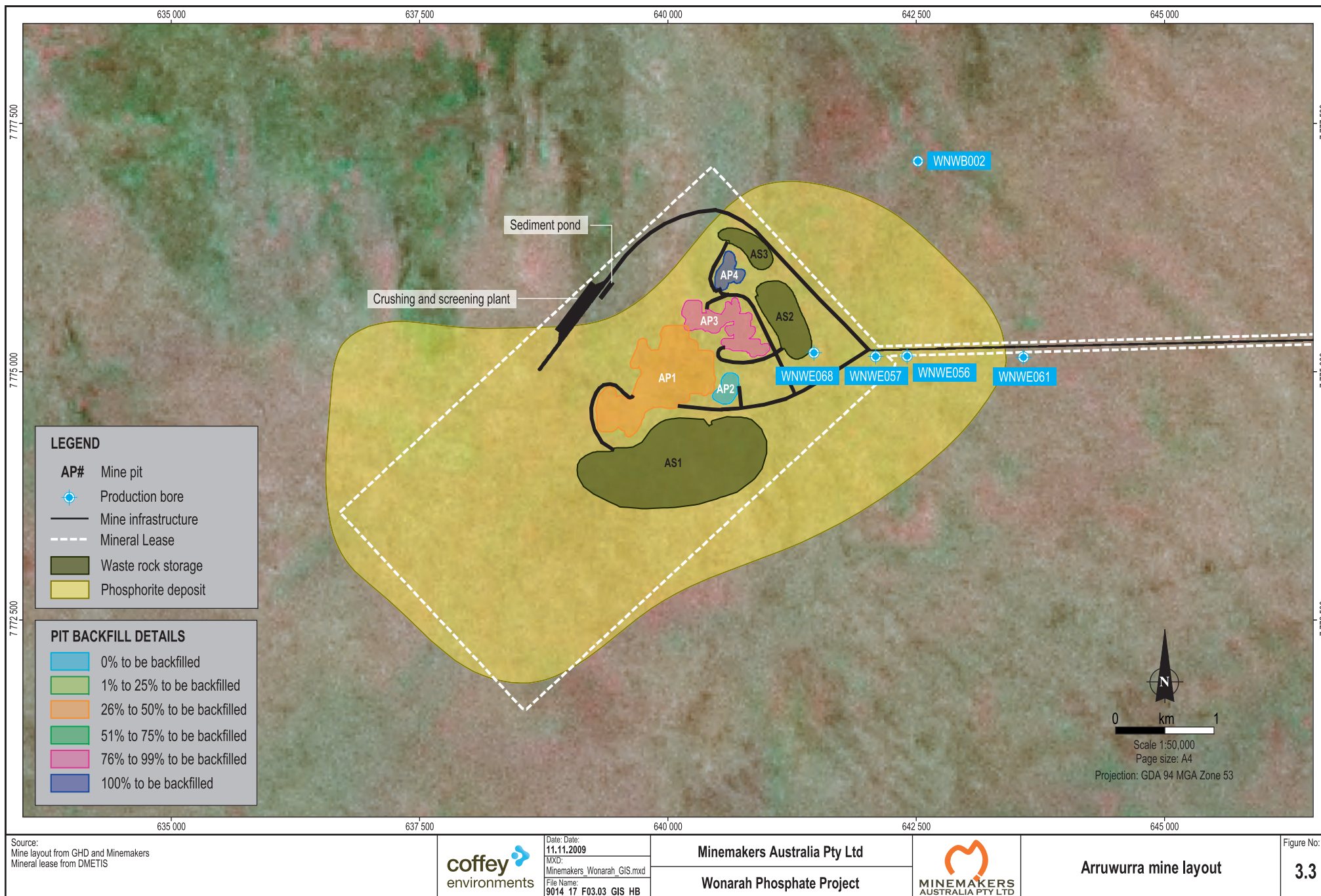
Date:
11.11.2009
MXD:
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File Name:
9014_17_F03.02_GIS_HB

Minemakers Australia Pty Ltd
Wonarah Phosphate Project

MINEMAKERS
AUSTRALIA PTY LTD

Main Zone mine layout

Figure No:
3.2



Source:
 Mine layout from GHD and Minemakers
 Mineral lease from DMETIS



Date: Date:
 11.11.2009
 MXD:
 Minemakers_Wonarah_GIS.mxd
 File Name:
 9014_17_F03.03_GIS_HB

Minemakers Australia Pty Ltd
 Wonarah Phosphate Project



Arruwurra mine layout

Figure No:
 3.3

The Draft EIS also presented the predicted 'worst case scenario' for backfilling. Since the submission of the Draft EIS, Minemakers has continued to refine the mine plan and schedule, which has in turn has identified a potential increase in backfilling. While mine planning and scheduling continues, present indications are that up to two thirds of the mine voids will be backfilled. These figures will continue to be refined and supports Minemakers' commitment to backfill where possible.

In relation to the increased number of pits and waste rock storages proposed by the current mining method, the Draft EIS (Table 5.4) identified that up to 596 ha will be disturbed for pits and between 713 and 1,376 ha will be disturbed for waste rock storages (depending the percentage of pit that are backfilled). This contributes up to 1,972 ha of the total disturbance area for the project. The Notice of Intent (NOI) identified strip mining as the mining method for the Wonarah Phosphate Project; this document stated that 2,090 ha would be disturbed for pits and 445 ha for waste rock storages. While strip mining does typically lend itself to backfilling, it would have still resulted in large final voids at mine closure.

Chapter 5 provides a response to submissions about the mine closure and rehabilitation proposed for waste rock stockpiles, voids and the project in general.

3.3.3 Backfilling and Development of Stage 2

Issues Raised in Submission

One submission questioned whether the backfilling and waste management plan for Stage 1 has been influenced by the possible future development Stage 2 of the project.

Response

All aspects of mine planning for Stage 1 have considered the project to be 'stand alone'. No consideration has been given to the potential development of Stage 2 when considering mine scheduling and backfilling for Stage 1. It would in fact be beneficial for Stage 2, were it to occur, to have as many pits backfilled as possible, as this would limit the amount of waste rock rehandling that would be required during that phase of operation.

3.4 Transport Infrastructure

3.4.1 Sealed Roads versus Unsealed Roads

Issues Raised in Submission

One submission requested further information as to the cost benefit analysis of sealing the haul roads within the Mineral Lease compared to the ongoing use of graders, water carts and dust suppressants.

Response

Minemakers acknowledges that the water requirements for dust suppression could be reduced if the haul roads were to be sealed. The feasibility of the Wonarah Phosphate Project lies in its financial viability; Minemakers has considered the costs and benefits associated with sealing haul roads during the mine planning process. However, due to the proposed design of the project, which includes a number of haul and connecting routes linking various mine pits and other areas (e.g., offices, accommodation village and the Arruwurra deposit), the use of graders, water carts and dust suppressant additives has been determined to be more cost effective than semi-permanently sealing haul routes. The Draft EIS has also taken the precautionary approach and has considered the potential impacts of the worst-case scenario for water requirements.

Minemakers will continue to review the costs, water demand, operational and occupational health and safety issues associated with the use of unsealed roads and revise its strategy should problems become apparent. Responses to adverse outcomes of such reviews may include full or partial sealing of the access and haul roads.

3.4.2 Access and Haul Road Disturbance Area

Issues Raised in Submission

One submission queried why the width of disturbance for constructing the access and haul road was required to be 35 m wide, to achieve a useable 8 m width.

Response

The area of disturbance during construction of the road corridors will typically be 35 m wide including shoulders and provision for drainage. The access road corridor will also host a power line over a distance of 3 km from the power station to the office complex and from the power station to the crushing and screening plant. The corridor will also host water supply and reticulation pipelines.

Therefore, the total cleared width at any part along the route may be up to 35 m to allow for statutory clearances from overhead power lines and to install buried water supply infrastructure. All pipes will be laid within the disturbed area of the road. The width of up to 35 m will also allow for the access of service vehicles along the route.

3.5 Ore Storage and Transport to Market

Issues Raised in Submission

One submission was concerned with the timing of the development of the proposed multi-user hub to receive ore from the project, and what alternatives Minemakers has considered if the multi-user hub is not ready in time.

Response

The multi-user hub will be subject of a separate approvals process and as such is not addressed in the Draft EIS. However, Minemakers is currently in discussions with the owner of the hub site regarding ways in which Minemakers can secure timely development of this facility and therefore its ability to use it once operations at the mine commence. However, as a contingency, the company continues to consider alternative options for ore storage and transport if the multi-user hub is not ready before Minemakers begins transporting the ore. Minemakers' preference is for an option to be located close to, or at, the site of the multi-user hub.

3.6 Other Mine Infrastructure

3.6.1 Borrow Pits

Issues Raised in Submission

One submission requested the number of and frequency of borrow pits that will be required along the haul road route.

Response

Seven potential borrow pits have been identified for the project, including along the haul road route. This will provide a source of borrow material at locations near the airstrip, accommodation village, main zone, and at three locations along the haul road route. The exact location of the borrow pits will be selected following further geotechnical investigations.

3.6.2 Workforce Accommodation

Issues Raised in Submission

One submission was concerned with the lack of housing available in Tennant Creek and the added pressure that a potential workforce of 180 people associated with road haulage will place on the town. It requested the provisions being made for additional housing for this workforce.

Response

Minemakers is not intending to provide additional workforce housing in Tennant Creek. However, an accommodation village will be constructed close to the multi-user hub and will be used to accommodate the road haulage workforce (Section 5.11.6 of the Draft EIS). This accommodation village will be subject to separate approvals process by its proponent, but will have sufficient capacity to house all road haulage workforce as well as spare capacity for visiting Minemakers staff or specialist consultants.

3.6.3 Sewage Treatment Facility and Mosquito Control

Issues Raised in Submission

One submission requested that the sewage treatment facility, particularly the irrigation area, other wastewater storage facilities and artificial ponding is checked monthly for mosquito larvae.

Response

Minemakers notes the above submission and the following text is added to Section 6 of the Mosquito Management Plan (Appendix 5I, Draft EIS):

The abundance of larvae and adult mosquitoes will initially be measured once a month for a period of 12 months. The frequency of monitoring will be reviewed after this time and reported in the Mining Management Plan.

3.7 Waste Management

3.7.1 Tyre Disposal

Issues Raised in Submission

Two submissions were concerned with reference made in the Draft EIS that tyres would be buried on site. One submission identified that tyres are a listed waste under the *Waste Management and Pollution Control Act*.

Response

Tyres will not be disposed in the waste rock storages. All tyres will be disposed offsite at an appropriately licensed facility.

3.7.2 Putrescible Waste Disposal

Issue Raised in Response

One submission requested that Minemakers investigates opportunities for composting organic waste from the accommodation and administration areas.

Response

Minemakers will adopt a waste management policy of reduce, reuse and recycle across all operations. As such, Minemakers will consider composting of organic waste on site and consider the beneficial uses of this composted material in rehabilitation work.

4. RESPONSE TO SUBMISSION – EXISTING ENVIRONMENT, POTENTIAL IMPACTS AND MANAGEMENT

4.1 Air Quality

4.1.1 Air Quality Monitoring Locations

Issues Raised in Submission

One of the submissions received highlighted that with the exception of dust gauges WONDD1 and WONDD4, the other six dust monitoring gauges were upwind (based on prevailing wind directions) of most activities (see Figure 6.2 of the Draft EIS). The submission requested that sampling locations be justified with reference to Australian Standards and that a dust gauge closer to the road be considered, to measure the potential effects of dust on highway travellers.

Response

The existing eight dust gauges were installed in June 2008 to obtain baseline dust data and their location was selected based upon exploration and mine planning activities that were taking place in 2008. The gauges were installed in accordance with the Australian Standard *Methods for sampling and analysis of ambient air* (AS/NZS 3580.1.1:2007). Since that time, the mine layout has been more clearly defined.

These existing dust gauges will be moved to new locations based on the mine plan. Figure 4.1 shows the proposed operational dust gauge locations, including two additional dust gauges that will be located north of the Barkly Highway to monitor any potential the dust movement across the highway from the Mineral Lease. As per the Australian Standard, the new location of dust gauges and the reason for the changed location will be recorded in the dust monitoring records for the site. Once installed at their new locations, Minemakers will supply details of their location to DNRETAS.

4.1.2 Dust Monitoring and Management

Issues Raised in Submission

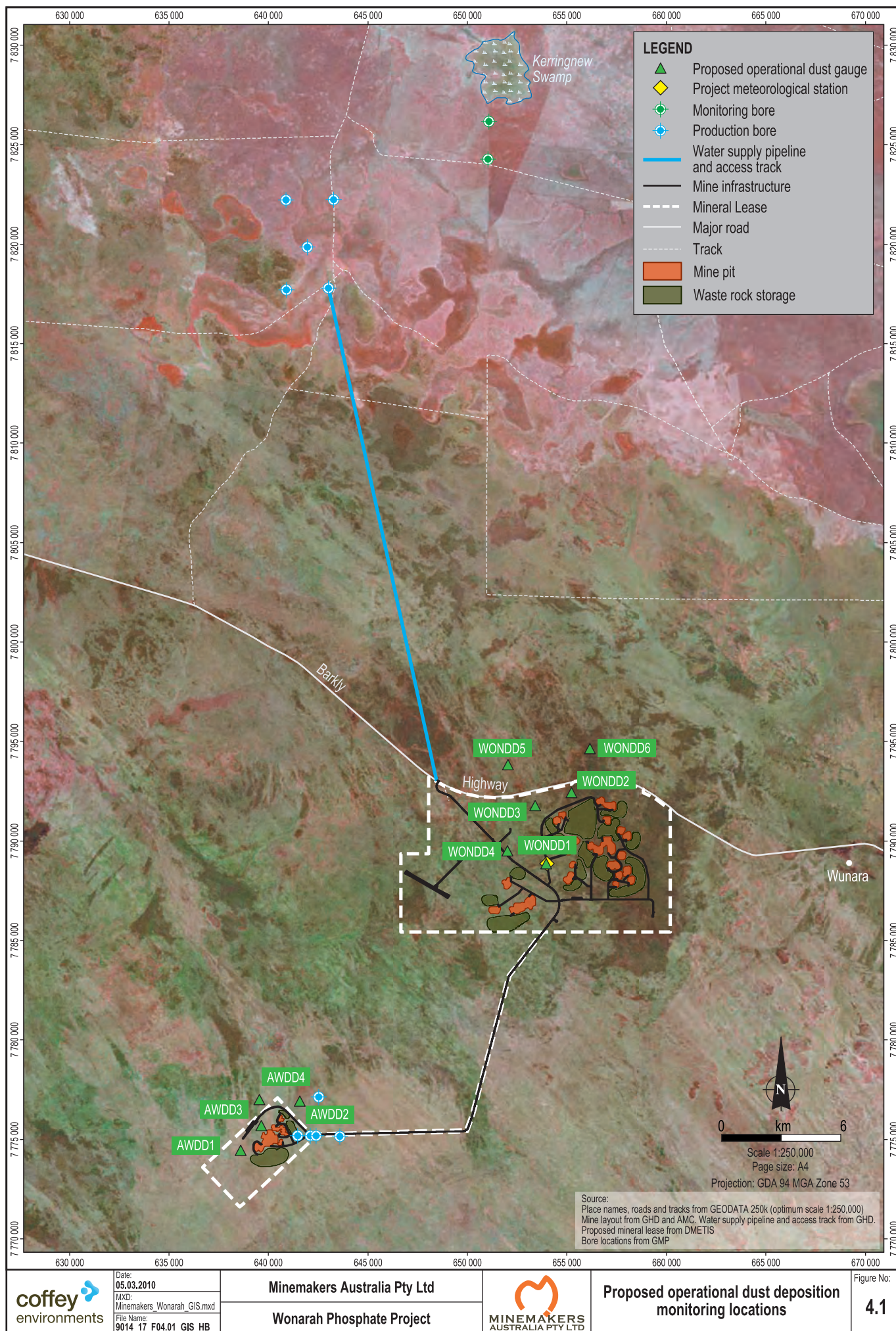
Submissions were received in relation to the potential for beryllium to be in the dust and workplace health and safety measures for mine staff in relation to dust, particularly in relation to the accommodation village.

Two submissions raised concerns in relation to the presence of beryllium in mine related dust and potential health impacts if inhaled. One submission also questioned the potential for a health hazard (e.g., asthma trigger), due to particle size of the dust; related to this was a question regarding how dust impacts on the accommodation village and mine workers would be managed.

Response

Particle Sizes and Health Management

It is estimated that 5% of the phosphate product particle size will be smaller than 10 µm, with 95% of the phosphate product particle size within the range of 4.75 mm to 10 µm (Section 6.2.2 of the Draft EIS). Particles 10 µm or smaller are either PM₁₀ or PM_{2.5} particles and are classified as very fine particles. Occupational health and safety measures to be implemented on site will focus on minimising workers' exposure to PM₁₀ or PM_{2.5} particles.



Beryllium

Beryllium may be present in dust generated on site; this is a potential occupational health and safety, rather than environmental, concern. As part of the occupational health and safety program for the site, occupational monitoring of PM₁₀ dust levels, including beryllium, will be considered. This will be documented in the risk management plan required under the *Workplace Health and Safety Act*.

Workplace Health and Safety Measures

Workplace health and safety measures will reduce potential exposure to dust to as low as reasonably possible. Specific workplace health and safety measures will be developed for the project and will comply with the Northern Territory's *Workplace Health and Safety Act*. In addition to the environmental dust management measures outlined in the Draft EIS, measures that will be implemented to minimise the potential exposure of mine workers to dust particles will include, but not be limited to:

- Providing climate controlled cabins (with appropriate filtration) for mine vehicles that isolate workers from dust outside.
- Ensuring personnel wear appropriate personal protective equipment (PPE) when working in dusty areas (such as the crushing and screening plant).
- Maintaining a clean work environment, e.g., keeping the mine site clean and tidy, discouraging wearing dusty overalls or shoes in office buildings, cleaning the cabins of vehicles regularly.
- Training workers who may be working in dusty areas (e.g., the crushing and screening plant) on the risks and preventative measures.

Dust at the Accommodation Village

The accommodation village is situated in the western part of the Mineral Lease approximately 2.0 km downwind from the closest activity with the potential to generate considerable dust (i.e., the crushing and screening plant and Main Zone pits) (Section 6.2.4 of the Draft EIS). Along with the maintenance of existing vegetation around the accommodation village to provide a vegetative buffer to mining activities, the village will be designed to minimise dust ingress through the use of an appropriate ventilating (including air conditioning) system. The camp will also be constructed to Northern Territory building regulations and Australian Standards, where required.

4.1.3 Dust Monitoring Baseline Data

Issues Raised in Submission

One submission requested the records from the 11 dust sampling periods included in the EIS Supplement.

Response

Dust monitoring results for the site for the sampling periods from June 2008 to January 2010 are included as Appendix 2.

4.2 Greenhouse Gases and Energy

4.2.1 Greenhouse Gases and Carbon Footprint

Issues Raised in Submission

Four submissions raised concerns about greenhouse gas emissions and/or carbon footprints associated with the project. Specific aspects raised were:

- Minemakers being proactive and investigating means to reduce emissions and increase voluntary offset measures.
- The use of alternative fuels being considered by Minemakers, as well as the full costs and benefits of alternative energy and fuel types.
- Consideration of the Emissions Trading Scheme (ETS) and a voluntary emission reduction target; the emissions are predicted to be large enough to require mandatory reporting under the National Greenhouse and Energy Reporting System and to attract liability under the Australian Government's proposed Carbon Pollution Reduction Scheme (CPRS).
- Calculations of predicted emissions from the project, including emissions generated from power consumption from pumping water from the northern borefield and any change in the expected fire regime for the project site.
- Options for the subcontractor tender process to include minimisation of the carbon footprint from the proposed transport operations.
- How Minemakers would demonstrate that fuel consumption and greenhouse gas emissions will be reduced over time by mitigation measures.

Responses

ACIL Tasman, on behalf of Minemakers, has completed an investigation into the use of a range of alternative energy sources to reduce diesel consumption and the associated greenhouse gas emissions from the project (Appendix 3). The investigation also considered voluntary greenhouse gas emission offsets.

Consideration of Alternative Energy and Fuel Types

Appendix 3 presents an analysis of the viability of the use of a range of alternative energy and fuel types to provide power for the project. The main findings of this analysis are:

- Due to the intermittent nature of energy supply from solar or wind power both an energy storage system and a reliable backup generation method (such as the currently proposed diesel generator set) would be required. Consequently, the use of renewable power at the site would require a significantly higher initial investment (i.e., an additional \$5.12 million) than the currently-proposed diesel generator set.
- About half the initial cost would be offset by lower ongoing fuel costs and lower greenhouse gas emissions.
- Based on the predicted mine life of ten years, it is not considered economically feasible to install solar or wind power for the mine site. This assessment would change if there is a large (i.e., about 60%) and sustained increase in the future real price of diesel.

- Solar power is more viable than wind power due to the high solar radiation levels in the project area. A solar power system would require the disturbance of 12 to 15 hectares of land; in the context of land disturbance for the project this is not large.
- For every megawatt of solar photovoltaic capacity installed, annual diesel use would be reduced by 398 kL and the annual greenhouse gas emissions from the project would reduce by 1,068 t CO_{2-e} per year. The installation of 1 MW of solar generation would enable the project to create 1,536 renewable energy certificates per year, which could then be sold to provide an additional revenue stream.
- Average wind speeds are generally too low to support an economic mix of wind power with diesel generation (e.g., 25% wind power and 75% diesel generation), even using micro-wind turbines.
- Using solar power to operate the northern borefield and the accommodation village at the mine site has been considered; the cost of the components for a stand-alone 10 kW solar photovoltaic power system with three days of battery storage is estimated to be \$16,000 to \$18,000 per kilowatt, excluding installation costs. About half the cost is related to battery storage capacity; reducing the battery storage capacity by connecting the system to a backup diesel generator will substantially reduce the capital costs (but with some diesel use, and therefore emissions, during periods of low sunlight). Approximately 9% of the cost of the estimated capital cost would be subsidised through renewable energy credits.
- The implied abatement cost of using solar (or wind) power for the project is very sensitive to the future price of diesel, with a 15 cents per litre change in the price of diesel changing the calculated cost of abatement by \$40/t CO_{2-e}.
- Using biodiesel will have the most significant effect in reducing greenhouse gas emissions for the project. Assuming 100% use of biodiesel rather than diesel, it is estimated that emissions could be reduced by 96%. This biodiesel would need to be sourced from Adelaide, as the Darwin biodiesel plant is no longer in operation. It should be noted that this analysis does not consider the life-cycle emissions associated with production of biodiesel, nor the source of the feedstock for biodiesel; there are significant concerns about the environmental impacts of this.

Given the above, Minemakers will consider the installation of solar power, with diesel backup, to power the northern borefield. Despite the higher costs associated with such an installation it may also offer some operational benefits due to the lower refuelling frequency and maintenance requirements. Minemakers will also further investigate the extent to which solar and biodiesel energy production can be incorporated into the development of the project.

With regard to biodiesel, Minemakers will contact each potential contractor who will tender on the civil, mining and haulage works and determine their ability to use biodiesel; this is generally limited by product guarantees offered by engine manufacturers, and their receptiveness to utilising biodiesel in their vehicles and if so, what level of biodiesel substitution may be acceptable. The company's pursuit of biodiesel substitution will be guided by these responses.

Consideration of Offsets and the CPRS

In addition to reducing greenhouse emissions by becoming more energy efficient (as outlined in Section 6.3.3 of the Draft EIS), Minemakers will consider reducing net emissions by using offsets. Potential offsets are detailed in Appendix 3; to offset the total CO_{2-e} emissions for the project at full 3 Mt/a production around 206,000 trees would need to be planted at an approximate cost of \$1 million, or about \$24/t CO_{2-e}.

Minemakers will consider what offset can be gained through potential reduction in greenhouse gas emissions due to altered fire frequency as part of the development of the biodiversity offset plan for the project (see Section 4.4.4). Minemakers will utilise the National Carbon Offset Standard (NCOS) when it comes into effect on 1 July 2010 to ensure the integrity of any offsets.

Calculations of Predicted Emissions

Emissions estimates in the Draft EIS did not include the effects of power consumption from pumping groundwater from the northern borefield or changed fire regimes.

Subcontractor Effort in Reducing Emissions from Transport

Minemakers' transport tender evaluation process will consider how companies propose to minimise their carbon footprints. Factors that help reduce the transporters' carbon footprint will be looked upon favourably; not only will they be good for the environment, but they will be good for business. Such factors may include the use of more fuel-efficient vehicles, use of alternative fuels for vehicles and emission controlling equipment and optimising vehicle mechanical maintenance.

Demonstration of Mitigation Measures

The project's total greenhouse gas emissions will be calculated and reported annually in the Mining Management Plan, and in accordance with relevant reporting guidelines under the *National Greenhouse and Energy Reporting Act 2007*. This will demonstrate how fuel consumption and greenhouse gas emissions are being reduced over time by mitigation measures.

4.2.2 Staff Environmental Training and Inductions

Issues Raised in Submission

One submission raised concerns regarding training and inducting staff for best practice environmental management, including the provision of information about energy efficiency and waste reduction/recycling.

Response

Minemakers is committed to sound environmental management and protection and, in accordance with its environmental policy, will 'provide information and training to our workforce, contractors, suppliers and customers to provide a greater understanding of environmental issues and responsibilities in relation to our business'. Minemakers will therefore ensure that its staff induction will include training regarding on-site sustainability measures including the provision of information about energy efficiency and waste reduction/recycling. Personnel will also be encouraged to suggest their own ideas of ways in which to minimise waste and facilitate more energy efficient production.

4.3 Noise and Vibration

Issues Raised in Submission

One of the submissions raised concerns about the impact of noise and vibration on fauna in the area, and that appropriate noise criteria should be identified and best practice activities for managing potential noise impacts on fauna should be described.

Response

The effects of noise and vibration on fauna can vary from negligible to severe, depending on the species and situation. There are no guidelines or established criterion that provide guidance to the level of noise to which fauna will experience annoyance or harm. It is expected that noise and

blasting will affect some fauna species that inhabit areas in close proximity to the site. However, most fauna species encountered in the area are highly mobile and will, therefore, be expected to temporarily move away from the immediate area of noise generating activities. This will be a residual impact of the project. As noise propagation over background levels is not be expected to extend more than 1 to 2 km from the mine (Section 6.4.2 of the Draft EIS), wildlife may move at least this far away from the site.

Minemakers will implement a number of noise mitigating measures, presented in Section 6.4.3 of the Draft EIS, in order to provide a safe working environment for mine workers. These measures will also be favourable to any wildlife present in the project area.

4.4 Flora

4.4.1 Weed Management

Issues Raised in Submission

A number of issues were raised about weeds and Minemakers' successful management of them, including:

- Identification of weed species in the project area, including the presence/absence of certain species (and particularly weeds of national significance, WONS), including olive hymenachne (*Hymenachne amplexicaulis*).
- Minimising the spread of weed seeds (including the use of wheel washes), the timing of weed management activities and the possible integration of weed management activities with adjoining landowners.
- Responsibility for the management of weeds in the project area, and the requirement for consultation with DNRETAS about weeds recorded in the project area.

