

Environment Effects Act, 1978

**ENVIRONMENT EFFECTS STATEMENT
MURRAY BASIN MINERAL SANDS
STAGE 2 PROJECT
WORKS APPROVAL APPLICATION
WA63046**

INQUIRY REPORT

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SEPTEMBER 2008

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INQUIRY REPORT

Mark Marsden, Chair

Geoff Angus, Member

Colin Burns, Member

SEPTEMBER 2008

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1. EXECUTIVE SUMMARY

Iluka Resources Limited (Iluka) proposes to develop mineral sands mines at the following two locations in north-western Victoria:

- 28 km east of Ouyen and 30 km west of Manangatang (Kulwin deposit); and
- 30 km southeast of Ouyen (Woonack, Rownack, Rainlover and Pirro (WRRP)) deposits.

The area is mainly freehold agricultural land with some areas of public land including bushland reserves, roadside reserves and roads. Cropping is the dominant activity with some sheep and cattle grazing. The land is largely cleared except for parts of the bushland reserves and some patches of remnant vegetation.

The Kulwin deposit is approximately 11.2 km long and 100 m wide and the WRRP deposits vary between 5.8 km and 14.4 km long and 45 and 100 m wide.

The project will involve mining the ore from open pits, processing it to produce heavy mineral concentrate (HMC) and transporting the HMC to Hamilton for further processing and returning Hamilton plant by-products to the mine for disposal. The expected life of the mines is 7.5 years (not including rehabilitation).

The Minister for Planning required Iluka to prepare an Environmental Effects Statement (EES) under the *Environment Effects Act, 1978* (EE Act) due to the potential significant effects on the environment.

Additionally, the project requires approval from the Commonwealth Government because the proposal has the potential to adversely affect a number of threatened bird species, including the Malleefowl and Regent Parrot and wetlands of international importance under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Commonwealth Government has accredited the EES process as the assessment process under the EPBC Act.

The EES was exhibited for six weeks from 19 February, 2008 to 3 April, 2008 and 14 submissions were received.

The Minister for Planning appointed an Inquiry on 13 May, 2008 under section 9(1) of the EE Act. Members of the Inquiry are Mark Marsden (Chair), Geoff Angus and Colin Burns. The Minister provided the Inquiry with terms of reference to inquire into and make findings regarding the potential environmental effects of the proposal; to recommend any modifications to the project; to recommend any mitigation and management measures to achieve acceptable environmental outcomes; and to recommend whether the project should proceed in light of its expected effects.

The Inquiry conducted a public hearing for 5 days between 21 July, 2008 and 29 July, 2008 in Ouyen and Melbourne. Submissions were made by the proponent, government departments and agencies, State and local group representatives and a member of the public.

The Department of Primary Industries (DPI), the government department responsible for administering the relevant approvals under the *Mineral Resources Sustainable Development Act, 1990* (MRSD Act), concluded that the proposal will result in economic and social benefits, and that environmental impacts can be controlled to low levels using proven methods.

The Environment Protection Authority (EPA) concluded that the environmental impacts associated with noise, air quality, water and greenhouse gas emissions are acceptable provided there is compliance with relevant requirements.

The Department of Sustainability and Environment (DSE) expressed concern about the loss of 256 ha of native vegetation, particularly the proposal to mine through two bushland reserves and the loss of habitat of the Malleefowl. The DSE considered more could be done to achieve the native vegetation net gain objectives under the State Government's *Native Vegetation Framework – a Framework for Action* (the Framework).

No local farmers nor local residents from Ouyen made submissions objecting to the proposal.

The Inquiry considers that the Iluka sand mine projects should be approved by the Minister for Planning. They have significant local, regional, State and national economic benefits, and potential local social benefits.

Further, the Inquiry considers that the environmental impacts can be properly managed through appropriate approval mechanisms, particularly the Work Authority and Work Plan to be administered by the DPI.

The Inquiry is also satisfied that the proposal can meet the *Native Vegetation Framework – a Framework for Action* goal to achieve net gain.

The Inquiry concludes that the proposed mines will not have a significant impact on threatened species under the EPBC Act, including the Malleefowl and Regent Parrot. Given the poor prospects for the Malleefowl in the WRRP deposit area, the Inquiry considers that appropriate offsets under the Framework as well as the \$300,000 funding Iluka is willing to provide to assist in the recovery program should benefit Malleefowl in the longer-term.

Offsets can also be provided to improve the flightpaths of the Regent Parrot, which should improve its habitat in the longer-term.

The Inquiry's detailed conclusions and recommendations are set out in Chapter 18.

PART A: BACKGROUND

2. INTRODUCTION

2.1 The Inquiry

The Minister for Planning required Iluka Resources Limited (Iluka), the proponent for the sand mine projects, to prepare an Environmental Effects Statement (EES) under the *Environment Effects Act 1978* (EE Act) due to the potential significant effects of the projects on the environment.

An Inquiry was appointed by the Minister for Planning on 13 May, 2008 under section 9(1) of the EE Act to consider the proposed Murray Basin Mineral Sands Stage 2 mining project and the submissions made in response to the EES. The projects contain two separate areas: the Kulwin deposit, about 28 km east of Ouyen and 40 km west of Manangatang; and the Woorneck, Rownack, Rainlover and Pirro (WRRP) deposits about 20 km south-east of Ouyen.

The Inquiry comprises:

- Chairperson: Mark Marsden;
- Member: Geoff Angus; and
- Member: Colin Burns.

The Terms of Reference note that the project needs approval under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The controlling provisions under this Act are:

- Section 16 and 17B (Wetlands of international importance); and
- Sections 18 and 18A (Listed threatened species and communities).

The Australian Government has accredited the EES process as the required assessment process under the EPBC Act to assess the matters relevant to the Commonwealth's Government's decision whether to approve the project.

2.2 Terms of Reference

The Minister for Planning issued Terms of Reference (TOR) for the Inquiry on 1 May, 2008 (see **Appendix A**). The TOR provides background information on the proposal and then outlines its task in point 2 and notes the Inquiry is required:

- i To inquire into and make findings regarding the potential environmental effects (impacts) of the proposed project, including impacts on relevant matters under the EPBC Act;*
- ii To recommend any modifications to the project as well as environmental mitigation and management measures that are needed to achieve acceptable environmental outcomes, within the context of applicable legislation and policy;*
- iii To recommend whether the project should proceed in light of its expected effects, assuming the measures recommended in ii were implemented.*

The Inquiry is required to provide advice in the form of a written report to the Minister for Planning within eight weeks of its last hearing day.

In addition, the TOR requires the Inquiry to consider the Works Approval application that was exhibited with the EES.

2.3 Public exhibition

The EES and the Works Approval application were on public exhibition for six weeks from 19 February, 2008 to 3 April, 2008.

2.4 Submissions and hearings

A total of 14 submissions were received in response to the public exhibition of the EES.

Seven submissions were received from government departments/agencies, six from interest groups and one from an individual.

A list of submitters is included in a table in **Appendix B**.

A Directions Hearing was held at the Mildura Rural City Council Ouyen offices on 14 May, 2008. Following the Directions Hearing, the Inquiry issued provisional directions on 22 May, 2008.

The Hearing was conducted for 5 days between 21 July, 2008 and 29 July, 2008 at the Mildura Rural City Council Ouyen offices and the Planning Panels Victoria meeting room.

2.5 Submissions made at Hearing

The Inquiry heard the parties listed in Table 1 below.

Table 1 Submitters who appeared at the Inquiry

Submitter	Represented By
Iluka Resources Limited	<p>Mr C Townshend of counsel with Mr P Connor of counsel instructed by Clayton Utz, who called the following witnesses:</p> <ul style="list-style-type: none"> • Dr Nigel Holmes (noise, air emissions and greenhouse gas emissions) • Mr Brian Barnett (surface water management, supply and disposal) • Dr Ian Sluiter (native vegetation offsets and flora) • Mr Peter Robertson (native vegetation offsets and fauna) • Mr Nigel Murphy (site rehabilitation) <p>The following other witnesses lodged expert witness statements but were not called:</p> <ul style="list-style-type: none"> • Mr Fabian Douglas (Orange Sunmoth) • Ms Genevieve Foley (groundwater management and quality) • Mr Peter Beck (reverse osmosis reject flow) • Mr Aaron Organ (ecological impact of disposal to salinas) • Mr Darren Billingsley (radiation) • Mr David Wintershoven (traffic) • Mr Alistair Sharp-Paul (socio-economic) • Dr Stuart Miller (geotechnical) • Mr Peter Hack (visual) • Mr Andrew Long (European heritage and Aboriginal cultural heritage)
Department of Planning and Community Development	Ms Fiona Murray
Department of Primary Industries	Ms Kathryn Friday
Environment Protection Authority	Mr Jeff Cummins, Dr Lyn Denison, Mr James Nancarrow, Mr Neville Stewart and Mr Chris McAuley
Mallee CMA	Mr Philip Stevens
Department of Sustainability and Environment	Mr Adam Muir
Mid Murray Field Naturalists	Mr Neil McFarlane
Mr Gil Hopkins	
Victorian Malleefowl Recovery Group	Ms Ann Stokie

Submitter	Represented By
Victoria National Parks Association	Ms Jenny Barnett

2.6 Inspections

An accompanied site inspection of the Kulwin and WRRP sites was undertaken on Tuesday 22 July, 2008.

In addition, the Inquiry conducted a site inspection of the Douglas mine operated by Iluka on 1 August, 2008.

Appendix C shows a map of the locations visited during the inspections of the Murray Basin project.

2.7 Approach to report

Part A: Background – This part provides information about the Inquiry and its processes, a description of the proposal, the relevant State and Commonwealth legislation and policies (Chapters 2 to 4).

Part B: Analysis of effects and impacts – This part of the report considers the key issues addressed in the EES and discusses them in summary form. In each of these chapters, the Inquiry provides a description of the subject matter, the relevant issues, the Inquiry response, findings and recommendations (where applicable, not all chapters have recommendations) (Chapters 5 to 16).

Part C: Evaluation and assessment – This part provides the response of the Inquiry in terms of its obligations under the EPBC Act. The Inquiry provides additional recommendations where warranted in this part of the report (Chapters 17 and 18).

Part D: Conclusions and recommendations – this section provides the overall conclusions of the Inquiry and its specific recommendations (Chapter 19).

2.8 Regulatory Framework

The EES is a starting point in the approval process for the proposed mine. **Appendix 4** sets out the regulatory framework for the mine that was provided in the DPI's submission to the Inquiry. It should be noted that many of the detailed requirements for the construction and operation of the mine will be included in the Work Plan. One of the key components of the Work Plan will be an Environment Management Plan (EMP), which will

include a Construction Environment Management Plan, Vegetation Management Plan, Radiation Management Plan etc. It should be noted that the Inquiry makes a number of recommendations for specific matters to be addressed in the Work Plan and Environment Management Plan.

3. THE PROPOSAL

3.1 What is proposed?

Iluka proposes to develop mineral sands mines at the following two locations:

- 28 km east of Ouyen and 30 km west of Manangatang (Kulwin deposit); and
- 30 km southeast of Ouyen (Woorneck, Rownack, Rainlover and Pirro (WRRP) deposits).

The project will involve mining the ore from an open pit, the extraction of heavy mineral concentrate (HMC) and transporting the HMC to Hamilton for further processing and returning Hamilton by-products to the mine site for disposal.

The EES describes the project as follows:

The deposits are long and narrow and are aligned from northwest to southeast. The Kulwin deposit is approximately 13 km long, the Woorneck deposit 16 km long, the Rownack deposit 9 km long, the Rainlover deposit 15 km long and the Pirro deposit 8 km long. Each deposit is approximately 100 m wide, 2 to 5 m thick and covered by up to 40 m of overburden. The deposits will be mined using a combination of dewatering (where necessary) and excavation using conventional earthmoving equipment.

3.2 Background to the proposal

Mr Townshend representing Iluka provided the following information about the mining company:

Iluka is an Australian Stock Exchange listed resources company that explores for, mines and markets mineral sands. It is the world's largest producer of zircon and second-largest producer of titanium minerals. It is managed by a Board of Directors and employs approximately 1,600 people.

The main mineral sands products of rutile, synthetic rutile, ilmenite and zircon have a wide range of consumer, lifestyle and industrial applications – from pigment production used in paints, plastics, papers,

titanium metal production, welding electrodes, to tiles and zirconium based products and zirconia metal applications.

Iluka has mining and processing operations within Australia (Victoria, Western Australia and Queensland) and the east coast of the United States.

In 2003, Iluka obtained Victorian Government approvals for a mineral separation plant at Hamilton. The plant at Hamilton was approved in contemplation of a number of mineral sands mines operating in Victoria. The Douglas Mine (70 km southwest of Horsham) was the first Iluka mine approved in Victoria. Heavy mineral concentrate from the Douglas mine is currently processed at the Hamilton plant. However, the Hamilton plant is not operating at capacity and this project will ensure continued supply to it. The mineral separation plant at Hamilton is a significant investment in Victoria by Iluka. The plant was heralded as a substantial development for the resources industry in Victoria.

Iluka has made a significant investment in the Hamilton mineral separation plant (approximately \$270 million) and at the Douglas mine. Total Iluka investment in the Murray Basin to date is approximately \$500 million. Iluka plans on having a presence in Victoria for many years to come.

4. LEGISLATIVE AND POLICY FRAMEWORK

The following is an overview of the various State and Commonwealth legislation and policy affecting the project, as well as the approval processes, that were included in Section 2 of the EES Main Report.

4.1 State legislation

Table 2 Summary of approvals

Legislation	Regulatory outcome	Regulatory Authority	Reason
<i>Mineral Resources (Sustainable Development) Act 1990</i>	Mining licence. Approved Work Plan. Work authority to commence mining	Department of Primary Industries (DPI)	Required for mining. Gives effect to the Native Vegetation Management: A Framework for Action
<i>Environment Effects Act 1978</i>	Environmental assessment of project by Minister	DPCD	Directed to prepare an EES by the Minister for Planning
<i>Aboriginal Heritage Act 2006</i>	Approval of Cultural Heritage Management Plan (CHMP)	Registered Aboriginal Party (RAP) (or Aboriginal Affairs Victoria (AAV) in their absence)	Required for mining impact on Aboriginal cultural heritage values
<i>Heritage Act 1995</i>	Approval to disturb known historic sites	Heritage Victoria	Historic sites are to be disturbed
<i>Water Act 1989</i>	Groundwater extraction licence	Grampians Wimmera Mallee (GWM) Water	To extract groundwater
<i>Planning and Environment Act 1987</i>	Planning permit	Mildura Shire Council	High voltage power line and potentially, a water supply pipeline
<i>Radiation Act, 2005</i>	Approved radiation management plan and radioactive waste management plan	Department of Human Services (DHS)	Potential for Radiation Plan to be required

In addition, the *Environment Protection Act 1970* applies because the proposed reverse osmosis plant is considered a 'scheduled premises' pursuant to Schedule 1 of the Environment Protection (Scheduled Premises and Exemptions) Regulations 2007. Specifically, the Schedule states:

Premises at which salt is removed from water for potable or other uses that have a design capacity to process more than 1 megalitre per day for feed water.

4.2 State Government policy and guidelines

Relevant State Government policies identified in the EES include:

- Growing Victoria Together (2001)
- Earth Resources Policy – Promoting Victoria’s Prospects (2006)
- Securing Our Water Future Together (2004)
- Regional Development Policy (Moving Forward) (2005)
- Native Vegetation Management Framework – A Framework for Action (2002)
- Victorian Greenhouse Strategy (2002)
- Victorian Biodiversity Strategy (1997)
- Environment Guidelines for Major Construction Sites
- Construction Techniques for Sediment Pollution Control (1991) (S275).
- Industrial Waste Management Policy – Waste Minimisation (1990).
- Industrial Waste Management Policy – Prescribed Industrial Waste (2000).
- Protocol for Environmental Management: Greenhouse Gas Emissions and Energy Efficiency in Industry (2002) (S824).
- Heritage Victoria Draft Guidelines for the Assessment of Heritage Planning Applications (2000).
- Victoria’s Environmental Sustainability Framework (2005).
- Our Environment Our Future – Sustainability Action Statement (2006).

In addition, the Inquiry identified three other EPA guidelines and one regulation relevant to the Inquiry’s task:

- Protocol for Environmental Management: State Environment Protection Policy (Air Quality Management) Mining and Extractive Industries: EPA Publication 1191 December 2007;
- Interim Guidelines for Control of Noise from Industry in Country Victoria, N3/89;
- Noise Control Guidelines TG 302/92;
- Environment Protection (Environment and Resource Efficiency Plans) Regulations 2007.

4.3 Commonwealth legislation

Table 3 Summary of Approvals

Legislation	Regulatory outcome	Regulatory Authority	Reason
<i>Environment Protection and Biodiversity & Conservation Act 1999</i>	Environmental approval under Commonwealth guidelines or an accredited Victorian process	Department of Environment, Water, Heritage and the Arts (DEWHA)	The project has been determined to be a 'controlled action' by DEWHA
<i>Native Title Act 1993</i>	Consider any application for native title	National Native Title Tribunal	Any native title claim would need to be resolved before the grant of a mining licence

4.4 Other policy and guidelines

- Radiation Protection Series Publication No. 1 (2002) - Recommendations for Limiting Exposure to Ionizing Radiation and National Standard for Limiting Occupational Exposure to Ionizing Radiation (ARPANSA 2002);
- Radiation Protection Series No. 9 (2005) – Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005); and
- Radiation Protection Series No. 2 (2001) – Code of Practice for the Safe Transport of Radioactive Material (ARPANSA 2001).

4.5 Local planning and policies

The proposed sand mining project is exempt from a planning permit under Clause 52.08-2 of the Mildura planning scheme if an Environmental Effects Statement (EES) has been prepared under the Environment Effects Act 1978 and mining is exempt from the requirement to obtain a permit under Section 42 or Section 42A of the Mineral Resources (Sustainable Development) Act 1990.

PART B: ANALYSIS OF EFFECTS AND IMPACTS

5. ECONOMIC AND SOCIAL IMPACTS

5.1 Description

The economic benefits of the project are set out briefly at page 1-6, paragraph 1.4 of the EES. It is predicted that over the 7.5 year life of the project the proposal will generate:

- a total capital investment of approximately \$180 million;
- a total revenue of approximately \$1,000 million;
- total royalties of approximately \$30 million and total taxes of approximately \$100 million;
- annual salaries during the operations phase of approximately \$4 million and \$13 million for Iluka personnel and contractors, respectively; and
- a total operating expenditure of approximately \$660 million.