Response

The record of the olive hymenachne presented in Section 6.7.1 of the Draft EIS was sourced from *Northern Territory Parks and Conservation Masterplan: Northern Territory Bioregions – Assessment of key biodiversity values and threats, Darwin, Northern Territory*. (Baker et al, 2005[R126]) (p. 66-67). This document indicates that this weed is present within the Davenport Murchison Bioregion, in which the project is located. While its exclusion in the WONS 2009 mapping (National Weed Strategy, 2009) may indicate that any previous infestations have been successfully eradicated from the area, it will remain in the list of potential weed species as a precautionary measure.

As recommended by one of the submissions, three additional WONS species are incorporated into Section 6.2.1 of the Flora Management Plan (Attachment 5G of the Draft EIS): Parthenium (*Parthenium hysterophorus*), prickly acacia (*Acacia nilotica* subsp. *indica*) and rubbervine (*Cryptostegia grandiflora*). The subsection now reads as:

All Minemakers and contractor personnel will be made aware of the location and extent of declared noxious and environmental weed species in areas to be disturbed during construction, specifically:

- Buffel grass (*Cenchrus ciliaris*).
- Kapok bush (*Aerva javanica*).
- Mesquite (*Prosopis limensis*).

- Olive hymanachne (*Hymenachne amplexicaulis*).
- Parkinsonia (*Parkinsonia aculeate*).
- Parthenium (*Parthenium hysterophorus*).
- Prickly acacia (*Acacia nilotica* subsp. *indica*).
- Rubbervine (*Cryptostegia grandiflora*).

Section 6.7.3 of the Draft EIS details the management and mitigation measures proposed by Minemakers to minimise the potential spread of weed seeds. This includes the requirement for vehicles and equipment to arrive on site clean and free of seeds. Section 6.2.3 of the Flora Management Plan (Attachment 5G of the Draft EIS) also details vehicle wash down procedures. A wheel wash will be available to be used by vehicles arriving or leaving site.

To aid in the control of weeds a recommendation was made to provide seeding periods for weeds presently found on site and consider this when planning weed control activities. The following dot point and table is added to Section 6.2.1 of the Flora Management Plan (Attachment 5G of the Draft EIS):

- Weed control activities will be timed, where possible, to occur prior to seed release, to maximise the potential for weed control. Flowering and/or seeding periods for weeds known on site or in the proximity of the project area are listed in Table 4.1.

Table 4.1 Flowering and/or seeding periods for weeds known on site or in proximity of the project area

Common Name	Scientific Name	Flowering/Seed period
Bellyache bush	<i>Jatropha gossypifolia</i>	Flowers most of year but chiefly late summer and autumn
Buffel grass	<i>Cenchrus ciliaris</i>	Flowers most of the year, usually after rain.
Caribbean stylo	<i>Stylosanthes hamata</i>	Flowers late autumn to spring.
Coffee bush	<i>Leucaena leucocephala</i>	Flowers summer and autumn.
Kapok bush	<i>Aerva javanica</i>	Flowers most of the year.
Marvel grass	<i>Dichanthium annulatum</i>	Flowers profusely over the winter.
Mesquite	<i>Prosopis pallida</i>	Flowers predominantly in spring and early summer, with pods taking two to three months to mature.
Neem	<i>Azadirachta indica</i>	Flowers profusely over the winter/spring dry-season.*
Noogoora burr	<i>Xanthium strumarium</i>	Flowers mostly summer and autumn.
Paddy's lucerne	<i>Sida rhombifolia</i>	Flowers in warmer months.
Parkinsonia	<i>Parkinsonia aculeate</i>	Flowers most of the year. Seeds mainly germinate during the wet season.
Ruby dock	<i>Acetosa vesicaria</i>	Flowers autumn to early summer.
Whorled pigeon grass	<i>Setaria verticillata</i>	Seed germinates from spring to early summer.
Spiked malvastrum	<i>Malvastrum americanum</i>	Flowers April, May, July. ^

Source: AWC (1998) [R122]

* DPI (2008) [R123]

^ DEC (2008) [R125]

Minemakers acknowledges the importance of a coordinated approach to weed management, as identified by one of the submissions. Minemakers understands its obligations under the Northern Territory's *Weed Management Act*, as an occupier of the land, to manage weeds within the project area. The *Weed Management Act*, however, does not require land owners or occupiers to

coordinate weed management activities. Minemakers therefore will promote a coordinated approach to weed management with adjoining landholders through the stakeholder consultation program, but cannot be responsible for the land management practices of these groups. The following point is added to Section 6.7.3 of the Draft EIS and Section 6.2.1 of the Flora Management Plan (Attachment 5G of the Draft EIS):

- Neighbouring landholders will be advised of Minemakers' weed control schedule to enable a collaborative effort of weed management in the local area.

Minemakers will employ an on site environmental officer when the mine becomes operational. Until the appointment of this person, suitably experienced and/or qualified environmental contract staff will be used to carry out Minemakers' environmental management obligations. The environmental officer will be responsible for the implementation of the Flora Management Plan for the mine site, which includes responsibility for the identification of weeds and implementation of suitable management and mitigation measures to minimise the spread or introduction of weed species.

Given the current distribution of weeds in the project area (i.e., only two environmental weeds have been identified on site), a dedicated weed control officer will not be employed. However, as recommended by one submission, the following dot point is added to Section 8.1 of the Flora Management Plan (Attachment 5G of the Draft EIS):

- New weed species or the spread of existing weed species into previously non-infested areas will be reported to the DNRETAS District Weed Officer located at Tennant Creek.

As requested by one submission, the following statement is added to Section 6.7.3 of the Draft EIS, Subsection Introduction of New Weed Species:

- The project area will also be examined by DNRETAS District Weed Officer annually, and all staff working on the mine site will be provided with identification material for easy reference for the identification of those weeds most likely to be encountered.

4.4.2 Baseline Flora Surveys

Issues Raised in Submission

One submission requested that the raw data from baselines surveys be provided to DNRETAS. This submission also recommended targeted future surveys for flora species listed as near threatened or data deficient species to better establish their conservation significance.

Response

All raw data from baseline surveys is provided within the appendices of Appendix 8A, Baseline Flora and Fauna Report, in the Draft EIS. Minemakers has also recently supplied the information to DNRETAS in digital format.

Minemakers will continue 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.

4.4.3 Fire Management

Issues Raised in Submission

One submission stated that fire should be added as a potential impact to flora; the submission acknowledged that flora management had been identified as an objective in the fire management plan, but that the potential impact from fire to flora needs to be articulated.

Response

Minemakers acknowledges the potential impact of fire on the flora in the project area and the following are additions to Section 6.7 of the Draft EIS.

Section 6.7.2:

Altered Fire Regime Adversely Affects Flora

Although fire is a common environmental feature of the Barkly Tableland, ecological communities, and therefore vegetation, may be adversely affected by an altered fire regime. For example, excessive burning (i.e., greater than once every two to five years) in open woodland may change vegetation composition by reducing the diversity of flora and causing a predominance of grasses in the understorey.

Section 6.7.3:

Altered Fire Regime Adversely Affects Flora

Fire management measures are discussed in detail in Attachment 5C – Fire Management Plan. In brief, management strategies will include:

- Consultation with Bushfires NT on the recommended timing of prescribed burning and placement of fire breaks.
- Discussion with Traditional Owners and the CLC with regard to opportunities for patch burning for the benefit of local biodiversity; however, the priority will always be for the health and safety of personnel and protection of property.
- Implementing control measures such as the protection of fire sensitive vegetation during the fire season and having a full trailer-mounted fire-fighting tanker on site at all times.

Section 6.7.4:

Altered Fire Regime Adversely Affects Flora

With the implementation of an appropriate Fire Management Plan, which will aim to maintain the natural fire regime, it is **unlikely** that flora will be adversely affected by an altered fire regime in the project area. Also, given that natural fire events are a commonly occurring feature in the region any effect on flora would be **minor**.

The residual impact is therefore **low**.

Table 4.2 is to be added to Table 6.19 in the Draft EIS.

Table 4.2 Summary of impact to flora

ID	Impact	Likelihood	Consequence	Residual Risk
I59	Altered fire regime adversely affects flora	Unlikely	Minor	Low

4.4.4 Biodiversity Offset Plan

Issues Raised in Submission

Two submissions sought information about the development of a biodiversity offset plan for the project to mitigate the impact of the project to biodiversity, and particularly vegetation.

Response

Minemakers will develop a biodiversity offset plan during the first twelve months of operations and include this in the Mining Management Plan for the second year of operation of the project. There is currently no formal policy for biodiversity offsets in the Northern Territory; therefore, Minemakers will develop the biodiversity offset plan in consultation with DNRETAS, the CLC, Traditional Owners and relevant experts.

In the absence of formal Northern Territory Government policy about biodiversity offsets, Minemakers will adopt an objective for the biodiversity offset plan to ensure that significant and unavoidable adverse environmental impacts to the biodiversity of the project area are counterbalanced by a positive environmental gain in the region. The main threats to biodiversity in the Barkly Tableland region include weed infestation, predation by feral animals (particularly cats and foxes) and grazing (Baker et al. 2005); Minemakers will focus on managing these in collaboration with the CLC and local Traditional Owners. The proposed measures for doing this will be documented in the biodiversity offset plan, however, it is likely that potential offset activities will follow the themes mentioned above and could include:

- Activities involving a concentrated effort to eradicate certain weed species to provide substantial environmental benefits. Preliminary discussions with DNRETAS Weed Management Officers in Tennant Creek have identified three high priority weeds in the vicinity of the project area: prickly acacia (*Acacia nilotica*), mesquite (*Prosopis pallida*) and rubber bush (*Calotropis procera*).
- Feral animal control focussing on fox and cat populations in known habitat areas of local species of conservation significance such as the bilby, mulgara and northern nail-tailed wallaby. Control activities would be collaborated with a monitoring program to determine the effectiveness of the measures. Predation by feral cats and foxes is recognised as a key threatening process for native fauna in the Barkly Tableland region.
- Fire management for the benefit of biodiversity as well as reduced carbon emissions.
- Development of sustainable agricultural activities that will provide subsistence to local Indigenous communities and reduce grazing impacts on local habitat, e.g., native seed collection and nursery or growing of bush foods.

Minemakers plans to target the management of vegetation types that are not currently represented in reserves in the Davenport Murchison Ranges Bioregion, such as hummock grassland, tussock grassland, chenopod shrubland and eucalyptus low woodland with tussock grass understorey (Baker et al., 2005). Through this, it is hoped that the improvement of a range of habitat types will be achieved, benefiting a range of flora and fauna species.

4.4.5 Flora Management

Issues Raised in Submission

One submission wanted specific measurable management objectives for flora and for each of the prescribed management actions proposed. The submission also questioned the effectiveness of monitoring by surveillance of permanent established sampling locations.

One submission noted that the environmental benefit measures referred to in Section 6.7.4 of the Draft EIS were not clear in the Flora Management Plan (Attachment 5G of the Draft EIS).

Response

The existing management measures will be regularly reviewed for effectiveness and will be revised throughout the life of the project. The monitoring program proposed in the Draft EIS is designed to enable assessment of vegetation that will not be disturbed by the project and to determine if any impact does occur. This monitoring program is separate to that which will be used for monitoring the success of rehabilitation of disturbed areas.

The monitoring program for flora will provide measurable statistical results over time, as well as a photographic record of monitoring sites. Statistical variances will be investigated to determine if the variance is due to a project related impact. Data to be collected in the monitoring program will include native species composition and abundance, vegetation condition and weed species composition and abundance. The monitoring program is based on standard method, and surveying of permanent established sampling locations will be supplemented by incidental observations.

The environmental benefit measures were not explicitly stated in Attachment 5G of the Draft EIS; these are discussed in Section 4.4.4 above.

4.4.6 Vegetation Clearance

Issues Raised in Submission

One submission requested identification of ephemeral areas that would be cleared as a result of the project. This request was related to a specific point in the Flora Management Plan (Attachment 5G of the Draft EIS), which states:

- The project will be designed to minimise and avoid unintended changes in the structure and condition of areas which contain flora of significance, including:
 - Minimising vegetation clearing in ephemeral land systems and areas subject to inundation.

Response

Clearing associated with the project will only occur within the following areas:

- Mineral Lease.
- Northern borefield.
- Water supply pipeline and associated access track.

There are no ephemeral land systems within these areas, therefore no clearing is proposed to occur within any ephemeral land systems.

4.4.7 *Sporobolus latzii*

Issues Raised in Submission

One submission requested details on the seasonal water table depth range around the low-lying area associated with the area of cultural exclusion, and the presence of *Sporobolus latzii*.

Response

Due to its location within an exclusion zone, water table depths in the area associated with *S. latzii* have not been measured. However, based on groundwater levels measured at Main Zone and Arruwurra it is expected that the water table is more than 18 m below ground level (bgl). *S. latzii* has a short fibrous root system that is unlikely to extend beyond 1 m bgl (RBG Kew, 2008). Therefore, this species is unlikely to be dependent on groundwater for sustenance and is more likely to be supported by ephemeral surface water.

4.4.8 Plant Species of Indigenous Value

Issues Raised in Submission

One submission acknowledged that flora species of Indigenous significance had been identified in the Draft EIS but that the full Indigenous value of these species had not been described.

Response

Appendix 38 of the Baseline Flora and Fauna Report (Appendix 8A of the Draft EIS) lists the Indigenous use and category (i.e., utilitarian or cultural) of flora species identified within the project area. This reflected the level of detailed information the Traditional Owners who were present during the flora and fauna survey wished to provide. Minemakers respects the Traditional Owner values for flora in the project area and will continue to work with the Traditional Owners and the CLC to ensure these values are respected.

4.5 Fauna

4.5.1 Fauna Road Strikes

Issues Raised in Submission

A number of comments were made in relation to the project's planned management of vehicle collisions with animals, and particularly threatened species. Comments mainly related to the potential for collisions with animals and subsequent mortalities to occur along the ore transport route, and that collisions and mortalities could also occur within the Mineral Lease.

One submission stated that the residual impact assessment was considered inadequate for this particular potential impact and recommended that it be included as a specific potential project impact. The submission also requested further detail in relation to Minemakers' management measures to minimise collisions with animals, responses to collisions and the records that will be kept.

Response

The following text is added to Section 6.8.2 of the Draft EIS:

Significant Impacts to Threatened Species Due to Increased Road Traffic

Increased traffic within the Mineral Lease and along public roads as a result of project construction and operations may increase the mortality rate of fauna, and particularly threatened species. Threatened fauna known to be present in the project area include the bilby (*Macrotis lagotis*), mulgara (*Dasyercus cristicauda*), Australian bustard (*Ardeotis australis*) and the northern nailtail wallaby (*Onychogalea unguifera*).

The following text is added to Section 6.8.3 of the Draft EIS:

Significant Impacts to Threatened Species Due to Increased Road Traffic

Measures to avoid, mitigate and manage traffic to limit the potential for vehicle accidents are addressed in Section 6.13.3. Avoidance, mitigation and management measures specific to the management of fauna hit or killed by project traffic includes:

- Minemakers haulage drivers will provide global positioning system (GPS) coordinates of any known collision with fauna to the environmental officer at the end of their shift.
- A weekly search will be made 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

travelling along the transport route. Records will be maintained of all road kill removed from the road, which will include road kill from non-project related traffic.

- The death of fauna of conservation significance will 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.
- Ensure that all vehicles contain contact details for the local (Tennant Creek) wildlife rescue organisation (08 8962 4599) and the environmental officer. If a collision with an animal occurs that does not result in a fatality, the environmental officer will be immediately contacted.

Table 4.3 is to be added to Table 6.23 in the Draft EIS.

Table 4.3 Summary of impact to fauna

ID	Impact	Likelihood	Consequence	Residual Risk
I60	Significant impacts to threatened species due to increased road traffic.	Unlikely	Moderate	Moderate

The following text is added to Section 6.8.4 of the Draft EIS:

Significant Impacts to Threatened Species due to Increased Road Traffic

It is **unlikely** that there will be a significant impact to threatened species as a result of increased road traffic. The consequence on existing local populations is **moderate** given the low populations of the fauna. The residual impact is therefore **moderate**.

4.5.2 Introduced Fauna

Issues Raised in Submission

A number of submissions were received that related to Minemakers' management plans for introduced fauna. One submission requested specific measures for cane toad prevention and management.

As with weeds, one submission requested that Minemakers details plans to work with neighbouring landholders in the eradication of existing feral animals and in the prevention of new feral animal introductions in the project region.

Response

Minemakers acknowledges the importance of a coordinated approach to pest management, as identified by one of the submissions. Minemakers also understands its obligations under the Northern Territory's *Territory Parks and Wildlife Conservation Act*, as an occupier of the land, to manage pest or feral animals within the project area. The Territory Parks and Wildlife Conservation Act, however, does not require land owners or occupiers to coordinate pest management activities. Minemakers therefore will promote a coordinated approach to pest management with adjoining landholders through the stakeholder consultation program, but cannot be responsible for the land management practices of these groups. The following point is added to Section 6.8.3 of the Draft EIS and Section 5.2.1 of the Fauna Management Plan (Attachment 5H of the Draft EIS):

- Neighbouring landholders will be advised of Minemakers' pest animal control schedule to enable a collaborative effort of pest animal management in the local area.

In relation to the specific management of cane toads, the following text is added to Section 5.2.1 of the Fauna Management Plan (Attachment 5H of the Draft EIS):

- Monitoring of permanent water sources, particularly those that are preferred cane toad habitat (i.e., disturbed areas, shallow ponds with little surrounding vegetation) (Molloy and Henderson, 2006).

The following text is added to Section 5.2.2 of the Fauna Management Plan (Attachment 5H of the Draft EIS):

- Ensure that fencing used to surround water storage areas is cane toad proof.

The following text is added to Section 5.2.3 of the Fauna Management Plan (Attachment 5H of the Draft EIS):

Cane Toad (*Bufo marinus*)

As the cane toad is not currently present within the project area, the following preventative measures will be introduced to minimise the likelihood of infestation:

- Cane toad proof fencing will be installed around permanent water areas.
- Cane toad traps will be installed in locations that are identified as preferred habitat (i.e., disturbed areas, shallow ponds with little surrounding vegetation).
- 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.
- Cane toad awareness will be included in staff inductions.
- Cane toad captures or sightings will be reported to the environmental officer and the identity of the animal is to be confirmed (to ensure it is not a misidentified frog) before it is humanely euthanised (preferred method is to place double-bagged toad in a freezer overnight).
- The environmental officer will immediately advise Frogwatch on 1800 243 564 of any sightings or captures of cane toads.

4.5.3 Threatened Fauna and Significant Habitat

Issues Raised in Submission

One submission requested the details of the expertise of persons conducting the site walkovers that will be conducted prior to any vegetation clearance and ground disturbance. The submission also questioned whether sufficient time would be allocated to relocate significant species if they are located in areas to be disturbed.

One submission also requested identification of the significant habitats that are proposed to be disturbed as a result of the project.

Response

Suitably experienced and/or qualified staff and/or contractors will conduct all walkovers.

Minemakers will consult with DNRETAS prior to construction commencing to develop procedures for the relocation of any threatened fauna found during pre-clearance surveys. These procedures will be documented in the Mining Management Plan.

As stated in Section 6.7 of the Draft EIS, no significant vegetation communities or ecological habitats (as listed under the *Environment Protection and Biodiversity Conservation Act 1999* or

Territory Parks and Wildlife Conservation Act) were identified within the project area. Therefore no significant vegetation communities or ecological habitats will be cleared as a result of the project. There is an ephemeral wetland area to the north of the Arruwurra section of the Mineral Lease, which is known to be an important habitat area for a range of species. This area is outside the Mineral Lease and will not be disturbed as a result of the project.

4.5.4 Fire Management

Issues Raised in Submission

As previously mentioned in Section 4.4, one of the submissions requested that fire be added as a potential impact. The submission acknowledged that fauna management has been identified as an objective in the fire management plan, but that the potential impact to fauna from fire needs to be articulated.

Response

Minemakers acknowledges the potential impact of fire on the fauna in the project area and as such, the following are added to Section 6.8 of the Draft EIS.

Section 6.8.2:

Altered Fire Regime Adversely Affects Fauna

Although fire is a common environmental feature of the Barkly Tableland, ecological communities, and therefore fauna habitat, may be adversely affected by an altered fire regime. For example, excessive burning (i.e., greater than once every two to five years) in open woodland may change habitat structure by reducing the diversity of flora and causing a predominance of grasses in the understorey.

Section 6.8.3:

Altered Fire Regime Adversely Affects Fauna

Fire management measures are discussed in detail in Attachment 5C – Fire Management Plan. In brief, management strategies will include:

- Consultation with Bushfires NT on the recommended timing of prescribed burning and placement of fire breaks.
- Discussion with Traditional Owners and the CLC with regard to opportunities for patch burning for the benefit of local biodiversity; however, the priority will always be for the health and safety of personnel and protection of property.
- Implementing control measures such as the protection of fire sensitive vegetation during the fire season and having a full trailer-mounted fire-fighting tanker on site at all times.

Section 6.8.4:

Altered Fire Regime Adversely Affects Fauna

With the implementation of an appropriate Fire Management Plan, which will aim to maintain the natural fire regime, it is **unlikely** that fauna will be adversely affected by an altered fire regime in the project area. Also, given that natural fire events are a commonly occurring feature in the region any effect on fauna habitat would be **minor**.

The residual impact is therefore **low**.

Table 4.4 is to be added to Table 6.23 of the Draft EIS.

Table 4.4 Summary of impacts to fauna

ID	Impact	Likelihood	Consequence	Residual Risk
I59	Altered fire regime adversely affects fauna	Unlikely	Minor	Low

4.6 Groundwater

4.6.1 Groundwater Aquifers

Issues Raised in Submission

One submission requested further information about the groundwater aquifers on the Mineral Lease, including maps and text. In particular, the submission requested a surface topographical map that shows the likely surface water flow paths, areas of potential surface expression of groundwater and/or seasonal inundation, and the location of mine infrastructure. Also, information was requested about the pits that will intersect groundwater aquifers and at what depth the groundwater aquifer will be intersected, as well as any estimated seasonal variation in the groundwater depths.

Response

As part of the hydrogeological investigation groundwater levels were measured in 51 holes at the Main Zone and 29 holes at Arruwurra (Section 3.3.1 of Appendix 9 of the Draft EIS). The majority of holes monitored at Main Zone had water levels deeper than 50 m and at Arruwurra deeper than 20 m. Holes where near-surface groundwater levels were identified were generally blocked immediately below the measured water level. It is likely that these shallow levels represent minor perched groundwater bodies that are not representative of the water table. The deep 100 m groundwater levels were measured in groundwater exploration drill holes approximately 10 km from the Main Zone deposit and 20 km from Arruwurra deposit. Therefore, the water table depths in the area of mining more realistically range from 50 to 60 m at Main Zone, and 20 to 35 m bgl at Arruwurra. As described above, water encountered at shallower depths or near-surface represent minor perched groundwater bodies rather than groundwater aquifers.

The aquifers identified at Arruwurra and near the current exploration camp at the Main Zone comprise discrete fracture systems, rather than the regional scale dolomite aquifers that occur north of the Mineral Lease area. As such, it is not possible to provide a plan showing their spatial distribution. However, the large numbers of dry exploration holes indicate the aquifers are likely to be poorly connected.

There are no known discernible significant watercourse or drainage channels within the project area. All of the watercourses and drainage lines in vicinity of the project area are relatively minor and ephemeral in nature and are likely to only carry runoff for short periods following significant rainfall. Catchments and estimated flow paths are shown in Figure 6.11 of the Draft EIS.

There are no known surface expressions of groundwater in the area. Groundwater assessment indicated that Kerringnew Swamp (located 10 km northeast of the northern borefield) is an ephemeral surface water feature not related to groundwater, while the Oolgoogarri Swamp is considered too far away to be hydraulically connected to the underlying groundwater in the area (Section 6.9.1 of the Draft EIS). Similarly, the cultural exclusion zone containing *Sporobulus latzii* is not related to groundwater (see Section 4.4.7 for further detail).

Groundwater level monitoring in the area of the Main Zone and Arruwurra deposits indicates groundwater levels are below the base of the ore zones, apart from a few occurrences that are believed to represent minor perched groundwater bodies (as discussed above and in

Section 3.3.1 of Appendix 9 of the Draft EIS). Therefore, pits will not extend below the water table, although there maybe some short-term localised inflows from minor perched groundwater bodies.

It is not anticipated that there will be pit void lakes after mining. Any water accumulating in the pits is most likely to be from rainfall inflows and is expected to seep downwards recharging the underlying water table aquifer.

The seasonal range in groundwater levels is not well understood. If there is significant variation it is likely to be in response to recharge.

4.6.2 Groundwater Monitoring

Issues Raised in Submission

Two submissions were received in relation to the groundwater monitoring program presented in the Draft EIS. One submission requested that, given the limited existing information on groundwater in the area, the groundwater monitoring program be developed to capture:

- Information relating to aquifer behaviour and in particular the occurrence of groundwater recharge.
- Data to enable the assessment of the impact of groundwater extraction during the project construction and operations.

The submission recommended five components be incorporated in to the groundwater monitoring program:

- Monthly water level measurements.
- Continuous water level recorders at both the northern borefield and the Arruwurra deposits.
- Monthly water quality monitoring of each production bore.
- Monitoring bores for the operational pits drilled and constructed as part of the monitoring network, if aquifers are encountered.
- Formal reporting and review of the groundwater monitoring program every two years, with particular consideration to the comparison of modelled and observed data, and submission of the report to DNRETAS.

Response

Minemakers acknowledges the importance of groundwater monitoring to confirm the results of the numerical groundwater modelling and check for any impacts on groundwater quantity or quality. Therefore, Minemakers has proposed a comprehensive groundwater monitoring program for the project. Future monitoring data will be reviewed and, if necessary, the model will be refined.

Minemakers will monitor groundwater for the following water quality parameters as a minimum:

- Ions and nutrients and other parameters, which include fluoride, phosphate, silica, chloride, sulphate, nitrate, carbonate and bicarbonate.
- Metals, which include aluminium, antimony, arsenic, barium, beryllium, boron, bromine, cadmium, calcium, chromium, copper, iodine, total iron, lead, magnesium, manganese, total mercury, molybdenum, nickel, potassium, selenium, sodium, tin, uranium and zinc.
- General parameters, which include total dissolved solids (TDS), total suspended solids (TSS), electrical conductivity (EC), pH, temperature, turbidity and total hardness (as CaCO₃).

These parameters will be monitored monthly at the northern borefield production bores for an initial six-month period to establish whether there are any shorter-term impacts from groundwater production. Should there be little variance between monthly monitoring results or no adverse trend shown over this period, monitoring frequency will be reduced to half yearly for the following 18 months. Similarly, if no adverse trends are identified after two years of pumping the frequency will be reduced to yearly.

Monitoring of general groundwater parameters will be conducted monthly for active production bores within the Arruwurra borefield and the northern borefield. Results will be compared against relevant Australian and New Zealand Environment and Conservation Council (ANZECC) criteria (ANZECC/ARMCANZ, 2000) and, where water is used for drinking purposes, against the Australian Drinking Water Guidelines (NHMRC, 2004).

Monitoring of the depth to the standing water level will be conducted at all active project bores (i.e., production bores and monitoring bores in the Arruwurra borefield and northern borefield) as identified in the Draft EIS (Table 6.28).

Minemakers will equip the three regional monitoring bores in the area of the northern borefield and two monitoring bores at Arruwurra with data loggers to confirm its interpretation of the groundwater model. Where aquifers are encountered in operational pits, Minemakers will install monitoring bores to monitor the quantity of groundwater inflow removed from pits and the period of time during which pumps are operating to remove groundwater flow (as stated in Table 6.28 of the Draft EIS).

Minemakers will undertake a formal biennial review of the groundwater monitoring program, including calibration of the groundwater flow model and simulation of future impacts from groundwater production.

Minemakers will prepare a formal biennial report and review the groundwater monitoring program every two years with particular consideration to the comparison of modelled and observed data. The report will be submitted to DNRETAS along with an electronic copy of the monitoring data as part of the MMP for that year.

4.6.3 Cumulative Impact on Groundwater Resources

Issues Raised in Submission

One submission questioned what consideration was given to the possible cumulative impacts on groundwater in the region from various developments, and gave the example of the proposed phosphate mine at Highland Plains proposed by Phosphate Australia Limited.

Response

The Draft EIS considers the project's potential impact to the existing users of the groundwater resource (Section 6.9.4 of the Draft EIS) and the potential groundwater drawdown over the life of the mine. Minemakers is not aware of any other major project that is proposing to source water from the same regional aquifers as the project; however, the groundwater model used for the Draft EIS could be used to determine potential impact to the groundwater resource should extraction from the groundwater resource be increased.

Any other major projects would likely require an EIS to be prepared prior to the project commencing. If the Wonarah Phosphate Project were to be approved, the Wonarah Phosphate Project and the water requirements would be considered as an existing groundwater user.

In relation to the specific question related to the proposed Highland Plains mine, this mine is proposed to be located about 200 km northeast of the Wonarah Phosphate Project, near the Northern Territory and Queensland border. Minemakers can provide no formal comment on the cumulative impact of this project, as no formal notification of the project (e.g., Notice of Intent to the Northern Territory Government, or referral to the Australian Government) has been made. However, given the distance between the projects, it is unlikely that both the Wonarah Phosphate Project and Highland Plains mine will use groundwater from the same aquifer source.

4.6.4 Suitable Alternative Water Supply

Issues Raised in Submission

Submissions were received in relation to the source of alternative water supplies should Minemakers activities impact on existing groundwater users. One submission also questioned if Stage 1 were to progress beyond the proposed mine life of 10 years, what the predicted groundwater drawdown would be.

One submission requested that third party user bores and the Wunara community bore be added to Figure 6.10 of the Draft EIS.

Response

The Draft EIS investigated the potential environmental impacts associated with Stage 1 of the Wonarah Phosphate Project, which comprises the ten-year mine life. Potential impacts associated with the project investigated in the Draft EIS have been restricted to those associated only with the proposed Stage 1. If the mine life was to be extended beyond 10 years, further assessment and approvals may be required; this would likely include an assessment of groundwater drawdown.

Minemakers proposes five low-yielding bores in the Arruwurra area to provide water for the first stage of construction, spanning approximately three months. The second stage of water supply will be the northern borefield, located 27 km northwest of the Mineral Lease. Once the northern borefield is operational, the Arruwurra borefield will no longer be required. The northern borefield will then provide all water requirements for the project for the proposed ten-year life of the mine.

No third party users have been identified within or surrounding the Arruwurra deposit. The groundwater assessment (Appendix 9 of the Draft EIS) showed that the only third party bores that may be adversely affected by the project are seven stock bores located approximately 2 to 9 km from the northern borefield. These bores lie within the predicted 5 and 10 m drawdown contours after ten years of operation. The groundwater assessment showed it is unlikely that an alternative water supply would be required for users of third party bores. However, in the unlikely event that the users of these bores experience a reduction in water supply as a result of the project, Minemakers will provide another water supply by one or more of:

- Deepening the existing bores impacted by the project's groundwater drawdown to provide additional water supply.
- Providing additional bores.
- Determining a new area suitable for groundwater extraction.
- Trucking adequate water supplies to the affected parties.
- Piping adequate water from its bores to a location required by the affected bore user.

Minemakers acknowledges the request to amend Figure 6.10 to include third party bores; the revised figure is included as Figure 4.2. The location of the Wunara community bore is not shown on this figure, as it is outside the limit of the figure and approximately 12.5 km southeast from the boundary of the lowest level (0.2 m) of predicted groundwater drawdown.

4.6.5 Community Water Supply

Issues Raised in Submission

One submission expressed concern about the potential impacts to the water supply for the Wunara community, particularly from drawdown as a consequence of mining. The submission questioned what the impacts might be for the Wunara community's groundwater supply if the development of the northern borefield is delayed and the Arruwurra borefield is required for longer than the anticipated three-month period. The submission also questioned what monitoring Minemakers was proposing for the Wunara community's bore.

Response

The groundwater assessment (Appendix 9 of the Draft EIS) showed it is highly unlikely that there is any active hydraulic connection between either the Arruwurra bores, the existing exploration camp bore or the Wunara community's bore. This lack of hydraulic connection is evidenced by the large number of dry groundwater exploration holes drilled on Minemakers' Exploration Lease, in particular at drill-holes which lie near the eastern edge of the lease opposite the community bore.

The exploration camp bore (near the Main Zone deposit), which is the nearest bore to the Wunara community (located about 15 km away), yields a modest 1.5 L/s. It is highly unlikely that pumping at this rate will have any impact upon the community bore. The Arruwurra production bores are located some 28 km from the community bore. At this distance it is again improbable that groundwater production at Arruwurra will impact in any way on the community bore.

In the unlikely situation that abstraction from the Arruwurra borefield is extended, impacts on the community bore are unlikely given the low extraction rates and lack of hydraulic connection.

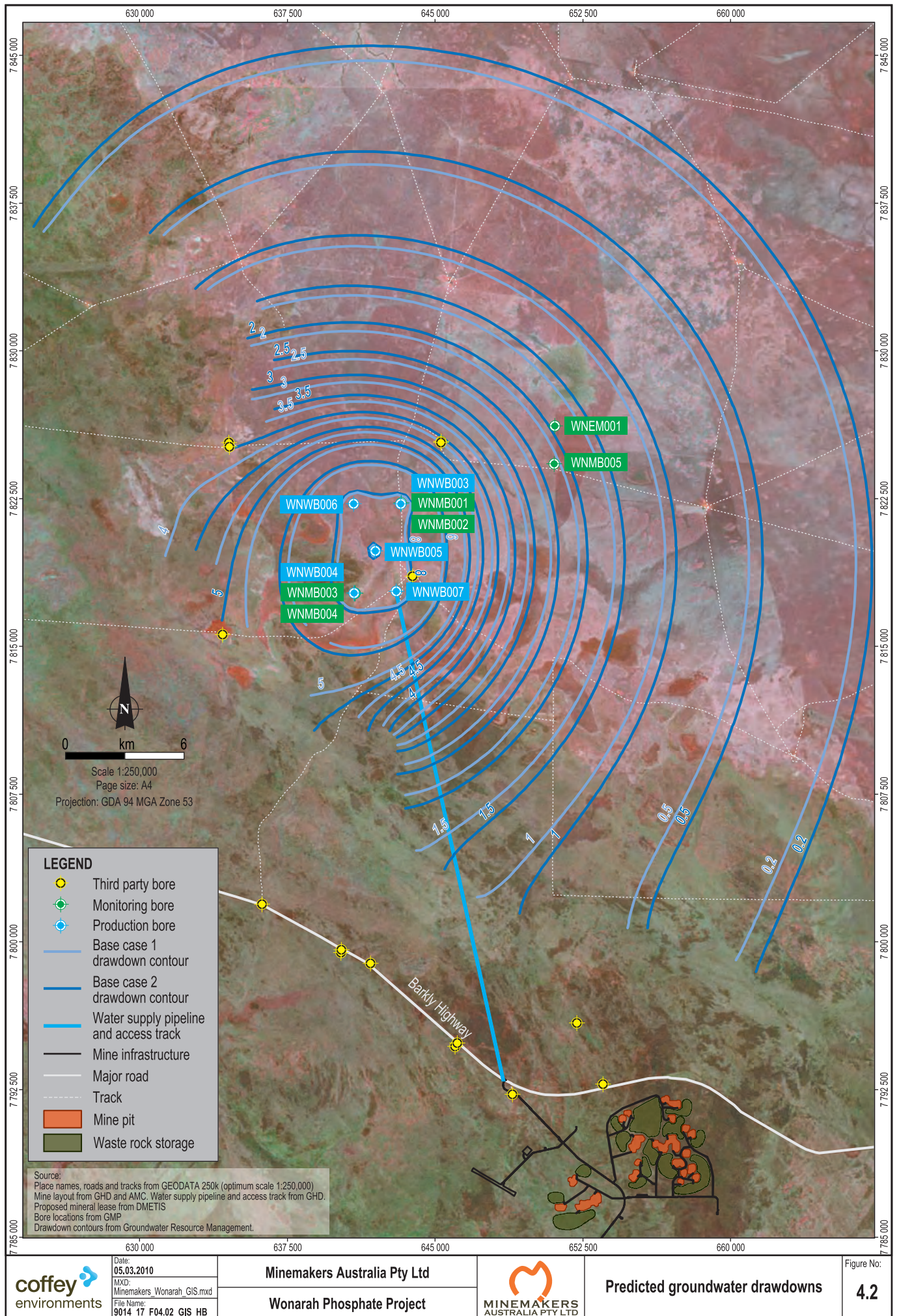
To confirm this assessment Minemakers will monitor the depth to the water level in the community bore on a monthly basis. The results of the monitoring will be included in the biennial reporting review discussed above (Section 6.6.2).

4.7 Surface Water

4.7.1 Alternative Water Supplies

Issues Raised in Submission

One submission received questioned the potential use of on-site rainwater harvesting to reduce the groundwater requirements for the project's water supply. This submission also identified the potential use of treated effluent to reduce the groundwater extraction demand.



Response

Minemakers has investigated the use of various water sources for potential use in the project. It was found that the region has insufficient surface water in terms of storage, diversion and supply infrastructure. The climate of the region is mainly dry with low mean annual rainfall (around 300 mm) and typically high evaporation rates (around 3,000 mm). Evaporation exceeds rainfall during all months of the year except January and February. In combination with the sandy, fast-draining condition of the soils, there will be little opportunity to harvest and retain sufficient rainwater for use in the project, particularly as the project has an average water requirement of 7,678 m³/day and a peak water requirement of 9,553 m³/day. Groundwater was therefore found to provide the main water source in the region. Minemakers will, however, continue to investigate opportunities to maximise the efficient use of water on site.

Where possible, Minemakers will reuse treated effluent to reduce its groundwater extraction demands. Dust suppression will be the major use of water on site and, where possible, treated effluent will be used for dust suppression. The use of treated effluent for this purpose is seen as the most beneficial use of the treated effluent and the greatest contributor to any reductions in groundwater extraction demands.

4.7.2 Contamination and Flooding

Issues Raised in Submission

Two submissions requested further information about the potential contamination of surface water, with hydrocarbons, phosphate, fluorine and beryllium the potential contaminants of interest. Concern was also expressed in two submissions that phosphate could contribute to the eutrophication of water supplies. One submission also questioned the surface water monitoring program and the lack of a specific surface water management plan.

In relation to hydrocarbon contamination, the submission questioned how any hydrocarbon-contaminated water would be appropriately disposed of. Other questions were focused on the potential for hydrocarbons to contaminate surface waters during flood events. Information requested included:

- The location of potentially contaminating infrastructure, such as fuel stores and workshops, in relation to the flow paths of rare extreme flooding events.
- What the design criteria or average recurrence interval (ARI) rainfall event bunds around fuel and hazardous goods stores are designed for.
- How oily water separators perform in flood conditions.

Response

The rock phosphate that will be mined is insoluble in normal conditions and can be considered to be benign (Appendix 6 of the Draft EIS). Given the insoluble nature of the phosphate, eutrophication of water supplies as a result of rock phosphate entering surface water storages is highly unlikely. Other elements detected at elevated levels in the low grade ore and waste rock included fluorine and beryllium. Given the low mean annual rainfall, surface water flows are infrequent and surface water monitoring will be event driven; however, Minemakers will include phosphate, fluorine and beryllium in the suite of elements to be tested in the surface water monitoring program. Other parameters to be included in any surface water monitoring will be:

- pH and electrical conductivity.
- Total dissolved solids (TDS) and total suspended solids (TSS).

- Unfiltered and filtered metals (As, Ba, Be, Cd, Cr, Co, Cu, Pb, Fe, Hg, Mn, Zn).
- Major ions (Ca, Mg, K, Na, Cl, SO₄).
- Total nitrogen.
- Hardness.
- Ammonium.
- Total petroleum hydrocarbon.

In response to the lack of a specific surface water management plan, a Sediment and Erosion Control Plan is provided in the Draft EIS (Attachment 5J). This plan provides details on the measures to be implemented to minimise erosion and control sediment for the project through the management of surface water.

Surface water may be contaminated with hydrocarbons used and stored on site. Specific management measures have been included in the mine design to minimise the risk of hydrocarbon contamination, and include bunding fuel storages and workshop areas where potential for hydrocarbon release is at its greatest, and inclusion of oily water separators in the surface water management system for the site (Chapter 5 of the Draft EIS). More specific information in relation to how potentially hydrocarbon-contaminated surface water will be managed is outlined below:

- Hydrocarbon-contaminated water will be pumped from within the bunded area and discharged to a bunded area within the bio-remediation facility located adjacent to the sewerage treatment facility.
- All potentially-contaminating infrastructure will be placed on natural or filled areas at or above the 100 year ARI flood elevation.
- All fuel and hazardous storage facilities will be placed on natural or filled areas at or above the 100 year ARI flood elevation. In addition, all bunding will be designed in accordance with the Australian Standard for the *Storage and handling of flammable and combustible liquids* (AS 1940-2004). Bunding is typically based on the volume stored rather than based on a hydrological event, and is designed to hold 110% of the total volume of liquid being stored.
- Oily water separators will serve clearly defined, relatively small, catchment areas such as bunded areas and floor drains from workshop areas. They will be designed with sufficient live storage to accommodate runoff from events of up to 10 year ARI. Flood protection levees around the Mineral Lease (Section 5.8.1 of the Draft EIS) are designed for a 100 year ARI event and will therefore protect oily water separators from flood events.

4.7.3 Sedimentation Ponds

Issues Raised in Submission

One submission requested explanation for why the sedimentation ponds are designed for a 1 in 10 year ARI runoff event, and what would happen during such a runoff event.

Response

The 1 in 10 year ARI event was the design condition considered appropriate by the surface water engineers for the project, based on professional experience and is in accordance with the Engineers Australia design guidelines (IEA, 1996).

Water quality of the sedimentation ponds will be monitored for the parameters listed in Section 4.7.2, including during storm events.

Should a 1 in 10 ARI or higher runoff event happen, the sedimentation ponds will overtop and release water. This may result in the release of sediment-laden water downstream; given the benign nature of water likely to be in these ponds and flood conditions across the site at the time of overtopping, no major environmental issues would be expected to result.

4.7.4 Erosion and Sediment Control

Issues Raised in Submission

One submission received requested that all on site works be carried out in accordance with the Northern Territory Government's *Erosion and Sediment Control Guidelines*. The submission also requested specific design criteria for rock-check dams and culverts.

Response

Minemakers will ensure that all on site works area carried out in accordance with the Northern Territory government's *Erosion and Sediment Control Guidelines*. As such, the following dot point is also added to Section 5.1 of the Draft EIS Erosion and Sediment Control Plan (Attachment 5J, Draft EIS):

- *Erosion and Sediment Control Guidelines*.

Minemakers will also ensure the following design parameters are incorporated into the sediment and erosion control structures:

- All rock check dams in major diversion drains, drop structures, drain outlets and flood protection berms will have a geotextile underlay to minimise the potential for soil erosion (as per Figure 4.3).
- Culvert outlets on the main haul road will be rock lined with a geotextile underlay (as per Figure 4.4).

As per the *Erosion and Sediment Control Guidelines*, Minemakers will also provide the amended Erosion and Sediment Control Plan to DNRETAS for approval prior to commencement of works.

4.7.5 Water Retention and Accumulation of Contaminants in Voids

Issues Raised in Submission

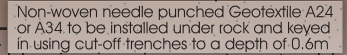
Two submissions were made in relation to the potential storage of water in pits and the potential accumulation of sediments, salts and precipitates through repeated stormwater runoff and evaporation cycles, and the potential for this to impact the long-term water quality and use of the voids by wildlife and stakeholders.

Response

Given that the pits will not intersect the groundwater table, any water accumulation in the pits is most likely to be from rainfall inflows, which are expected to seep downwards. The geology of the project area (sandy, fast-draining soils), as well as the high evaporation rate compared to rainfall (3,000 mm and 300 mm average annually, respectively), does not allow surface water, such as pooled rainwater, to be retained for long periods of time. The retention time of water in pits cannot be reliably calculated, but it would be estimated to be in terms of weeks and therefore unlikely to provide much long-term benefit. It would more likely provide a seasonal supplement to the bore water supply.

Line with non-woven needle punched geotextile

1. Check dam required for diversion ditch where gradient greater than 1%
2. Key stone into channel banks and extend it beyond the abutment a minimum of 0.5m to prevent flow around dam



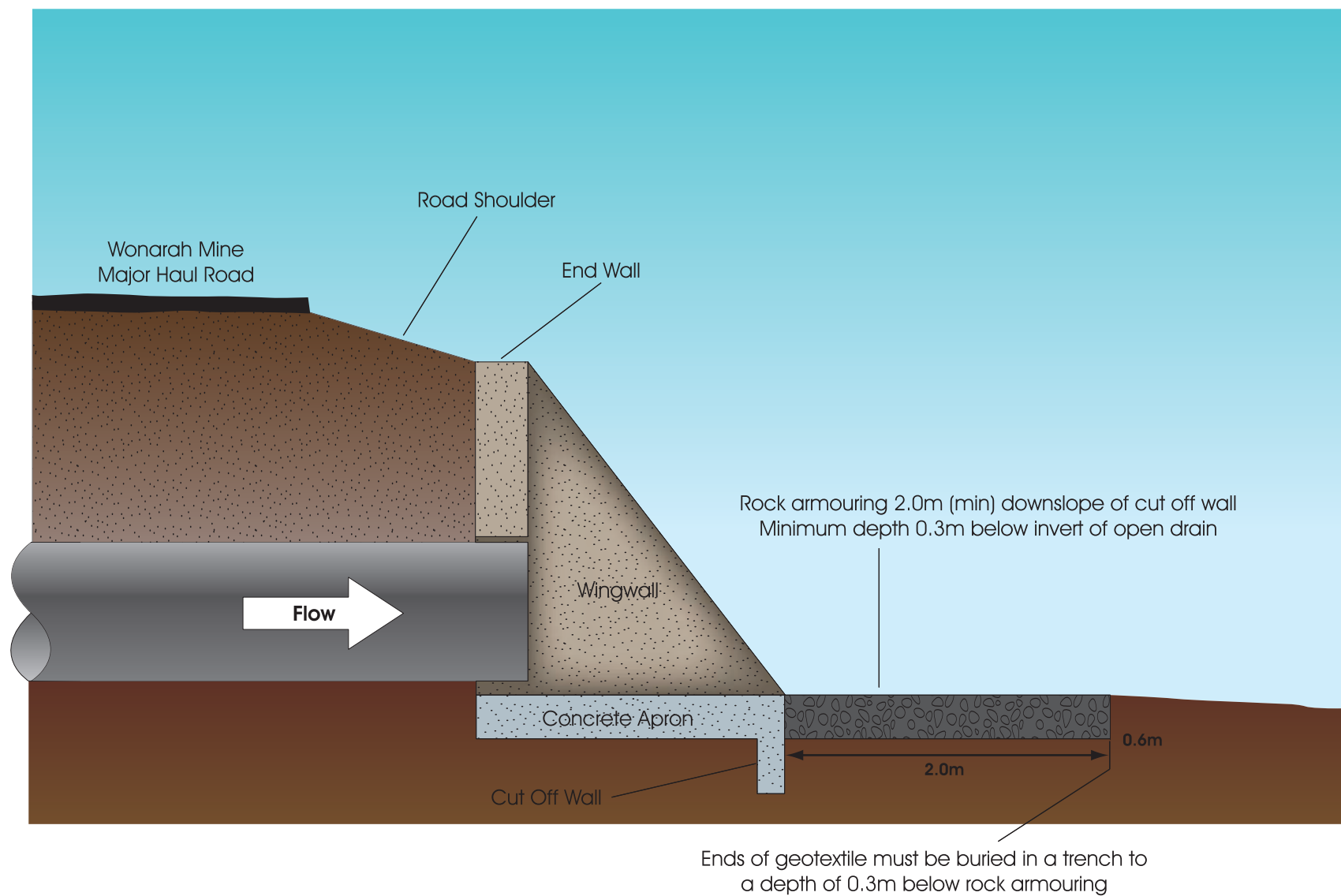
Rock Check Dam Typical Details



Line with non-woven needle punched geotextile



Source:
Northern Territory Government, Department of Natural Resources, Environment, the Arts and Sport - Land Management Unit



The geochemical analysis of the waste rock and low grade ore (Appendix 6 of the Draft EIS) demonstrated that the material is non-acid forming and other elements that may be present have a low solubility. This geochemical composition of material (which comprises the waste materials and pit walls) means that the generation of salts and precipitates will be limited. Also, management measures implemented across the site will reduce the potential for sediment laden surface water to enter the pits. These factors, combined with the lack of water retention in pits, means that it is unlikely that there will be an accumulation of sediments, salts and precipitates in the pits. However, if after mining is complete in the pits it is found that permanent pit void lakes develop, then a monitoring bore will be installed to enable measurement of groundwater levels adjacent to the pit void lake and collection of groundwater samples. Ideally, the bore would be located as near as possible and down hydraulic-gradient of the pit void lake.

Groundwater levels in the pit void lake monitoring bores would be measured monthly and samples collected from the bores annually and submitted to a suitably accredited laboratory for analysis of the following:

- Physico-chemical parameters – electrical conductivity and pH.
- Major ions – calcium, magnesium, sodium, potassium, carbonate/bicarbonate, chloride, sulphate and nitrate.
- Selected metals and minor ions – iron, phosphorous, beryllium, silver, cadmium, copper, magnesium, lead, thallium, uranium and zinc.

4.7.6 Use of Voids For Hunting Purposes

Issues Raised in Submission

One submission identified that the mine closure and rehabilitation plan (Appendix 5 of the Draft EIS) contained a potential post-mine land use for pits to be designed as areas to attract wildlife for hunting by Traditional Owners. The submission explained that if this were to occur access ramps to these pits would need to be designed to reduce the potential for large animal or human entrapment in the pits and pit water bodies.

Response

The mine closure and rehabilitation plan developed for the Draft EIS aims to demonstrate that it is technically and economically feasible to successfully close and rehabilitate the project and to develop a closure and rehabilitation process that can be built on during the life of the project. Rehabilitation and mine closure will be refined throughout the life of the mine and will involve consultation with the Traditional Owners.

If the pit voids demonstrate that they will retain water (refer Section 4.7.5) and could be made safe to access, some final voids may be designed to be suitable habitat for fauna. This will be discussed with the Traditional Owners as the mine closure and rehabilitation plan is developed. However, safety to people and animals and the long-term stability of the pits will be the primary concern.

4.8 Socio-economic

4.8.1 Northern Territory Input-output Multipliers

Issues Raised in Submission

One submission requested that the socio-economic impact assessment in the Draft EIS be revised to use the latest Northern Territory or Northern Territory Regional (Barkly Region) input-output multipliers, to ensure that the potential economic benefits of the project are not overstated.

Response

Multipliers are commonly used in socio-economic impact assessments to predict the flow-on economic benefits of a project. The Draft EIS used the national (1989-90) income multiplier of 0.428 (Madden, 1994), which means that for every \$1 spent by Minemakers, an additional \$0.43 was predicted to be generated in the community. This equated to a predicted flow-on economic benefit of \$11.9 million from the project per annum.

In response to this submission Minemakers discussed with the Northern Territory Government Economics and Policy Unit, Department of Business and Employment, what it considers the most suitable economic multipliers to use (Ashcroft, pers com, 1 March 2010). Based on advice from the Northern Territory Government, the revised predicted economic benefits of the project are provided in Table 4.5.

Table 4.5 Revised predicted economic benefit of project

Multiplier	Multiplier value	Predicted flow-on economic benefit per annum
Type 1B*	1.29	\$8.1 million
Type 2A^	1.46	\$12.8 million

* Type 1B multipliers reflect the predicted direct and indirect economic benefits of money invested.

^ Type 2A multipliers reflect the predicted consumption-induced economic effects (i.e., Type 1B plus consumption induced effects).

Source: Northern Territory Government Economics Policy Unit, Department of Business and Employment (Ashcroft, pers. Com, 1 March 2010[R121]).

Using the revised predicted economic benefit multipliers shown in Table T004, the revised estimate for the predicted consumption-induced economic effects has now been revised from \$11.9 million to \$12.8 million.

4.8.2 Over-estimation of Employment Level

Issues Raised in Submission

One submission questioned the predicted flow-on employment benefits that were presented in the socio-economic impact assessment in the Draft EIS, and whether, given the large proportion of fly-in fly-out (FIFO) workers and simple mining operation, the predicted additional 475 jobs during operation of the project was too high.

Response

Multipliers are commonly used in socio-economic impact assessments to predict the flow-on employment benefits of a project. The Draft EIS used the national (1989-1990) employment multiplier of 1.588, which means that for every 100 jobs created by Minemakers, an additional 59 jobs were predicted to be generated. This equated to a predicted employment benefit of an additional 475 jobs locally from the project.

In response to this submission Minemakers discussed with the Northern Territory Government Economics and Policy Unit, Department of Business and Employment, what it considers the most

suitable employment multipliers to use (Ashcroft, pers com, 1 March 2010). The outcome of this discussion was that a multiplier of 1.6 should be used. Using this multiplier the predicted employment benefits of the project are an additional 480 jobs, i.e., close to the initial prediction of 475. There are no multipliers for FIFO mining operations available from the Northern Territory Government.

4.8.3 Government Revenue

Issues Raised in Submission

One submission wanted further detail about the various sources of taxation revenue for the Northern Territory Government, particularly payroll taxes and indirect taxes.

Response

Section 6.11.4 of the Draft EIS detailed the estimated total annual salaries for Minemakers' employees and contractors. Based on this, data on average wages from the mining industry and average personal income tax levels for the relevant tax brackets (Department of Parliamentary Services, 2005), the project is predicted to generate approximately \$9.73 million in payroll tax each year.

Indirect taxes will come from sources such as stamp duty and lease fees.

Minemakers has not approached the Northern Territory government for any relief on royalties and expects to pay this at the scheduled rate. Details of royalty payments to other parties remain commercial in confidence.

4.8.4 Impact on the Tennant Creek Community

Issues Raised in Submission

One submission wanted a more detailed socio-economic analysis of the impact of the project to Tennant Creek.

Response

The socio-economic impact assessment in the Draft EIS presented the predicted positive and negative impacts of the project to Tennant Creek, as well as other locations likely to be affected by the project. The level of the socio-economic impact assessment approach and method for predicting impacts was considered appropriate for the scale of the project.

As identified in Section 6.11.5 of the Draft EIS, Minemakers will monitor indicators of socio-economic impacts, including workforce, service and goods supply statistics, and local community contributions, throughout the life of the project. This will provide detailed analysis of the project's impact on Tennant Creek and other areas affected by the project.