Socio-economic analysis was undertaken as part of the EES and the key findings and conclusions are identified in Section 7.12, pages 7-191 to 7-208.

Key socio-economic issues identified in the EES include:

- Landholder issues:
 - Access to properties for exploration and environmental assessment;
 - Land purchase;
 - Loss of agricultural productivity;
 - Landholder compensation;
 - Landholder relocation; and
 - Order of mining the deposits.
- Health impacts;
- Economic benefits;
- Employment:
 - Shortages in local workforce (including volunteers) if people start working for the mine; and
 - Training and employment and servicing opportunities for locals.
- Local and regional issues:
 - Impacts on local infrastructure and services;
 - Availability of accommodation in Ouyen;
 - Community well-being;

-
- Ongoing community engagement;
 - Impacts on tourism; and
 - Long-term benefits to the community
 - Project uncertainty:
 - The instability of the mineral sands industry and dependence on markets.
 - The possibility of the Project being moth-balled.

The EES then identifies the primary avoidance, mitigation and management issues associated with the mines (Pages 7-202-208 of the EES).

5.2 Issues

Issues concerning economic and social impacts identified by the proponent, the proponent's consultants and the Inquiry include the following:

- Economic benefits of the proposal;
- Whether there will be a net social benefit to the local community; and
- The establishment of an Environment Review Committee (ERC).

5.2.1 Economic benefits of the proposal

Mr Townshend for Iluka summarised the economic benefits in his submission to the Inquiry as follows:

- total capital investment of approximately \$210 million;
- generation of significant royalties;
- securing a supply of raw materials to the existing mineral separation plant in Hamilton;
- generating approximately 250 direct jobs for the 6 month construction period;
- generating approximately 150 direct jobs during operations (giving rise to a total Iluka workforce of approximately 285 for the Murray Basin, including this project, the Douglas mine and the Mineral Separation Plant at Hamilton);
- creating approximately 150 flow on jobs during operations; and
- creating flow on benefits to the Port of Portland which will facilitate export of final product to Iluka's overseas markets.

In addition, Mr Townshend mentioned the direct spend benefits of the workforce in Ouyen and Hamilton.

DPI submitted that the proposal can deliver economic benefits, especially at local and regional levels, but also at State and National levels.

No other submissions were received addressing economic impacts.

5.2.2 Will there be a net social benefit?

Submissions received addressing social impacts were received from the DPI and Mr Gil Hopkins.

The DPI noted that a number of concerns on health and amenity identified in a survey of local residents by Iluka would be addressed by compliance with relevant EPA standards.

Further, DPI suggested that under a worst case scenario failure to comply with health, environmental and amenity standards could shut down operations.

The DPI suggested that an ERC should be established to provide continuing community engagement.

Mr Hopkins expressed concern about the breakdown of local community structures and their personnel, and that every effort needs to be made to increase the involvement of the local community in the project.

5.3 Inquiry response

In terms of purely economic considerations, there is little doubt that the project would deliver substantial economic benefits in terms of investment, royalties and taxes and employment opportunities. As identified in the EES (page 7-205/06), the value of the estimated loss of agricultural production is \$294,000 or 0.04% of total agricultural land in the Mildura region. This contrasts with total expected revenues from the project of approximately \$1,000 million (including royalties and taxes).

While social impacts are more subjective, the Inquiry notes there were no submissions from local farmers or residents to the EES that raised concerns with social issues.

It appears that Iluka have consulted widely with local farmers as well as Ouyen residents, and that the consultation has led to an adequate understanding of the issues.

The Inquiry also notes that the two mine sites are in relatively isolated locations, with few farms being directly affected by the mines' operations. Part of this is due to Iluka buying a number of farms in the area.

One social implication for the Ouyen township is the construction of an accommodation facility. According to the EES, the main purpose of constructing the facility will be to minimise impacts on housing demand.

The Inquiry agrees that providing a purpose-built accommodation facility for mine workers will reduce demand for housing in Ouyen. However, a sudden influx of workers could potentially cause disruption to the local community. The Inquiry supports Iluka's response to these issues (as identified in the EES) by encouraging the workforce to use local recreation services in Ouyen including sporting and cultural facilities, and to also continue to support these services through community partnerships.

The Inquiry strongly supports the establishment of an ERC for the Iluka Murray Basin Stage 2 project. The function, structure and operation of the ERC can be resolved by the relevant parties at the appropriate time (which should be before construction of the mine commences).

It is understood that the ERC would comprise Iluka, relevant government departments and agencies, the Mildura Rural City Council and local residents/farmers.

The Inquiry is aware that the DPI has recently produced a discussion paper on ERCs, which contains recommendations on the composition, function and operation of such committees.

5.4 Findings and recommendations

The Inquiry finds that:

- **There are significant potential economic benefits of the project;**
- **Social impacts particularly on the Ouyen township need to be carefully managed; and**
- **An Environmental Review Committee (ERC) should be established to monitor the environmental impacts, and should be set up, function and operate having regard to the recommendations of the DPI discussion paper on ERCs.**

The Inquiry recommends that:

- **The DPI establish an Environmental Review Committee (ERC) to monitor the environmental impacts of the proposal; and**
- **The ERC should be set up, function and operate having regard to the recommendations of the DPI discussion paper on ERCs.**

6. SURFACE WATER AND WATER SUPPLY

6.1 Description

Surface water and water supply analysis was undertaken as part of the preparation of the EES and included in Volume 1, Appendix A. The key findings and conclusions are identified in Section 7.1, pages 7-4 to 7-12 of the EES.

The proposed establishment and operation of the mines and associated infrastructure has the potential create impacts on surface waters.

Surface waters are protected under the *State Environment Protection Policy (Waters of Victoria)* (SEPP WoV). The project area falls within the Murray and Western Plains segment defined in this policy and as a result protected uses include:

- Natural amenity (aquatic ecosystems, aesthetic enjoyment);
- Cultural and spiritual values; and
- Domestic, industrial, commercial and recreational (including agriculture, aquaculture and fishing).

The surface water environment of the proposed mine site is characterised in the EES as follows:

- Low rainfall, high evaporation rates, sandy soils and undulating terrain combining to result in minimal runoff with ephemeral drainage lines terminating in salinas (salt lakes);
- Flooding during a 1:100 year event restricted to local depressions rather than causing widespread inundation;
- No natural permanent open water bodies or defined water courses with the nearest water body being the Murray River some 25km to the north of the Kulwin deposit and 40 km north of the WRRP deposits;
- Well outside the Murray River floodplain; and
- There are several salinas in the vicinity of the proposed mine sites but none are classified as a Ramsar wetland or as “important” in *Environment Australia’s A Directory of Important Wetlands in Australia* 2001.

The Project area lies within the catchments of the Kerang Lakes and Lake Albacutya Ramsar sites, which are located approximately 107 km to the southeast and 57 km to the southwest respectively. The Hattah-Kulkyne

Lakes Ramsar wetlands lie approximately 35 km to the north of the project area.

The EES identifies the potential impacts on surface water as follows:

- Increase in salinity of natural ephemeral water flows, due to mining operations, dust suppression or water disposal;
- Contamination of land and salinas by drainage from overburden or leaching from stockpiles;
- Inundation and contamination during flood events; and
- Impacts on Ramsar wetlands.

In addition the EES identifies the deliberate discharge of water to salinas as a potential impact. This relates to the proposal provided in the EES to utilise salinas for discharge of excess water from the site as a contingency. Such discharge was eliminated from the proposal subsequent to the publication of the EES.

The EES lists the proposed mitigating measures to be taken to avoid or minimise the identified potential impacts on surface waters as follows:

- A safety bund running along the edge of the mine pit to prevent flood water entering the pit;
- Drains surrounding overburden and soil stockpiles to intercept runoff and use collected water on site; and
- Diversion drains to intercept and collect for reuse any saline runoff resulting from dust suppression activities.

It is proposed that the majority of the water required for ore processing and dust suppression will be sourced from the pit dewatering operations, however, there is a need for freshwater (non saline) at an estimated average rate of 30 m³/hr up to a maximum of 60 m³/hr. The majority of this freshwater requirement will be met by the treatment of saline water from the site in two reverse osmosis plants with a combined capacity of 60 m³/hr of treated water. In addition, it is proposed that the ability to supplement the production from the reverse osmosis plants from the GWM Water stock and domestic supply be provided. A standard connection to the Northern Mallee pipeline is proposed with a capacity to deliver 20 m³/day, subject to water restrictions imposed from time to time.

Under the *Environment Protection (Scheduled Premises and Exemptions) Regulations 2007*, a reverse osmosis facility of the size proposed is considered a Scheduled Premises and hence requires Works Approval to be granted by the EPA. An application for Works Approval for a water treatment plant at

the Kulwin mine site has been prepared by the proponent. The Works Approval application was exhibited in conjunction with the EES.

6.2 Issues

Surface water and water supply related issues identified by the proponent, the proponent's consultant, submitters and the Inquiry include the following:

- The adequacy of proposed surface water management at the mine site;
- The accuracy and acceptability of predicted impacts resulting in the provision of freshwater by either desalination by reverse osmosis or from the Northern Mallee pipeline; and
- Impacts on Ramsar sites.

Each of these issues are discussed in the following.

6.2.1 Surface water management

The submission made to the Inquiry by the EPA generally accepts the adequacy of the surface water management aspects of the proposal but suggests that sediment control works should be undertaken in accordance with EPA Publication 480 *Environmental Guidelines for Major Construction Sites*.

Both the EPA and Mr Gil Hopkins expressed concern in regard to the potential for environmental damage resulting from spillage or leakage of saline water from pipe systems.

In response, Mr Brian Barnett, of Sinclair Knight Merz Ltd for the proponent stated that:

Where practicable all major water pipelines will be located in protected, bunded corridors with no vehicle access. In this manner the pipelines will be protected from heavy machinery at the site. In addition an inspection and maintenance plan will be instigated aimed at minimising the chances (and subsequent impacts) of groundwater accidentally discharging onto non-saline soils at the site.

Mr Hopkins also expressed concern in regard to the possible impact of major rainfall events particularly in the light of climate change with the prediction of less rain but more intense events. Mr Hopkins stated his view that planning needs to be based on the future rather than the past.

In response Mr Barnett stated that:

"The impacts of extreme rainfall events have been considered. The most significant impacts of heavy rainfall at the site will be the potential for

water to fill the mining void and the disposal basins. In this regard it should be recognised that both of these voids have no “catchment area” and hence the only water to enter will be rain falling directly on the void. The volumes of water falling on the mine pit and disposal basin are relatively small when compared to those pumped from the dewatering system and disposed of in the disposal basin. There are no existing surface water bodies that will be impacted by sediment loaded runoff from the site”.

6.2.2 Freshwater water supply

The EPA confirmed that a Works Approval would be required in relation to the proposed reverse osmosis plants and that the application for such approval is currently being assessed by the EPA.

GWM Water advised the Inquiry that:

GWM Water is responsible for administration of water supply and groundwater management functions under the Water Act (1989).

GWM Water will continue to work closely with Iluka Resources Ltd throughout the implementation of the project, and in particular regarding:

- Licensing of bore construction and groundwater extraction in accordance with the requirements of the Water Act (1989).*
- Access to supplementary water supplies from the Northern Mallee Pipeline if required, recognising that the installation of two desalination units makes the project largely self sufficient in regard to freshwater supplies. Any supplementary supply from the Northern Mallee Pipeline would be dependent on restriction levels in the supply system.*
- Maintenance of supply to GWM Water customers connected to the Northern Mallee Pipeline.*

6.3 Inquiry response

6.3.1 Surface water

The Inquiry notes that there is general agreement that the surface water management proposed is satisfactory and that implementation of the proposed management measures will limit impacts on the surface water environment to an acceptable level. The Inquiry agrees with this view.

The Inquiry accepts the view of the EPA that sediment management should be according to EPA Publication 480 *Environmental Guidelines for Major Construction Sites*.

Concerns raised in regard to the risks associated with the pumping of saline waters are valid but the Inquiry considers that such risks can be adequately addressed in the detailed design and subsequent approval stages. It is considered extremely unlikely that a work plan that did not include adequate minimisation of this risk would be approved.

The Inquiry accepts the views of Mr Barnett in relation to the potential impact from extreme rainfall events.

6.3.2 Water supply

The Inquiry notes the agreement between all parties in regard to the merits of the proposal to utilise saline water as the primary source of water for the proposed operations. The Inquiry joins in this agreement and notes the existence of appropriate statutory approval processes that will minimise the risk of inappropriate implementation of the proposal.

6.3.3 Ramsar sites

The Inquiry notes that the project area is within the catchments of the Kerang Lakes and Lake Albacutya Ramsar sites and that the Hattah-Kulkyne Lakes Ramsar wetlands lie approximately 35 km to the north. Potential impacts on these Ramsar sites as a result of impacts on surface waters were not dealt with specifically in the EES or in submissions, however, the Inquiry considers the evidence provided in regard to lack of adverse impact on nearby surface waters is sufficient to enable it to conclude that the Ramsar sites will not be affected as a result of impacts on surface waters.

6.4 Findings and recommendations

The Inquiry finds that:

- **Given the implementation of the surface water management measures proposed and the application of guidance provided by EPA Publication 480 *Environmental Guidelines for Major Construction Sites*, impacts on surface waters will be acceptable;**
- **The proposed supply of freshwater by a combination of treatment of saline water from the site and water supplied via the Northern Mallee pipeline is sound and the statutory approval regime can be expected to ensure implementation without significant risk to the environment; and**

- **Surface water impacts will have no effect on Ramsar sites.**

The Inquiry recommends that the following be included in the conditions attached to the approval of any Work Plan:

- **Sediment management will be conducted in conformance with EPA Publication 480 *Environmental Guidelines for Major Construction Sites*.**

7. Groundwater

7.1 Description

Groundwater analysis was undertaken as part of the preparation of the EES and included in Volume 1, Appendix B. The key findings and conclusions are identified in Section 7.2, pages 7-12 to 7-32 of the EES.

Chapter 7.2 of the EES provides a summary of the assessment of potential impacts on groundwater based on the detailed assessments provided by:

- Sinclair Knight Merz (SKM) – *Water Supply and Water Impact Assessment* (Appendix A to the EES);
- GHD – *Groundwater Management Assessment* (Appendix B to the EES) and *Adjustment to Reverse Osmosis Reject Flow* (Appendix C to the EES); and
- Environmental Geochemistry International (EGI) - *Geochemical Assessment of Mine Materials* (Appendix R to the EES).

The SKM report provides a description of geology and existing hydrogeological environment summarised below.

The Parilla Sands Aquifer System occurs within the Parilla Sand, which consist of unconsolidated to weakly cemented, fine to coarse grained, well sorted quartz sand, sandstone, minor clay and silt. This aquifer occurs across the entire project area, is located at around 44 m AHD and varies in thickness from 80 to 60 metres. The ore body lies within the Parilla Sand with the proportions above and below the water table varying across the extent of the orebody.

Immediately below the Parilla Sand a layer of poorly consolidated calcareous clay, silt and sand known as the Bookpurnong Beds separates the Parilla Sands Aquifer from the Upper Renmark Group Aquifer, which is expected to be confined or semi-confined by the overlying Bookpurnong Beds.

The Blanchetown Clay layer, consisting of sandy and silty clays with a thickness of 5 to 10 metres, lies immediately above the Parilla Sand and generally confines the Parilla Sands Aquifer. The Woorinen Formation which consists of unconsolidated, wind blown units including siliceous, silt sand, calcareous clays and sand clay, lies immediately above the Blanchetown Clay layer. The Woorinen Formation is known to contain

local and perched watertable aquifers that are ephemeral and not expected to be connected to the regional groundwater system.

The SKM report states that the groundwater at each mine site is highly saline, acidic, has elevated sulphate concentrations and that a search of available databases revealed no registered users of groundwater within 50 kilometres of the project site.

Groundwater quality is protected under the *State Environment Protection Policy (Groundwaters of Victoria)* (the Groundwater SEPP). The stated goal of this policy to “*maintain, and where necessary, improve groundwater quality sufficient to protect existing and potential beneficial uses of groundwater throughout Victoria*”.

The Groundwater SEPP defines the beneficial uses of groundwater by reference to the salinity of that water. The EES indicates that the salinity of the groundwater in the region of the proposed mines is between 23,000 and 43,000 mg/L Total Dissolved Solids (TDS).

Under the Groundwater SEPP water of such salinity is defined as being in Segment D and the beneficial uses protected for such water include:

- Maintenance of eco-systems;
- Industrial water use; and
- Buildings and structures.

The description of the proposal contained in the EES includes the following aspects that have the potential to impact on the groundwater regime:

- Dewatering of the area to be mined prior to and during mining;
- Disposal of mining by-products (fines and sands and reverse osmosis reject) to a tailings storage facility or the mine void; and
- Disposal of excess water by way of infiltration pits.

The EES identifies the potential impacts of the proposal on groundwater as follows:

- Changes to the level of the watertable;
- Reduced groundwater quality as a result of dewatering, storage of mining by-products, disposal of waste water streams, seepage from the tailings storage facilities and/or use of saline water for dust suppression;
- Changes in groundwater chemistry as a result of groundwater oxidation when exposed to the atmosphere in the infiltration basins;
- Saline contamination of salinas due to groundwater to surface water interactions;

-
- Degradation of water quality in local perched aquifer systems, providing a conduit for saline water to discharge to the surface in low lying swales and salinas;
 - Acid rock drainage from mine materials raised above the watertable;
 - Deterioration in groundwater quality resulting in groundwater unsuitable for the defined beneficial uses;
 - Contamination of sensitive sites, including Ramsar wetlands and the Murray River; and
 - Contamination of non-saline soils due to mounding or spillage from ruptured pipelines.

The EES concluded that, in the absence of any groundwater users in proximity to the project site, there are no potential impacts of dewatering or disposal on groundwater users.