Minemakers' ongoing community consultation program and grievance mechanism will provide regular feedback on the socio-economic impacts of the project, and Minemakers will review its management practices accordingly. The Industry Participation Plan will further elaborate on the positive socio-economic impacts of the project to Tennant Creek.

4.8.5 Impact on Wunara Community

Issues Raised in Submission

One submission expressed concern that the likelihood of social disruption at Wunara as a consequence of the project was determined as 'unlikely' in the Draft EIS. In particular, concern was raised about social disruption for Traditional Owners living at Wunara due to a potential influx

of people to the community as a result of the project, and the lack of infrastructure, particularly housing, to support this. The submission recommended that the Industry Participation Plan be developed in conjunction with the CLC to maximise participation and opportunities for Traditional Owners.

Response

The project has the potential to bring significant socio-economic benefits to the Wunara community, however the potential for negative impacts to the Wunara community is acknowledged. Minemakers' goal is to maximise the benefits to, and take care of employees from, the community, to give the community the best chance of handling the pressures that will arise. To this end, Minemakers is involved in ongoing negotiations with the CLC about how to best do this. Minemakers current approach is detailed below.

Minemakers will provide sufficient accommodation and associated services (e.g., catering, laundry and medical) for all Minemakers staff and contractors, including Traditional Owners employed by the project, in the accommodation village within the Mineral Lease during their shift. For this reason, the likelihood of potential impact from social disruption caused by population and demographics was assessed as being unlikely (i.e., could occur but not expected to occur). However, the potential impact on housing for Traditional Owners in the Wunara community was assessed in the Draft EIS as a separate impact and was considered possible (i.e., could occur).

As stated in Section 6.11.3 of the Draft EIS, the Traditional Owners and the Wunara community will receive income in the form of royalties from the project. The Traditional Owners and the CLC are currently working together to establish a mechanism to ensure that the royalty flow provides a sustainable future for the Traditional Owners. Outcomes such as additional infrastructure including housing, educational facilities and additional water supply (e.g., another bore at Wunara) as well as scholarships and investment in business opportunities are understood to be under consideration. The compensation income may also be used to increase accessibility of healthcare for the community.

Minemakers will support the development of local business opportunities and, where possible, provide training and employment opportunities for Traditional Owners and other Indigenous people. As stated in Section 6.11.3 of the Draft EIS, Minemakers will develop an Industry Participation Plan, in conjunction with CLC's Employment Unit and the Northern Territory Government, to maximise participation and business and employment opportunities for Traditional Owners. Minemakers, through its association with the Northern Territory branch of the Minerals Council of Australia, will also be developing a coordinated approach within the Tennant Creek region to Indigenous employment and training programs focused on providing the relevant skills to work in the mining industry. During the exploration drilling and bulk sampling program Minemakers and its contractors have employed up to six Traditional Owners.

Through the above measures, Minemakers hopes to best position the members of the Wunara community to deal with the pressures from any influx of people to the community, and any social disruption that may arise from this. It will continue to work with the CLC to determine any further ways the company can best assist with this.

4.8.6 Worker Accommodation

Issues Raised in Submission

While a number of submissions recognised that the proposed multi-user transport hub will be the subject of a separate assessment process, one submission wanted more information about

additional housing to accommodate the road haulage workforce in Tennant Creek given the existing housing shortage in the town.

Response

Section 6.11.4 of the Draft EIS predicts that most road haulage workers will choose to reside in the purpose-built accommodation village next to the multi-user hub rather than in Tennant Creek. Other workers may already reside in Tennant Creek. Given this, there is not predicted to be a requirement for additional housing in Tennant Creek. However, a detailed assessment of this is outside the scope of the Wonarah Phosphate Project EIS and is best addressed by the proponent of the multi-user hub.

4.8.7 Contributions to Community Groups and Training

Issues Raised in Submission

One submission requested the commitment made by Minemakers in Section 3.3.1 of the Draft EIS to contribute financially to local sporting communities and clubs, community based training providers and service groups be included in Table 6.36 of the Draft EIS, as it will represent a socio-economic benefit of the project.

Response

Minemakers acknowledges that the commitment to contribute financially to local sporting communities and clubs, community based training providers and service groups represents a socio-economic benefit of the project. The wording 'commitment to contribute financially to local sporting communities and clubs, community based training providers and service groups' is added to the end of Table 6.36 of the Draft EIS.

4.9 Indigenous and Non-Indigenous Cultural Heritage

4.9.1 Cultural Heritage

Issues Raised in Submission

One submission received raised the issue of incorporating an Indigenous approach to land management and the cultural landscape management into all phases of the project. The interested party believed that the project could benefit from further engagement of Traditional Owners and adoption of a cultural landscape management approach.

Response

Minemakers recognises the importance of the Traditional Owners' connection to the land and their approach to land management. During the project planning process, Minemakers has:

- Undertaken regular ongoing consultation with the Central Land Council (CLC), specifically about the identification of Traditional Owner issues and interests.
- Involved the Traditional Owners in the baseline flora and fauna surveys of the project area (Sections 6.7 and 6.8 of the Draft EIS).
- Considered the mine closure planning and rehabilitation wishes of the Traditional Owners.

Minemakers continues to work with the CLC to resolve any issues identified with the project and to provide an avenue for Traditional Owner concerns to be addressed and incorporated in the mine planning process. Minemakers will maintain this consultation with the CLC and Traditional Owners throughout the life of the mine to continue to identify and address issues or concerns as they arise. The consultation with the CLC and Traditional Owners also allows Minemakers to

update the Traditional Owners on the development of the mine planning, as well as the mining and rehabilitation methods to be used on the site.

All Minemakers' staff and contractors will undertake a cultural awareness induction prior to commencing work with the project. While the development of the induction program is outside the EIS process, it will involve the CLC and Traditional Owners in its development and implementation. Cultural landscape management may be incorporated into this program.

The Draft EIS (Section 6.6.3) acknowledges Traditional Owners' concerns about cultural landscape issues and changes to it due to mining (particularly in post-mining landscape) and that successful closure planning will be heavily reliant on discussions with Traditional Owners in regards to this. Minemakers envisages that Traditional Owner involvement in the future development and design of the mine closure and rehabilitation plan will include addressing issues such as post-mine landform and land use and preferred flora species for rehabilitation. As such, Minemakers will continue to involve the Traditional Owners in all phases of the project; however, the mine closure and rehabilitation phase of the project will be the project phase that provides the most effective avenue for incorporating an Indigenous cultural landscape management approach.

4.9.2 Clearance of Sites of Cultural Heritage Significance

Issues Raised in Submission

A number of interested parties raised issues relating to the approvals required for clearance of sites of cultural heritage significance. One submission criticised Minemakers' reliance on the Aboriginal Areas Protection Authority (AAPA) authority certificates and stated that they were concerned that cultural material and sites that have not been registered on the AAPA Heritage Database will not be protected as required by the *Northern Territory Aboriginal Sacred Sites Act*.

In contrast, another submission acknowledged Minemakers application for an AAPA Authority Certificate but stated that the Clearance Certificate issued by the CLC does not offer indemnity from prosecution under the Northern Territory Aboriginal Sacred Sites Act, despite their very similar nomenclature. The AAPA remains open and willing to the issue of a formal AAPA Authority Certificate upon receipt and assessment of relevant material from the CLC.

It is also noted that one of the submissions made an incorrect reference to a section of the Draft EIS. The section quoted in the submission was:

Sections 4.9 and 5.10 of the EIS dealing with cultural heritage matters fail to refer to the *Northern Territory Aboriginal Sacred Sites Act* ("NTASSA") in any way.

The sections referred to and passage quoted in this submission have been taken from the Notice of Intent that was submitted to the Department of Natural Resources, Environment, the Arts and Sport (DNRETAS) on 10 March 2009 to commence the EIS process. Section 2.2.4 of the Draft EIS outlines the objective of the Northern Territory Aboriginal Sacred Sites Act and its application to the project.

Response

As stated in the Draft EIS, Minemakers has applied to the AAPA for an Authority Certificate over the Mineral Lease to identify sacred sites and provide legal indemnity for work carried out in accordance with certificate conditions, one of which will be that sacred sites are not disturbed without prior approval or consent under the Northern Territory Aboriginal Sacred Sites Act. The AAPA is yet to receive relevant material from the CLC to enable assessment of the application.

During the process for the provision of the AAPA Authority Certificate, the CLC is required to consult with Traditional Owners to ensure that sites not registered on the AAPA Heritage Database are identified and protected.

In addition to the application for an AAPA Authority Certificate, Minemakers has consulted directly with the CLC, in conjunction with the Traditional Owners, to identify sacred sites within Minemakers' Mineral Lease. Consultation with the CLC in relation to cultural heritage and archaeological matters provides an alternate means of identifying sites and objects that are not registered on the AAPA Heritage Database.

The cultural heritage management plan will be implemented throughout the life of the mine. This plan assumes that all required statutory approvals and clearances under both the *Heritage Conservation Act* and the *Northern Territory Aboriginal Sacred Sites Act* have been obtained prior to mining commencing. The Traditional Owners will be involved in the application and assessment processes under these acts. The Residential Manager will be aware of all the relevant statutory approvals, as well as being responsible for maintaining consultation with the CLC and Traditional Owners during mining.

4.10 Traffic and Transport of Ore

4.10.1 Road Safety

Issues Raised in Submission

Five submissions raised concerns about the safety risk to road users along the Barkly and Stuart highways as a result of traffic from the project. Specific concerns raised were:

- How Minemakers would mitigate any increase in road accidents in the area due to the project.
- Further consultation with those Aboriginal people who regularly use the Barkly Highway to access services in Tennant Creek.
- Road safety affected by the increased number of road trains including interactions with other road users and associated road degradation along the Barkly Highway.
- Visibility and safety considerations for night time operations.
- Fatigue management and the occupational health and safety of the road train drivers and fleet.

Responses

Increase in Road Accidents

The traffic impact assessment in the Draft EIS (Section 6.13) predicted that an increase in road accidents as a result of the project was possible. Based on this, management and mitigation measures have been developed. In addition to the measures proposed by Minemakers, its transport contractors will be required to develop detailed traffic management plans with measures to minimise the potential for road accidents as a result of the project. The effectiveness of these measures will be assessed during monitoring of traffic associated with the project, as detailed in Section 6.13.3 of the Draft EIS. All accidents and incidents involving Minemakers' activities will be investigated as a matter of course under the company's occupational health and safety management measures. Should these investigations or monitoring of traffic accidents along the route show that there is an increase in the frequency and/or nature in road accidents that can reasonably be attributed to the project, then additional measures to further mitigate the risk of road accidents will be investigated.

Consultation with Traditional Owners and Indigenous Communities

Minemakers will deliver a traffic awareness program to Traditional Owners and members of Indigenous communities along the Barkly Highway. The program will include information on mitigation measures to reduce traffic accidents and increase safety awareness among Indigenous drivers. The contents of the program will also be provided to the Department of Lands and Planning, Road Network Division. Minemakers acknowledges the community's concerns about an increased road safety risk due to traffic and road degradation associated with the project, and particularly road trains travelling between the mine site and the multi-user hub. Section 6.13.3 of the Draft EIS details the measures proposed to minimise the risk to members of the public travelling along the Barkly Highway.

Road Safety Effects Due to Increased Number of Road Trains and Road Degradation

Road safety issues related to increased road train traffic and associated road degradation will be handled by the haulage contractor. The detailed traffic management plan which will be produced by the haulage contractor (and approved by Minemakers) will set procedures to:

- Limit the potential for vehicle accidents through the elimination of dangerous practices, driver awareness of any potential hazard areas and the provision information regarding any accidents that occur along the route.
- Ensure that road transport of ore will be conducted in a responsible and legal manner with minimal disruption to other road users, particularly as the road trains hauling ore to the multi-user hub and back will not enter Tennant Creek.
- Address procedures and policies to mitigate safety issues that will be created by the increased prevalence of road trains and their interactions with other vehicles on the network.
- Manage driver fatigue.
- Regulate measures for overtaking and/or traffic holdup by drivers.

Visibility and Safety for Night Time Operations

The traffic management plan will include a section for night time operations which will include visibility and safety considerations and control measures, particularly with issues that may be created around dusk and dawn. The plan will also cover how to manage project-related road transport issues such as incident hotspots, how spills will be handled (noting that the product is benign), as well as general aspects such as covering loads. Contractors will be required to comply with Minemakers' procedures and the relevant codes and standards for transport, storage and handling of hazardous materials, including emergency response.

Intersections where mine traffic merges onto another road, i.e., Wonarah mine site, Three Ways intersection, Warrego Road intersection and the Multi-user hub, will all be provided with lighting. This will not only draw all drivers' attention to the potential hazard, but also ensure a high degree of visibility through the hazard zone.

Fatigue Management

Mitigation measures for driver fatigue include scheduled driver breaks during each shift (two for 15 minutes and one for 60 minutes). Driver rosters will comply with the National Transport Commission 36 hour rule, 12 hour shift/7 hours rest allowance, 7 day night roster and at least 4 nights of rest for every 14 day work period (Kartuz, pers. com., 2010).

4.10.2 Traffic Volume and Road Condition

Issues Raised in Submission

Four submissions raised concerns about the traffic volumes and/or road conditions being impacted as a result of the project. Specific concerns raised were:

- An increase in the total number of road trains using the public roads.
- Road trains transporting ore through Tennant Creek to the existing rail loading area if there is delay to the multi-user transport hub.
- The adequacy of the traffic impact assessment, regarding the supply and logistics requirements (e.g., the delivery of diesel fuel) and construction activity requirements (e.g., over-dimensional and overweight loads).
- Upgrades to intersections along the Barkly and Stuart highways.
- Standard of Warrego Road and upgrades required to it, to cope with traffic associated with the multi-user hub.
- New access or variations to the existing road network.

Responses

Total Number of Road Trains Using Public Roads Increased

An average of 240 vehicles use the Barkly Highway and 380 use the Stuart Highway south of Three Ways intersection each day. The peak transport demand including other public road users projected for the project is 400 AADT. The capacity of the Barkly Highway is 6,000 AADT therefore the impact of the proposed increase in traffic on the road system is negligible (see Draft EIS, Appendix 12B).

Transport of Ore Through Tennant Creek

Transporting ore through Tennant Creek was one of four temporary alternatives proposed for the transport of ore to market should the multi-user transport hub be delayed (as detailed in Section 5.1 of the Draft EIS). FreightLink has indicated that capacity available via their terminal is limited to 500 tonnes per week or less loaded in containers. This precludes the use of this terminal for regular production volumes, even at start up tonnages. The terminal could only be used to dispatch small parcels for client testing. In such circumstances a 500 t consignment would comprise five to six road trains over the course of a week, or an average of one per day. The traffic management plan will include management of project related traffic through Tennant Creek.

Adequacy of the Traffic Impact Assessment

The adequacy of the traffic impact assessment is considered to be appropriate as the predicted impact of the proposed increase in traffic on the road system is negligible. The proposed increase in traffic will conform to all Territory Registration controls and contribute to taxes and other legislative requirements for road maintenance.

The construction contractor will ensure that all vehicles used during this phase are appropriately licensed and capable for their required task, this will include over-dimensional and overweight requirements (no vehicle will exceed its gross vehicle mass). All appropriate legislation will be followed for load size and weight. Where oversize or overweight loads cannot be avoided an 'Oversize/Overweight permit' (Form VS6) will be obtained from the Northern Territory Department of Lands and Planning, with all corresponding mitigation measures that correspond to this permit

put in place. All vehicle operators will be trained and licensed appropriately for the vehicles they are operating.

Over dimensional loads will be transported as currently occurs from time to time along these roads and therefore will not be introducing a new circumstance to the roads. Traffic associated with the delivery of supplies during the operational phase of the project is considered to be minimal. Table 4.6 identifies the predicted construction and operational traffic associated with the delivery of goods and services.

Table 4.6 Construction and operation traffic details for the delivery of goods and services

Traffic Type	Frequency	Remarks
Low loader	12/week	Delivering accommodation units and mining equipment over a 12 to 16 week period during the construction phase.
Fuel delivery truck – multi combination, two dog trailers	3/week	At 3 Mt/a.
Explosives truck – rigid, three axle	2/week	At 3 Mt/a.
Food supply truck – multi combination, one dog trailer	2/week	
Courier – rigid, two axle	2/day	
Light vehicles	4/day	

Intersection Upgrades

As identified in Section 6.13.4 of the Draft EIS, Minemakers acknowledges that upgrades will be required to major intersections on the Barkly and Stuart highways. Minemakers and/or its road haulage contractor will be responsible for completing these upgrades during construction of the project.

Any further road upgrades will be subject to government funding arrangements and Minemakers will contribute to the maintenance of roads through licence fees, fuel excise, taxes and royalties paid. The proposed traffic increases will conform to all Northern Territory registration controls and will contribute to taxes and other legislative requirements for road maintenance

Minemakers will continue to consult with the Department of Lands and Planning, Roads Network Division, about the upgrades required to these intersections.

Warrego Road Upgrade

Minemakers notes the comments regarding the low level of maintenance that has been undertaken on the Warrego Road due to the low volumes of traffic currently using this road. The company reiterates that it will contribute to the maintenance of public roads through licence fees, fuel excise, taxes and royalties paid.

Minemakers is unable to speak on behalf of the proponent of the multi-user hub. However, it believes that access to and from the site would form part of that company's development proposal.

New Access or Variations to Existing Road Network

Any new access or variations to the existing road network will be discussed/negotiated between Minemakers and the Department of Lands and Planning, Road Network Division.

4.10.3 Miscellaneous Road Issues

Issues Raised in Submission

Three submissions raised the following concerns regarding roads:

- Potential to construct and operate a rail system to connect the mine to Tennant Creek, or Mount Isa, or both.
- Various issues to be discussed between Minemakers and the Department of Lands and Planning, Road Network Division.
- Transport impacts of multi-user hub relating to residents, FIFO workforce and road haulage.

Responses

Minemakers acknowledges 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, as stated in Section 3.4.5 of the Draft EIS, the cost of building a railway between the mine and Tennant Creek is estimated to be in the order of \$500 million. This is not economically feasible for Minemakers at this stage of the project. The option of building a railway between the mine and Mount Isa is not favoured due to the limited spare capacity of the Mount Isa to Townsville line.

Minemakers has, and will continue to, actively support the provision of a rail system between Tennant Creek and Mount Isa, funded through Infrastructure Australia.

Minemakers will commence consultation with the Department of Lands and Planning, Road Network Division to resolve any road related issues associated with the project. Issues to be addressed include funding of maintenance and upgrade of public roads and the registration of vehicles used in haulage.

In response to the submission regrading the transport impacts of the multi-user hub, the multi-user hub will be permitted separately as it is intended as a multi user facility. Minemakers expects the proponent of the hub to have considered the capacity, standard and condition of the roads feeding to the hub in its development application. Notwithstanding this, Minemakers considers that its comments regarding its contribution to road maintenance through truck licensing fees and diesel fuel levy are equally valid for the Warrego Road as they are for the Barkly and Stuart highways. The multi-user hub is also not within the scope of the Draft EIS (see EIS Guidelines in Attachment 1 of Draft EIS).

5. MINE CLOSURE AND REHABILITATION

5.1 Topsoil Removal and Storage

5.1.1 Vegetation and Topsoil Storage

Issues Raised in Submission

Two submissions were received in relation to vegetation and topsoil storage. One submission requested further details about how the removed vegetation and topsoil will be stored and maintained in order to ensure that it is fit for use in rehabilitation.

Response

Minemakers recognises that the quality and quantity of topsoil available for use in rehabilitation will be a contributing factor in the success of this rehabilitation. Procedures that will be implemented for stripping, stockpiling, storing, handling and preparing will aim to minimise the impact on the soil's important structural and biological properties.

As described in the Draft EIS, vegetation and topsoil will be removed from disturbance areas in the course of surface clearing for pits, waste rock storages and infrastructure. The topsoil will be harvested for use in future rehabilitation work. Topsoil will be managed to avoid or minimise contamination and structural deterioration and maximise the fertility for the flora species to be used in rehabilitation.

The first stage in harvesting the vegetation and topsoil will require large vegetation (such as trees) to be cleared. Vegetation will be either stockpiled or, where appropriate, used in rehabilitation as windrows or to assist with erosion and sediment control through provision of a cover for exposed surfaces. Once cleared, the upper surface layer (i.e., first 5 to 10 cm) will then be removed, as it is likely to contain the highest amount of organic matter. The deeper subsoils will then be removed to a depth of approximately 30 cm. Where deeper sub-soils exist and they can be used in the course of rehabilitation these too will be recovered and either used immediately or stored for later use.

If there are no available areas where the topsoil can be immediately used for rehabilitation, the stripped upper surface layer and subsoil will be stored in separate stockpiles. These stockpiles will be constructed in designated zones at the edge of the disturbance areas at a height of no more than 2 m. Minemakers will aim to minimise the period for which topsoil is stockpiled. In general topsoil stockpiles will be managed so that they are respread within six to twelve months as the longer the topsoil is stockpiled, the greater the potential decline in soil quality and seed bank. This will also reduce the potential for compaction of topsoil during stockpiling.

If topsoil needs to be stockpiled for longer periods of time (due to a lack of available areas for rehabilitation), Minemakers will consider if a protective surface cover is necessary to preserve the seedbank; this is discussed further in Section 5.1.2.

5.1.2 Seed Bank in Stockpiles

Issues Raised in Submission

One submission raised concerns about seed loss due to seeds germinating while in the topsoil stockpile, particularly when topsoil is stockpiled over a wet season or watered for dust control purposes. This submission also questioned how long the seed bank in the topsoil would remain viable when stored according to the proposed methods.

Response

As described in Section 5.1.1, topsoil stockpiles will be managed so that they are respread within six to twelve months where possible to maximise the potential for good quality topsoil for use in rehabilitation and for a viable seed bank to exist within the topsoil. If topsoil is required to be stockpiled for longer periods, Minemakers will consider if a protective surface cover is necessary to maintain the seedbank. Protective surface covers that may be used include a cultivated vegetative cover with species that are consistent with those that will be used in revegetation. An alternative surface cover may also be to cover topsoil stockpiles with cleared vegetation, which will protect the topsoil stockpiles from erosion and any seeds that fall from the cleared vegetation will be retained on the topsoil stockpiles.

The viability of the seed bank will be dependent on the physical and chemical properties of the topsoil as well as the handling and storage procedures used, as well as the seeds themselves. Minemakers will investigate the specific period for the seed bank to remain viable within topsoil stockpiles during progressive rehabilitation trials. Minemakers will also implement the measures outlined above to maximise the viability of the seed bank for any stockpiled topsoil. Where topsoil has been stockpiled for extended periods Minemakers will test the seed viability of the topsoil prior to use in rehabilitation; if it appears insufficient for rehabilitation purposes additional seeding of rehabilitated areas may be required.

5.1.3 Available Topsoil

Issues Raised in Submission

One submission suggested that Minemakers provide a topsoil budget on the proposed stockpiling of soil and landforms requiring rehabilitation to ensure adequate topsoil and subsoil is available.

One submission received questioned the soil assessment that was undertaken as part of the flora and fauna survey in (Appendix 8A, Draft EIS). This submission requested clarification as to the actual depth of subsoil across the areas of mining. The submission also requested clarification as to why 30 cm of subsoil will be stockpiled when more may be available and that greater subsoil depths on rehabilitated areas would assist with revegetation.

Response

The soil survey conducted by Low Ecological Services Pty Ltd during the 2009 wet season ecological survey, which was based upon the Australian Soil and Land Survey Field Handbook (MacDonald et al., 1990), in most cases only sampled depths of 40 cm, with some sample depths reaching 1.2 m (in pre-dug pits). These samples depths deviate from the McDonald et al. (1990) method (which recommends a survey depth of 1.8 m) due to time constraints (limiting the use of an excavator) and the limited availability of pre-dug pits. However, the absence of horizons

beyond a depth of 40 cm in the seven drill sumps analysed indicated that 40 cm pits were adequate for soil classification within the project area (Appendix 8A, EIS).

Low Ecological Services Pty Ltd identified the first 10 cm of soil as topsoil and the next 30 cm as subsoil; these are the soil horizons that will be stripped and respread during rehabilitation.

The Draft EIS states that generally soil will be stripped to a depth of 40 cm; however, Minemakers will adapt stripping depths to reflect the actual topsoil present in the area to be disturbed, thus maximising the amount of topsoil available for rehabilitation. A detailed plan for topsoil removal will be a component of the detailed mine planning currently underway. Detailed mine planning will also will prioritise areas where the topsoil is to be used to ensure the most effective use of topsoil.

5.2 Flora and Rehabilitation

5.2.1 Flora Species Used for Rehabilitation

Issues Raised in Submission

One submission requested that consideration be given to the collection of seeds from uncommon flora species for nursery propagation, prior to their disturbance by mining or for species that fail to reappear in revegetated areas.

One submission questioned if revegetation is to occur on the 18 degree slopes of the waste rock storages or only on the top and berms.

Response

Seed collection, in conjunction with relevant data recording (e.g., locations of seeds and types of seeds), will be instigated prior to the disturbance of an area. Seeds of uncommon flora species will be especially targeted for nursery propagation. These seeds may be used to replace species that fail to reappear from the stockpiled/respread topsoil seed banks, for direct seeding or nursery propagation for later tube stock planting.

Collected seeds will be stored in dedicated seed storage areas on-site, which will be constructed to suit the requirements of the seeds. Most seeds are orthodox, i.e., can be dried for storage purposes. Once well-dried, sealed in air-tight containers and kept at room temperatures, many orthodox seeds, such as *Acacia* (found on-site), *Jacksonia*, *Kennedia*, *Oxylobium*, *Daviesia*, *Leptospermum* and *Callistomeon* species, should remain viable in the short-term (approximately five years) (Mortlock, undated), although specific seed storage requirements will be researched prior to collection. It is unlikely that seeds collected as part of the project will require medium or long-term storage as seeds will be collected just prior to disturbance and planted as soon as possible where respread topsoil does not revegetate successfully or in addition to respraying topsoil. An appropriately experienced ecologist will be used to oversee the seed collection program including the design of seed storage units.

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

5.2.2 Pre-Disturbance Photos

Issues Raised in Submission

One submission requested that a comprehensive stock of pre-disturbance photos be established of pre-disturbance flora and fauna communities in areas to be cleared. The request stated that sufficient detail should be contained to help provide a baseline/benchmark for later comparison, to demonstrate when closure criteria have been met.

Response

Minemakers will ensure that pre-disturbance photos are taken of all areas that will be cleared. Minemakers will also ensure that sufficient detail, such as site location, type of ecological community (including notable and common observed species), date, and weather conditions of the day, are recorded with the photographs to help provide a baseline/benchmark for later comparison to demonstrate when closure criteria have been met. Pre-disturbance photos will be taken at different times of the year to account for seasonal variation in flora and fauna on-site.

5.3 Hydrology and Water Retention in Voids

Issues Raised in Submission

One submission suggested that the rehabilitated landform has the potential to change the pre-mining hydrology.

Response

More detailed mine closure and rehabilitation planning will be conducted throughout the life of the mine and will build upon the mine closure and rehabilitation plan provided in the Draft EIS. This detailed planning will include the production of site-specific rehabilitation plans for each individual area of the project to accommodate for each site's varying requirements. However, the location of waste rock storages as presented in the Draft EIS took into consideration potential changes to the existing hydrology. Particular attention has been given to ensuring that existing surface water flows to wetland areas downstream of the project area will be maintained and this principle will be carried through to the mine closure and rehabilitation plan.

5.4 Traditional Owner Interest in Rehabilitation

Issues Raised in Submission

One submission questioned the level of consultation that has occurred with the Traditional Owners in relation to the changes in the mine plan and associated post-closure landform since the Notice of Intent.

Two submissions were also received from representatives of the Traditional Owners that also expressed concerns with the changes to the mine plan and the implications for the post-mine landform, including the long-term management implications and financial responsibilities for these. These submissions expressed concerns that the main consideration for the degree of backfilling that will occur was based on financial, not environmental, considerations.

Response

Through Minemakers' consultation with the CLC, Traditional Owners are aware of the increase in the number of final voids, waste rock storages heights, and total area of disturbances. Minemakers will continue to consult with the CLC and Traditional Owners throughout the life of the mine on the post-mine landform and land use. The results of this consultation will be incorporated in to mine closure and rehabilitation planning.

The basis for backfilling voids is provided in Section 3.3.2.

Financial provision for mine closure will be provided through the security bond required to be paid by Minemakers to the Northern Territory Government before construction and operation can commence. The amount of, and the method of calculating, this security bond is detailed in Appendix 5 of the Draft EIS. The Northern Territory Government will review Minemakers' closure liability annually as part of the Mining Management Plan review process. The security payment will ensure that, among other things, the Minister has sufficient financial resources to cover the costs and expenses associated with complete rehabilitation of the Mineral Lease at any time during the life of the mine, should it be required.

Mine closure is still being negotiated with the Northern Territory Government and Traditional Owners. Negotiations will be ongoing through the life of the mine, with the mine to be left in an appropriate landform as agreed with the Northern Territory Government and Traditional Owners. However, the mine closure and rehabilitation plan (Appendix 5 of the Draft EIS) identifies the high-level closure outcomes for the waste rock storage and voids. This will include ensuring they are physically and chemically stable and have a landscape function and vegetation coverage that is resilient, self-sustaining and comparable with the surrounding areas. Final voids will be assessed to ensure the walls are geotechnically stable and have an abandonment bund to prevent public access.

5.5 Stage 2 Considerations In Rehabilitation Planning

Issues Raised in Submission

Two submissions raised concerns with rehabilitation of Stage 1 when Stage 2 may proceed and require previously rehabilitated areas to be re-disturbed. One submission was concerned mainly with the risk of Stage 1 waste rock storages being located on top of non-DSO resources. The other submission stated that a precautionary approach should be taken to rehabilitation of Stage 1, recognising that some areas and non-DSO stockpiles will require re-disturbance if Stage 2 were to proceed.

Response

Minemakers acknowledges that Stage 1 may result in waste rock storages (which include non-DSO stockpiles) being placed above non-DSO resources. Minemakers also acknowledges that non-DSO stockpiled and rehabilitated as per the rehabilitation plan for waste rock storages for Stage 1 may be re-disturbed if Stage 2 were to proceed.

As stated in Section 3.1.2, Stage 1 is being developed as a stand alone project and therefore mine closure and rehabilitation assumes Stage 2 is not proceeding. If Stage 2 were to proceed, the scale of the project would be much larger than Stage 1 and, given the increased scale, will most likely utilise strip mining methods. Minemakers therefore considers that placement and

rehabilitation of waste rock storages on top of non-DSO resources will not sterilise this material. Mine planning for Stage 2 will include consideration of re-disturbing non-DSO stockpiled in Stage 1 as part of site surface preparation.

5.6 Closure Cost Estimates

5.6.1 Inclusions in Closure Cost Estimate

Issues Raised in Submission

Three submissions raised issues in relation to the calculation of closure cost estimates. Questions raised in these submissions include:

- Was the closure cost estimate in the Draft EIS based on the premise that progressive rehabilitation has already occurred over the mine life?
- What percentage of pit backfilling has been assumed in the closure costs?
- Did the closure estimates for waste rock storages incorporate the costs of shaping, re-contouring and re-spreading topsoil to an adequate depth to support plant growth?
- Have the long term costs and likely success of rehabilitation been adequately estimated in the closure cost estimate?
- Have the long-term water quality and monitoring of final voids been considered in the closure cost estimate?

Response

The majority of assumptions for the closure cost estimated in Table 8.4 of the Draft EIS are included in the mine closure and rehabilitation plan (Appendix 5 of the Draft EIS), but are included below for ease of reference:

- The closure cost was calculated using the draft Mines and Energy Security Calculation Form (DRDPFR, 2009) (Section 8.8 of the Draft EIS). This calculation “assumes a worst case scenario, i.e., that the total final disturbance area of the project undergoes no progressive rehabilitation during the life of the project. In reality, the actual closure liability at any stage of the project is likely to be significantly lower than this estimate” (Appendix 5 of the Draft EIS), particularly as progressive rehabilitation will be undertaken as part of the project.
- For the purposes of the worst case scenario, only incidental backfilling of 400,000 m³ of material has been assumed. It is emphasised that Minemakers is committed to maximising backfilling of pits where possible. This will reduce the closure costs.
- The cost for post closure monitoring has been calculated at 5% of the total post closure management cost, as per the draft Mines and Energy Security Calculation Form (Appendix C to Appendix 5 of the Draft EIS).
- The closure estimates for waste rock storages (including non-DSO stockpiles) have incorporated the costs of shaping, re-contouring and re-spreading topsoil to an adequate depth to support plant growth and includes the rehabilitation of low-grade ore stockpiles.
- As stated above, the closure cost provides a ‘worst-case’ calculation. It is therefore considered that the long-term costs and likely success of establishing vegetation, controlling erosion,

maintenance and monitoring of the waste rock storages post-mining, have been adequately estimated. Specifically:

- The cost of the management of the waste rock storages includes estimations for major and minor earthworks, topsoil transportation and spreading, soil ripping, planting/seeding, fertiliser application and installation of drainage infrastructure.
- The closure costs include an estimate for on-going earthwork maintenance and pest and weed management (which will help in the establishment of native vegetation and control of erosion).
- The cost estimate assumes a 20% failure rate for all disturbed areas for a period of two years.
- A 5% contingency is also included in the closure cost calculations, which may be used by the Northern Territory Government's Department of Resources to cover any additional works that may be needed for satisfactory site closure, for example, further remediation works or monitoring.

5.6.2 Long-term Post-mining Rehabilitation Commitment

Issues Raised in Submission

Two submissions discussed the potential long-term costs associated with maintaining revegetated areas. These submissions presented potential options for sufficient funds to be available for any long-term maintenance requirements. These included:

- Long-term maintenance requirements reflected in security submitted for the project.
- Profits withheld during operation or held in perpetuity in a trust established to assist landowners to continue to monitor and rehabilitate the post-mine landform after Minemakers has left.

Response

As stated in Section 5.6.1, the security calculation provides for post closure monitoring and is consistent with the draft Mines and Energy Security Calculation Form (DRDPIFR, 2009). They also include an estimate for on-going earthwork and pest and weed management.

Environmental maintenance and stewardship will be undertaken as part of the mine closure and rehabilitation works and is included in the calculated mine closure cost. It is expected that environmental maintenance and stewardship will be undertaken for as long as necessary. Currently, it is envisaged that this period will last between two to 10 years; after this time, it is expected 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.

It is understood that the relinquishment of the Mineral Lease and return of the security will not occur until such time as all liabilities and Mineral Lease conditions have been addressed. This includes assessing the success of rehabilitation of the project area against agreed closure criteria.

6. CONCLUSION

The Environmental Impact Statement (EIS), comprising the Draft EIS and this EIS Supplement, is the principal document by which the environmental and social aspects of the Wonarah Phosphate Project will be assessed by the Northern Territory Government. The EIS has been prepared in accordance with the EIS guidelines issued by DNRETAS (detailed in Appendix 1 of the Draft EIS).

The Draft EIS was placed on exhibition over the period 21 November to 21 December 2009. The Environment, Heritage and the Arts Division of DNRETAS provided to Minemakers copies of the 11 submissions that it received during the public exhibition period, including those from various government agencies and DNRETAS itself. No submissions were received from the public.

As required by legislation, Minemakers prepared an EIS Supplement (i.e., this document) that addresses the additional questions and issues raised during the public exhibition process. The EIS Supplement identifies issues raised in the 11 submissions and provides a response to each of these issues in Chapters 3 to 5. The responses are grouped around common issue topics.

The EIS Supplement will be posted on the DNRETAS website and Minemakers' website and copies will be provided to those parties who made submissions. However, there is no scope for further public submissions. Following review of the EIS, DNRETAS will prepare an assessment report for an assessment decision to be made by the Northern Territory Government Minister for Natural Resources, Environment and Heritage.

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8. GLOSSARY

8.1 Units and Symbols

%	Percent
kg	Kilogram
km	Kilometre
L	Litre
µm	Micrometre
m	Metre
m ²	Square metre
m ³	Cubic metre
mg	Milligram
mm	Millimetre
ppm	Parts per million
>	Greater than
~	Approximately

8.2 Abbreviations

AADT	Annualised average daily traffic
AAPA	Aboriginal Areas Protection Authority
ARI	Average recurrence interval
AS/NZS	Australian standard/New Zealand standard
Ba	Barium
Be	Beryllium
bgl	Below ground level
Ca	Calcium
Cd	Cadmium
Cl	Chlorine
c/litre	Cents per litre
CLC	Central Land Council
Co	Cobalt
CO₂	Carbon dioxide
CO₂-e	Carbon dioxide equivalent
CPRS	Carbon Pollution Reduction Scheme
Cr	Chromium
Cu	Copper
DNRETAS	Northern Territory Government Department of Natural Resources, Environment, the Arts and Sport
DSO	Direct shipping ore

EIS	Environmental Impact Statement
EPA	Environmental Protection Authority Northern Territory
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ERP	Emergency response plan
ETS	Emissions trading scheme
Fe	Iron
FIFO	Fly-in, fly-out
GPS	Global positioning system
GRM	Groundwater Resource Management Pty Ltd
Hg	Mercury
IFC	International Finance Corporation
K	Potassium
kW	Kilo watt
MCA	Mineral Council of Australia
Mg	Magnesium
Mn	Manganese
MW	Mega watt
m/s	Metres per second
Na	Sodium
NCOS	National carbon off-set standard
NGO	Non-government organisation
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
NT	Northern Territory
Pb	Lead
PPE	Personal protective equipment
PV	Photovoltaic
REC	Renewable energy credit
SO₄	Sulphate
t	Tonne
TDS	Total dissolved solids
TGP	Terminal gate price
TSS	Total suspended solids
U	Uranium
Zn	Zinc

Appendix 1

EIS Submissions Cross-reference

Appendix 1

EIS Submissions Cross Reference

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
No Authority Certificate in place for this project.	Authority Certificate	Aboriginal Areas Protection Authority	4.9.2	General Comment	
Sections 4.9 and 5.10 of the EIS dealing with cultural heritage matters fail to refer to the <i>Northern Territory Aboriginal Sacred Sites Act</i> (NTASSA) in any way. Section 5.10 notes "The CLC have issued sacred site clearance certificates C2008-008, issued 28 March 2008, and C2008-087, issued 18 November 2008, and amendments issued 20 November 2008 and 26 November 2008 and has identified exclusion zones where exploration and mining cannot occur. All activities are undertaken in accordance with these certificates and agreements."	Authority Certificate	Aboriginal Areas Protection Authority	4.9.2	Section 4.9, Section 5.10	
It is important to note that these "certificates" are not issued by the Authority and offer no indemnity from prosecution under the NTASSA, despite their adoption of a nomenclature very similar to that employed by the Authority for 30 years.					
Borrow pits required for haul road construction – depth to 3 m. How many and what frequency of pits will be required along the haul road route?	Project Description	Central Land Council	3.6.1	Section 5.11.1	
Average uranium concentration in the ore is reported as 75 ppm, thereby requiring no specific radiation management. Will there be ongoing testing to determine if some areas contain more concentrated uranium (and radiation) than others? If so, will specific management be required?	Uranium	Central Land Council	3.2		
Traffic management on the Barkly Highway and increased frequency of road trains is a concern for those Aboriginal people (and local tourists) who use the Highway regularly, both with respect to amenity and safety. CLC supports a consultation and education strategy for affected Aboriginal people who use the Barkly Highway to access services in Tennant Creek. Consultation should include affected communities such as Pukaki, Rockhampton Downs (Wograla), Alroy (Gulunguru), Ngurra and Corella Creek as well as Wonara and Tennant Creek.	Haulage off-lease	Central Land Council	4.10.1		
Traffic through Tennant Creek township to the existing rail loading area to the south of the town is proposed as an option in the event that the transport hub proposed by GPS to the north of the town is delayed. Several other alternatives are listed in the EIS. The CLC is of the view that the option of transporting ore through the town of Tennant Creek is not viable as it would pose a significant safety issue in the town.	Traffic Through Tennant Creek	Central Land Council	4.10.2		
The proposed transport hub will be the subject of a separate assessment process but the required haulage of ore from the phosphate mine will see an increased number of workers in Tennant Creek. Road haulage personnel based in Tennant Creek at the start of the project is predicted to be 80 with a future increase up to 180 positions. What provision is being made for additional housing to accommodate the new workforce given there is already a housing shortage in the town?	Social/Community/Housing	Central Land Council	4.8.6	General Comment	Section 5.11.6 of the Draft EIS provides details on the proposed road haulage workforce's accommodation village close to the multi-user hub.
Mineowners will consider offsets for greenhouse gas emissions and ETS. This has not been explored further in the EIS.	GHG Emissions	Central Land Council	4.2.1	Section 6.3.3 – Greenhouse Gases	
It is acknowledged that the EIS is addressing the DSO phase of the project and that Stage 2 (beneficiation) will be subject to separate assessment. What form will the additional assessment take if Stage 2 proceeds?	Project	Central Land Council	3.1.2	Project	

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
<p>The report states, "the intent of mine closure and rehabilitation is to return the land to as close as is reasonably possible to its pre-disturbed condition, suitable for use by Traditional Owners and as a habitat for flora and fauna". The project layout plan shows that mining will involve substantial alteration to the landscape with the development of numerous pits. A multi-pit operation should provide an excellent opportunity for backfilling thereby reducing the amount of disturbance for closure. However, after mining the plans indicate that there will be many voids (19 MZ, 4A) and waste dumps (14MZ, 3A) remaining. The percentage of pits not backfilled seems high (Table 5.5) as does the corresponding 20 m waste dumps overall footprint (Table 5.6). The report states that backfilling the voids will cost in excess of \$250 M.</p> <p>The challenge to the company will be to achieve a better rate of backfill by a strategic approach to mining to enable backfilling whilst minimising costs and handling of waste. Our experience in the Tanami is that a 15 m limit on waste dump height has resulted in a more subtle alteration to the existing landscape, and has been acceptable to the Traditional Owners.</p> <p>It is understood that the haulage distance between successive pits may impact on the cost effectiveness of backfilling by returning the land to pre-disturbance condition should be viewed as a priority. The cost effectiveness of backfilling should be closely monitored and reviewed subject to the changes in the economics of the mine. Rehabilitation expenditure on backfilling pits may be money well spent as the problems associated with managing a site with waste dumps and voids be costly.</p> <p>It is this site is left in the condition proposed in the current mine plan there are likely to be significant impacts on surface water flow regimes including, impeding flow so that some areas will have limited altered surface flow and others will be subject to both sedimentation and erosion. Altered surface flow regimes may have an impact on sacred sites in the vicinity of the Project.</p> <p>Is the backfilling and waste management plan for Stage 1 influenced by the possible Stage 2 of the Project? Stage 1 of the Project (the subject of this EIS) relates to mining DSO - how will progressive rehab work with respect to DSO mining when there is likely to be adjoining areas of non-DSO mined in the future? It seems there is a risk that DSO waste dumps will be located over non-DSO orebodies?</p> <p>What consideration has been given to the possibility cumulative impacts on groundwater in the region given that there is another proposed phosphate mine at Highland Plains (Phosphate Australia), which proposes to also use the same aquifer for mining and a transportation of product via a slurry pipeline to the Gulf of Carpentaria.</p> <p>The groundwater extraction model shows quite significant drawdown commensurate to the projects water usage, particularly at a higher mining rate. For a long term mine with a life of a minimum of 10 years, what alternatives are there should the water supply in the region be significantly impacted?</p> <p>The community of Wonarah has expressed concern about possible impacts on its water supply, particularly from drawdown as a consequence of mining. Given the nature of the aquifer in the region and the likely interconnectedness of the cavities in the limestone, possible effects on the community bore from drawdown resulting from continuous project water usage should be considered in the EIS. What monitoring of the community's bore is proposed?</p> <p>What are the possible impacts on the community water supply if there is a delay in developing the Northern Borefield and the Arnuwura borefield (proposed to be used for 3 months) needs to be used for a longer period of production? Are there possible impacts on the community water supply in the event pit development encounters the water table and ongoing dewatering is required?</p>	<p>Pit backfilling/Rehabilitation and Closure</p>	<p>Central Land Council</p>	<p>3.3.2 Section 5</p>		
	Groundwater	Central Land Council	4.6.3		
	Groundwater	Central Land Council	4.6.4		
	Groundwater	Central Land Council	4.6.5		

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
<p>The CLC is concerned about the assertion in the EIS that there is unlikely to be social disruption at Wunara as a consequence of the project. Traditional owners have lived at Wunara for many years. The population fluctuates for various reasons mainly because of difficulty in accessing basic services and employment. Some young men from Wunara are currently working for Minemakers on the project but return to the community at the end of the day where their families reside. These men have expressed a strong interest in continuing their employment with the project and living in the community. Other traditional owners have aspirations of gaining employment and residing at the community with their families, or for some elders, close to their adult children who hope to work at the mine and consequently have grandchildren in their care.</p> <p>However there are significant impediments to achieving this goal, including:</p> <ul style="list-style-type: none"> * Lack of housing * No school * Limited health care * No accessible fresh food supply * Sustainable, uninterrupted water supply <p>Lack of housing in particular may result in conflict within families given that there are only 4 basic houses in the community and decisions about who can live there and potential overcrowding will be stressful.</p> <p>Development of an Industry Participation Plan should be carried out in conjunction with CLC's Employment Unit to maximise participation and opportunities for traditional owners.</p>	Social/Community/Housing	Central Land Council	4.8.5 General Comment		
<p>The CLC is surprised with the extent that matters the CLC considered commercial-in-confidence have been disclosed in the Stakeholder consultation records contained in Attachment 6. Future dealings will be far more circumspect if the company intends to publish such material in public documents. In our view a record of the fact of a series of consultations and communications with the CLC and traditional owners, indicating broadly the nature of the issues and outcomes would be sufficient and more useful.</p> <p>Use of the latest Northern Territory or Northern Territory Regional (Barkly Region) input-output multipliers instead of outdated national (1989-90) multipliers would have been more appropriate in measuring the flow-on benefits. This may reduce the overall scale of the economic and employment benefits from the Project.</p> <p>Given that a large proportion of the employment is on a fly-in, fly-out basis and that the mining operation is essentially excavating, crushing and haulage of materials, the employment flow-on impact locally and regionally of an additional 475 employees in the operational phase may be somewhat over-estimated.</p> <p>The study does not separately detail revenue accruing to government. The direct revenue to the Northern Territory government will principally come from the payroll tax and the indirect taxes. The study provides the royalties expected to be paid to the Northern Territory Government but not other taxes cited above.</p> <p>A more detailed analysis of the project's impact on the local region (Tennant Creek) would be of assistance.</p>	Stakeholder Consultation - Disclosure of Private Information	Central Land Council			Minemakers will resolve this issue directly with the CLC.
	Economic/Employment	Department of Business and Employment, Economics and Policy Division	4.8.1	Socio-economic	
	Economic/Employment	Department of Business and Employment, Economics and Policy Division	4.8.2	Socio-economic	
	Economic/Employment	Department of Business and Employment, Economics and Policy Division	4.8.3	Socio-economic	
	Economic/Employment	Department of Business and Employment, Economics and Policy Division	4.8.4	Socio-economic	
	Mosquito Control	Department of Health and Families, Centre for Disease Control	3.1.1	Mosquito Management Plan Section 4.1 (Legislation, Guidelines and Codes)	
	Mosquito Control	Department of Health and Families, Centre for Disease Control	3.6.3	Mosquito Management Plan Section 5 (Planning and Preparation)	
	Traffic - Logistics	Department of Lands and Planning, Road Network Division	4.10.2		
<p>All intersections along the Barkly Highway and Stuart Highway will require some upgrading, which will include lighting at minimum to provide for the proposed traffic movements at night. These intersections include:</p> <ul style="list-style-type: none"> * Warrego Road / Stuart Highway * Stuart Highway / Barkly Highway * Barkly Highway / Mine Site Access road 	Traffic - Road Lighting	Department of Lands and Planning, Road Network Division	4.10.1		

Environmental Impact Statement Supplement
Wonarah Phosphate Project

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
<p>Common road train operations are approved for a maximum of 120 road trains per day, including night time operation, which is nearly a 1000% increase in road trains. Lane capacity of the Barkly and Stuart Highway is not the only consideration and other issues that are relevant have not been adequately addressed. These include:</p> <p>1. Increase in the total number of road trains</p> <p>2. Safety issues associated with road trains and their operation on the network, including interactions with other road users.</p> <p>Potential impact on the Barkly and Stuart highways will be significant on pavement deterioration. The original design of the Barkly Highway did not anticipate the proposed Road Train loading which will lead to accelerated deterioration of the pavement. Increased 'edge break' and shoulder deterioration. There will also be an accelerated demand for seal widening to accommodate the increased road train traffic on the Barkly Highway, at present this is not anticipated in the vicinity of the mine.</p> <p>Marago Road is not currently maintained to a high standard due to the low traffic volumes currently using the road. This road would need upgrading and increased maintenance to accommodate the proposed traffic volumes for the operation and associated camp. This does not address other users of the hub. Cumulative impact needs to be considered in this instance. The EIS does not make reference to these issues and potential impact of their proposal.</p> <p>Reliance on indirect royalties and fees to cover costs associated with maintenance and upgrading the highway may not be appropriate, due to the significant level of impact. This matter should be the subject to further negotiations between the proponent and the Department of Lands and Planning, Road Network Division.</p> <p>The management of the drivers and fleet will require careful split and fatigue management regimes should journeys be delayed due to other traffic hold-ups and minimal overtaking opportunities for road trains.</p> <p>Any new access or variations to existing access will require the approval of Road Network Division, Department of Lands and Planning prior to construction.</p> <p>All vehicles used in the haulage will be complying vehicles, application and approvals should be through the vehicle standards section of Department of Lands and Planning.</p> <p>The Multi-User Hub will be a large focal point of the operation and logistical requirements with a large camp located at the hub (180 people) and will also be the servicing centre for the project. This is not considered within this EIS. The impact of 180 people living at the hub in a camp situation needs to address the transport considerations, this would also include the fly in and fly out arrangements for the camps at both locations.</p> <p>The monitoring activities associated with mitigation management in the main text and Attachments lack specific measurable management objectives. The current monitoring program is largely based on surveillance of permanent established sampling locations. This is likely to provide ineffective information regarding the success of management actions. This is likely to provide ineffective information regarding the success of management actions. DNRE/AS recommends an adaptive management framework be established and included in the Environment Management Plan, whereby specific measurable management objectives are formulated for each of the prescribed management actions used.</p> <p>The detail regarding rehabilitation is limited. The potential for changes to hydrology is high, as well as extensive areas of bare rock in the waste rock storages in the project area.</p> <p>There are two environmental weeds in the project area. However, three weeds of national significance have been recorded in close proximity.</p> <p>The baseline flora surveys conducted in the project area are considered adequate. The vegetation communities present in the project area are widespread throughout the region. Please note that it is important that the raw data are provided to DNRE/AS to be incorporated into the Atlas databases.</p> <p>There were five plant species listed as Near Threatened or Data Deficient with 10 or fewer records observed in the project area. The lower number of existing records for these species may reflect insufficient survey effort in the past or genuine narrow range distribution for these species. It is recommended targeted surveys for these species is incorporated into the plant management plan to establish whether these species are rare or poorly known.</p> <p>The main potential impacts to flora have been identified. However, fire needs to be added as a potential impact. Poorly managed fire regime will negatively impact rehabilitation and non-disturbed areas. Flora has been identified as an objective in the fire management plan, but the potential impact needs to be articulated.</p>	Traffic - Road Capacity	Department of Lands and Planning, Road Network Division	4.1		
	Traffic - Road Deterioration	Department of Lands and Planning, Road Network Division	4.10.3		
	Traffic - Road Upgrade	Department of Lands and Planning, Road Network Division	4.10.2		
	Traffic - Road Upgrade	Department of Lands and Planning, Road Network Division	4.10.3		
	Traffic - Road Safety	Department of Lands and Planning, Road Network Division	4.10.1		
	Traffic - Regulations	Department of Lands and Planning, Road Network Division	4.10.2		
	Traffic - Regulations	Department of Lands and Planning, Road Network Division	4.10.3		
	Transport - Multi-User Hub	Department of Lands and Planning, Road Network Division	4.10.3		
	Fauna - Monitoring	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.4.6/7.5	Section 6.7.3 and Section 6.7.5	
	Rehabilitation - Hydrology	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	5.3	Section 8 - Mine closure and Rehabilitation	
	Weed Management	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.4.1	Section 6.7.1 – Baseline Introduced Species	
	Baseline Flora Surveys	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.4.2		Noted.
	Weed Management	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.4.2	Section 6.7.1 – Baseline Introduced Species	
	Flora - Fire Management	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.4.3	Section 6.7.2	