The EES provided descriptions of the proposed avoidance, mitigation and management measures and an assessment of residual impacts including:

- Lowering groundwater levels – creation of a temporary “cone of depression” from which no adverse impact is expected;
- Increase in groundwater levels in the area surrounding infiltration basins was modelled with modelling results predicting that mounding to within two metres of the ground surface would not occur;
- While groundwater will return to the *Parilla Sands Aquifer* via seepage from the mining by-products placed in the mine void and from the infiltration basins, the quality of the water entering the aquifer will be such that no significant change in groundwater quality is expected;
- Water used for dust suppression on materials below the watertable will be of the same salinity as the groundwater and therefore have no impact on groundwater quality;
- Extracted mine materials are not expected to be a source of acid rock drainage and, as a result, drainage from the site to the groundwater will have no impact on groundwater quality;
- The risk of contamination of perched aquifer systems near the proposed mines is low as there is a low probability that such systems exist in the vicinity of the mines and the very nature of perched aquifers, forming above confining layers, means that interaction with a rising watertable is unlikely. Contamination would, at most, be restricted to a small region around the infiltration basins and is unlikely to represent an adverse impact as these areas are located on the mine path and will be rehabilitated; and

-
- Modelling predicts no impact on the Murray River or the Lake Albacutya, the Kerang Lakes or the Hattah-Kulkyne Lakes Ramsar wetlands.

The prediction of residual impacts was based on the results of hydrogeological modelling that in turn was based on estimated water balances at various stages of mining. The estimated water balances were provided in the SKM report and predicted that, in some circumstances, the quantity of water to be extracted will exceed the amount to be consumed therefore predicting an excess of water for disposal. The magnitude of the excess depends on the dewatering rate required, which depends on the proportion of the ore that lies below the watertable, and the quantity of water retained in the tailings storage facility. The magnitude of the water excess was predicted to range from zero to 360 m³/hr.

On the basis of this predicted water disposal requirement, two infiltration basins, each 750 m in length, for the Kulwin site and one with a length of 1500 metres for the WRRP site, were proposed. In addition the following contingency measures were included in the proposal:

- Extension of the existing infiltration basins;
- Construction of additional infiltration basins;
- Use of the test pit storage basin for temporary water storage; and
- Disposal of water to nearby salinas.

Subsequent to the publication of the EES, the proponent:

- Decided that a permanent tailings storage facility (which had been included in the EES as an option) would be established;
- Reduced the proposed mining rate; and
- Provided revised estimates of water retention.

In light of this information the water balance was recalculated and presented as expert evidence. The result of these changes was that the predicted volume of water to be disposed of is substantially less than had been previously predicted.

As a consequence SKM determined that:

A single disposal basin will be required for disposal of all excess groundwater in the Kulwin mine;

The disposal to salinas will not be required under any circumstances.

Furthermore SKM stated that:

A single disposal basin located in the Pirro deposit as shown in the EES Report (Figure 12) will be capable of disposing all excess groundwater from the WRRP mine.

7.2 Issues

The major groundwater related issues identified by the proponent; the proponent's consultant, submitters and the Inquiry are as follows:

- The potential for soil salinisation resulting from the mounding of groundwater below the proposed infiltration basins and tailings storage facilities; and
- The potential for impact on Ramsar sites.

These and other issues raised by submitters are discussed below.

7.2.1 Potential for soil salinisation

Concerns with this issue relate to the adequacy of the design and proposed operation and monitoring of the infiltration basins to be utilised for disposal of saline water.

In its submission the EPA states that the primary impact to land, in reference to the Groundwater SEPP, is the potential for an increase in groundwater levels to result in an increase in salinity in the root zone and surface adversely impacting on agricultural production. The EPA identified the fact that potential for such impacts are related to seepage from infiltration ponds and the tailings storage facility. While EPA indicted its support for the overall assessment, concerns were expressed in regard to management of the infiltration basins. The EPA noted that it is proposed that groundwater levels below the basins be monitored and that a "management trigger value" be set at two metres below ground level. On this matter the EPA stated that:

The intention should be to ensure that the groundwater level due to operation of the mine does not come any closer to the surface than 2 metres. This would imply that the trigger for action should be set at some depth deeper than 2 metres to allow for management activities to prevent groundwater becoming any shallower than 2 metres.

The EPA also expressed concerns in regard to the potential for chemical reactions to result in changes in groundwater chemistry and aquifer properties that may result in a reduction in seepage rates and the effectiveness of the basins. The EPA recommended that the groundwater management regime include:

mechanisms to assess seepage rates, and to make an assessment of any change in impacts should there be a need to increase the capacity or operating levels of the seepage ponds prior to the operational change being made.

In response to this submission Mr Brian Barnett of SKM stated that:

The terms "Environmental Trigger Level" and "Maximum Allowable Ponding Level" as shown in Figure 33 and Figure 40 of Appendix A are poorly chosen. These levels should have been described as "Minimum Groundwater Level" and "Maximum Allowable Ponding Level" being defined as 2m below minimum ground level at the disposal basins. The disposal system has been designed to avoid water ponding to within 2m of ground surface in the basins;

Disposal Basin Trigger Levels will be defined in the mining plan for various stages of the mine life. Trigger Levels will be used to assess actual basin operation against prediction and will help to identify the need for and subsequently initiate contingencies should operation of the basins substantially deviate from prediction; and

Monitoring of water levels in the disposal basins will be an integral and important part of mining operations. As stated above a series of trigger or target levels will be defined for the basins so that the actual basin operation can be compared to model predictions.

The DPI advised that the Work Plan will require an assessment of whether water quality monitoring of suspended solids in the infiltration basin is required to give early warning of potential issues with infiltration rates.

In response, Mr Barnett stated that:

Recent investigations into the required disposal basin capacity indicate that a single disposal basin will be capable of disposing all excess groundwater. There will be no facility for settling of suspended sediments in the excess groundwater. This is not considered to be of concern as there is a large excess capacity built into the disposal basin design and seepage observations in the test pit disposal basin did not indicate that sedimentation had a significant adverse impact on basin seepage.

7.2.2 Other Issues

Other groundwater related issues raised by submitters and responses to those submissions are described below.

The EPA and Mr Gil Hopkins expressed concern with the risks created by the transport of saline waters in pipelines. This matter has been dealt with in Chapter 6 of this report.

The EPA noted that:

The EES also does not outline the proposed rehabilitation of the seepage basins post active mining. How the seepage basins are rehabilitated may impact on groundwater levels and associated impacts that differ from the mining phase (e.g. no mine void to act as a drawdown from groundwater).

and recommended that:

the mine closure plan has an assessment of the impact of rehabilitation of the seepage basins on groundwater levels.

A response to this submission was provided by Mr Nigel Murphy of Earth Systems Pty Ltd, the author of a report on site rehabilitation appended to the EES as Appendix S.

Mr Murphy stated that:

The EES Report was completed prior to the details of the infiltration basins being included in the project design. The decommissioning of the infiltration basins will be as per the EES (page 7-237). The details of rehabilitation of infiltration basins will need to be incorporated into subsequent revisions of the Rehabilitation Plan.

Regarding the recommendation that the mine closure plan has an assessment of the impact of rehabilitation of the seepage basins on the ground water levels, I provide the following response: I support the proposed assessment being part of the mine closure plan.

Mr Hopkins suggested that the replacement of the geological strata may influence groundwater flow patterns.

In response Mr Barnett stated that:

The rehabilitation of the mining void will cause a change in the hydraulic parameters of the sediments that fill the volume that has been mined. The net changes are expected to be small as the material excavated from the void will be returned to the void. The changes result from the working of the sediments through the excavation and mineral processing required to extract the minerals. In my opinion the impacts on groundwater flow caused by the change in aquifer properties within the void will be negligible. The volume of aquifer disturbed in this manner is negligible when compared to the volume of aquifer through which water can flow.

7.3 Inquiry response

It is apparent from the information available, and evidence provided, that dewatering before and during mining will result in a lowering of the watertable in areas in close proximity to the mines, however, the limited extent of this impact and lack of existing groundwater users mean that no adverse impact can be identified.

The information and evidence also enables acceptance of the prediction that impacts on groundwater quality will be minimal and will not adversely impact on the beneficial uses protected under the Groundwater SEPP.

The Inquiry also accepts the prediction of no impact on Ramsar sites.

While the water balance estimates provided in the EES and supporting documents have been subsequently modified in light of new and more definitive information, the Inquiry is satisfied that the water balance estimates provided in expert evidence represent what should be considered best available estimates and provide a valid input to the modelling undertaken to assess the adequacy of the design of the infiltration basins.

As with the water balance estimates, the results of modelling to predict groundwater levels below the infiltration basins are acceptable.

The Inquiry notes that concerns raised by the EPA in regard to operation of the proposed infiltration basins resulted from poor wording in the consultants report rather than any real difference in opinion. There is universal agreement that the groundwater level below the infiltration basins should be monitored and that trigger levels for action should be set such that action can be taken to prevent the groundwater entering the root zone rather than at the bottom of that zone.

While the DPI has indicated that it would require the Work Plan to include an assessment of the need for monitoring of suspended solids in the infiltration basins and the Inquiry accepts that the DPI has the power to require such an assessment, the Inquiry is doubtful that such an assessment would add value to the Work Plan.

Overall the Inquiry is of the view that, in all likelihood, the proposed infiltration basins will be sufficient to meet the water disposal requirements and that, should this not be the case; the proposed monitoring program will detect the need to implement the identified contingency plans.

The Inquiry believes that the concerns expressed by the EPA in regard to the absence of a plan for rehabilitation of the infiltration basins from the rehabilitation plan to be valid. There is no doubt, and in fact no argument,

that rehabilitation of the infiltration basins should be included in the rehabilitation plan. It is also agreed that the plan should consider the potential impacts on groundwater levels post mining.

While the Inquiry finds that an appropriate rehabilitation plan for the infiltration basins is required, it is also confident that this is a standard requirement of the rehabilitation plan and that a work plan would not be approved unless this requirement was satisfied. It therefore finds it unnecessary make a specific recommendation on this matter.

The Inquiry is of the view that the concern raised by Mr Hopkins in regard to alteration of groundwater flow patterns resulting from excavation and backfilling of the pits would be valid if no information had been provided on the methods to be applied. This however is not the case and the Inquiry agrees with Mr Barnett that it is safe to conclude that the impacts on groundwater flow will be negligible.

7.4 Findings and recommendations

The Inquiry finds that:

- **No adverse impacts are expected from the lowering of the watertable by dewatering and mining;**
- **Impacts on groundwater quality will be minimal and are extremely unlikely to adversely impact on the beneficial uses of groundwater protected under the *State Environment Protection Policy (Groundwaters of Victoria)*;**
- **Predicted impacts on groundwater levels and quality will have no impact on Ramsar sites;**
- **The water balance estimate and the prediction of infiltration basin performance provided in expert evidence to the Inquiry are sound and acceptable;**
- **In all likelihood the proposed infiltration basins will provide sufficient water disposal capacity for the project without adverse impact in terms of salinisation of the root zone or surface;**
- **Monitoring of infiltration basin performance, particularly in terms of the impact on groundwater levels, is required and should be designed to enable detection of departures from predicted performance such that action to prevent adverse impacts can be taken;**
- **Monitoring of suspended solids in the infiltration basins is unlikely to provide valuable information on infiltration basin performance;**
and

- **The impacts on groundwater flow caused by changes in the aquifer properties within the mining void will be negligible.**

The Inquiry recommends that the Work Plan not be approved unless it contains:

- **A monitoring program that will enable assessment of infiltration basin performance in such a way that any rise in the watertable below the basins can be detected; and**
- **The establishment and definition of action trigger levels plus descriptions of actions to be taken in the event of trigger levels being reached.**

8. BIODIVERSITY AND HABITAT

8.1 Description

Biodiversity and habitat analysis was undertaken as part of the preparation of the EES and included in Volume 1, Appendix D. The key findings and conclusions are identified in Section 7.3, pages 7-32 to 7-76 of the EES.

The EES identifies that the issues for biodiversity and habitat as a result of the construction and operation of the mines include:

- Habitat loss (clearing will total 256 ha of native vegetation);
- Habitat fragmentation (potentially limiting movement of Mallee-dependent species across the landscape);
- Increased number of weeds;
- Loss of hollow-bearing trees (reduced habitat availability for hollow-dependent fauna); and
- Increased predation due to lost refuges and increased predation from foxes and cats.

The mine sites are located in the bioregions of Lowan Mallee and Murray Mallee and contains nine Ecological Vegetation Classes (EVCs), including:

- Woorinen Mallee;
- Chenopod Mallee;
- Loamy Sands Mallee;
- Grasslands/Shrublands Mallee;
- Red Swale Mallee;
- Ridged Plains Mallee;
- Sandstone Ridge Shrubland;
- Woorinen Sands Mallee; and
- Samphire Shrubland.

Each EVC patch in the project area has been given a conservation significance rating. The DSE's submission identified the following ratings for the various EVC patches:

- Very high conservation significance - Woorinen Mallee and Chenopod Mallee;

- High conservation significance - Loamy Sands Mallee, Grasslands/Shrublands Mallee, Red Swale Mallee, Ridged Plains Mallee, Sandstone Ridge Shrubland and Woorinen Sands Mallee; and
- Low conservation significance - Samphire Shrubland.

Because of the extensive clearing of the area most of the remaining native vegetation exists on Crown land, scattered patches or along roadsides. The conservation status of the Woorinen Mallee and Chenopod Mallee EVCs are identified as vulnerable, and the Ridged Plains Mallee is identified as endangered. The conservation status of other EVCs are identified as 'least concern'.

Native Vegetation Management Framework – A Framework for Action

The EES Assessment Guidelines prepared by the DPCD required, inter alia, that biodiversity and habitat issues had to be assessed using the Victorian Government's *Native Vegetation Management Framework – A Framework for Action* (the Framework).

The primary aim of the Framework is to achieve:

A reversal across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to net gain

There is a three step approach to ensuring net gain:

- Avoiding adverse impacts to indigenous vegetation;
- If impacts cannot be avoided, minimising impacts through appropriate consideration in planning processes and expert input into project design and management; and
- Offsetting unavoidable impacts.

Under the Framework, offsets requirements are determined by:

- Calculating the native vegetation loss – using the 'habitat hectare' approach including Large Old Trees in remnant patches and the number of scattered Large Old Trees;
- Determining the net gain to be achieved;
- Identifying the offset criteria and other relevant planning scheme objectives; and
- Identifying an appropriate offset.

It should be noted that one of the criteria relevant to this proposal is the temporal nature of the loss (e.g. mining followed by rehabilitation).

In undertaking a net gain assessment, the following documents are relevant:

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- *Victoria's Native Vegetation Management – A Framework for Action*. DNRE (2002)
 - *Managing native vegetation in the planning system: VPP Practice Note* March 2006
 - *Assessing applications involving native vegetation removal*. DSE (March 2006)
 - *Native vegetation offsets – how to determine and provide offsets*. DSE (March 2006)
 - *The Vegetation of North West Victoria: A report to the Central and Mallee Catchment Management Authorities*. DSE (2003)
 - *Vegetation Quality Assessment Manual: Guidelines for applying the habitat hectares scoring method*. DSE (2004)
 - *Native Vegetation: Guide for assessment of referred planning applications*. DSE (2006)
 - *Native Vegetation: Scoring gain from an offset*. DSE (2006)
 - *Native Vegetation: Revegetation Planting Standards – Guidelines for establishing native vegetation for Net Gain accounting*. DSE (2006)

The biodiversity and habitat assessment for the project was undertaken by Ogyris Ecological Research and Wildlife Profiles. The authors of the report, Ian Sluiter and Peter Robinson, also prepared expert witness statements and presentations for the Inquiry hearing.

The flora and fauna assessment indicates that a total of 256.20 ha will be cleared as a result of the project. This comprises approximately 123 habitat hectares, including:

- 15.41 hha of very high conservation significance;
- 46.19 hha of high conservation significance;
- 21.18 hha of medium conservation significance¹; and
- 39.67 hha of low conservation significance.

Based on the conservation significance of the impacted EVC patches and once multipliers have been applied, the total net gain target outcome was originally calculated to be 161.32 habitat hectares (see Table 7.13 of the EES).

However, an addendum to the EES provides a revised total net gain outcome of 191.18 hectares as a result of a further assessment of the conservation significance for Regent Parrot habitat.

¹ The Inquiry notes that the DSE submission did not identify any EVC of having medium conservation significance. However, the DSE did not query the habitat hectare assessment in the EES.

The EES also states that once revegetation allowances are taken into account, the offset requirement is reduced to 90.57 habitat hectares with 70.75 habitat hectares by revegetation. The Inquiry notes that no further calculations of the reduced offset requirements are provided in the EES that take into account the revised total net gain outcome.

In addition, the assessment identifies 2,540 Large Old Trees within the EVC patches and approximately 90 other scattered Large Old Trees to be removed which requires a total offset of 20,200 Large Old Trees and 101,000 new recruits.

Under the Framework, further reductions to providing offsets are permitted by the temporary loss of vegetation as occurs with mining proposals.

The EES states that five sites have been identified as potential offset areas through:

- Referral from government agencies;
- Direct discussion with landholders; and
- Aerial photography.

The achievement of a final net gain target outcome will be developed once land management agreements and progressive rehabilitation and revegetation plans have been finalised.

Environment Protection and Biodiversity Conservation Act, 1999 (EPBC Act)

Under the EPBC Act, an action (which includes a project, a development, an undertaking and an activity or series of activities) which will have, or is likely to have, a significant impact on a matter of national environmental significance must be referred to the Commonwealth Environment Minister for a decision on whether the action is a 'controlled action' requiring assessment and/or approval under the EPBC Act.

The Minister's delegate advised DSE on 27 July 2004 that the project was a 'controlled action' on the basis that the project could have a potential to impact on listed species and communities. On 24 September, 2004 the Minister accredited the EES process as the assessment process for this project under the EPBC Act.

It should be noted that despite the accreditation, the Commonwealth retains its decision making powers and will be required to issue an approval under the EPBC Act following the completion of the Victorian assessment process.

An assessment of the proposed mine against the EPBC Act implications was undertaken for the proponent by Ogyris Ecological Research and Wildlife Profiles.

The ecological surveys recorded 159 vertebrate species, consisting of 109 bird species, 2 frog species, 28 reptiles and 20 mammals, in the study area or in areas immediately surrounding the study area.