Environmental Impact Statement Supplement
Wonarah Phosphate Project

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
The monitoring activities mentioned throughout the main text and Attachments lack specific measurable management objectives. The current monitoring program is largely based on surveillance of permanent established sampling locations. This is likely to provide ineffective information regarding the success of management actions. DNRETAS recommends an adaptive management framework be established and included in the Environmental Management Plan, whereby specific measurable management objectives are formulated for each of the prescribed management actions used.	Flora - Weed Monitoring	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.4.5	Section 6.7.3 and Section 6.7.5	
Possible indirect impacts on <i>Sporobolus latzii</i> would be the main concern. There is only one known collection of this species and the type locality is ~ 4.5 km north of the southern part of the project area. The habitat is given as clay soil seasonal swamp. From the imagery and mapping this location and habitat seems to be on a drainage line but not on the actual development area. The other taxa listed are widespread if not commonly collected, probably mostly a function of occurring in a relatively poorly surveyed zone of the Northern Territory.	Weed Management	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.4.7		
The main potential impacts to fauna have been identified. As stated in the EIS, the risk to species listed under Territory and Federal legislation from habitat loss is relatively low. However, the risk to listed fauna from truck movements along the Barkly Highway is considered likely and impacts to be moderate. This has not been identified as a potential impact in the EIS. If peak truck movements are estimated to be one vehicle every 9 minutes during peak production, then the probability of mortalities from trucks is likely.	Fauna - Potential Impacts	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.5.1	Section 6.8.2	
Management of road mortalities of threatened species should be added to the mitigation measures. It is recommended that vehicles record the number of mortalities of all threatened and near threatened species, if the number of mortalities becomes significant then mitigation may be required.	Fauna - Road Kill	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.5.1	Section 6.8.3 – Fauna - Avoidance, Mitigation and Management	
The residual impact assessment is considered inadequate. The impact of road mortalities on Threatened or Near Threatened Species is moderate. DNRETAS recommends the inclusion of this impact in the residual risk assessment.	Fauna - Road Kill	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.5.1	Section 6.8.4	
As stated, introduced species such as cats and foxes have the potential to impact native fauna. It is recommended that all cats and dogs are banned on the project area to minimise the risk to fauna.	Introduced Fauna	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.5.2	Alt. 5H Fauna Management Plan	As stated in Section 5.1.3 of the Fauna Management Plan 'All personnel will be forbidden from bringing pets into the project area.'
Fire needs to be added as a potential impact. Poorly managed fire regime will negatively impact rehabilitated and non-disturbed habitats. Fauna has been identified as an objective in the fire management plan, but the potential impact needs to be articulated.	Fauna - Fire Management	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit	4.5.4	Section 6.7.2	
The residual impact assessment is considered adequate.		Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit			Noted.
The baseline flora surveys conducted in the project area are considered to be adequate. The fauna present in the project area are typical of the region and widely distributed. Please note that it is important that the data are provided to DNRETAS to be incorporated into the databases.	Fauna - Baseline Surveys	Department of Natural Resources, Environment, The Arts and Sport, Biodiversity Unit			Noted.
In Table 5.4 the total disturbance area of project components is based on 0% backfilling when it is estimated from Table 5.5 that average percentage backfilling is 34% (54% backfilling at Aruwurra deposit and 29% backfilling at the Main Zone). Table 5.5 indicates that of the total disturbance area for pits (596 hectares) 74% of that area would remain disturbed after backfilling (~440 hectares). This is a deviation from the original Notice of Intent where it was proposed strip mining and progressive rehabilitation (with few final voids) would be the main mining process. While it is recognised less land disturbance would occur as a result of targeting the ore with shallow open pits and building higher waste rock storages, information needs to be provided on the impact of 440 hectares of final voids and 700 plus hectares of permanent 20 m high waste rock storages. Minemakers need to commit to maximising backfilling of pits and illustrate on Figures 5.2 and 5.3 where backfilling (and percentage backfilling) is to occur.	Waste Rock/Backfilling	Department of Natural Resources, Environment, The Arts and Sport, Heritage and The Arts Division	3.3	Section 5.5 – Mining Process	
Further information is required on what distance between pits Minemakers considers 'significant' and whether the mining process can be revised to reduce haulage distances to make backfilling more cost-effective. Minemakers should compare the proposed mining process with the costs of rehabilitating, decommissioning and rehabilitation-performance monitoring (>2 years) 20 m high waste rock storages and any maintenance/monitoring issues with final voids post closure. Minemakers should consider the benefits of reducing visible scars on the landscape in the shape of final voids and permanent 20 m waste rock storages.	Waste Rock/Backfilling	Department of Natural Resources, Environment, The Arts and Sport, Heritage and The Arts Division	3.3	Section 5.5 – Mining Process	
A question of timing is emerging as to whether the proposed Multi-User Hub would be ready in time to receive ore from Wonarah's proposed operations in 2010 - third quarter. Proponents of the Multi-User Hub currently (Dec 2009) have only submitted plans to NT Government for a container loading facility and stated that the accommodation and bulk-transfer facility are not scoped/designated. Alternatives to the Multi-User Hub outside Tennant Creek should be discussed in the Supplement, including if containers will be used to ship ore and how that affects transport issues.	Multi-User Hub	Department of Natural Resources, Environment, The Arts and Sport, Heritage and The Arts Division	3.5	Section 3.4.5 – Multi-User Hub	
Information is required on how road impacts will be mitigated if there is a substantial increase in accidents.	Road Accidents	Department of Natural Resources, Environment, The Arts and Sport, Heritage and The Arts Division	4.10.1	Section 6.13 – Traffic and Transport of Ore	

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
<p>Minemakers need to demonstrate they are actively committed to reducing greenhouse gas emissions rather than merely indicating that project development would not constitute a significant increase in emission of greenhouse gases in the Northern Territory. While it is recognised that the project emissions would be a small contributor nationally and internationally, they are significant enough to require mandatory reporting under the National Greenhouse and Energy Reporting System and to attract liability under the Australian Government's proposed Carbon Pollution Reduction Scheme (CPRS). It is in Minemakers interest to identify and demonstrate how they aim to reduce their carbon emissions from the baseline provided in the draft EIS (Table 6.7 and Table 6.8). This commitment is also important given that there is potential for Stage 1 of the project to be extended beyond the 10 year mine life and a potential Stage 2 (>40 years with beneficiation plant) proposed.</p>	GHG Emissions	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.2.1	Section 3.4.4 – Power Supply, Section 6.3 – Greenhouse Gas Emissions	
For this purpose, Minemakers should undertake a comparison of the full costs and benefits of alternative energy and fuel types and how greenhouse gas emissions can be best minimised in supplying power to the project and from vehicle emissions.	GHG Emissions	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.2.1		
Report on the assessment of the economic viability of installation of photovoltaic cells and if prohibitive to use as a sole power supply, investigate options for installation at the camp.	GHG Emissions	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.2.1		
Have Minemakers estimated, and included in Table 6.7 and Table 6.8, the emissions generated from power consumption to pump groundwater from the Northern Bore field?	GHG Emissions	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.2.1		
While it is recognised that the predicted net increase in greenhouse gas emissions would be insignificant relative to the Northern Territory's total emissions, Minemakers should recognise the greenhouse implications of their activity, the legal obligations they will attract, and aim to minimise the impact.					
<p>The previous estimate of greenhouse gas emission from land clearing provided to Minemakers (35.1 CO₂-equivalent per hectare after 5 years) has been revised after further research, scientific consultation and consideration of the particular character of the proposed clearing event (the mining activity not being a normal grazing plot). The revised estimate for the Worarah phosphate project would result in net greenhouse gas emissions of ~ 161,481.29 tonnes of CO₂-equivalent after 5 years from clearing (~ 68.1 CO₂-equivalent per hectare). These calculations are based upon computer modelling of emissions using FULCAM, the Australian Government model for tracking the greenhouse gas emissions and carbon stock changes associated with land use and management.</p> <p>These revised estimated emissions represent approximately 0.93% of the total annual greenhouse gas emissions from Northern Territory in 2007, and 7.03% of the Northern Territory's total annual emissions for deforestation.</p> <p>Furthermore, the estimated emissions from this general proposal are valued at ~ \$3,714,069, based on the projected price of greenhouse gas emissions within an Australian emissions trading scheme. This represents an indication of the economic cost of the proposed clearing from a greenhouse gas emissions perspective.</p> <p>This proposal has significant implications for the emission of greenhouse gases.</p>	GHG Emissions	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.2.1	Section 6.3 – Greenhouse Gas Emissions	
What voluntary greenhouse gas offsets are Minemakers considering? For example, Minemakers could investigate potentially installing solar power for the nearby Wulara community, if it is considered a benefit to that community.	GHG Emissions	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.2.1		
Minemakers could play a role in minimising the carbon footprint of the ore transport operators by requiring transport sub-contractors, as part of the tender process, to demonstrate minimisation of the carbon footprint from their proposed transport operators. Consideration should then be given in the tender process to rewarding measures to reduce the carbon footprint, such as use of more fuel efficient vehicles, use of alternative fuels for vehicles, optimising vehicle mechanical efficiency, maintaining maximum safe tyre pressures, fitting emission control equipment, etc.	GHG Emissions	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.2.1		
Table 6.7 – estimated annual diesel fuel consumption and greenhouse gas emissions. Minemakers should investigate potential for more fuel efficient vehicles or use of alternative fuels for vehicle movement. This table should be used as a base and Minemakers demonstrate how fuel consumption and greenhouse gas emissions are reduced over time. There is no demonstration of mitigation measures leading to a reduction in residual impacts.	GHG Emissions	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.2.1		
Has any change in the expected fire regime for the project site been accounted for in calculating the carbon emissions footprint for the project? Early controlled burns may reduce the comparative footprint.	GHG Emissions	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.2.1	Section 6.3 – Greenhouse Gas Emissions	

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
Whilst the obvious sensitive receiver is human, Minemakers should consider the potential impacts to surrounding fauna. Mining activity may generate low frequency noise profiles especially from rolling and screening activities. Minemakers should identify appropriate noise criteria and describe best practice activities to manage potential noise impacts on wildlife.	Noise and Vibration	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division		Section 6.4.2 – Noise and Vibration	
Discuss the likelihood of final voids accumulating sediments, salts and precipitates through repeated stormwater runoff and evaporation cycles, impacting long term water quality and use by wildlife and stakeholders.	Water Quality	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.7.5		
1. How would hydrocarbon-contaminated water be appropriately disposed? 2. Are potentially contaminating infrastructure, such as fuel stores and workshops, being placed out of the path of rare extreme flooding events? 3. To what Average Recurrence Interval (ARI) rainfall event are bund heights designed around fuel and hazardous goods stores, to contain all captured stormwater? 4. How do oily water separators perform in flood conditions?	Surface Water Contamination	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.7.2	Section 6.10 – Surface water	
With reference to the following statement "...there are some elements that occur at elevated concentrations in waste rock and low grade ore. Although their solubilities are expected to be low, it is recommended that PO4, F and Be, be included in site water quality monitoring programmes": 1. This consultants' recommendation should be adopted into groundwater and surface water quality monitoring programs. 2. Describe proposed contingency management in the event monitoring indicates these elements are elevated.	Surface Water Monitoring	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.7.2	Appendix 6, Section 4.0	
The remote location of Tennant Creek is likely to make it difficult for local businesses to offer goods and services to Minemakers at competitive prices, compared to those available from larger cities. The EHA Division supports all recommendations in Appendix 4, Socio-economic Impact Assessment (Section 6), including the development of an Industry Participation Plan and local procurement policy to optimise employment of local businesses. Indigenous employment opportunities are likely to exist associated with the revegetation program, in areas such as seed collection, planting, nursery propagation, weed and feral animal control, monitoring and revegetation trials. The statement "The progressive and staged rehabilitation of the disturbed areas by Minemakers will have a similar effect on flora communities, resulting in a diverse mosaic vegetation community, which also has benefits for local faunas" is assuming successful long term rehabilitation and Minemakers should provide information on how monitoring will provide evidence to support this statement.	Economic/Employment	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.8	Socio-economic	
The long term water quality and monitoring of final voids should be considered in the final rehabilitation closure costs compared to costs of backfilling pits.	Flora - Rehabilitation	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.2.2		
If an intention is for the legacy pits to hold and keep water into or through the dry season, consideration is required for increasing the stormwater catchment of individual pits, through land contouring and alignment drains/bunds to receive local runoff, rather than repel it.	Water Quality	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.3.3	Deposit Geochemistry	
If Traditional Owners have requested that a number of pits remain after mining, as areas to attract wildlife for hunting, access ramps open to these pits will need consideration – especially those likely to maintain legacy pit-water bodies. Open access ramps may also reduce potential for large animal entrapment in pits and pit water bodies.	Legacy Pits	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.3	Mine Closure and Rehabilitation	
Some preliminary work on potential impacts of anticipated final landscape profiling should be discussed with appropriate agencies and Traditional Owners.	Legacy Pits - Traditional Owner Access.	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.4	Mine Closure and Rehabilitation	
Stage 2 of the Wonarah mine utilising the Non-Direct Shippable Ore appears to be more vulnerable than the current proposal to market prices for phosphate, and will require greater resources, such as water, acid and capital investment. The uncertainty associated with Stage 2 proceeding in the near future means a precautionary approach should be taken in revegetating the low grade ore stockpiles as soon as possible to avoid losing the period of viability of the seed bank in the topsoil, as per the revegetation of the waste rock stockpiles.	Revegetation	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.4	General Comment	
Given the dry climate and potential difficulties in revegetating the post-mined landscape, a long-term (e.g., 10-20 years) post-mining commitment to activate rehabilitation effort may become necessary. This should also be reflected in the bond submitted for the project.	Revegetation	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.6.2	Revegetating low grade ore stockpiles	

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
Mine-makers should indicate the anticipated mining life of Stage 1 in light of any additional exploration data conducted since the Draft EIS was submitted. If it is expected to extend significantly beyond ten years this may have implications on regional groundwater drawdown and use and the groundwater model should also run scenarios for the anticipated extended Stage 1 (>10 years) mining life.	Groundwater Drawdown	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	3.1.2 and 4.6.4	Section 1.1 - Background	
Mine-makers should provide clarification on why Pits 1 and 15 have remaining disturbance areas higher than total disturbance areas after they have been backfilled by 35% and 57%, respectively (Table 5.5).	Waste Rock/Backfilling	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	3.3.1		
Provide a concept diagram of the proposed generic waste rock landform and clarify whether revegetation is to occur on the 18 degree slopes or only on the top and berms.	Waste Rock/Landforms	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	3.3.1	Section 5.6 – Waste Rock Storage	
Discuss costs and benefits of semi-permanently sealing the haul roads into the mine site (Arruwwura and/or Main Zone) compared to ongoing use of graders, water carts and dust suppressant additives.	Water Use	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	3.4.1	Section 5.8.2 – Water Use	
2. Discuss benefits of harnessing runoff and storing surface water for mine use.	Haul Road Disturbance	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	3.4.2	Section 5.9.1 – Transport Infrastructure	
Clarify why the width of disturbance for construction of the access/haul road needs to be 35 m wide, to achieve a useable 8 m width.	Type Disposal	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	3.7.1	Section 5.13.1 – Waste and Hazardous Material Generation	
Table 5.8 suggests that waste tyres may be disposed by burying in the waste rock storages and justification is required on the dumping of whole tyres into waste rock storages. Tyres are a listed Waste under the <i>Waste Management and Pollution Control Act</i> and in a whole state may return to the surface and, being inert, would remain in the environment long term. Mine-makers should provide a cost benefit analysis on alternative use of disposal of waste tyres. More details are required on the economic viability and proposed number of waste tyres that would be produced over the mine life and best management of those tyres. Mine-makers would need to provide a written record of location and number of waste tyres should they be disposed of in the waste rock storages and investigate the long term impact of burying tyres and landform stability.	Dust	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.1.1		
The monitoring program of dust emissions detailed in Section 6.2.5 is very thorough and Mine-makers should be commended on their risk assessment and mitigation measures for managing this issue. Mine-makers need to consider the location of dust sampling points in relation to the prevailing winds and sources of dust – particularly for the 12 month continuous monitoring plan. With the exception of dust gauges WONDD1 and WONDD4, the other dust monitoring gauges are upwind of most activities (Figure 6.2). Mine-makers should provide justification of locations for sampling points referring to specific Australian Standards and consider a gauge to be incorporated closer to the road affecting highway travellers.	Dust	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.1.3		
The dust monitoring results for the 11 sampling periods from June 2008 to September 2009 should be included in the Supplement.	Dust	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.1.2		
Will the dust present a potential health hazard (e.g., asthma trigger), due to particle size, or mineral content (e.g., Beryllium)?	Dust	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.1.2		
How will dust impacts on the accommodation camps, and mine workers in general, be managed?	Dust	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.1.2	Section 6.2 – Air Quality	
As a mitigation measure for weed infestation, Mine-makers should provide details on whether vehicles and plant brought to the mine would go through wheel wash to ensure they are free of mud, seeds and other plant material.	Weed/Pest Control	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.4.1		
Seeding periods for weeds found to be present on-site should be accounted for in planning of control efforts, to ensure eradication has occurred prior to seed release.	Weed/Pest Control	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.4.1		
A dedicated weed control and environmental officer on-site is likely to help keep the mine site secure against weed and feral animal outbreaks, which avoids Mine-makers incurring future costs associated with eradication programs and repair of revegetation efforts.	Weed/Pest Control	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.4.1		

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
Given the disturbance footprint, this (Minemakers will also consider developing a biodiversity offset plan for the project, this may involve collaboration with Traditional Owners') should be a firm commitment as part of the mitigation measures and details of the proposed offset included in the Supplement.	Flora - Rehabilitation	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.4.4	Section 6.7.3 – Flora - Avoidance, Mitigation and Management	
The environmental benefit measures are not clear in Attachment 5 and should be provided in the Supplement.	Flora Management Plan	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.4.5	Section 6.7.4 – Flora – Residual Impact	
With reference to the statement "The project will be designed to minimise and avoid unintended changes in the structure and condition of areas which contain flora of significance, including: Minimising vegetation incurring future costs associated with eradication programs and repair of revegetation efforts" – given that 'minimise and avoid unintended changes' does not represent a definitive statement of exclusion, clarify which ephemeral areas are being targeted for disturbance?	Flora	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.4.6		
Define expected impacts and proposed management of impacts of groundwater drawdown on local ephemeral or groundwater-connected vegetation communities and ecosystems.	Flora	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.4.6 and 4.4.7	Section 6.7.3 Att. 5G Increased Weed Density and Disturbance	
Indicate the seasonal water table depth range around the low-lying area associated with the area of cultural exclusion, and the presence of <i>Sporobolus laevis</i> .	Groundwater Drawdown	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.4.7	Section 6.9 - Groundwater	
A potential impact of the transport of up to 3 Mtpa of ore would be an increase in road kill of native fauna along the Barkly Highway: 1. How do Minemakers propose to respond in the event of injuries occurring to native fauna, both on-site and in the case of road strikes? Provide details in a revised Fauna Management Plan, demonstrating a commitment to animal welfare. 2. What management actions do Minemakers propose to minimise and manage road kill and ensure safety to other vehicles when a large animal is hit? 3. Table 6.43 should include the commitment to keeping a record of road kills and how they have been managed to reduce risk of road accidents due to ore transport.	Fauna Road Kill	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.5.1	Att. 5H Fauna Management Plan	
Minemakers should provide the following information: 1. The potential for water holding structures, including legacy pits, for providing cane load breeding habitat. 2. How imported machinery and goods can be screened for importing cane load individuals to prevent cane loads from entering the area.	Introduced Fauna	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.5.2	Section 6.8 – Fauna	
Minemakers has committed to fencing surface water storage areas to prevent access by feral animals – the management of cane loads and permanent water bodies should also be considered as part of the Fauna Management Plan.	Introduced Fauna	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.5.2	Att. 5H Fauna Management Plan	
A strong feral animal control program would likely have significant benefits for the success of revegetation programs.	Introduced Fauna	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.5.2		
Details need to be provided on the expertise of persons conducting the walkover and whether sufficient time would be allocated to relocate significant species if they are located in areas to be disturbed.	Threatened Fauna Species	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.5.3	Section 6.8 – Fauna	
With reference to the following statement "During the design phase the project footprint has been minimised and located to avoid disturbance to significant habitats where practical" – the term 'where practical' could represent a significant nullification of any commitment. Indicate the significant habitats that are proposed to be disturbed (which are not practical to avoid).	Habitat	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.5.3	Section 6.8.3 – Fauna - Avoidance, Mitigation and Management	
Provide a map and text describing aquifers on the Mining Leases(s) indicating span, depths and connectivity: 1. Overlay a surface topographical map to show likely surface water flow paths and areas of potential surface expression of groundwater and/or areas of seasonal inundation. 2. Overlay a mine infrastructure plan. 3. Describe which proposed pits will intersect groundwater aquifers, and to what extent/depth. 4. Account for seasonal variation in water table heights.	Groundwater Drawdown	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.6.1	Section 6.9 - Groundwater	

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
Indicate the expected extent of legacy water retention in individual pits.	Groundwater Drawdown	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.6.1	Section 6.9 - Groundwater	
With reference to Figure 6.10 – provide the location of the third party bore users and Wunara community bore in relation to the predicted groundwater drawdown. If Stage 1 progresses longer than 10 years, what is the predicted groundwater drawdown?	Groundwater Drawdown	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.6.4	Section 6.9 - Groundwater	
Justification is required for why the four sedimentation ponds are designed for a 1 in 10 year ARI runoff event when Table 15, Appendix 10A shows there is a 65% probability that this rainfall event would occur. Discuss the consequences of failure should a higher ARI event occur during the project's life.	Sedimentation Pond Failure	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.7.3	Section 5.8.1 – Surface Water Management	
Mememakers commitment to "contribute financially to local sporting communities and clubs, community based training providers and service groups" would represent a socio-economic benefit of the project and should be included in Table 6.36 as a mitigation measure.	Economic/Employment	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.8.7	Section 3.3.1 – Economic Benefits	
If topsoil is stockpiled over a wet season, or wet by dust control operations leading to seed germination, the germinated seed may be effectively lost when the stockpile is disturbed for respreading. The practice of topsoil stockpiling thus may only be appropriate where it is undertaken and respread in a single dry season, and kept dry.	Topsoil Seed Stockpile	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.1.1	Section 8, Appendix 5 – Mine Closure and Rehabilitation	
How long can the viability of the seed-bank in topsoil be maintained when stored according to the proposed methods?	Topsoil Seed Stockpile	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.1.2		
Topsoil and subsoil profile sampling undertaken as part of the floraviana survey in Appendix 8A appeared to only sample to a depth of 40-60 cm (which may reflect the depth of a hole for a pitfall trap bucket). 1. Clarification is required as to the actual depth of subsoil layers across the areas of mining. 2. If subsoils are deeper than the ~30 cm proposed to be stockpiled (as well as ~100 mm of topsoil) justification is required as to why a greater depth of subsoil is not proposed to be stockpiled for later layering, to better replicate the existing soil profile in the new landforms. Greater subsoil depth would increase moisture holding capacity of the created landforms. Greater subsoil depth would increase moisture holding capacity of the created landform, provide greater resilience of the landform against soil erosion, provide greater depth of soil for plant roots, and generally improve the likelihood of long term success of the revegetation effort.	Topsoil/Subsoil	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.1.3		
Mememakers should provide a topsoil budget on proposed stockpiling of soil and landforms requiring rehabilitation to ensure adequate topsoil and subsoil is available.	Topsoil/Subsoil	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.1.3	Subsoils	
Consideration may be required of collection of seeds from uncommon flora species for nursery propagation, prior to their disturbance by mining. This would also apply to species which fail to reappear from the stockpiled/respread topsoil seed banks or direct seeding.	Topsoil Seed Stockpile	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.2.1		
A comprehensive stock of pre-disturbance photos should be established up-front of floraviana communities in areas to be cleared. Sufficient detail should be contained to help provide a baseline/benchmark for later comparison, to demonstrate when closure criteria have been met.	Revegetation	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.2.2		
Mememakers has provided a cost of backfilling the remaining voids post cessation of mining (>\$250 M). The closure costs listed in table 8.4 need clarification on the following issues so that a comparison can be made of alternative rehabilitation and closure options: 1. Is the cost estimate for rehabilitation of the site based on the premise progressive rehabilitation has already occurred over the mine life? 2. What percentage of pit backfilling has been assumed in the closure costs? 3. How many years of post closure monitoring are proposed? 4. Has the closure estimates for waste rock storages incorporated the costs of shaping, re-contouring and re-spreading topsoil to an adequate depth to support plant growth and included rehabilitation of low grade ore stockpiles? 5. Have the long term costs and likely success of establishing vegetation, controlling erosion, maintenance and monitoring of the waste rock storages post mining been adequately maintained? 6. Are the Traditional Owners aware of the increase in number of final voids and 20 m high waste rock storages (>700 hectares) proposed in the draft EIS?	Cost of rehabilitation	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	5.6.1	Section 3.4.3 – Alternative Mine Closure and Rehabilitation Options, Section 8.7 Post-closure Monitoring and Maintenance	

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
Minemakers need to provide details on the capacity of the sediment traps for that purpose (directing runoff from exposed subsoil to sedimentation ponds).	Erosion/Sediment Control	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division	4.7.3	Section 5.8.1 - Surface Water Management	Section 5.8.1 of the Draft EIS provides the site water management structures and identified that sedimentation ponds would be designed for a 1 in 10 year ARI event.
Consultant Recommendations: The Environment, Heritage and Arts Division supports all recommendations made in the reports: - Appendix 8A, Baseline Flora and Fauna Report, by Ern Moon, Tom Newsome and Dr Bill Low, April 2009, s.7, Pages 44-53, 174-177 and 181-184; and - Appendix 8B, Desktop Flora and Fauna Assessment: Proposed Borefield and Water Pipeline, by Tom Newsome and Dr Bill Low, 13 Nov 2009, s.5, Pages 15-16.	Flora and Fauna	Department of Natural Resources, Environment, The Arts and Sport, Environment, Heritage and The Arts Division			Noted.
All heritage and archaeological issues have been addressed for this project. Mitigative measures have been advised and Heritage Branch will await permit applications to disturb any relevant archaeological sites.	Heritage	Department of Natural Resources, Environment, The Arts and Sport, Heritage Branch			Noted.
The 12-15 culvert outlets described on the main haul road should be rock lined with a geotextile underlay. An amended Erosion and Sediment Control Plan with these changes is required to be approved by the Department of Natural Resources, Environment, The Arts and Sport (DNRETAS) prior to commencement of works.	Erosion/Sediment Control	Department of Natural Resources, Environment, The Arts and Sport, Land Management Division	4.7.4	Erosion and Sediment Control Plan	
All on-site works should be carried out in accordance with the Northern Territory Government's Erosion and Sediment Control Guidelines.	Erosion/Sediment Control	Department of Natural Resources, Environment, The Arts and Sport, Land Management Division	4.7.4	Erosion and Sediment Control Plan	
All rock check dams in major diversion drains, drop structures, drain outlets and all flood protection berms should have a geotextile underlay to minimise the potential for soil erosion.	Erosion/Sediment Control	Department of Natural Resources, Environment, The Arts and Sport, Land Management Division	4.7.4	Erosion and Sediment Control Plan	
It is a recommendation to at least conduct a monitoring programme to capture aquifer behaviour and in particular, the occurrence of groundwater recharge. It will also furnish data enabling the assessment of the impact of groundwater extraction during the project construction and operations. The Monitoring Program should be upgraded to include the following components: 1. A water table monitoring network should be established in the production borefield area to the north to confirm the predicted (modelled) drawdown regime due to pumping. The network should comprise a minimum of 4 monitoring bores (see Figure 6.10). Water level measurements should be taken on a monthly basis as a minimum. 2. Available data suggests there is a 'perched' two aquifer system - however the model presents a recharge scenario to the lower aquifer. This clearly demonstrates a conflict in the conceptualisation of the groundwater model. Therefore, acquisition of long term data to provide some knowledge and confirm hydrogeological conceptualisation is obviously required. As the occurrence of groundwater recharge is a key knowledge gap, it is recommended that continuous water level recorders (such as downhole loggers) be deployed as below to adequately establish the events should they occur: * 3 sites in the northern borefield area. * Two sites in the southern monitoring area. 3. Water quality monitoring should be undertaken as there are identified quality issues in the area. Sampling of each production bore should be conducted monthly for the following: * General parameters: pH, TDS, ES, Turbidity, Hardness (as CaCO3), Na, K, Ca, Mg, SiO2, HCO3, SO4, F, CL, NO3, PO4 * Trace metals: Al, As, Ba, Be, Br, Cd, Cr, Cu, Fe, Hg, I, Mn, Mo, Ni, Pb, Sb, Se, Sn, U, Zn 4. Monitoring bores for the operational pits should be drilled and constructed to form part of the monitoring network if aquifers are encountered.	Groundwater	Department of Natural Resources, Environment, The Arts and Sport, Water Resources	4.6.2		
Minemakers should commit to formal reporting and review of the groundwater monitoring program every two years with particular consideration to the comparison of modelled and observed data and submit report to DNRETAS.	Groundwater	Department of Natural Resources, Environment, The Arts and Sport, Water Resources	4.6.2	Section 6.9.5	
Under Section 6.7.1 – Baseline Introduced Species mention is made of Olive Hymenachne, Hymenachne amplexicaulis being within a 50 km radius of the proposed work area, a search our database indicates that are no records of this Weed of National Significance (WONS) within the Barkly region.	Weed Management	Department of Natural Resources, Environment, The Arts and Sport, Weeds Management Branch	4.4.1		