Table 7.10 of the EES identifies five species of National conservation significance (Malleefowl, Regent Parrot, Swift Parrot, Hooded Robin and Major Mitchell's Cockatoo) and eight species of State significance.

The Malleefowl and Regent Parrot are listed under the EPBC Act as vulnerable, and the Hooded Robin and Major Mitchell's Cockatoo are listed under the EPBC Act as threatened.

Neither the Swift Parrot nor the Hooded Robin were discovered in the project area, and no nesting sites of the Major Mitchell Cockatoo were discovered in the project area.

Ogyris Pty Ltd and Wildlife Profiles conducted surveys of the Malleefowl in the study area for the proponent. They concluded that the main Malleefowl habitat in the area was the 14,000 ha Bronzewing Flora and Fauna Reserve to the west of the WRRP mine site, and there was also evidence of Malleefowl in the middle sections of McBains Reserve to east of the mine footprint.

Surveys were also conducted for the Regent Parrot. Approximately 250 ha of non-breeding feeding habitat for the Regent Parrot will be affected by the project, including the following linear vegetation corridors:

- Three north-south corridors (vegetated flight paths 3, 7 and 9) and two east-west corridors (vegetated flight paths 4 and 6) in the vicinity of the Kulwin deposit; and
- One north-south corridor (vegetated flight path 26) and one east-west corridor (vegetated flight path 27) in the vicinity of the WRRP deposits.

Flora and Fauna Guarantee Act, 1988 (FFG Act)

In addition to the four threatened species listed under the EPBC Act, there were four Mallee bird species listed in the *Flora and Fauna Guarantee Act 1988* (FFG Act) recorded in the study area (Ground Cuckoo Shrike, Yellow-Bellied Sheath-tail Bat, Australian Bustard and Crested Bellbird).

Two FFG Act listed butterfly species were also recorded in the study area – the Amethyst Hairstreak Butterfly and Bitter-bush Blue Butterfly.

A targeted survey of the FFG Act listed Orange Sun-Moth did not record the species in the study area.

Environmental Management Plan requirements

Under the MRSD Act, Iluka will be required to submit a Work Plan to the DPI for approval. The Work Plan is the key approval document through which a range of regulatory requirements are implemented under the Work Authority.

The Work Plan will be required to include an Environmental Management Plan (EMP). Iluka tabled a draft EMP during the Hearing which identified the range of matters to be included in the document. Table 4.1 of the EMP summarises the proponent's commitment or mitigation measures.

While the DPI is the relevant authority for approval of the EMP, Kathryn Friday of the DPI advised the Inquiry that relevant government agencies are consulted in assessing the Work Plan and that DSE would be closely involved in the assessment of the EMP, specifically in relation to biodiversity and habitat matters.

8.2 Issues

Submissions in response to biodiversity and habitat issues were received from the DSE, the Mallee Catchment Management Authority (MCMA), the Mid-Murray Field Naturalists (MMFN), the Victoria Malleefowl Recovery Group (VMRG), the Bird Observation & Conservation Australia (BOCA), the Victorian National Parks Association (VNPA), WWF Australia and Mr Gil Hopkins.

Issues concerning biodiversity and habitat identified by the proponent, the proponent's consultants, submitters and the Inquiry include the following:

- Whether the Native Vegetation Framework's three step approach to net gain can be satisfied;
- Whether there are nationally significant species listed under the EPBC Act that are threatened;
- Whether there are State significant species listed under the FFG Act that are threatened; and
- Appropriate matters to include in an Environmental Management Plan.

8.2.1 **Has the Native Vegetation Framework's net gain objective been satisfied?**

In its submission to the EES, the DSE stated that the proposal will impact significantly on the biodiversity values of the area including the 256 ha of existing native vegetation that will be cleared. Specifically, concern was expressed in relation to:

- The 140 ha of public land;
- 26.8 ha of native vegetation of very high conservation significance;
- The 27 ha of known and potential habitat for the Malleefowl;
- The 250 ha of feeding habitat for the Regent Parrot including the loss in connectivity of seven flight paths;
- About 70 ha that support four threatened flora species; and
- The reduced connectivity between large areas of public land, particularly conservation parks and bushland reserves.

One of the directions of the Inquiry was to request the DSE to provide its further analysis on the range of options that may exist to meet the Framework's principles of avoid, minimise and offset appropriate for the project.

Mr Adam Muir, Manager Biodiversity North West region for the DSE, tabled a PowerPoint presentation at the Hearing that provided options to retain native vegetation, such as not mining the public reserves and retaining the Malleefowl habitat in the WRRP deposit area. His overall conclusions were that the impacts would be:

- Loss of 256 ha of habitat;
- Loss of populations of species with concurrent loss of the functions of those individuals;
- Fragmentation with consequent reduction in size of habitat and potentially a reduction of viability of existing populations;
- Concurrent loss of linkages and reduced dispersal opportunities; and
- Increase in edge habitat of patches that have been fragmented.

In terms of offsets, Mr Muir did not dispute the offset calculations that had been included in the EES and stated that mitigation offsets must be undertaken to the satisfaction of the DSE. Mr Muir did acknowledge that there was potential to improve the flight paths for the Regent Parrot.

The MCMA, MMFN, VMRG, BOCA, WWF Australia and Mr Hopkins all expressed general concern that the project would lead to further fragmentation and isolation of habitat for threatened and non-threatened species, and concerns were also raised by some of these submitters on

whether purchasing offsets could replace lost remnant vegetation and the need for offsets to create linkages for habitat.

Mr Neil McFarlane of MMFN expressed concern that any further clearing is unacceptable due to the wholesale clearing that occurred with initial European settlement and the fragmented clearing that has occurred since the 1950's with the sale or leasing of a number of Crown reserves. Mr McFarlane stated that the impact of further clearing may well result in the loss of a number of threatened species, including the Malleefowl, Regent Parrot and other species.

During the Hearing, Mr Townshend indicated that six offset areas have been identified but that because a number of the sites involved discussions with private landholders there were privacy issues that needed to be considered and therefore it was not appropriate to discuss these matters in a public forum.

However, during his closing submission, Mr Townshend provided an update on the potential offset areas and tabled a document from Iluka which concluded as follows:

Iluka is well advanced in negotiations with Landholders to secure these six properties. Detailed assessment by Ogyris Pty Ltd and preliminary consultation with DSE show that these properties are of a suitable quality and size to exceed the "net gain" requirements determined in accordance with the Victorian Native Vegetation Framework. In total, the six properties provide in excess of 2000 hectares of remnant vegetation.

The DSE did not raise concerns with the offsets calculations in the EES, and Mr Muir stated at the Inquiry hearing that the mine footprint will be rehabilitated to provide effective land protection functions.

Mr Muir noted the biodiversity value of the public land that would be affected without any active revegetation of the F1 block, and that the revegetation of native vegetation areas on freehold land will be subject to landholder consent, which may make securing such offsets difficult. However, overall, Mr Muir stated that there will be an increase in security of existing habitat with offset provisions.

In response to the general issues concerning biodiversity and habitat raised by submitters, Mr Townshend made the following points (as summarised):

- The evidence of Dr Sluiter that the Kulwin and McBains reserves can be rehabilitated was not seriously challenged. These are relatively small in area. No permanent clearing is proposed. The areas can be

rehabilitated. There are no significant impacts on threatened or endangered species. Offsets are readily achievable. In these circumstances the achievement of net gain militates against the submissions which oppose any clearance on the basis of “drawing a line”; and

- On the other hand the avoidance of vegetated areas would have known impacts on the efficiency, value and economic benefits of the mine.

Mr Townshend stated that for the purposes of the Terms of Reference, the Panel is invited to find that the DSE confirms that areas are available to satisfy the Native Vegetation Framework.

During his closing submission, Mr Townshend tabled an Australian Government discussion paper, *Use of Environmental Offsets under the Environment Protection and Biodiversity Conservation 1999*. This paper was issued by the Government as a “without prejudice draft”. It contains a number of suggestions for offsets, including “indirect” offsets that may include implementation of recovery actions plans – including surveys.

8.2.2 Are there nationally significant species identified under the EPBC Act that are threatened?

Specifically, the species identified in the EPBC Act relevant to the project include:

- Regent Parrot; and
- Malleefowl.

Regent Parrot

The main concern in relation to the Regent Parrot relates to the impact of removing native vegetation on flight paths.

The Inquiry was also informed that concerns were raised during the Technical Reference Group process about the adequacy of surveys on the Regent Parrot initially conducted by the flora and fauna consultants. Since the completion of the EES, a Spring breeding season survey was conducted in October 2006 and an Autumn non-breeding season survey was conducted in March 2008.

The Spring breeding season survey found that there were no Regent Parrots within the Murray Basin Stage 2 area during the survey period and it was concluded that Regent Parrots were unlikely to be using the study area during the breeding season.

The second report found that four small groups of Regent Parrots totalling 27 birds in all within or immediately surrounding the study area. It was concluded that a minimum of 3% (27 birds) of the Regent Parrot population of 900 birds, and possibly up to 11% (100 birds) may have been present within the study area on the day of the survey.

Despite the above findings, Mr McFarlane of the MMFN expressed concern that removal of any further habitat would threaten the survival of the Regent Parrot species.

However, Mr Robertson of Wildlife Profiles stated that there was an opportunity to actually improve flightpaths through replacement planting of native vegetation required as part of the offset. Mr Muir agreed that this was possible.

Malleefowl

The fate of the Malleefowl is a key issue in consideration of this proposal.

The main area that will have an impact on the Malleefowl is 29.3 ha of Mallee vegetation that is proposed to be removed for the WRRP mine. This area is on private land that is currently used for wheat and cattle production. The proponent's consultants submitted that it appeared that this area is occupied by two pairs of older Malleefowl.

It is also possible that the Malleefowl exists in McBains bushland reserve.

The Inquiry heard a comprehensive submission from Ms Anne Stokie of the Victorian Malleefowl Recovery Group (VMRG) on the challenges the Malleefowl faces in surviving in the Mallee region. While it has adapted to the semi arid and harsh conditions, the loss of habitat as a result of clearing for wheat and sheep production has resulted in significant decline in the species' population. Under the EPBC Act it is listed as an endangered species in Victoria, and the prospects for long term conservation are considered poor.

A national recovery program has been established to develop actions to protect the Malleefowl species. The recovery plan states that:

The future of malleefowl in small and isolated reserves is grim. Population numbers are typically very small, often numbering just a few birds, and remnant patches of habitat are often surrounded by cleared land that is a hostile environment for Malleefowl to traverse or survive in.

Mr Townshend submitted that the proposal to remove the 29.3 ha is predicated on the following approach:

The EES proceeds on the basis that the mine may cause short-term interference with malleefowl habitat but there is potential for long-term benefits to be achieved for the species of the region. Longer term options described in the EES include the creation and security of habitat links.

During the hearing, Mr Townshend announced that an agreement had been reached with the VMRG in which Iluka would provide direct funding for Malleefowl management and research in the area. Iluka has agreed to provide \$150,000 subject to the grant of the Work Authority under the MRSD Act for the Kulwin deposit and a further \$150,000 on the grant of the Work Authority for the WRRP deposit.

Mr Townshend stressed that the funding was an additional offset measure to the offsets required under the Native Vegetation Framework.

He further stated that the funding was subject to an agreement that the VMRG would not oppose the other approvals Iluka requires to commence the mine.

Mr Townshend made the following conclusions:

- The presentation by VMRG was consistent with the evidence of the Iluka's two flora and fauna experts, in terms of:
 - The Malleefowl habitat to be removed is to the south of the WRRP deposit;
 - This habitat is a fragment. It has only "tenuous" links to Bronzewing Flora and Fauna Reserve;
 - The pair of birds that range in this area are probably older birds predating land clearance;
 - The future of the remaining pair of birds is grim. The area to be cleared forms part of a patch on private land surrounded by cleared farmland. It is lawfully grazed. Even without grazing this patch will not sustain a Malleefowl population without an upgrade of the links west of Bronzewing and corridors to the west;
 - The existing birds could survive the mining operation. They may avoid the areas or find their way around it;
 - Rehabilitation of the cleared area providing feeding habitat within 12 months and breeding habitat in 30 years. Birds may choose to breed in existing established areas near favourable feeding opportunities in younger growth areas;

- Bronzewing reserve is a stronghold for the species;
- The cleared area relevant to this habitat is 29 ha. It would not be cleared in one go;
- Mitigation measures are necessary during operations. These include monitoring (inspections), consultation with the VMRG, predator and vehicle control and prompt rehabilitation;
- There are opportunities for offsets in the local region; and
- There is merit in targeted funding to implement the National Recovery Plan.

Ms Stokie advised the Inquiry on the final day that the VMRG had formally agreed to the proposal for the funding. During her main submission, Ms Stokie had advised that the funding could be used for:

- On-going population monitoring, assessment and research;
- Habitat improvements within existing remnants;
- Habitat protection within existing remnants, such as fencing and predator control; and
- Establishing links between existing remnants by revegetation.

The Inquiry suggested to Iluka that they seek a response from the DSE to Iluka's funding offer. The DSE advised on 8 August, 2008 (after the completion of the Hearing) that the preferred course of action is to avoid the destruction of the Malleefowl habitat, but if this was not possible a compensation package commensurate with the loss should be imposed on the proponent.

Further, the DSE stated that any offset package must be taken from the National Recovery Plan and agreed to by the DSE and the Commonwealth Department of Environment, Water, Heritage and Arts (DEWHA), and must be paid to and administered by the DSE.

Alternatively, the DSE suggested that the proponent could be held responsible for successfully delivering the offset package and reporting on progress to the State and Commonwealth at regular intervals.

In response to the DSE's letter, received on 12 August, 2008 Iluka reiterated the points it made during their closing submission, which were that:

- *The net present value of mining the habitat area at the southern end of the WRRP deposit is 12.5% of the total WRRP deposit;*
- *Sterilisation of this area from mining would render that part of the deposit further south uneconomic;*
- *The consequential impacts of not mining both these areas include:*

- *Reducing the life of the mine by 4.5 months;*
 - *Reducing the period of employment for workers and loss of associated flow-on benefits to business and families in the area;*
 - *Reducing the amount paid in royalties to the State.*
- *The combined effect of these impacts would threaten the viability of the entire Project, including the Kulwin deposit, and require the proponents to re-examine the Project's overall feasibility. This has significant ramifications for the existing Murray Basin Stage 1 Project, being operated in and around Hamilton.*

The VMRG also responded to the DSE's letter, and submitted a letter received by the Inquiry on 25 August, 2008.

Whilst stating it would prefer that no Malleefowl habitat was destroyed by the mine, it acknowledged that the National Recovery Plan refers to the avoidance of permanent destruction of habitat, and that the habitat in question would eventually be restored.

The VMRG questioned whether the DSE was best placed to determine priority actions for the Malleefowl given the DSE's lack of involvement and absence of input in the recent national activities directed to the conservation of the Malleefowl.

Further, the VMRG advised that it is currently managing two projects for the DEWHA, which included managing substantial amounts of money. The VMRG is satisfied that a committee representing Iluka, VMRG and the DSE could successfully manage the project. Should the Inquiry consider that a State Government body should administer the funds, it suggested Parks Victoria would be appropriate as it is the land manager for public land near the mine site.

8.2.3 Flora and Fauna Guarantee Act, 1988

The DSE expressed some concern on the adequacy of surveys and the impacts of the clearing of remnant vegetation on the FFG listed species, but did not provide specific recommendations to address how any potential losses could be managed.

According to Peter Robertson of Wildlife Profiles, the Amethyst Hairstreak Butterfly and Bitter-bush Butterfly exist on the F1 block. He recommended that the Amethyst Hairstreak Butterfly habitat should be avoided, and there were opportunities to enhance the habitat of the Bitter-bush Blue Butterfly.

8.3 Inquiry response

The Inquiry considers that the following issues need to be determined in concluding whether or not the Murray Basin Stage 2 sand mining project will have an acceptable impact on biodiversity and habitat.

8.3.1 Net Gain

As noted above, the EES Assessment Guidelines prepared by the DPCD require, inter alia, that biodiversity and habitat issues be assessed against the Native Vegetation Framework's net gain three step approach of avoidance, minimise and offsets.

When avoidance cannot be achieved, it is then necessary to consider how impacts on native vegetation can be minimised.

And when impacts on native vegetation cannot be avoided nor minimised, it is then necessary to consider appropriate offsets.

While there may be concern that the loss of existing, mature native vegetation is irretrievable and unacceptable (which was the view of some submitters), the purpose of the net gain principle is to provide a framework in which there is not only compensation for the losses but opportunities to provide net gain – that is, a net benefit.

Another important matter to bear in mind is that Native Vegetation Framework must be considered against other relevant planning policies. As stated by the Victorian Civil & Administrative Tribunal (VCAT) in *Salta Constructions Pty Ltd v Hobsons Bay CC*:²

We also remark that the policy outcomes sought in the Native Vegetation framework must be examined in the context of the entire State and Local Planning Policy framework.

In other words, the approach to assessing proposals to remove native vegetation requires the consideration of competing objectives in the planning framework. In this case, in broad terms, the competing objectives relate to the economic and potential social benefits of the proposal on the one hand, and whether the loss of native vegetation can be offset on the other hand.

² *Salta Constructions Pty Ltd v Hobsons Bay CC* [2008] VCAT 1253

Avoidance

The VPP Practice Note on *Managing Native Vegetation in the Planning System* (DSE, 2006) identifies a number of factors to consider whether removal can be avoided, including:

- *The purpose for which the land is zoned, relevant overlays, local policies and the intensity and scale of development*
- *The conservation significance of the native vegetation*
- *The extent of vegetation removal proposed*
- *The size and physical capacity of the site to accommodate the development in a different form or location*
- *The surrounding land use context*
- *Existing and potential threats to the extent and quality of vegetation.*

As can be seen from the above criteria, it is necessary to form a judgement as distinct from providing a quantitative analysis on determining whether or not avoidance has been achieved.

It is important to bear in mind that if a proposal fails to meet the avoid principle, a proposal is not necessarily rejected but can lead to a consideration of appropriate offsets.

The Inquiry considers this to be an important point in this matter, because where a resource to be won is directly beneath native vegetation it is not practically possible in an open mine to avoid removing the native vegetation.

Indeed, it was the view of Mr Townshend, counsel for Iluka, that the principle of avoidance has little practical application to mining.

State and local planning policies and intensity and scale of development

Clause 17.08 of the State Planning Policy Framework (SPPF) includes a specific provision on mining, as follows:

To protect identified mineral resources, to encourage mineral exploration and mining in accordance with acceptable environmental standards and to provide a consistent planning approval process.

Mildura Planning Scheme does not contain a specific local policy on mining, however the Inquiry was not able to identify any policies that discouraged mining.

The land affected by the proposal is within the Farming Zone and Public Conservation and Resource Zone and Road Zone – Category 1 under the Mildura Planning Scheme.

As noted by DPCD in its submission to the Inquiry, mining is a Section 1 (permit not required) use in all three zones provided the requirements of Clause 52.08-2 are met.

The Inquiry also notes that Mildura Rural City Council did not lodge a submission objecting to the proposal, or raise any concerns on environmental or social matters.

Having regard to the State policy and the zoning provisions and the Council's apparent lack of concerns with the proposal, the Inquiry considers that mining is an appropriate use for the area provided environmental impacts are adequately addressed. Accordingly, in balancing the policies and provisions that encourage mining against the net gain principle of avoid, the Inquiry considers that there is policy support for the project despite the loss of native vegetation that will not be avoided.

Notwithstanding, the Inquiry notes that the decision by Iluka to reduce the size of the project and thereby decrease the amount of native vegetation to be removed from 500 ha to 256 ha will result in the avoidance of some significant native vegetation.

Extent of vegetation removed

With a mine footprint of 2,087 ha, the area of native vegetation affected is 256 ha which comprises 12% of the total footprint.

As noted above, the size of the project has been to reduce the amount of native vegetation loss from 500 ha to 256 ha.

The EES also identifies other means to achieve avoidance, such as rerouting corridors and roads or rerouting services. Indeed the EES indicates that native vegetation on the Calder and Mallee Highways will be avoided by not mining at these locations.

The DSE identified other "examples" to avoid loss of native vegetation, including the Kulwin Bushland Reserve and the Malleefowl habitat on the southern end of the WRRP deposit.

While there are no quantifiable standards or guidelines to provide a relative assessment, the Inquiry notes that Iluka has modified the overall project to reduce the amount of native vegetation removal.

Conservation significance

As noted above in the DSE's submission, the conservation significance of two EVC patches are classified as very high, five EVC patches are classified as high and one EVC patch is classified as low.

Total habitat hectares of very high conservation significance proposed to be removed is 14.43 hha and the total habitat hectares of high conservation significance to be removed is 46.19 hha.

Under the Framework's requirements, clearing of native vegetation that has very high conservation significance is not permitted unless exceptional circumstances apply. Approval of the Minister for Environment is required for removal of native vegetation of very high significance (outside of the EES process).

Removal of native vegetation of high conservation (and medium conservation significance) is "generally not permitted".

With applications involving the removal of vegetation of very high conservation significance, matters to be taken into account include the vegetation to be retained, the extent and condition of EVC information and arrangements for offsets.

With applications involving the removal of vegetation of high conservation significance, matters to be taken into account include where removal of the vegetation is of a very limited scale to other native vegetation on the property, the economic or infrastructure significance of the projects under which an EES has been prepared and for small remnants where there are very low prospects of surviving.

Having regard to the Framework's guidelines, the Inquiry considers that removal of vegetation of both very high conservation significance and high conservation significance may be justified in this matter because:

- The economic significance of the project (which is estimated to be \$1000 million) and other socio-economic benefits of the project to the region;
- The provision of offsets, including the prospect of actually improving habitat for the Regent Parrot (see below); and
- The additional offset in the form of a financial contribution of \$300,000 to assist in the implementation of the National Malleefowl Recovery Plan (see below).

Size of the site to accommodate the development in a different form or location

The location of the mineral sands resource is a given, so it is not possible to consider alternative locations.

As noted above, Iluka has revised the proposal and reduced the amount of vegetation to be removed. The EES also identifies design and operational measures to avoid loss of vegetation, such as placing infrastructure within areas devoid of native vegetation.

Surrounding land use context

Given the significant clearing that has occurred in the area since European settlement, this factor is not significant.

Existing and potential threats to the extent and quality of vegetation

The habitat hectare approach applied in this case takes into account issues concerning existing and potential threats.

Minimising

The Practice Note states that if the removal of native vegetation cannot be avoided, the second step requires the amount of vegetation to be minimised through appropriate consideration in planning processes and expert input into project design or management. Factors to be considered in this step include:

- *The size, layout and density of the proposed development*
- *Project design and management that minimises removal*
- *Implementation of reasonable and practical measures to minimise vegetation loss.*

Size, layout and density

As noted above, the overall size of the project has been reduced which will reduce the amount of native vegetation to be removed, and the EES identifies vegetation clearance is to be minimised by the following measures:

- Locate mine structures and activities in existing cleared areas where practicable;
- Locate the Mining Unit Plant in the pit to further minimise disturbance;
- Construct the haul road along the length of the pit, within the existing disturbance corridor;

-
- Salvage large old trees and hollow logs prior to vegetation clearing for later use in revegetation;
 - Avoid all area of Ridge Plains Mallee (and endangered EVC) and Boinka Big Mallee Woodland; and
 - Consult with private landholders to ensure that, where possible, revegetation is undertaken on private land to minimise fragmentation of vegetation.

In addition, the EES identifies at pages 7-61 to 7-64 a range of measures to minimise impacts on the Malleefowl, Regent Parrot and other threatened species.

Project design and management

Further opportunities to minimise vegetation losses should be identified in the Environmental Management Plan's (EMP's) environmental procedures, such as the Vegetation clearance procedure. For example, siting of stockpiles and mining equipment provide opportunities to minimise vegetation losses.

Implementation of measures to minimise vegetation loss

This approach is addressed in the preceding paragraph.

The Inquiry considers that the EES has identified a range of appropriate measures to minimise the extent of native vegetation removal and therefore satisfies the Framework's guidelines. Further opportunities to minimise vegetation loss should be included in the Environment Management Plan's (EMP) Vegetation clearance environmental procedure.

Off-sets

As noted above, under the Framework once steps 1 and 2 have been considered, then off-sets requirements can be calculated.

Whilst expressing concern about the loss of native vegetation, the DSE did not question the offset requirements identified in the EES (including the revised requirements to take into account the higher conservation significance of Regent Parrot habitat).

As noted in the EES and Mr Townshend's submission, final offset requirements will be determined once land management agreements and progressive rehabilitation and revegetation plans have been finalised.

Whilst there was concern expressed by the DSE and other submitters that losing remnant vegetation should be avoided at all costs (notwithstanding the provision for offsets), the benefit of the Framework is that the offsets

allow consideration of proposals that result in other economic and social benefits whilst still ensuring a positive (albeit long-term) environmental benefit.

8.3.2 EPBC Act requirements

As noted above, the species identified in the EPBC Act relevant to the project include:

- Regent Parrot; and
- Malleefowl

Regent Parrot

Having regard to the proposed revegetation under the offset management plan and the apparent adaptability of the Regent Parrot to access alternative flight paths, the Inquiry considers that the Murray Basin Mineral Sands Stage 2 project will not have a significant adverse impact on the Regent Parrot species.

Malleefowl

The Inquiry supports the conclusions made by Mr Townshend that the proposal to remove the 29.3 ha of Mallee vegetation in the WRRP deposit will have little impact on the survival of the Malleefowl, particularly given the fragmented nature of the habitat and the existing lawful rights to use the land for grazing.

Whilst the offsets required under the Framework may have resulted in an acceptable outcome to the Malleefowl, the Inquiry considers the \$300,000 direct funding to be provided by Iluka will result in additional measures to protect the Malleefowl that would not exist otherwise.

The Inquiry does not consider it necessary that the funds to be provided by the proponent are directly made to the DSE to manage the program. However, the Inquiry considers that any final funding arrangement must be to the satisfaction of the DPI (as the State Government department responsible for approving the Work Authority).

Whatever arrangements are put in place for the management of the funds, the Inquiry considers that the program should be overseen by a committee comprising the proponent, the DSE, Parks Victoria, the DEWHA and the VMRG.

Having regard to the fragmented nature and lack of protection of the Malleefowl habitat to be affected by the WRRP mine, as well as the offset

management programs required under the Framework, the Inquiry considers that the proposed project will not have a significant adverse impact on the Malleefowl species. Further, the Inquiry considers the \$300,000 funding to be provided by Iluka will provide further opportunities to assist in the recovery of the Malleefowl species in the region.

8.3.3 Flora and Fauna Guarantee Act, 1988

The Inquiry supports the recommendations of the proponent's fauna consultant to avoid the Amethyst Hairstreak Butterfly habitat and that opportunities to enhance the Bitter-bush Blue Butterfly be developed as part of the Vegetation Management Plan.

8.3.4 Environmental Management Plan requirements

The EMP process will provide an opportunity for matters of detail to be resolved, particularly in relation to identifying how the loss of native vegetation is to be minimised which will influence the final offsets that will be required. The Inquiry is satisfied that Iluka is aware of its obligations to develop and implement the EMP.

8.4 Findings and recommendations

The Inquiry finds that:

- **The decision by Iluka to review the size of the project and reduce the amount of native vegetation to be removed from 500 ha to 256 ha will avoid the removal of some existing native vegetation;**
- **Despite the areas of native vegetation to be removed, there is policy support in the planning framework to support the sand mining project;**
- **Having regard to the Framework's requirements, the Inquiry considers that removal of vegetation of both very high conservation significance and high conservation significance may be justified in this matter because:**
 - **The economic significance of the project (which is estimated to be \$1000 million) and other socio-economic benefits of the project to the region;**
 - **The provision of offsets, including the prospect of actually improving habitat for the threatened species; and**
 - **The additional offset in the form of a financial contribution of \$300,000 to the VMRG to assist in the implementation of the National Malleefowl Recovery Plan.**

- Iluka has identified a range of appropriate measures to minimise the extent of native vegetation removal and therefore satisfies the Framework's guidelines. Further opportunities to minimise vegetation loss should be included in the Environment Management Plan's (EMP) Vegetation Management Plan;
- The Inquiry considers the offset calculations developed in the EES are in accordance with the Framework's guidelines, and notes that that DSE did not seriously question the proposed offsets identified in the EES;
- Having regard to the proposed revegetation and the apparent adaptability of the Regent Parrot to access alternative flight paths, the Inquiry considers that the Murray Basin Mineral Sands 2 project will not have a significant adverse impact on the Regent Parrot species;
- Having regard to the fragmented nature and lack of protection of the Malleefowl habitat to be affected by the WRRP mine, as well as the offset management programs required under the Framework, the Inquiry considers that the proposed project will not have a significant adverse impact on the Malleefowl species. Further, the Inquiry considers the \$300,000 funding to be provided by Iluka will provide further opportunities to assist in the recovery of the Malleefowl species in the region;
- It is not necessary that the funds to be provided by Iluka for the conservation of the Malleefowl are directly made to the DSE to manage the program, however any final funding arrangement must be to the satisfaction of the DPI (as the State Government department responsible for approving the Work Authority);
- The Malleefowl conservation program to be developed by the funding should be overseen by a committee comprising the proponent, the DSE, Parks Victoria, the DEWHA and the VMRG; and
- The Native Vegetation Management Plan should include details as to how the Amethyst Hairstreak Butterfly habitat can be avoided and that opportunities to enhance the Bitter-bush Blue Butterfly habitat should be developed.

The Inquiry recommends that the Work Plan not be approved unless the EMP contains the following:

- Native Vegetation Management Plan including
 - Native Vegetation Offset Plan
 - Native Vegetation Clearance Plan
 - Weed Management Plan
 - Pest Management Plan

- **Wildlife Management Plan**

The Inquiry recommends that:

- **The Victorian Minister for Planning advise the Commonwealth Minister for Environment, Water, Heritage and the Arts that the Iluka Murray Basin Stage 2 Mineral Sands project will not have a significant impact on any listed threatened species or communities under the EPBC Act provided the relevant mitigation measures identified by the proponent's flora and fauna experts are implemented.**

9. AIR QUALITY

9.1 Description

Air quality was considered as part of the preparation of the EES and is included in Volume 2, Appendix H. The Air Quality assessment is summarised in the EES in Section 7.4, pages 7-76 to 7-94.

The proposed mining will produce dust from the mechanical movement of large volumes of materials, eg topsoil, subsoil, overburden and ore. Dust generation will also be produced by the movement of large mining equipment and trucks, both within the mine pit and along the unsealed roadways adjacent to the pit. Dust particles, especially the very fine particles, will potentially be harmful to human health, may create amenity issues, might affect the quality of tank drinking water at nearby residences, and possibly be detrimental to photosynthesis in nearby crops.

The widths of the pits will be relatively narrow, eg 45 to 100 metres wide and the active mine face will move relatively rapidly. The EES indicates that the mining of the Kulwin deposit is expected to be at the rate of approximately 17 metres per day over a length of more than 11,000 metres. The WRRP involves sequential mining of three (and possibly a fourth) strandline ore bodies and these too will be mined at an average rate of approximately 17 metres per day. Woornack is the longest of these ore bodies at nearly 14,500 metres.

With the face of the mine moving at this rate, the impact on air quality at nearby residences will be limited in time as such impacts are very dependant on the direct distance between the source of the dust and the sensitive receptor such as a residence.

The EES on page 7-78 stated that two project scenarios for the operational phase of mining were considered as the basis for the air quality modelling:

- *Case A involved establishing a 15 metre high overburden stockpiles on the eastern side of the deposits running the entire length of the mines.*
- *Case B involved establishing start up stockpiles, approximately 2.5 km long and 30 meters high, at the beginning of the mined areas, with the remainder of the overburden returned directly to the mine void.*

As Case A represented a greater potential for impacts on air quality, it was used as the basis for air quality assessments. This gives the modelling a more conservative approach to estimating impacts.

The air quality modelling has used “eight different time-place scenarios” covering nine residences near the Kulwin deposit and nine residents near the WRRP deposits. The EES on page 7-79 advised that the modelling included the following sources of dust:

- *Initial stripping, loading, transport and unloading of topsoil and subsoil.*
- *Loading, hauling and unloading of overburden.*
- *Shaping the in-pit stockpile; loading, hauling, handling and exporting of heavy mineral concentrates.*
- *Grading roads and open areas.*
- *Wind erosion from various stockpiles and disturbed areas.*

The EES also provided information on the emission factors used in the modelling – refer page 7-87.

Dust emission estimates were made by analysing the proposed operation and applying equations developed both locally and internationally. Where emission factor equations do not already exist for a particular process (e.g., use of a scoop to remove topsoil), a new calculation has been made based on similar operations. A high standard of dust control of 90% was assumed throughout the Project life, except for those areas where dust cannot be controlled (such as areas actively being mined or reshaped).

Although the construction phase will also produce dust emissions, emissions from ore extraction and other mining related activities during the operational phase will be greater. Air quality impacts during initial site activities should therefore be less than the predicted maximum during mining operations.

The air quality consultant has used the Ausplume Gaussian dispersion model, which is the EPA approved (and preferred) regulatory model for air quality assessments. The modelling undertaken has included the incorporation of background concentrations of PM₁₀ particles and has produced the output as time-series graphs for the most affected sensitive receptors, contour plots showing the geographic extent of maximum concentrations, and a general discussion on the analysis of the modelling results including the degree of uncertainty in the results.

The modelling undertaken was for several air quality indicators, viz., PM₁₀, PM_{2.5}, respirable crystalline silica, heavy metals and deposited dust.

9.1.1 Assessment criteria

To facilitate the assessment of future mining proposals, the Victorian EPA has recently released the *Protocol for Environmental Management – Mining and Extractive Industries* (Publication 1191, dated December 2007) (the PEM). The proposal will be assessed against the requirements contained in the PEM.

The annual extraction rate and the location of residences less than 500 m from mine means that the level of assessment specified in the PEM is for a Level 1 assessment, the most rigorous form of pre-mining assessment. It also means that the most demanding monitoring of air quality would be required.

The closest residences to the two mine sites are shown in the following table.

Table 4 Nearest residences to mine sites

Mine site	Residence designation	Distance from closest mining activities
Kulwin	6K(u)	300 metres
Kulwin	3K(u)	1,070 metres
WRRP	7W(o)	190 metres
WRRP	8W(o)	690 metres
WRRP	9W(o)	1,220 metres

Note: (u) means the residence is unoccupied and (o) means the residence is occupied.

During the Hearing, the proponent advised that as both 6K(u) and 3K(u) were now owned by Iluka, they will not be occupied during any nearby mining activities. As this means that there will not be any residences less than 500 m from mine, the assessment required of the Kulwin mine will change to a Level 2 assessment. In the case of the WRRP mine site, the Inquiry was advised that the proponent proposes to acquire 7W(o) by negotiation and if this was successful the residence would be unoccupied and as a result the WRRP mine site would also be subject to a Level 2 assessment. However, if the negotiations do not lead to the residence being unoccupied when the separation distance between the residence and the work site is less than 500 metres then a Level 1 assessment would be required.

Background air quality data was obtained from on-site measurements by the proponent over two periods. The first period was between November 2002 and May 2005 when PM₁₀ data at two monitoring sites – one near the Kulwin

deposit and one near the WRRP deposit – were obtained. A second period of measurements for Total Suspended Particles (TSP) was made between March 2005 and July 2005 at a site near the earlier Kulwin monitoring site and north of the test pit that was the being established. A local meteorological station was established near the initial Kulwin PM₁₀ monitoring site and this operated during the period November 2002 to June 2005.

The background PM₁₀ data and the meteorological data derived from the on-site monitoring have been used in the air quality modelling in accordance with the requirements for a Level 1 assessment. The 70th percentile of the background concentrations has been used as the background PM₁₀ concentration for the two sites. This figure is 41 µg/m³, and this concentration has been added to the PM₁₀ concentrations predicted to be produced by the mining activities to give a total estimate of dust particles at the various residences.

The PEM lists criteria for air quality for the assessment of proposed mines as per the following extract from the PEM.