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
Picky Acacia (<i>Acacia nilotica</i>) is a Weed of National Significance (WONS) species and should be included a high priority weed species in the project area.	Weed Management	Department of Natural Resources, Environment, The Arts and Sport, Weeds Management Branch	4.4.1		
Perithemum (<i>Perithemum hysterophorus</i>) and Rubbervine (<i>Cryptosegia grandiflora</i>) are also WONS species and although not in the region at present, do pose a significant threat of invasion from over the border in Queensland and therefore require strict vigilance for their early detection and intervention should they be detected.	Weed Management	Department of Natural Resources, Environment, The Arts and Sport, Weeds Management Branch	4.4.1		
The presence and spread of all weed species should be reported to the District Weeds Officer based with Weed Management Branch, DNRERAS, Tennant Creek.	Weed Management	Department of Natural Resources, Environment, The Arts and Sport, Weeds Management Branch	4.4.1	Section 6.7.1 – Baseline Introduced Species	
Add the following statement to this section: "The project area should also be examined by Weeds officers annually, and all staff working on the mine site should be provided with identification material for easy reference for the identification of those weeds most likely to be encountered".	Weed Management	Department of Natural Resources, Environment, The Arts and Sport, Weeds Management Branch	4.4.1	Section 6.7.3 - Avoidance Mitigation and Management, Introduction of New Weed Species	
The Environment Centre NT would like to see further details about renewable energy options being investigated by the proponent.	Environment/Conservation	Environment Centre NT	4.2.1	Section 3 page 3-6, Section 6-18	
Any company that purports to follow 'best practice' should be proactive in reducing and offsetting greenhouse gas emissions associated with their activities, rather than waiting for a directive from government. We expect Minemakers to investigate every opportunity possible for emission reductions, and to look seriously at offset measures that are Territory-focused and that realise both carbon and biodiversity benefits.	GHG Emissions	Environment Centre NT	4.2.1	Section 6 page 6-19	
The staff induction process should comprehensively cover on-site sustainability measures, including the provision of information about energy efficiency and waste reduction/recycling. Induction should be viewed as an opportunity to promote awareness about best practice environmental management.	Energy Efficiency	Environment Centre NT	4.2.2	Section 9 page 9-4	
The Environment Centre NT would like to see further details about alternative fuel options being investigated by Minemakers.	Fuel - Alternatives	Environment Centre NT	4.2.1	Page 5 Attachment 5A	
As Minemakers has rightly acknowledged, there is growing world demand for phosphate to support increasing agricultural production to feed a rising world population. However, what the company fails to address is the urgent need to mine and use this resource sustainably, rather than primarily mine and export phosphate in line with price signals from global commodity markets (as per Project Objective 1, p. 3-1, Main Report).	Mining Sustainability	Environment Centre NT	3.1.3	General Comment	
While Minemakers may well argue that this overarching sustainability concern is beyond the scope of their single-project EIS, and as such, does not warrant consideration, we suggest that if the company is seriously committed to corporate social and environmental responsibility, then this concern will be at the forefront of their business planning and project development. Indeed, a company that has the privilege of having access to a resource as important as phosphate should be committing to the development of a sustainable phosphorus future, and in turn, food security, for Australia and the world.					
If types are buried in the waste rock dumps the proponent needs to ensure that there is minimal potential for the leaching of toxic compounds and subsequent impacts on the receiving environment. Minemakers should be aiming to achieve the smallest environmental footprint possible, with respect to every aspect of their operation.	Type Disposal	Environment Centre NT	3.7.1	Section 5 page 5-32	
Opportunities for composting organic waste from the accommodation and administration areas should be investigated. This compost could be utilised in site landscaping work.	Waste	Environment Centre NT	3.7.2		
The proponent should detail plans to work with neighbouring landholders in the eradication of existing weeds and in the prevention of new weed species introductions in the project region. Joint weed management efforts will be far more effective than any weed management activities that occur in isolation.	Weed Management	Environment Centre NT	4.4.1	Section 6 page 6-51	
Has any real attempt been made to develop a biodiversity offset plan for the project, particularly in light of the significant area of land that the proponent is proposing to clear? We would like to see more details provided, not just a couple of vague sentences in the Draft EIS.	Biodiversity Offset Plan	Environment Centre NT	4.4.4	Section 6 page 6-50, 6-68	
As with weeds, the proponent should detail plans to work with neighbouring landholders in the eradication of existing feral animals and in the prevention of new feral animal introductions in the project region.	Introduced Fauna	Environment Centre NT	4.5.2	Section 6 page 6-68	
Where is the proponent planning to find a suitable alternative water supply from? Is this a sustainable option?	Water Use	Environment Centre NT	4.5.4	Section 6 page 6-94	
Notwithstanding the relatively low annual rainfall, there may be potential for on-site rainwater harvesting, utilising the various buildings and structures that are planned as part of the development. Has Minemakers given any thought to utilising other water sources apart from groundwater?	Water Use	Environment Centre NT	4.7.1	Section 3 page 3-9	
Treated effluent should be viewed as a valuable resource, particularly in a semi-arid climate. The proponent should utilise it, where possible, in order to reduce their groundwater extraction demands.	Groundwater	Environment Centre NT	4.7.1	Section 5 page 5-30	

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
We request further details about how the removed vegetation and topsoil will be stored and maintained in order to ensure that it is fit for rehabilitation work. How is the proponent accounting for seasonal variability? What is the chance of rehabilitation success?	Topsoil Seed Stockpile	Environment Centre NT	5.1.1	Section 5 pages 5-20, Section 6 page 6-34	
The Environment Centre NT seriously questions if two years of monitoring post-mine closure will be adequate for ensuring adequate site rehabilitation and stability.	Monitoring	Environment Centre NT	5.6.2	Section 8 page 8-16	
The proponent does not provide any detail on how this "economic viability" <i>[of backfilling pits and rehabilitation]</i> has been determined but it is made clear that haulage distances between successive pits is a key factor in those calculations. We are not provided with hard, dollar-based figures that demonstrate the actual differences in cost between the backfill and non-backfill options, only advised that haulage distances make backfilling "less cost effective" than constructing waste rock storages adjacent to the pits (page 5-17) and that it is estimated that if all remaining voids backfilled upon cessation of mining, the cost would exceed \$250 million. Presumably this value represents the maximum liability that will be passed onto either the landowners or to the Government once Phase 1 of the mine is completed. However, it is reasonable to assume that the full liability will increase significantly should Phase 2 of the mining operations be implemented.	Pit, Pit Voids and Closure	Northern Land Council	3.3	Section 5 page 5-17	
The proponent plans to ship ore via a series of road trains from Wonarah to Tennant Creek. This will increase the risk of accident or death for other users of the Barkly Highway. However, the proponent states that the cost of a rail link between the project and Tennant Creek will be in excess of \$500 million, and therefore be cost prohibitive (page 3-8). An alternative option, rail through to the Queensland system has not been evaluated, but has been dismissed due to the carrying capacity. Other alternatives that don't seem to have been considered include the construction of a railway through to Tennant Creek with Northern Territory Government assistance (similar to that provided to McArthur River Mines), or with other prospective phosphate projects in the same area. While these projects may still be in the future, they should not be dismissed altogether and it may be appropriate to review construction of a railway at a later date.	Transportation of Ore	Northern Land Council	4.10.3		
The proponent suggests that surface water will be tested for major anions and cations, total and dissolved metals, pH, total dissolved solids and electrical conductivity (Section 6.10.5, page 6-10); but does not disclose sufficient information for us to determine if the monitoring program would be appropriate for the project. There is no surface water monitoring or management plan provided (Attachments to Section 9.6) and we are not told which major anions and cations or dissolved metals will be monitored, nor the standards against which the magnitude or "adverse effects" will be determined.	Surface Water Monitoring	Northern Land Council	4.7.2	Section 6.10.5, page 6-101	
Elemental analysis of selected waste rock composites indicates significant concentrations of phosphorous and beryllium (Appendix 6) is present. An excess of soluble phosphate (PO4 -2) in water bodies may lead to eutrophication and algal growth to the detriment of water supplies and the environment in general, and should therefore be monitored.	Water Quality	Northern Land Council	4.7.2	Appendix 6	
The proponent has indicated they intend to use a mixture of shallow open-pit and strip mining methods, which should allow for complete and cost-effective progressive rehabilitation. During Phase 1 the maximum total residual disturbance area resulting from mining activities will be between 1,300 and 2,000 hectares (pit void and waste rock storage data from Table 5.4). This will remain as numerous scars across the landscape, representing a loss of future land value, resource and socio-cultural amenity to future generations. While small in comparison to many other mining projects, the size of the prospective area shown in Figure 5.5 and potential implementation of Phase 2 suggests that the amount of disturbed land is likely to increase significantly well into the future.	Pit, Pit Voids and Closure	Northern Land Council	5.5	Section 5, Table 5.4, page 5-16	
It is unfortunate the proponent is not yet in a position to make a decision on whether or not Phase 2 is to proceed. Phase 1 is expected to last a minimum of 10 years, while Phase 2 would last a further 40 years (page 1-1), making the overall economic viability of a rail system for more attractive. Consequently, we believe that further consideration to the rail system should be given, either now or in the near future, in an effort to reduce the potential risk to the general public passed by the large number of mine related vehicles that will be constantly on road.	Transportation of Ore	Northern Land Council	3.1.2		
Principal concerns with how the proponent has determined the true value of backfilling all of the pits are summarised below: 1. "Less cost effective" does not mean economically unviable – but does imply that reduced profit would be made available to shareholders if additional backfilling were undertaken. A sacrifice of some of this profit margin over the entire length of the project would assist in dealing with high closure costs; and 2. Long-term cost of on-going environmental maintenance and stewardship is not visible in calculations of "economic viability". Complete backfilling of pits will minimize ongoing stewardship costs and reduce the future liability passed on to Government and land owners.	Pit, Pit Voids and Closure	Northern Land Council	3.3 and 5.6	General Comment	
Beryllium (Be) is a carcinogen that can have toxic effects if inhaled at levels as low as 0.2 micrograms/m3. While there may not be a significant impact upon the surrounding areas due to atmospheric dilution, it is important that monitoring of Be occurs where personnel are working in dusty areas; so it should be measured through any ambient air monitoring plans. Ingestion of dissolved Be is generally not harmful, but should also be mitigated and monitored in surface water systems as it may be present as a dust once the surface water evaporates.	Surface Water Monitoring; Air quality monitoring	Northern Land Council	4.1.2		

Submission	Issue	Interested Party	EIS Supplement Cross Reference	Draft EIS Cross Reference	Comment
<p>The proponent has identified several flora and fauna species that are of indigenous significance (Section 4.5) but has not described the full value that has been placed upon them. This means that we cannot compare their values with those of the European systems that are usually used to describe their conservation value. For example, while many species may have food value, indigenous values of some species also includes totemic or spiritual significance, suggesting that a greater level of thought about protection should be applied rather than relying solely upon a measure of abundance. This is a potential impact that could have been better described had cultural landscaping and mapping been undertaken.</p> <p>Cultural landscapes tie together the physical, spiritual and socio-economic environments into a world view. They are of special importance to indigenous persons and can provide suitable baselines whereby impacts on cultural matters can be measured and environmental management processes guided during pre-mining, operational, closure and stewardship phases of the project.</p> <p>Cultural landscapes are powerful tools because through them, stewardship principles and practices that are based on indigenous knowledge can be used to develop environmental and cultural management practices that are meaningful to and easily understood by indigenous land owners. Although these are typically not requested as part of the EIS, we believe that the project would benefit through further engagement of traditional land owners at this level</p>	Cultural Heritage and Landscapes - Flora and Fauna of indigenous significance	Northern Land Council	4.4.8		
<p>The Northern Land Council has some concern about how culturally sensitive matters will be handled by the proponent. It has been suggested (page 6-129) that the mine site environmental officer will have the capacity to determine whether a formal assessment of the significance of archaeological site use is or is not required. It is not made clear what level of involvement the traditional custodians would have in this process, even though it is appropriate that they should be contacted in all instances with respect to cultural matters. The manner in which the proponent has relied largely upon AAPA certificates for some parts of the EIS, and lack of clarity with respect to cultural heritage management leaves us with concerns that cultural material and sites that have not been registered will remain protected as required under the Cultural Heritage Act.</p> <p>We believe this can be rectified through a clear commitment to developing a Cultural Heritage Management system that fully engages traditional owners prior to any decisions about cultural material being made.</p>	Cultural Heritage and Landscapes	Northern Land Council	4.9.2	Section 6 page 6-129	
<p>The only issue the Northern Territory Police, Fire and Emergency Services (NTPFES) has is the possible road safety factor. With the production of the mine there will be an extensive amount of road trains on the Barkly and Stuart Highways with transport of the phosphate between the mine and the proposed rail head. With the high increase of heavy vehicles on the road, there is an increased risk to possible safety of other road users. Additionally, the increased level of heavy transport will likely cause the road to degrade. NTPFES do not foresee any other issues for police.</p>	Traffic - Road Safety	Northern Territory Police, Fire and Emergency Services	4.10.1		
<p>Section 3.2.1 states in part that : "The objectives of the Mining Management Act are to ensure that the development of mineral resources is in accordance with the best practice health, safety and environmental standards and to protect the environment and health and safety of all persons on mining sites," and that "A mine management plan includes information relating to the description of mining activities, the management system to be implemented for the management of health, safety and environmental aspects...."</p> <p>These statements are not correct. The <i>Mining Management Act</i> has no role in the regulation of health and safety on mine sites. This role has been taken over by the <i>Workplace Health and Safety Act</i>. Also, mine management plans are no longer required to include details of management systems for health and safety. Instead the Regulations attached to the <i>Workplace Health and Safety Act</i> identify mining operations as a 'hazardous activity' for which a risk management plan is required. The required content of such a plan is detailed in the Regulations.</p>	Health and Safety - Regulations	NT WorkSafe	3.1.1	Section 3.2.1	
<p>The <i>Workplace Health and Safety Act</i> is also not identified in the draft EIS as 'relevant legislation'.</p>	Health and Safety - Regulations	NT WorkSafe	3.1.1		
<p>Section 2.11 estimates a road haulage work workforce based in Tennant Creek of approx. 140 drivers and support staff. Is this figure correct? What does this figure translate into in terms of daily truck movements on and off site?</p>	Traffic - Logistics	NT WorkSafe	4.10.2	Section 2.11	The figure provided in the Draft EIS for the road haulage workforce is correct. Section 5.10 of the Draft EIS provides details on the daily truck movements and Table 6.42 of the Draft EIS identifies the increase in Class 12 vehicles related to the transport of ore.
<p>Section 6 will require review and amendment to take the foregoing into account.</p>		NT WorkSafe		Section 6	Noted.
<p>NT WorkSafe would also be interested in sighting any documentation in relation to the Tennant Creek and Darwin elements of the proposed project.</p>		NT WorkSafe			Mine-makers is happy to provide future approvals documentation in relation to the Mine-makers developments in Tennant Creek and the Port of Darwin.

Appendix 2

Dust Monitoring Results – June 2008 to January 2010

Wonarah Phosphate Project Dust Deposition Monitoring Results

Site Code	Location		Month of collection													
	Northings	Eastings	Elevation (m)	Jun-08	Jul-08	Aug-08	Sep to Nov-08	Apr-09	May-09	Jun-09	g/m ² /month					
											Jul-09	Aug-09	Sep-09	Oct-09	Nov-09	Dec-09
WonDD1	653,957	7,788,847	293	3.0	3.0	1.7	1.3	0.9	0.8	0.5	0.7	3.6		6.2	7.4	1.6
WonDD2	657,010	7,786,757	289	4.0	2.9	2.0	3.4	0.8	0.9	1.3	0.6	0.7	3.8	5.6	4.5	3.1
WonDD3	649,497	7,786,544	285	3.0	3.0	0.8	3.1	0.9	0.6	0.4	0.6	3.8		5.5	3.1	5.1
WonDD4	651,992	7,789,470	289	3.4	3.3	1.6	2.4	1.3	1.1	-	0.8	1.1	5.1	5.5	4.1	3.9
AWDD1	637,222	7,775,069	289	3.4	3.5	1.7	2.5	1.2	1.2	0.5	0.8	1.2	3.7	4.2	7.2	3.4
AWDD2	638,524	7,772,379	250	3.9	4.0	4.0	2.3	1.9	1.2	-	0.6	1.3	4.2	4.4	6.6	4.7
AWDD3	641,214	7,775,310	251	3.3	2.7	1.2	2.5	5.1	1.9	0.7	0.9	0.9	3.6	4.8	7.4	4.3
AWDD4	652,027	7,775,432	252	3.1	3.3	1.9	1.1	1.0	0.9	0.6	0.7	1.5	4.9	9	3.8	3.7

Note: Dust collection was combined for the months of September, October and November 2008, the results in the table are averaged over this period.

Appendix 3

Greenhouse Gas Emissions and Alternative Energies



Alternative energy and greenhouse gas implications

Information for the Wonarah
Phosphate Project

Prepared for Minemakers Pty Ltd

15 March 2010



ACIL Tasman
Economics Policy Strategy

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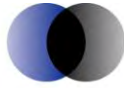
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A Alternative energy and greenhouse gas implications

This appendix provides a summary of the costs associated with using a range of alternative energy sources to reduce the diesel consumption and associated greenhouse gas emissions connected with the Wonarah Phosphate Project (the project) proposed by Minemakers Australia Pty Ltd. This appendix also provides some current cost estimates for voluntary greenhouse gas emission offsets and the cost of installing solar power for the accommodation camp or northern borefield.

A.1 Renewable energy generation options

A key issue in relation to any decision by Minemakers to using renewable power generation at the project site is the reliability of supply associated with alternative energy technology options (i.e. solar or wind). As the mine will not be connected to an electricity grid, all power requirements must be generated on site. Renewable power sources such as wind or solar technologies only supply power intermittently. Intermittent generation from wind or solar technologies will therefore require investment in either energy storage or reliable backup generation technology (such as the currently proposed diesel generator set) and quite possibly both. Consequently, the use of renewable power at the mine site will require a significantly higher initial investment in the generation equipment. This higher initial cost will be offset to some extent by lower ongoing fuel costs and lower greenhouse gas emissions. This section provides some estimates of the costs associated with different generation options.

Solar power

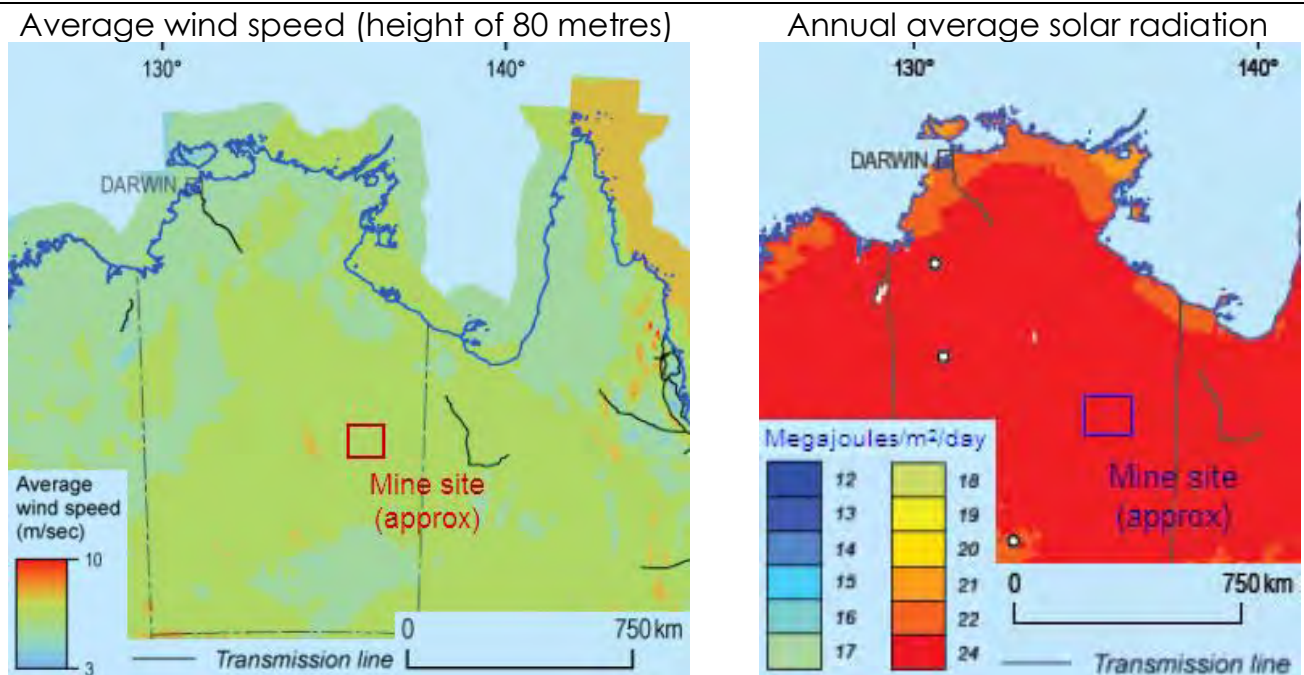
As shown in Figure 1 there is a very good solar resource at the project site. The Office of the Renewable Energy Regulator has a zone rating of 1.536 MWh a year per kW of installed capacity (ORER 2010). This equates to a capacity factor of 17.5%. This is likely to be a conservative estimate of the annual electricity that could be generated from the solar resource at the project site. In the absence of more detailed information, this capacity factor has been used for all solar calculations in this section.

Electricity generation for the project using solar power would require a large land area. The currently proposed 4MW of diesel-fired generation capacity uses a land area of approximately 1 hectare. In comparison, 1 MW of solar photovoltaic (PV) panels will use around 12 to 15 hectares¹. As the panels will be located on a mine site, they are likely to be affected by dust and may require regular cleaning to ensure that the generation efficiency is maintained. This cleaning will increase the water requirements of the project.

¹ Land area calculations are based on the dimensions of Sanyo HIP-210NKHE5 and Yingli YINGLI-175 panels and assume a panel density of 50% of the land area.



Figure 1 Potential wind and solar resources at the Wonarah mine site



Data source: Adapted from Figures 9.8 and 10.1 in Geoscience Australia and ABARE (2010).

It is estimated that every MW of solar PV capacity that is installed will reduce annual diesel requirements by 398 kL and reduce the annual greenhouse gas emissions from the project by 1,068 t CO₂-e (carbon dioxide equivalent). Further, installing a 1 MW solar generation facility would enable the project to create 1,536 renewable energy certificates (RECs) per year, which can be sold to provide an additional revenue stream.

Table 1 presents the implied emissions abatement cost associated with installing 1 MW of solar generation capacity under alternative diesel prices. The implied emissions abatement cost is very sensitive to the future price of diesel with a 15 c/L change in the price of diesel changing the calculated cost of abatement by \$40/t CO₂-e.

Assuming a 10 per cent real discount rate on the debt and equity invested in the capital, it is estimated that the additional upfront cost associated with a solar PV system should breakeven with the net ongoing cost savings for an average real diesel price of \$1.75/L excluding GST and fuel excise (over a 10 year planning horizon). For comparison, the average delivered price of diesel that would have been paid by Minemakers over the past two years (had the project been operating) would have been around \$0.85/L. Consequently, based on a proposed mine life of 10 years, installation of a solar PV system to reduce diesel consumption is not economic in the absence of a large and sustained increase in the future real price of diesel.



Table 1 Implied abatement cost associated with installing a 1 MW solar PV system (in addition to the current diesel generation system)

	Units	Diesel price (real 2010 terms excluding GST and fuel excise)				
		\$0.85/L	\$1.00/L	\$1.15/L	\$1.30/L	\$1.45/L
Up-front capital cost ^a	\$m	5.12	5.12	5.12	5.12	5.12
Annual electricity produced ^b	MWh/year	1,536	1,536	1,536	1,536	1,536
Fuel savings	kL/year	398	398	398	398	398
Reduction in annual greenhouse gas emissions ^c	t CO ₂ -e/year	1,068	1,068	1,068	1,068	1,068
NPV of fuel savings	\$m	2.42	2.84	3.27	3.70	4.12
NPV of REC credits ^c	\$m	0.44	0.44	0.44	0.44	0.44
NPV of additional operation and maintenance costs ^a	\$m	0.27	0.27	0.27	0.27	0.27
Total NPV of installing 1 MW	\$m	2.53	2.10	1.68	1.25	0.83
Implied emissions abatement cost	\$/t CO₂-e	237	197	157	117	77

^a Source: AEMO (2010) for fixed flat solar PV plate.

^b Source: Calculated using ORER (2010) zone rating for solar power.

^c Does not include land clearing emissions associated with the land area required for the solar panels. Emissions calculated using stationary emission factors presented in Table 3.

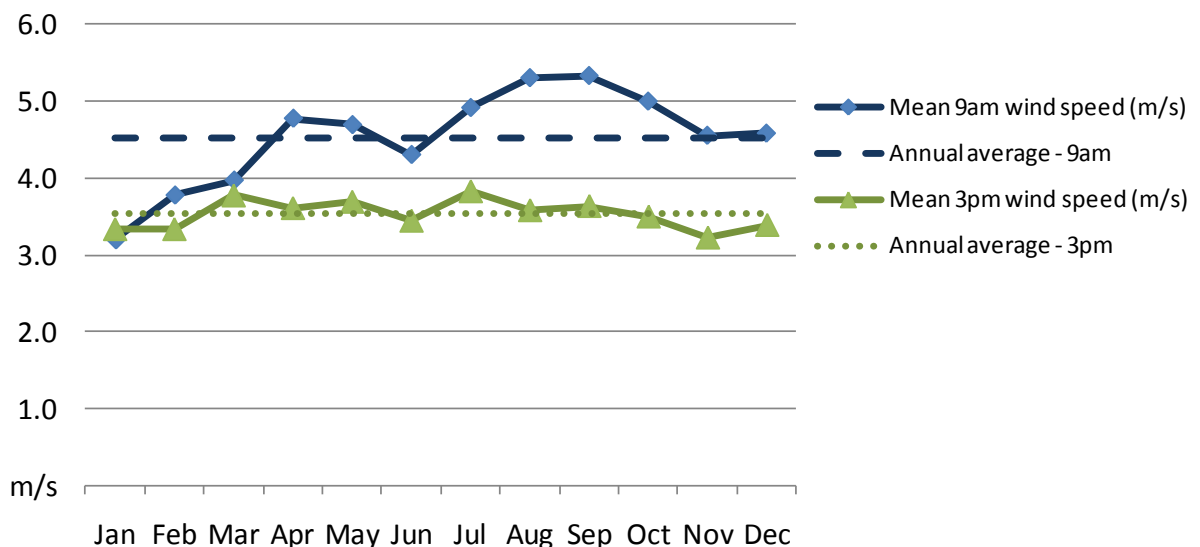
^d Assuming an average REC price of \$40 per certificate per year (in real 2010 terms).