Table 5 Assessment criteria for mining and extractive industries

Indicator	Criteria	Averaging period
PM ₁₀	60 µg/m ³	24-hour average
PM _{2.5}	36 µg/m ³	24-hour average
Respirable crystalline silica (as PM _{2.5})	3 µg/m ³	Annual average
Arsenic (total inorganic)	0.003 µg/m ³	Annual average
Hydrogen cyanide	340 µg/m ³	1-hour average
	9 µg/m ³	Annual average
Nitrogen dioxide	0.14 ppm	1-hour average
Carbon monoxide	29 ppm	1-hour average
PAHs (as BaP) ¹	0.3 ng/m ³	Annual average
Asbestos	0.2 µg/m ³ OR	Annual average
	0.05 PCM fibres/m ³	
Radionuclides ²	As low as reasonably achievable	Annual average

Note 1: PAHs = polycyclic aromatic hydrocarbons

Note 2: Radionuclides are included in a section 7.7 of the EES and are covered in a separate Chapter in this report.

The PEM also requires the proponent to assess the impact on air quality of various heavy metals that may occur in the mined materials. These include

lead, antimony, copper, manganese, mercury, arsenic, beryllium, cadmium, chromium IV and nickel.

9.1.2 Requirements for “Best Practice” and “Maximum Extent Achievable”

The PEM requires the use of “best practice” as used by the industry for the control of air pollutants. In the case of Class 3 indicators such as respirable crystalline silica (RCS), arsenic, hydrogen cyanide, PAHs and asbestos, the control requirement is for the use of “maximum extent achievable” controls. The definitions of these levels of control are included in the SEPP (Air Quality Management) and they have also been included in the PEM as follows:

*SEPP (AQM) defines **best practice** as:*

‘the best combination of eco-efficient techniques, methods, processes or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector or activity’.

***Maximum extent achievable** is defined in the SEPP (AQM) as:*

“a degree of reduction in the emission of wastes from a particular source that uses the most effective, practicable means to minimise the risk to human health from those emissions and is at least equivalent to or greater than that which can be achieved through application of best practice.”

Appendix H includes a discussion on these levels of dust control – refer page 28 of the report. Dust controls to minimise emissions (as opposed to managing emissions) will include:

- *The use of water carts to maintain trafficked areas in damp conditions;*
- *The use of DustMag™ dust suppressant (or equivalent) on selected sections of trafficked areas;*
- *The seeding of stockpiles and all disturbed areas which are likely to remain undisturbed for sufficient time for useful growth to occur;*
- *The use of PVA sealant (or equivalent binding agent) on exposed areas under dry conditions where seeding would not work;*
- *Implementation of speed limits on all roads carrying mine traffic;*
- *Use of procedures and clear signage and markings to ensure that traffic is kept as far as practicable to properly formed roads.*

In addition, a monitoring program will be established in consultation with the EPA, to determine actual air quality and to allow the design of

additional mitigating measures should the mine be found to cause deterioration in air quality. This approach will be applied for both mining areas and monitoring would continue during the period when active mining (i.e. dust generating activities) were occurring.

Finally, day-to-day reviews of mining operations and the locations of work areas relative to residences and the prevailing winds will be required. This will ensure that air quality impacts are kept to minimum levels practicable.

A comparison of the proposed dust and vehicle emission controls with “best practice and “maximum extent achievable” is summarised in the following table, which has been extracted from a larger table in Appendix H – refer Table 7 on page 17. Activities that were stated as being “not applicable” have been omitted.

Table 6 Comparison of proposed controls to be used at Murray Basin Stage 2 with Best Practice and Maximum Extent Achievable (MEA) (from Draft PEM).

Activity	Best practice	MEA	Mb stage 2
Haul roads	Water sprays Vegetation and landscape screening	Chemical sealants/paving/asphalt	Complies with MEA
Truck emissions	Vehicle fleets routinely serviced and maintained to minimise emissions	Vehicle fleets routinely serviced and maintained to minimise emissions	Complies with MEA
Material conveyors	Water sprays Foam sprays	Enclosures	Complies with MEA
Stockpiles	Water spray Vegetation and landscape screening	Chemical sealants	Complies with MEA
Overburden/mullock heaps	Revegetation	Rapid revegetation and chemical sealants	Complies with MEA

9.1.3 Monitoring requirements

A considerable part of the PEM is devoted to monitoring requirements. These cover both the assessment of the proposed development and later the assessment of performance of the operating mine.

For a mining site that requires a Level 1 assessment (as was the original expectation for these two mines), the PEM sets out requirements for 12 months of pre-mining background data (from the actual site or from a

reasonably close monitoring site) as well meteorological data (from a meteorological station that would be reasonably representative of the proposed mining site). The requirements for a Level 2 are similar but the requirement for 12 months of data is less restrictive, eg data collected at a similar location and considered by EPA to be representative of the location to which the proposal applies.

If the proposal for a mine is approved, the PEM requires compliance monitoring to confirm the modelling predictions and this form of modelling would only be conducted for a limited period of time, eg. 12 – 24 months.

For a mine that requires a Level 1 assessment, the compliance monitoring requires the use of monitoring equipment for PM₁₀ and PM_{2.5} that complies with the Australian Standards for monitoring these particles. Monitoring should be conducted on a daily basis (24-hour periods) or in real-time. There are some additional requirements to enable analysis of some of the components of particles, eg respirable crystalline silica and heavy metals. Sampling for crystalline silica (and arsenic if applicable) must be conducted for a period of up to 1 week each month for an entire year to allow calculation of an annual average – a total of 12 samples per year.

For a mine that requires a Level 2 assessment, a 1-in-6 day sampling of PM₁₀ should be undertaken for a limited period to confirm the results of the modelling. The period of time required should be confirmed in consultation with EPA during the development of the site environmental management plan. The sampling should be undertaken at the time of year when the modelling predicts that the greatest contribution from the mining or quarry operations is likely to occur.

To ensure that the emissions from the site do not adversely impact sensitive locations, monitoring must be undertaken that allows for real-time reactive management practices to be implemented. This type of monitoring should be implemented for developments that have required a Level 1 or Level 2 assessment. This monitoring would be incorporated in the site environmental management plan. The need for ongoing monitoring would be reviewed at the end of each 12-month period and the site environmental management plan amended if required.

9.1.4 Results of modelling of impacts on air quality

As previously stated, the air quality modelling has used “eight different time-place scenarios” covering nine residences near the Kulwin deposit and nine residents near the WRRP deposits. These scenarios have used the 70th percentile background dust concentration of 41µg/m³ for PM₁₀ but no background concentration is available for PM_{2.5} and deposited dust.

However, the air quality consultant has suggested a background concentration of $16\mu\text{g}/\text{m}^3$ for $\text{PM}_{2.5}$.

Full details of the modelling and the results are provided in the EES (refer to Tables 7.17, 7.18 and 7.19) and especially in Appendix H. The results of the modelling appear graphically as time-series graphs and as contour plots in the Appendices of Appendix H. Two of the time-series graphs appear in the EES as Figure 7.18.

Modelling indicates that PM_{10} concentrations are expected to exceed the PEM criterion of $60\mu\text{g}/\text{m}^3$ averaged over 24 hours at nearby residences.

Table 7 Predicted maximum PM_{10} concentrations and predicted contributions from mining activities

Residence and stage of mining	Predicted maximum PM_{10} 24 hr average $\mu\text{g}/\text{m}^3$	Predicted PM_{10} contribution from mining activities $\mu\text{g}/\text{m}^3$	Percentage from mining activities
3K(u) during stage 4 of the Kulwin mine	60.2	19.2	32%
6K(u) during stage 3 of the Kulwin mine	115.5	74.3	64%
7W(o) during stage 2 of the Woorack mine	75.2	34.2	45%
7W(o) during stage 4 of the Rownack mine	93.6	52.6	56%
8W(o) during stage 1 of the Woorack mine	115.0	74.0	64%
8W(o) during stage 3 of the Woorack mine	73.2	32.2	44%
9W(o) during stage 1 of the Woorack mine	80.3	39.3	49%
9W(o) during stage 3 of the Pirro mine	69.9	28.9	41%

Time-series graphs for the four residences closest to the mining are shown in Figure 11 in Appendix H. These show predictions of PM_{10} concentrations (due to mining plus background) over a 12-month period, assuming that the mining occurs at the same location, i.e. it uses the time-place scenarios for a period of 12 months of meteorological data. These show that there would be numerous exceedances over a 12-month period. Residence 6K(u) is easily the most impacted residence followed by residence 7W(o).

Since the mining activity is moving, eg at approximately 17 meters per day, the period when exceedances are likely to occur is not 12-months but a much shorter period, eg a number of months, depending on the distance between the mining and the residence.

The modelling of **PM_{2.5}** particles indicate that the concentrations of these particles (from the mining activities plus an estimated background concentration of 16 $\mu\text{g}/\text{m}^3$) is not expected to exceed the criterion of 36 $\mu\text{g}/\text{m}^3$ averaged over 24 hours at any of the nearby residences. This applies to both Kulwin and WRRP mines. The maximum predicted **PM_{2.5}** concentration from mining activities was 11.34 $\mu\text{g}/\text{m}^3$ at residence 8W(o) during stage 1 of the Woorack mine. The second highest predicted concentration was 8.06 $\mu\text{g}/\text{m}^3$ at residence 7W(o) during stage 4 of the Rownack mine. When the suggested background concentration is added to these two concentrations, the totals are 27.34 $\mu\text{g}/\text{m}^3$ and 24.06 $\mu\text{g}/\text{m}^3$ respectively and these are significantly less than the criterion of 36 $\mu\text{g}/\text{m}^3$, all averaged over 24 hours.

Dust deposition, measured by using dust deposition gauges over monthly periods, is not a criterion in the PEM. However the PEM states that this form of dust measurement should be used as an indicator of the effectiveness of site management practices. Consequently modelling was also undertaken to predict dust deposition rates. This showed that except for residence 6K(u), dust deposition due to mining activities are not expected to exceed the prescribed maximum rate of no more than 4g/m²/month with no more than 2g/m²/month above background, both as monthly averages.

Appendix H - on page 22 – refers to the potential for dust deposition to impact on vegetation. It states:

Given that dust emissions from the mine are likely to be less than from other areas, it is unlikely that dust emissions will adversely affect vegetation, including commercial crops, beyond the levels currently experienced.

There are no comments on the effects of dust on tank drinking water.

9.1.5 Crystalline silica emissions from mining

An assessment of crystalline silica impacts was undertaken based on the crystalline silica content of **PM_{2.5}** being 1.1%. Modelling of the concentration at the nearest residence – 6K(u) – resulted in a maximum predicted concentration of 0.118 $\mu\text{g}/\text{m}^3$, which when combined with the assumed background concentration of 1.7 $\mu\text{g}/\text{m}^3$ (suggested by the EPA) gave a total concentration of 1.818 $\mu\text{g}/\text{m}^3$ compared with the criterion of 3 $\mu\text{g}/\text{m}^3$, all as annual averages. As 6K(u) was the nearest residence to any mining it was

concluded that “all other residences would easily meet the criteria for crystalline silica”.

9.1.6 Heavy metals modelling

An assessment of the expected concentrations of various metals at the nearest sensitive receptor was undertaken using modelling to estimate the maximum 3-minute average metal concentration. Where necessary, the 3-minute averaging period was converted to an annual basis for comparison with the established EPA criteria, eg for arsenic and lead. The result (see page 24 of Appendix H) was expressed as:

..... The predictions make use of the modelling described in earlier and apply to the highest concentrations in the period when mining is giving rise to the highest concentrations for the particular residence. No residence is predicted to experience exposure to 3-minute average concentrations above the design criteria and in most cases the concentrations are at least one order of magnitude lower than the design criterion.

9.1.7 On-site combustion emissions

No specific modelling of combustion emissions was undertaken. However some of these emissions were considered as part of the greenhouse gas assessments and this is discussed in a separate Chapter of this report.

9.1.8 Proposals for monitoring

The need to demonstrate compliance with air quality criteria by the use of monitoring was recognised by the air quality consultant – refer page 28 of the detailed air quality report.

In addition, a monitoring program will be established in consultation with the EPA, to determine actual air quality and to allow the design of additional mitigating measures should the mine be found to cause deterioration in air quality. This approach will be applied for both mining areas and monitoring would continue during the period when active mining (i.e. dust generating activities) were occurring.

Table 8.2 in the EES includes an outline of the environmental monitoring program as part of the Environmental Management Plan (EMP). This includes monitoring of total suspended particles (TSP), PM₁₀ and dust deposition.

If residence 7W(o) is vacated (as expected) the WRRP mining is very likely to significantly affect only two occupied residences, viz. 8W(o) and 9W(o). The

proponent would still need to take action to control dust when exceedances at these two residences were likely to occur. This is described in Appendix H – refer page 22 – in the following manner:

The modelling results indicate the potential for impacts to occur rather than prove that the impacts will occur. The predicted dust levels are consistent with current levels measured in the area, which arise from normal agricultural activities that have been part of the local economy for decades. The only practical approach to the control of dust will be the management of the mine on an hour-by-hour basis to ensure that mining operations are reviewed whenever the wind is blowing towards residences and conditions are dry. The way this will be done is discussed in Section 10.

9.2 Issues

Air quality issues identified by the proponent, the air quality consultant, submitters and the Inquiry include:

- The adequacy of the air quality assessment;
- The adequacy of the proposed mitigation and management measures to keep impacts of air emissions at acceptable levels; and
- The adequacy of the proposed air quality monitoring program.

9.2.1 Adequacy of air quality assessments

At the Hearing, the air quality consultant advised that the PEM was not in existence (even in draft form) at the beginning of the preparation of the air quality assessment for the EES, which began in late 2002.

The EPA in its appearance at the Hearing acknowledged that the PEM was not available at the commencement of the EES process but the early advice given to the proponent was consistent with the direction in the finalised PEM. The EPA also stated that they had advised the proponent that the 70th percentile value for PM₁₀ concentration could be used as background for the assessment.

The EPA acknowledged that based on the advice from the proponent that the two closest properties to the proposed Kulwin mine site [3K(u) and 6K(u)] had been acquired by the proponent, the appropriate assessment for the Kulwin mine under the PEM is a Level 2 assessment. The EPA was aware that the proponent was negotiating to purchase 7W(o), the nearest residence to the WRRP mine site (190 metres from the proposed mining). If these negotiations were successful, the appropriate level of assessment for the WRRP mine would also be a Level 2 assessment.

At the Hearing, the EPA raised several matters that were felt to be in need of clarification or that should be considered further. These included:

- The link between default emission factors and site management practices;
- The modelling needs to be conducted assuming that PM₁₀ and PM_{2.5} are gases; and
- The criteria for assessment of dust deposition.

The need to link default emission factors with site management practices was explained by the EPA in the following terms – refer to page 12 of the EPA’s written submission:

The modelling has been conducted using default emission factors that are not clearly linked to the practices being implemented on site for control of emissions. This will add significant uncertainty to the modelled predictions and reinforces the need for the implementation of a reactive monitoring program for the site. The PEM requires the use of NPI emission factors unless site-specific factors are available. USEPA AP42 factors can only be used when NPI factors are not available.

The air quality consultant responded as follows:

The proposed controls and their anticipated efficiencies are set out in Table 7 and also in Appendix D. It is noted that the “Emissions Estimation Technique Manual for Mineral Sands Mining and Processing” (Environment Australia, 2001A) refers to the “Emissions Estimation Technique Manual for Mining” (Environment Australia, 2001B) for all the emission factors relevant for the Murray Basin Stage 2 Project. A careful examination of actual equations used in the NPI manual and a comparison with the AP42 reference will show that the NPI equations have been taken from the AP42 reference. Our report simply refers to the original reference rather than the NPI reference. Thus the estimation of emissions is consistent with the PEM MEI.

The published PEM requires “that PM₁₀ and PM_{2.5} must be modelled as though they behave as a gas”. This requirement only appeared in the final version of the PEM so the air quality consultant’s modelling had not adopted this approach. As a result, the modelling undertaken did allow for deposition. The EPA raised this matter on page 12 of their written submission.

The PEM requires a conservative approach to modelling including the modelling of PM₁₀ and PM_{2.5} as a gas rather than assuming deposition from the plume. The air quality assessment has been conducted using deposition in the modelling of PM₁₀ (and as a consequence PM_{2.5}).

The air quality consultant's response was:

This requirement appears in the final version of the PEM MEI and was not known to us at the time the assessment was undertaken. Following discussion with the EPA we have reviewed the effect of modelling, assuming that no dust deposition would occur, and compared this with the assumption used in the EES that dust deposition did occur. For a receptor 1 km away from a dust source PM₁₀ concentrations would be 12% greater under the no deposition assumption and PM_{2.5} concentrations would be 4% higher. These are relatively minor differences and given that dust deposition is a real and important factor in causing dust concentrations to decrease we believe that the assessment is not significantly altered by this deviation from the current requirements of the PEM MEI.

The EPA was concerned about the criteria for dust deposition as expressed in the results of the modelling. Their written submission stated on page 14:

Dust deposition has been modelled as an annual average. Although this is the approach used in NSW it is (the) not the approach that has been applied in Victoria. The DPI dust deposition criteria that has been used in Victoria for many years is applied as a monthly average not an annual average. Therefore the modelling of dust deposition cannot be compared with the criteria included in the PEM.

There was no specific response on this matter by the air quality consultant.

The conclusion reached by the EPA in its commentary on the air quality modelling at the Hearing was that:

Modelling of PM₁₀ has indicated that there will be exceedances of the assessment criteria at some residences".

EPA recommends that:

A reactive management strategy with real time monitoring of PM₁₀ be implemented to ensure that these exceedances are minimised and that the beneficial uses of the environment are protected. The requirement for such monitoring is set out in the PEM (Mining and Extractive Industries).

With respect to respirable crystalline silica, the EPA in its presentation to the Hearing, stated:

Modelling of RCS indicates that levels are predicted to be well below the assessment criteria.

Although the proponent did not provide evidence of modelling of combustion emissions, the EPA in its presentation at the Hearing stated:

NO₂ and CO are unlikely to be of concern and it is unlikely that levels of these pollutants would exceed the assessment criteria set out in the PEM.

Other submitters

The DPI in its written submission acknowledged that the EPA was the lead agency for regulating air quality but stated that “DPI and EPA work cooperatively to avoid or resolve air quality problems”. Several comments were made by the DPI with respect to air quality:

DPI will ensure that the EPA is satisfied with the air quality impact assessment prior to approving a work plan.

DPI will require that Iluka undertake further risk assessment in relation to sites where exceedances of PM₁₀ objectives will occur, in consultation with DPI and EPA, for the environmental management plan as part of the work plan.

DPI will require a detailed strategy to address these potential exceedances to the satisfaction of EPA and DPI in the environmental management plan as part of the work plan.

Compliance with the applicable emission standards will be a condition of work plan approval. If emission standards are not met, DPI will require Iluka to modify their activities to achieve compliance and, if this is not successful, DPI could ultimately shut down the operation.

In response to the DPI’s comments about exceedances, the air quality consultant stated:

It is noted that the Proponent has now purchased 6K(u) and will be acquiring 7W(o)

The closest occupied residences to any dust generating activity associated with mining will be 8W(o), located 690 m away from the mine.

The Proponent has also agreed to review operations on a real time basis and to modify operations when meteorological conditions are such as to carry dust to any nearby residence, in situations when levels could exceed the assessment criteria.

The DHS submission stated that no residents adjacent to mining shall be subjected to air quality parameters in excess of the specifications contained within the SEPP (Air Quality) and the PEM.

9.2.2 Adequacy of the proposed mitigation and management measures

The EES on page 7-86 lists the proponent's primary avoidance, mitigation and management actions to minimise dust emissions. It is noted that this includes the on-site transport of ore as a slurry, the stabilisation of stockpiles through natural crusting and seeding of selected stockpiles, the watering of unsealed roads, stockpiles and other disturbed areas to reduce dust generation, the use of dust suppressant (such as DustMag™) on roads as required, implementation of speed restrictions on unsealed roads, etc.

On page 7-92 of the EES information is provided about the proponent's adaptive management approach to controlling air quality impacts. The specific management measures include a daily review of weather conditions and an assessment of soil moisture levels, the modification of mine activities during adverse weather conditions, temporarily halting dust generating activities, etc.

The EPA expressed concern about the lack of information about how the avoidance, mitigation and management measures listed in the EES related to best practice and maximum extent achievable as defined in the PEM. On page 11 of EPA's written submission comment is made as follows:

The PEM establishes the process to determine best practice for the industry. Best practice means industry best practice for similar size industries internationally. Best practice and how it has been determined needs to be clearly documented in the air quality assessment. This has not been done. Best practice should be clearly documented and these practices built into the site EMP. How this relates to the emission factors used in the modelling needs to be clearly identified to ensure that the assumptions in the model relate to the site practices for dust control.

With regard to Class 3 indicators such as RCS and PAHs, the EPA submitted:

All activities on site that generate emissions of any of these substances require control by application of MEA. MEA requires site-specific management practices that may go beyond the industry best practice. How operations will meet the requirement for MEA needs to be clearly documented and is not included in the EES documentation. This will need to be clearly identified in the site EMP.

The EES states that dust cannot be controlled at the areas where active mining is being undertaken or where the mine is being reshaped. EPA is of the view that dust emissions at these locations should be controlled by application of water sprays or other dust suppressants and that uncontrolled emissions should not occur.

The air quality consultant responded as part of his expert witness statement as follows:

Appendix 1 of the Draft PEM MEI provided illustrative examples of BP and MEA. Table 7 of the air quality assessment report reviewed the controls proposed for each dust generating activity in the proposal and identified what levels of control the Proponent has committed to applying. In every case the proposal intends to use MEA.

The consultant also advised:

The company will commit to the use of water sprays prior to stripping, shaping or other activities that might generate dust from dry materials. This would apply to all circumstances where it is practicable to do so.

The Proponent accepts the principle that controls should follow best practice and commits to applying water and chemical treatment of haul roads to achieve the maximum level of control compatible with safe and efficient operation of the roads. This will be clearly documented in the site EMP as discussed on page 12 of the EPA's submission.

With regard to the assumed 90% of dust control mentioned in the EES, the EPA asked on page 11 of its written submission how this related to best practice and MEA.

On page 7-87 of the EES document it is stated that 90% dust control has been assumed. It is unclear how this level of dust control is to be achieved and how it relates to best practice and MEA for the site. This needs to be clearly documented to ensure that the 90% control can be achieved and implemented in practice.

The air quality consultant responded to the EPA query:

It is difficult when predicting emission levels from fugitive emission sources such as haul roads, which have not yet been constructed to demonstrate convincingly what the level of emission will be. However information published in Buonicore and Davis (1992) shows control levels on haul roads achieved by the application of water and dust stabilisation materials. They show that the maximum dust level control factors are approximately 95% which occurs with a surface moisture content of approximately 9%. Similar control efficiencies can be achieved by the application of chemical suppressants.

We have undertaken the assessment assuming 90% control. It has been our experience that excessive levels of moisture and steep gradients on mine haul roads make vehicle operations unsafe if the roads become too slippery thus a 90% level of control would appear to be a reasonably conservative basis for the control efficiency that could be achieved and is

reasonably close to the maximum which suggests that the proposed controls are close to the maximum extent achievable.

The EPA in its presentation to the Hearing included the following recommendation with respect to control of emissions:

Best practice and MEA control of emissions must be identified in the site EMP. These practices need to be implemented on site to ensure that all emissions are controlled in accordance with the SEPP (AQM) and PEM (Mining and Extractive Industries) and that the beneficial uses of the environment are protected. Class 3 indicators identified for the site are respirable crystalline silica, heavy metals and radionuclides.

There were some initial differences between the proponent and the EPA about a reactive management strategy. This was aired by Mr Townshend in his submission on behalf of the proponent at the Hearing:

There was a potential disagreement between the EPA and Iluka as to whether a "Level 1" reactive management strategy, including real-time monitoring of PM₁₀ was required:

....to ensure that actions can be taken on site in a timely manner to ensure that off-site impacts are minimised.³

This matter has been resolved and it is agreed that a "Level 2" management strategy is appropriate. Of course, this is contingent on resolution of occupancy of residence 7W. In its written submission, the EPA made three primary conclusions and recommendations in its written submission.⁴ The EPA now agrees that air quality issues can be addressed within the detail of the EMP.

9.2.3 Adequacy of the proposed air quality monitoring program

At the presentation to the Hearing the EPA made several points about monitoring and these included:

For Level 1 and Level 2 sites there is a requirement for both compliance monitoring and monitoring for reactive management

- *Statutory requirement under PEM (Mining and Extractive Industries)*

This has not been documented in the EES and response to submissions (Nigel Holmes) states that Iluka will not commit to such monitoring and it is not reflected in the draft EMP

³ At page 14 of the EPA submission.

⁴ At page 15-16 of the EPA submission.

- *Further discussions have been held with Iluka and EPA are of the understanding that the company will include such monitoring in their final EMP.*

Monitoring plans need to be developed and built into the site EMP.

The plans must be approved by EPA and DPI and reviewed after 12 months.

Towards the end of the Hearing, a draft EMP was provided to the Inquiry by the proponent and this included air quality compliance monitoring involving PM₁₀, PM_{2.5}, RCS, heavy metals and radionuclides. Air quality reactive management monitoring would include meteorology, visual assessment of dust, PM₁₀ and dust deposition.

9.3 Inquiry response

9.3.1 Adequacy of air quality assessments

The PEM for mining was evolving during the development of the EES so there was a degree of uncertainty for the proponent and the air quality consultant when undertaking the air quality modelling. In fact the PEM had not appeared in draft form when the proponent was monitoring pre-mining air quality and meteorology. However there has been liaison between the air quality consultant and the EPA over the time when the PEM was evolving, so although the pre-mining air quality monitoring and the modelling may not have been strictly in accordance with the new PEM, they were substantially so.

The modelling has been thorough and well documented and its presentation has been quite convincing. Although modelling of both PM_{2.5} concentrations and dust deposition rates indicate that exceedances of relevant criteria will not occur, modelling of PM₁₀ indicates a real likelihood of some exceedances. The Inquiry notes the significant concentration of PM₁₀ that has been assumed as the background concentration, viz. 41 µg/m³, and that the early on-site monitoring showed that background concentrations alone exceeded the criterion of 60 µg/m³ on several occasions.

The Inquiry also notes the changes in the status of some of the residences closest to the Kulwin mine site, namely 3K(u) and 6K(u). These two residences are now owned by the proponent and will not be occupied during the period of mining. The modelling indicated that the other residences, which are further away from the mine, are unlikely to encounter any exceedance of the PM₁₀ criteria.

If the proponent purchases (as expected) the nearest residence to the WRRP site, viz. 7W(o), there still remain two nearby residences, viz. 8W(o) and 9W(o), which are likely to be exposed to PM₁₀ concentrations in excess of the prescribed limit. While it is difficult to accurately predict the number of days when these residences might be so affected, it is clear from the modelling (time-series graphs) that it is not likely to be only once or twice. It is more likely to be several or more days, depending on the time of year (a reflection of dryness of the mined materials and weather conditions) when mining will be in close proximity. Both residences are south of the southern end of the WRRP, being 690 metres and 1,220 metres respectively from the mine when the mine is closest to them. The modelling indicated that none of the remaining residences, which are further away from the mine, were likely to be subjected to unacceptable PM₁₀ concentrations.

Other air quality parameters

The assessment of likely **crystalline silica** concentrations at sensitive receptors indicates that this pollutant will be adequately controlled so that concentrations in air at sensitive receptors will be below the criterion of 3 µg/m³ as an annual average. The Inquiry considers that the assessment conducted is acceptable. It is also reassuring that operational monitoring (12 months of 1 in 6 day sampling) will be able to confirm the findings of the assessment.

The level of control needed for this Class 3 pollutant is “maximum extent achievable”. The Inquiry agrees with the EPA that the proponent will need to demonstrate this level of control as part of the EMP.

The modelling of a range of **heavy metals** indicates quite a wide margin of safety with the estimated concentration in air of most of the heavy metals being an order of magnitude lower than the respective design criteria. Like crystalline silica, the level of control needed for several heavy metals will be “maximum extent achievable”.

Combustion emissions have not been considered in any detail, except for those that have been assessed as greenhouse gases. It is not surprising to the Inquiry that the EPA finds that combustion emissions are unlikely to be a cause of concern with respect to local air quality. Although large mining machinery individually combust large volumes of diesel fuel, in a rural environment the concentration of air pollutants from combustion will still be relatively low.

9.3.2 Adequacy of the proposed mitigation and management measures

The Inquiry accepts that the air quality consultant has made an attempt to identify “best practice” and “maximum extent achievable” control methods for the proposed mines in Appendix H. (A table of these, extracted from Appendix H, has been included earlier in this Chapter.) The control methods for dust and other pollutants as shown in the table may be acceptable as categorised as it appears that they may relate to a table that was included in a draft of the PEM.

Irrespective of this, the EPA has emphasised that there is a process in the PEM for determining what is “best practice” and “maximum extent achievable” and this has not been followed. In effect, there is a need to justify the control methods as categorised in the table in the consultant’s report. The Inquiry expects that such justification could be included in the site Environment Management Plan (EMP) for each mine.

The proponent must have the required reactive management strategy in place to avoid exceedances of the PM₁₀ criteria at the two nearest residences mentioned above. This will involve determining trigger levels, eg by real-time PM₁₀ monitoring located near the closest residence, to instigate additional mitigation procedures.

Whether the reactive management strategy involves the proponent modifying mining activities, temporarily halting dust generating activities or increasing the dust control actions, the outcome must be the same – the avoidance of unacceptable impacts at these residences. Depending on negotiations with the owners/occupiers, a period of relocation might be agreed for the time when impacts are most likely to be a problem. However, in the view of the Inquiry, this is far less acceptable than the instigation of additional controls. If temporary relocation is to be invoked, the Inquiry’s view is that it is likely to be due to the impact of noise at the residences rather than the impact of air quality.

9.3.3 Adequacy of the proposed air quality monitoring program

The proponent intended to establish a monitoring program in consultation with the EPA to determine actual air quality when the mine is operating and to assist in the development of additional mitigating measures if these were needed. This would form part of the EMP for each site.

The Inquiry notes that the PEM monitoring requirements for both Level 1 and Level 2 sites are as follows:

- For sites requiring a Level 1 assessment, compliance monitoring conducted in accordance with Australian Standards to monitor 24 hour

average PM₁₀, and PM_{2.5} concentrations on a daily basis for a period of 12 to 24 months;

- For sites requiring a Level 2 assessment, compliance monitoring conducted in accordance with Australian Standards to monitor 24 hour average PM₁₀ concentration on a 1 in 6 day basis for a limited period during a time of the year for which greatest contribution from mining is predicted;
- Irrespective of the level of assessment required, monitoring conducted in real time (continuous) that enables implementation of real-time reactive management practices; and
- Although not mandatory, deposited dust should be monitored at the site boundary to indicate the impact of dust from the mining operations especially for the predominant wind directions

The Inquiry realises that the proponent and the EPA have held discussions about monitoring requirements. The Inquiry also understands that the proponent will be including the required monitoring as set out in the PEM in the revised EMP. This particularly needs the inclusion of full documentation on what is to be the reactive management strategy, including the need to establish a trigger level that will invoke the actions to reduce dust emissions when an exceedance is likely at a nearby residence.

The Inquiry notes that the PEM includes advice that *“Hourly trigger levels will be provided by EPA that will allow site managers to identify when a problem may be arising on site.”* In the Inquiry’s view, the proponent would be well advised to seek this advice from the EPA.

9.4 Findings and recommendations

The Inquiry finds that:

- **The results of on-site monitoring conducted by the proponent show that background PM₁₀ concentrations of PM₁₀ can exceed the assessment criterion for PM₁₀ without contribution from mining;**
- **The results of modelling predict that the concentration in the air of:**
 - **PM₁₀ at sensitive receptors near the Kulwin mine can be expected to remain below the criterion for this indicator as specified in the *Protocol for Environmental Management – Mining and Extractive Industries*;**
 - **PM₁₀ at sensitive receptors near the WRRP mine can be expected to exceed on some days the criterion for this indicator as specified in the *Protocol for Environmental Management – Mining and Extractive Industries*;**

- **PM_{2.5} concentrations and the rate of dust deposition at all sensitive receptors near both mines can be expected to remain below the criteria for these indicators as specified in the *Protocol for Environmental Management – Mining and Extractive Industries*; and**
- **The concentration of respirable crystalline silica as PM_{2.5}, heavy metals and the products of the combustion of diesel fuel at all sensitive receptors near both mines can be expected to be significantly below the criteria for these indicators as specified in the *Protocol for Environmental Management – Mining and Extractive Industries*.**
- **Except for PM₁₀ concentrations at the sensitive receptors to the south of the WRRP mine, the predicted margin by which compliance with the relevant criteria will be achieved provides significant confidence that emission control to achieve an acceptable result is possible;**
- **The prevention of exceedances of the PM₁₀ criterion at the nearest sensitive locations near both mines will require the use of real-time monitoring and the implementation of an effective reactive management strategy;**
- **In order to satisfy the requirements of the *State Environment Protection Policy (Air Quality Management)* and the *Protocol for Environmental Management – Mining and Extractive Industries* the proponent needs to provide evidence in the Work Plan that the controls proposed for all relevant air quality indicators, as specified in the *State Environment Protection Policy (Air Quality Management)* are “best practice and “maximum extent achievable” for indicators specified as Class 3 indicators; and**
- **Monitoring requirements specified in the *Protocol for Environmental Management – Mining and Extractive Industries* must be satisfied.**

The Inquiry recommends that the Work Plan not be approved unless it contains:

- **Adequate information in the EMP to satisfy the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries* to identify and evaluate “best practice” controls for all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and “maximum extent achievable” controls for indicators specified as Class 3 indicators;**
- **A dust emission management strategy that includes actions that are considered “best practice” for all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and**

“maximum extent achievable” controls for indicators specified as Class 3 indicators; and

- **A monitoring program in the EMP that satisfies the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries*.**

10. GREENHOUSE GAS EMISSIONS

10.1 Description

Greenhouse Gas Emissions were considered as part of the preparation of the EES and are included in Volume 2, Appendix H. The Greenhouse Gas Emissions assessment is summarised in the EES in Section 7.5, pages 7-94 to 7-98.

The mining proposal will be a significant source of greenhouse gases (GHGs), primarily due to emissions of carbon dioxide (CO₂). The two dominant sources will be the combustion of hydrocarbon fuels by:

- the use of diesel fuel in mobile mining equipment, for temporary on-site electricity generation, for off-site road transport of Heavy Metal Concentrate (HMC) to Hamilton for further processing; and
- the use of coal in the Latrobe Valley to generate electricity and then its distribution to the mine site to power plant and equipment and mine site facilities.

Important greenhouse gases, other than carbon dioxide, that are likely to be emitted are carbon monoxide (CO), methane (CH₄), nitrous oxide (N₂O), and nitrogen dioxide (NO₂). Although CH₄ and N₂O are more effective greenhouse gases than CO₂, the amount of these gases emitted will be very small.

10.1.1 Energy usage and GHG emissions

A detailed analysis of the diesel fuel used by different types of mining equipment and the electricity usage by ore processing equipment is given in an appendix to Appendix H. This lists the various items of mining equipment, their usage and calculations of the amount of diesel fuel expected to be used per year. Similarly, there is a list of electrically powered equipment to be used together with the expected level of electrical energy utilisation. The calculation of the annual diesel usage by off-site transportation is shown separately. Separate calculations of total GHGs have been undertaken for the Kulwin and WRRP mines.

To estimate the annual emissions of CO₂-equivalent, the greenhouse gas consultant has followed the procedures outlined in the Australian Greenhouse Office document *AGO Factors and Methods Workbook, December 2005*. The emission factors used in the calculations were:

- 3.0 kg CO₂-equivalent/litre for diesel usage – based on full fuel cycle analysis; and
- 1.467 kg CO₂-equivalent/kWh of electrical energy used in Victoria.

The estimated greenhouse gas emissions are summarised in the EES on page 7-98 and a revised form of the table (with CO₂-equivalent expressed in tonnes rather than kg) is reproduced below.