Notes: NPV = Net present value. The net present value was calculated over 10 years as per the current proposed mine life. If the mine life is extended to 20 years the breakeven diesel price is estimated to be \$1.30/L. NPV calculations assume a 10 per cent real discount rate. Installation of solar generation capacity should reduce the operation and maintenance costs associated with the diesel-based generation but have not been included in these calculations.

Wind power

In the absence of a detailed study of the wind resource available at the Wonarah mine site, we have relied on the estimated wind resource presented in Figure 1 and Figure 2. Based on Figure 1, the average wind speeds in the region of the mine are around 4 to 6 m/s while based on Figure 2 the average annual wind speeds at 9am and 3pm are 4.5 and 3.5 m/s, respectively.

Figure 2 Average monthly and annual wind speed for Wonarah



Note: The Wonarah weather station is no longer operational. The data presented is the average for each month over the period 1957 to 1974.

Data source: Bureau of Meteorology. On line climate statistics for the Wonarah weather station (site number 015034). Available at http://www.bom.gov.au/clim_data/cdio/tables/text/IDCJCM0038_015034.csv.

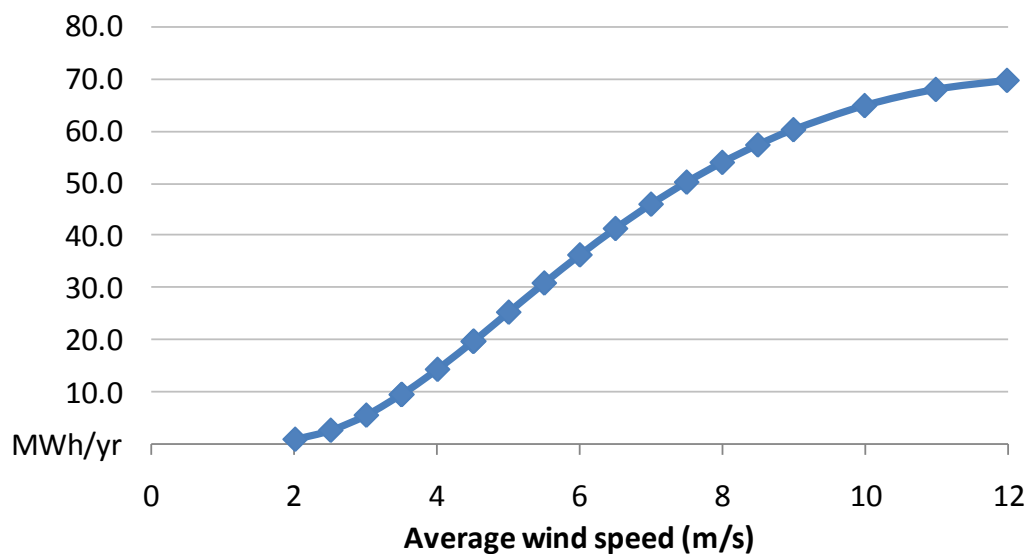


Some micro-wind turbines suitable for generation to meet small scale power demands can generate power from wind speeds as low as 1-3 m/s (the Windside turbine², for example). However, most modern large scale wind turbines start producing energy at 4 m/s and reach maximum energy output at around 12 to 14 m/s (Geoscience Australia and ABARE 2010). This suggests that while generating power using wind at the site is certainly possible, the cost would be significantly higher compared to power generated from current Australian wind farms, which tend to be situated in areas where the average wind speed is greater than 8 m/s (and generally are closer to 10 m/s).

The low wind speeds indicate that multiple small to medium scale wind turbines of 0.3 to 25 kW that can generate electricity at low wind speeds will be more suitable for power generation at the site than, say, a single large 1 MW turbine.

The annual wind production from a Proven Energy 15kW wind turbine is provided in Figure 3. As can be seen, the annual electricity generated by the same turbine varies dramatically based on the average wind speed. For example, an average annual wind speed of 4 m/s will generate approximately 14.3 MWh/year while an average wind speed of 6 m/s will generate approximately 36.3 MWh/year.

Figure 3 Example annual electricity generation for different average wind speeds (15kW wind turbine)



Note: Data based on the performance of the Proven Energy 300Volt 15kW wind turbine with a 15m tower.

Data source: Graph produced from data supplied on the Proven Energy website: <http://www.provenenergy.co.uk> (accessed 8th March 2010).

The capital cost associated with small scale commercial wind farms of around 50 MW is around \$3,500/kW of installed capacity (AEMO 2010). In Minemakers' case, however, installing 1 MW of wind capacity using multiple small turbines which are capable of generating electricity at lower wind speeds is likely to have a much higher cost. For example, the cost of the Proven Energy 15kW turbine with a 15m tower is around \$6,700/kW excluding

² See <http://www.windside.com/products.html>.



installation costs. For this analysis, it is assumed that the installed cost for up to 1 MW of capacity is \$7,000/kW.

Table 2 presents the implied abatement cost associated with installing 1 MW of wind generation capacity under alternative future diesel prices. The implied abatement cost is very sensitive to the assumed average wind speed as well as to the future price of diesel. For example, a 15 c/L change in the price of diesel changing the estimated emissions abatement cost by \$40/t CO₂-e, while changing the assumed average wind speed from 4 m/s to 5 m/s reduces the estimated emission abatement cost by \$480/t CO₂-e.

Assuming a 10 per cent real discount rate on the debt and equity invested in the capital, it is estimated that the additional upfront cost associated with a wind electricity generation system should breakeven with the net ongoing cost savings for an average wind speed of 6.0 m/s and a real diesel price of \$1.75/L (excluding GST and fuel excise).

Consequently, based on a proposed mine life of 10 years, installation of wind turbines to reduce diesel consumption is not economic if the average annual wind speeds at the project site are 6 m/s or less, and even then, only in the presence of a large and sustained increase in the future real price of diesel.

Table 2 **Implied abatement cost associated with installing a 1 MW wind turbine system (in addition to the current diesel generation system)**

	Units	Diesel price (real 2010 terms excluding GST and fuel excise)					
		\$0.85/L			\$1.30/L		
		Average wind speed			Average wind speed		
		4 m/s	5 m/s	6 m/s	4 m/s	5 m/s	6 m/s
Up-front capital cost	\$m	7.0	7.0	7.0	7.0	7.0	7.0
Annual electricity produced	MWh/year	952	1,684	2,418	952	1,684	2,418
Fuel savings	kL/year	247	436	626	247	436	626
Reduction in annual greenhouse gas emissions ^c	t CO ₂ -e/year	662	1,171	1,681	662	1,171	1,681
NPV of fuel savings	\$m	1.50	2.65	3.80	2.29	4.05	5.82
NPV of REC credits ^b	\$m	0.27	0.48	0.69	0.27	0.48	0.69
NPV of additional operation and maintenance costs ^a	\$m	0.30	0.30	0.30	0.30	0.30	0.30
Total NPV of installing 1 MW	\$m	5.53	4.17	2.80	4.74	2.77	0.79
Implied emissions abatement cost	\$/t CO₂-e	836	356	167	716	236	47

^a Source AEMO (2010)

^b Assuming an average REC price of \$40 per certificate per year (in real 2010 terms).

^c Does not include land clearing emissions associated with the land area required for the turbines. Emissions calculated using stationary emission factors presented in Table 3.

Notes: NPV = Net present value. The net present value was calculated over 10 years as per the current proposed mine life. If the mine life is extended to 20 years the breakeven diesel price is estimated to be \$1.30/L, but only if the average wind speed at the project site is 5.5 m/s. NPV calculations assume a 10 per cent real discount rate. Installation of wind generation capacity should reduce the operation and maintenance costs associated with the diesel-based generation but have not been included in these calculations.



A.2 Use of biodiesel in the transport fleet

Another way for Minemakers to reduce emissions associated with their combustion of diesel is to use a biodiesel blend. Biodiesel can be used in modern engines (i.e. those suited for using ultra-low sulphur diesel) with little impact on operating performance. Using 100 per cent biodiesel can cause issues in cold climates (due to gelling at low temperatures). However, it appears that Minemakers could use pure biodiesel instead of conventional mineral diesel subject to checking with equipment manufacturers.

The high degree of substitutability between biodiesel and conventional diesel means that the products are typically comparable with respect to price. Consequently, Minemakers should not need to pay a higher Terminal Gate Price (TGP) for biodiesel (blended or pure) compared to conventional diesel (from suppliers in the same region). Further, there are currently no taxation implications of Minemakers using biodiesel instead of conventional diesel. In particular, Minemakers should be able to claim the same fuel tax credits using either fuel.

As shown in Table 3 using biodiesel instead of conventional diesel would reduce the on-site emissions by approximately 96 per cent.

Table 3 Greenhouse gas emission intensity of alternative biodiesel blends

Technology	Conventional diesel	20% biodiesel blend (B20)	50% biodiesel blend (B50)	100% biodiesel (B100)
	kg CO ₂ -e/L	kg CO ₂ -e/L	kg CO ₂ -e/L	kg CO ₂ -e/L
Transport energy purposes	2.692	2.177	1.405	0.118
Stationary energy purposes	2.683	2.148	1.346	0.009
Mine average @ 3.0 Mt/year	2.691	2.174	1.398	0.105

Notes: All emissions calculated according to the National Greenhouse Gas (NGA) emission factors (DCC, 2009). Euro IV diesel emission factors have been used for transport emission factors. 'Mine average' is based on annual consumption of 13.5 ML for transport energy and 1.8 ML for stationary energy.

Ensuring access to a reliable supply of biodiesel is a key barrier to its regular use at the project site. Although there is a biodiesel refinery located at East Arm in Darwin, it was mothballed in early 2009 due to it being uneconomic to operate (principally due to high feedstock prices). There is no indication that it will reopen.

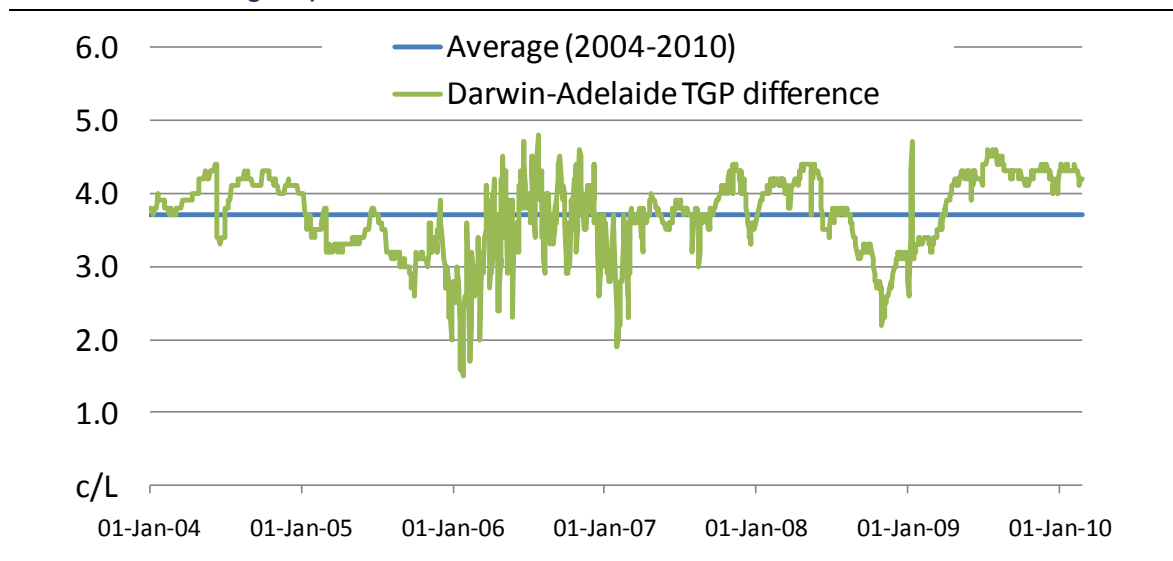
The closest operating biodiesel refinery identified that has sufficient capacity to supply some or all of Minemakers diesel requirement is the Australian Renewable Fuels refinery in Adelaide. Discussion with the refinery's Plant Manager indicates that a pure or blended biodiesel product of sufficient quantity could be provided at an equivalent TGP to conventional diesel (ex-Adelaide).

Until biodiesel can be sourced from Darwin, the cost to Minemakers of using a biodiesel blend is the difference in transporting conventional diesel from Darwin and the price of transporting a biodiesel blend from Adelaide (approximately 1,100 km additional distance). Based on the Australian transport market, it is estimated that this cost would be in the order of 4 to 7 c/L.



In estimating the cost to Minemakers it is important to note that the Terminal Gate Price (TGP) from Darwin has historically been more expensive than the Adelaide TGP (see Figure 4). Over the past six years the TGP from Adelaide has been approximately 3.7 c/L cheaper than the TGP from Darwin. Assuming that Minemakers can take advantage of this price differential, the net additional cost to Minemakers of sourcing biodiesel from Adelaide compared to conventional diesel from Darwin would therefore be around 1 to 4 c/L.

Figure 4 **Difference in the Terminal Gate Price of conventional diesel in Darwin versus Adelaide (daily average including GST)**



Data source: Australian Institute of Petroleum online data (www.aip.com.au). Downloaded 4th March 2010.

If the additional cost of sourcing biodiesel is 4 c/L, then the cost of reducing the projected onsite emissions is estimated to be approximately \$93/t CO₂-e for a B20 blend, falling to around \$15/t CO₂-e if pure biodiesel is viable (Table 4). A lower additional cost will result in a lower estimated emissions abatement cost. If the Darwin biodiesel refinery reopens at some time in the future, then the additional cost of using biodiesel will be close to zero (assuming it remains at price parity with diesel).

Table 4 **Emissions abatement cost of using various biodiesel blends (ex-Adelaide)**

	20% biodiesel blend (B20)	50% biodiesel blend (B50)	100% biodiesel (B100)
	\$/t CO ₂ -e avoided	\$/t CO ₂ -e avoided	\$/t CO ₂ -e avoided
Net additional cost = 1 c/L	23.2	8.1	3.9
Net additional cost = 4 c/L	93.0	32.3	15.5

Source: ACIL Tasman estimates using emission factors from Table 3. Includes emissions associated with the additional transportation distance. Transport emissions calculated assuming an average fuel efficiency of 0.83 MJ/tonne-km with the truck using the same biodiesel blend.

These abatement estimates are based on the combustion emissions resulting from Minemakers' use of liquid fuel for on-site energy requirements. They do not take into account the life cycle emissions associated with each fuel (e.g. upstream emissions associated with the feedstock production and refining processes).



A.3 Cost of installing solar power for the northern borefield and accommodation camp

The potential cost to Minemakers of using solar power to operate the northern borefield and/or the accommodation camp is dependent on the size of the generation capacity that is installed on the project site as a whole. If a large solar PV array is installed in addition to the proposed diesel generator sets similar to that discussed in Section A.1, then the costs and benefits will be similar to those presented in Table 1.

However, if a small scale, stand alone solar PV system is installed to provide power to the northern borefield or to the accommodation camp, then the cost of the PV array is likely to be per kW and will also require the use of battery storage to allow for night time electricity use or to compensate for extended cloudy periods. Based on estimates from industry suppliers, the cost of the components required for a standalone 10 kW solar PV power system with three days of battery storage is around \$16,000 to \$18,000 per kW. This costing does not include installation. Around half of the cost is related to the battery storage capacity. Reducing the need for the battery storage capacity by connecting the system to a backup generator would substantially reduce the upfront capital costs, but will result in some diesel use during extended periods of low sunlight.

Under the current³ rules for generation of renewable energy credits, a 10 kW solar PV system is eligible to receive 368 RECs, while a 12 kW system is eligible for 414 RECs. Assuming a REC price of \$40, this equates to an up-front subsidy of around \$14,700 to \$16,600 — approximately 9 per cent of the estimated capital cost of a standalone system.

A.4 Potential emission offsets

As stated in the EIS, Minemakers has already taken a number of steps to ensure that the emissions associated with the project are minimised. These include to:

- Develop and apply policies and procedures for efficient mine operation that will ensure fuel use is minimised.
- Minimise haul distances to minimise diesel use in vehicles and subsequent combustion emissions.
- Monitor energy consumption (e.g., diesel and electricity) and calculate greenhouse gas emissions. This data can then be used to identify and address any key opportunities to reduce greenhouse gas emissions.
- Identify and assess economically viable opportunities for reductions in emission rates, e.g., reducing areas of vegetation clearance and exploring opportunities to use more efficient fuel technology such as natural gas.

³ A joint media release by Senator Wong and Minister Combet on the 26th February 2010 announced changes to the current scheme titled the 'Enhanced Renewable Energy Target Scheme'. The proposed legislation will not be considered until mid-2010, however. It is likely that the proposed changes will not alter increase the value of the RECs generated by a small solar PV system.



- Use renewable energy sources where available and viable (e.g. solar hot water systems, monitoring systems powered by solar energy).
- Ensure that vehicles and equipment are mechanically sound, serviced regularly and fitted with appropriate emission control equipment.
- Use energy efficient lighting in all accommodation and office areas.
- Use 5-star appliances in accommodation and offices where available (e.g., refrigerators, air conditioners and cookers).
- Continue to pursue opportunities to reduce combustion emissions from ore transportation through development of a rail link between the mine and Tennant Creek.

In addition to reducing greenhouse emissions by becoming more energy efficient and making smarter equipment choices, it is also possible to reduce net emissions by using offsets.

To offset its own emissions an organisation can pay someone else to reduce their emissions or sequester carbon already in the atmosphere such as by planting and maintaining a forest plantation that absorbs CO₂ from the atmosphere. Total CO₂-e emissions for the Minemakers project at full production are estimated at 41,228 t/year. Based on a Carbon Conscious calculator, fully offsetting this amount of emissions would require planting of about 206 thousand trees, at an approximate cost of \$1 million or about \$24/t CO₂-e offset.⁴

The Government is developing a National Carbon Offset Standard (NCOS) to ensure there are clear criteria regarding how offsets are generated, verified and calculated. The NCOS is intended to come into effect on 1 July 2010. It is designed to ensure the integrity of the carbon offset and carbon neutral products available for purchase and provide consumers with confidence in the voluntary carbon offset market. The Standard specifies:

- the types of carbon offsets that constitute genuine, additional emissions reductions in the context of the CPRS
- the general principles and requirements for calculating the carbon footprint of a product or organisation
- requirements for transparent recording of the carbon footprint, measures taken to reduce emissions and the amount reduced and the emissions amount offset and the type of carbon offsets purchased and retired
- requirements for auditing the veracity of carbon footprint calculations and offset claims.⁵

According to the Department of Climate Change, the following units are currently accepted under the NCOS for the purposes of voluntary carbon offsetting:

⁴ Carbon Conscious web site, <http://www.carbonconscious.com.au> accessed 2 March 2010.

⁵ National Carbon Offset Standard, <http://www.climatechange.gov.au/government/initiatives/carbon-offset.aspx>, accessed 2 March 2010.



- CPRS permits, which are known as Australian Emissions Units (AEUs), including those issued for forestry projects and any offsets allowed under the CPRS.
- Other units accepted for compliance under the CPRS which include the following units generated under the United Nations Framework Convention on Climate Change (UNFCCC) flexible mechanisms:
 - Certified Emissions Reductions (CERs), excluding temporary (tCERs) and long term (lCERs) CERs
 - Emission Reduction Units (ERUs)
 - Removal Units (RMUs).
- Voluntary Emissions Reductions (VERs) issued by the Gold Standard.
- Voluntary Carbon Units (VCUs) issued by the Voluntary Carbon Standard, including credits issued for agriculture, forestry and other land use (AFOLU) and reduced emissions from deforestation and degradation (REDD) projects, where they apply methodologies approved by the Department of Climate Change.
- Offsets generated from emissions sources in Australia not counted toward Australia's Kyoto Protocol target and using a methodology that has been approved by the Department of Climate Change.

The offset units accepted for compliance under the CPRS are backed by domestic regulatory and compliance frameworks and international treaty obligations, and are subject to rigorous accounting and audit protocols providing a high level of integrity. The Gold Standard and Voluntary Carbon Standard together accounted for 60 per cent of over-the-counter transactions in international voluntary carbon markets in 2008.⁶

Gold Standard and Voluntary Carbon Standard offsets are traded on the over the counter (OTC) market⁷ and the Chicago Carbon Exchange (CCX). The average price of an offset on the CCX in 2008 was US\$4.43/t CO₂-e. On the OTC the average price paid for an offset in 2008 was US\$7.34/t CO₂-e.

There is a wide range of different projects that can be used to generate offsets. The price per tonne of CO₂-e varies considerably between different projects. Figure 5 illustrates how the volume weighted average price of an offset in 2008 in one market varied from as low as US\$2.60/t CO₂-e to a high of US\$22/t CO₂-e.⁸

⁶ Ecosystem Marketplace and New Carbon Finance (2009) Fortifying the Foundation: State of the Voluntary Carbon Markets 2009, p. 11

⁷ The OTC is based on bilateral deals and operates largely outside of exchanges.

⁸ Ecosystem Marketplace and New Carbon Finance (2009) Fortifying the Foundation: State of the Voluntary Carbon Markets 2009, p. vii

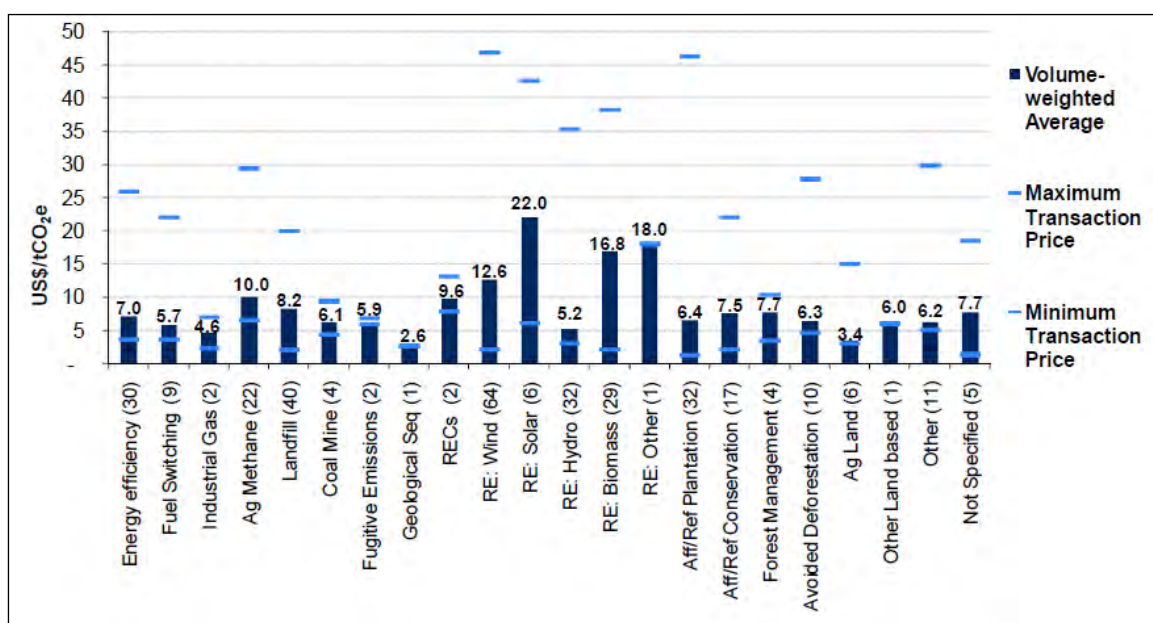


ACIL Tasman

Economics Policy Strategy

Alternative energy and greenhouse gas implications

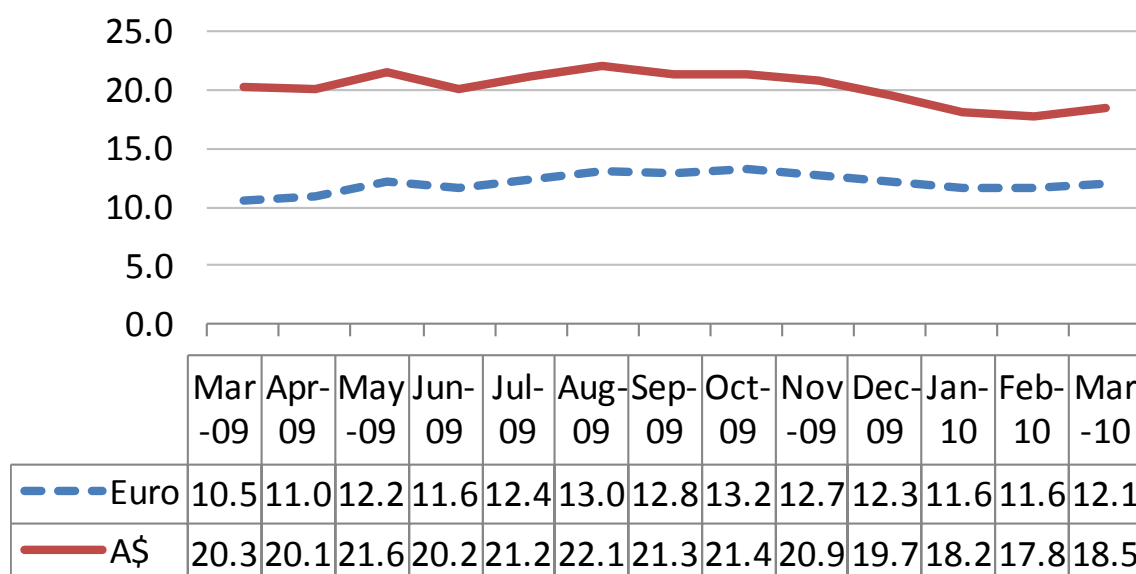
Figure 5 Credit Price Ranges and Averages by Project Type, OTC 2008



Data source: Ecosystem Marketplace, New Carbon Finance. Note: Numbers within parentheses indicate number of observations

Another potential mechanism for offsetting emissions would be to purchase Certified Emission Reduction (CER) permits on the European Climate Exchange (ECX). The average spot price of a CER permit in the last year has been around €12 (or A\$18.50 at an exchange rate of A\$1=€0.65). The price trend for CER permits over the last year is shown in Figure 6.

Figure 6 CER daily futures – spot contracts. Price per CER (in t CO₂-e)



Data source: EUA & CER daily futures. Retrieved March 2010, from European Climate Exchange: <http://www.ecx.eu/EUA-CER-Daily-Futures>. Australian exchange rate from Reserve bank of Australia, retrieved March 2010 from <http://www.rba.gov.au/statistics/hist-exchange-rates/index.html>.



The estimated annual emissions of just over 41 kt CO₂-e associated with a production level of 3 Mt of ore implies that each tonne of ore mined leads to an emission of 13.7 kg CO₂-e. This implies that purchasing CER offsets for the emissions associated with one tonne of ore would cost approximately 24.5c. Based on the average price in 2008 the cost of buying an offset on the OTC market would be around 11 c/t of ore. The equivalent price if the offset had been purchased on the CCX in 2008 would have been closer to 7 c/t of ore.

NCOS also allows firms to propose methodologies for offset projects and develop offset projects within Australia from emissions sources not counted toward Australia's obligations under the Kyoto Protocol target. Eligible activities for the generation of domestic offsets under the Standard are:⁹

- Forest management (forests established before 1990);
- Revegetation (establishment of woody biomass that does not meet forest criteria); and
- Cropland and grazing land management (net greenhouse gas emissions from soil, crops and vegetation).

A.5 References

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⁹ *National Carbon Offset Standard*, <http://www.climatechange.gov.au/government/initiatives/carbon-offset.aspx>, accessed 2 March 2010, p. 4



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