Table 8 Annual carbon dioxide equivalent emissions

Source	Emission Factor	Mining Operations at Kulwin		Mining Operations at WRRP	
		Quantity	GHG Emission (CO ₂ -e t)	Quantity	GHG Emission (CO ₂ -e t)
Onsite diesel	3 kg CO ₂ -e/L	16,789 kL	50,366	23,419 kL	70,256
Offsite diesel	3 kg CO ₂ -e/L	5,443 kL	16,329	5,443 kL	16,329
Power	1.467 kg/kWh	30,397 MWh	44,593	30,397 MWh	44,593
CO ₂ -equivalent (t/yr)			111,288		131,178

The 111,288 tonnes and 131,178 tonnes of CO₂-e represent 0.095% and 0.112% respectively of the estimated 2004 greenhouse gas emissions for Victoria.

The 16,329 tonnes of GHGs from the off-site transportation is approximately 17% and 14% of the total estimated amounts of GHGs associated with the operation of the respective mine sites.

If connection to the high voltage electricity grid cannot be achieved at the commencement of the Kulwin mine, diesel generators will produce the electricity required for ore processing and this will result in an additional 17,542 tonnes of CO₂-e but electricity from the grid would be reduced below the figure in the above table. If this on-site generation of electricity is needed, it is expected to operate for only six months.

The EES on pages 7-96 and 7-97 provides an extensive list of “Primary Avoidance, Mitigation and Management” measures to minimise energy use and GHG emissions. The list includes, *inter alia*, such items as:

- *Implementing an energy monitoring program in key areas of the mine (i.e., MUP, pumps, PCP and WCP) with the view of optimising the unit rate of consumption.*

- *Using 'high-efficiency type' motors in equipment that is continuously operated. Approximately 95% of motors will be this type.*
- *Fitting variable speed motors to 95% of drives in the processing plants. This will allow motors to operate more efficiently using the appropriate amount of electricity for their load at any one time. These motors are expected to reduce energy use by 30% when compared to conventional methods, and have been successfully implemented at the Iluka's Douglas Mine.*
- *Installing direct driven equipment in lieu of belt-driven systems where this is technically feasible to avoid energy wastage on mechanical conversion elements.*
- *Ensuring that mine equipment is correctly sized for production requirements.*
- *Minimising the size of the mining fleet.*
- *Minimising haul distances.*
- *Ensuring that vehicles and equipment are mechanically sound, regularly serviced and fitted with appropriate emission control equipment.*
- *Integrating processes to minimise material handling such as direct replacement of mine materials where possible.*
- *Monitoring energy consumption and calculating greenhouse gas emissions. This will enable additional sources of greenhouse gas emissions to be identified and extra measures employed to identify and assessing economically viable opportunities for reducing greenhouse gas emissions.*

The EES on page 7-98 also states that *"While the Project is designed to minimise the use of energy, opportunities to further reduce energy use will be examined as part of the detailed Project design"*.

Alternative methods for the transport of HMC to Hamilton are briefly discussed in the EES – refer Table 5.1 Project alternatives – and specifically at alternatives 36, 37 and 38. The most feasible option for transportation by rail was for the HMC to be transported by road to Hopetoun and then transported by rail to Hamilton. This option would require an upgrade of road and rail infrastructure, including an additional rail loading facility. There is no mention of the impacts on GHGs for these alternatives.

The advantage in terms of GHG emissions of using a road/rail method of transport for the HMC over road transport was recognised by the proponent

by way of Mr Peter Beilby's presentation at the Hearing. He expressed a continuing interest in the road/rail option but emphasised that with the current infrastructure problems, such an option was not practical.

10.1.2 EREP and PEM requirements

In the EES on page 7-95 the proponent has committed to the completion of Environment and Resource Efficiency Plans (EREP) in anticipation of the amount of GHG emissions associated with the proposal. The proponent also acknowledges the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency in Industry*, (Publication 824, dated January 2002) (the PEM) produced by the EPA.

The PEM requires best practice with respect to energy use and this is defined in the following way:

'Best practice' means the best combination of eco-efficient techniques, methods, process or technology used in an industry sector or activity that demonstrably minimises the environmental impact of a generator of emissions in that industry sector or activity.

'Eco-efficient' means producing more goods and services with less energy and fewer natural resources, resulting in less waste and pollution.

A more recent initiative has been the proclamation of the *Environment Protection (Environment and Resource Efficiency Plans) Regulations 2007* (EREP) and the EPA has assessed the EES against this new requirement.

The EREP program is a requirement for all large energy and water users who trigger one of the resource use thresholds – thresholds for energy and water usage but there is no current threshold for generation of wastes. The four-step process involves:

- Self-assessment and registration;
- Development of an EREP;
- Submission of an EREP to the EPA; and
- Implementation, monitoring and reporting.

10.2 Issues

The GHG issues identified by the proponent, the greenhouse gas consultant, submitters and the Inquiry were:

- Reducing GHG gas emissions from mining and transport; and
- Potential use of renewable and alternative energy.

10.2.1 Reducing GHG gas emissions from mining and transport

The proponent has identified numerous measures to minimise energy use and so minimise the emissions of GHGs and has committed to the completion of an EREP.

Overall, the environmental management framework, monitoring program and environmental management commitments in relation to GHGs were supported by the EPA. The EPA also stated that the energy use and GHG emission calculations appeared accurate and the minimisation and mitigation measures were adequately discussed in the EES.

However, the EPA was not completely satisfied with the information in the EES and in the detailed GHG report and made the following recommendations in their written submission:

That the proponent acknowledge the PEM requirement to “identify and implement best practice for energy efficiency and greenhouse gas emissions with respect to the proposed activities”, and provide any necessary additional information (as outlined below).

That the proponent provide information to address how the proposal comprises best practice for energy efficiency and greenhouse gas emissions in relation to the following matters, when compared with other options that may be available:

- (a) the nature of the process to be used for the processing of the materials involved;*
- (b) the selected desalination process for the provision of suitable quality water for the plant operations, and the quality of water needed for the proposed operations;*
- (c) the transport of heavy mineral concentrate to Hamilton, and return of waste to the Kulwin site.*

There were no responses to the EPA comments by the greenhouse gas consultant in his expert witness statement or in his presentation at the Hearing.

10.2.2 Potential use of renewable and alternative energy

Mr Gil Hopkins, in his presentation at the Hearing expressed concern about energy supply as per the following statement:

The project needs to consider how it can supply its own energy requirements. Both State and Federal governments have programs available to subsidise sustainable energy generation. There is a major

opportunity here for a large energy consumer to add to the grid and help local power generation and Australia's conversion to 'green power'. This includes

- Geothermal electrical generation*
- Solar power – PV or solar heating for electrical generation*
- Biodiesel, bio-ethanol and biogas, maybe in conjunction with local agricultural enterprises and projected installations at Donald and Murtoa*
- Wind power is an alternative that should be considered, and there are companies already looking for installation sites*

With regard to carbon emissions offsets, Mr Hopkins stated:

Looking ahead a lot of industry is thinking about carbon trading and purchasing carbon offsets. There was a major opportunity here for the proponent to commit to long-term biodiversity enhancement through carbon trading. CMAs and other organisations already have plans in place.

Carbon offsets should also include offsets for the energy used in transport, refining, manufacturing and distribution of product, wherever it occurs on earth, including countries like China who may not have to comply with carbon trading arrangements.

10.3 Inquiry response

10.3.1 Reducing GHG gas emissions from mining and transport

Large scale mining (as is the case with this proposal) is invariably associated with a great deal of energy usage. There are few opportunities to avoid the use of large earthmoving equipment that is not fuelled by diesel fuel and the consumption of electricity for powering processing plant.

The recent increases in the prices for fuels and electricity have increased the awareness amongst users of large amounts of energy of the need to seek improvements in the efficiency of energy usage. This reinforces both State and Commonwealth governments' established aims of achieving improved efficiency of energy use.

The proponent has already made progress in identifying the likely energy use and in assessing the resulting emissions of greenhouse gases from the two mining sites. The Inquiry notes that the greenhouse gas consultant has used the more conservative emission factors for diesel fuel and electricity. These are based on full fuel cycle analysis, not just the use of the energy.

In this regard, the Inquiry notes that the full fuel cycle emission factor is the sum of the direct emission factor for the combustion of the diesel fuel plus the specific emission factor for the emissions from the extraction, production and transport of the fuel. For the consumption of purchased electricity, the full fuel cycle emission factor is the sum of the indirect emission factor for emissions from fuel combustion at the power station plus the specific emission factor for emissions from the extraction, production and transport of that fuel and for emissions associated with the electricity lost in distribution.

The Inquiry also notes that the most recent national emission factors published by the Australian Department of Climate Change in January 2008 as the *National Greenhouse Accounts (NGA) Factors* are somewhat lower than those used to calculate the CO₂-e emissions for the EES. This means that the emission predictions detailed in the EES may be seen as somewhat higher than would be the case if they were determined by a new calculation.

The Inquiry notes that the EPA acknowledges that the proponent has committed to the completion of an Environment and Resource Efficiency Plan as required by Victorian legislation. However it is clear to the Inquiry that the proponent has further work to do with regard to energy efficiency, particularly the provision of "best practice" information on the processing plants and the plant for the desalination of groundwater.

The Inquiry agrees with the EPA that the greenhouse gas consultant has used the appropriate methodology to estimate the future emissions. The estimate is appropriate at this stage in the development of the proposal but an updated estimate would be appropriate when more specific plans for the mining and the equipment that will be used are known.

The Inquiry notes that the predicted annual GHG emissions from the transportation of HMC to Hamilton are approximately 15% of the predicted annual GHGs produced by the mining. If major reductions in energy use are to be made, there appears to be greater scope for this at the mine than in the transportation of HMC to Hamilton.

The Inquiry has little doubt that energy efficiency is a high priority for any mineral sands mining venture because of the obvious impact of the cost of energy on mining and transport activities. While the EPA is emphasising efficient energy use, the proponent should have plenty of experience in selecting and operating mining plant and equipment. The Inquiry realises that selection of equipment will not just be based on energy considerations but will include other factors such as cost, reliability, performance, availability of existing plant, etc. The proponent's extensive experience of

mining minerals sands should be useful in providing the EPA with the information it is seeking about “best practice for energy efficiency”.

Transport of HMC

The current plan is to transport the HMC by road from the respective mine sites to the minerals separation plant in Hamilton with by-products from the Hamilton plant being back loaded for deposit into the mine void. Although no calculation was made of the GHG emissions if the HMC was transported by rail, the Inquiry would expect that such a calculation would show significantly lower emissions compared to that for road transport.

The proponent was obviously aware of the advantages of a lower level of GHGs if the rail system were to be used. During Mr Peter Beilby’s presentation on behalf of the proponent at the Hearing, he made it very clear that the rail option was worth pursuing. The Inquiry accepts the information provided to it that the current railway infrastructure is inadequate for the rail option to be seriously considered at this time.

The Inquiry therefore accepts that until an upgrade of the rail infrastructure is undertaken, there is no realistic alternative to the transport of HMC to Hamilton than by road. Perhaps with an upgrade of the infrastructure in the future, rail might be a viable option for the transport of HMC and waste materials in the future. However the Inquiry notes that the proposed length of active mining is approximately 7.5 years and therefore this relatively short period of time might be insufficient to economically justify the expenditures required to upgrade the rail system.

10.3.2 Potential use of renewable and alternative energy

Mr Hopkins was the only submitter who overtly raised the issue of renewable and alternative energy supplies in the context of sustainability.

The Inquiry considers that while Mr Hopkins’ concerns about the lack of consideration of potential alternative energy supplies are legitimate, there was no requirement for the proponent to consider renewable and alternative energy supplies in the preparation of the EES. The Inquiry notes that these matters were not included in the Assessment Guidelines provided to the proponent.

10.4 Findings and recommendations

The Inquiry finds that:

- Compliance with relevant sections of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency* is required;
- The magnitude of the proposed energy and water consumptions are such that the requirements of the *Environment Protection (Environment and Resource Efficiency Plans) Regulations 2007* will need to be satisfied and participation in the Commonwealth's *Energy Efficiency Opportunities* (EEO) program will be mandatory;
- The greenhouse gas emissions from the mining activities are far greater than from the transport of HMC to Hamilton for further processing, about six times greater in magnitude;
- The much greater greenhouse gas emissions from the mining than from the transportation indicate that it is likely that there will be more opportunities for greenhouse gas reductions at the mines;
- The information provided in the EES and supporting documents identifying and committing to "best practice" does not satisfy the requirements of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency*; however these requirements will need to be satisfied in the Work Plan;
- The use of rail rather than road to transport the HMC to Hamilton does not appear to be a realistic option at this time due to rail infrastructure limitations; however the rail option could be a preferred option in the future because of its lower greenhouse gas emissions; and
- The EES has not considered renewable and alternative energy supplies as these matters were not included in the Assessment Guidelines for the proposal.

The Inquiry recommends that the Work Plan not be approved unless it contains:

- An Energy Consumption and Greenhouse Gas Emission Plan that demonstrates compliance to the satisfaction of the EPA, with the requirements of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency*;
- Plans to meet the requirements of both the Victorian *Environment and Resource Efficiency Plans* and the Commonwealth's *Energy Efficiency Opportunities* programs when relevant thresholds for energy use are reached;

- **A Transport Management Plan that includes actions to be taken to investigate the option of transporting HMC to Hamilton by rail; and**
- **An Environmental Management Plan that includes actions to be taken to give consideration to the use of renewable and alternative energy supplies.**

11. NOISE

11.1 Description

Noise was considered as part of the preparation of the EES and is included in Volume 2, Appendix I. The noise assessment is summarised in the EES in Section 7.6, pages 7-98 to 7-113.

Mining, processing and associated activities cannot be conducted without the emission of noise. In the case of this proposal the main noise generating activities include the following:

- Construction of the processing plant, roads and infrastructure plus initial clearing works on the mine sites;
- Mine operation including soil removal/stockpiling/placement, overburden removal/stockpiling/placement, ore extraction and rehabilitation works. These activities involve the operation of tractors, scrapers, excavators, haul trucks and other earthmoving equipment;
- Fixed processing plant operation; and
- Heavy mineral concentrate handling including truck loading and haulage from the site.

While there is no doubt that these activities will generate noise, assessment of the acceptability of such noise requires consideration of its impact. In some circumstances government policy specifies what should be considered to be acceptable. In the case of in the Melbourne metropolitan area, the *State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N-1* (SEPP N-1) provides maximum allowable noise levels at sensitive receptors that are statutory requirements. There is no such policy applying in the area of the proposed development, however, the EPA has published *Interim Guidelines for Control of Noise from Industry in Country Victoria N3/89* (N3/89) that provide guidance as to what should be considered as acceptable noise levels at sensitive receptors.

N3/89 suggests the following:

- The application of noise limits for Day, Evening and Night with these periods being defined as in SEPP N-1, that is, as follows:

Day	7:00 am to 6:00 pm, Monday to Friday
	7:00 am to 1:00 pm, Saturday;
Evening	6:00 pm to 10:00 pm, Monday to Friday
	1:00 pm to 10:00 pm, Saturday

Night 7:00 am to 10:00 pm, Sunday and public holidays; and
10:00 pm to 7:00 am. Monday to Sunday;

- Where background noise levels are comparable to those in metropolitan Melbourne, noise limits should be determined using the procedures prescribed in SEPP N1;
- Where background noise levels are very low (i.e. less than 25dB(A) at Night and 30 dB(A) in the Evening or Day) then the following limits should apply:
 - Day 45 dB(A);
 - Evening 37 dB(A);
 - Night 32 dB(A); and
- An allowance to be added to the Day limit during construction of 10 dB(A), up to a maximum of 68 dB(A).

The EPA provides further guidance with respect to noise during construction in *Noise Control Guidelines TG302/92* (TG302/92) in which guidance is provided on procedures to be used in construction and demolition and the following noise limits suggested:

Evening Background plus 10 dB(A) for up to 18 months after commencement,
Background plus 5 dB(A) after 18 months;

Night Inaudible in a habitable room in a residence; and

No limit for the Day period

It should be noted that the noise measurement methods suggested by TG302/92 differs from that of N3/89. N3/89 requires measurements of noise from industry to be of the equivalent continuous sound pressure level (Leq) over a period of 30 minutes and background noise levels measurements to be of the noise level that is exceeded for 90% of the time (L₉₀). Noise measurements prescribed by TG 302/92 are:

Noise from Industry Maximum noise level (L_{max}) defined as the average of maximum levels; and

Background Minimum noise level defined as the average of the minimum levels.

The EES states that sleep disturbance criteria have been suggested by the World Health Organisation (WHO) and, in Australia, the work of Professor Barbara Griefahn is often referred to in discussion on sleep disturbance. The WHO sleep disturbance criteria and the results Griefahn's work suggest a noise level from a single event resulting in a noise level of less than 45 dB(A) or 47 dB(A) respectively, will not cause sleep disturbance.

A noise assessment for the proposal has been conducted by Holmes Air Sciences (HAS) and a report on that assessment was appended to the EES as Appendix I (the HAS Noise report)

The HAS Noise report included the following:

- The results of measurements of background noise levels;
- Calculation of noise limits using procedures prescribed in SEPP N-1;
- Modelling predictions of noise levels at sensitive receptors at six stages of development throughout the life of each of the Kulwin and WRRP deposits; and
- A discussion of noise control options.

The background noise level measurements showed that, at locations subject to noise from highways, background noise levels were as follows:

Day	35.7 dB(A);
Evening	32.4 dB(A); and
Night	31.7 dB(A);

At locations not subject to highway noise the measured background noise levels were found to be:

Day	28.2 dB(A);
Evening	28.4 dB(A); and
Night	27.1 dB(A).

HAS considered that these background noise levels could be considered as being similar to those in metropolitan Melbourne and as a result utilised the procedures prescribed in SEPP N-1 to calculate appropriate noise limits.

The results of those calculations are shown in Table 9.

Table 9 Noise Limits derived using SEPP N-1

Location	Day	Evening	Night
Affected by Highway Noise	47	41	38
Not Affected by Highway Noise	45	39	36

The modelling results for the operation of the mine and the processing plant at the Kulwin site predict compliance with the limits shown in Table 9 at all occupied residences throughout the life of the mine. Predictions for mine and processing plant operation at the WRRP site are of compliance at the majority of the occupied residences; however, some exceedances of those limits at a number of residences were predicted for certain stages of the mine life. The predicted exceedances are at the following residences:

- 7W Located on the eastern side of the WRRP deposits;
- 8W Located to the southeast of the WRRP deposits; and
- 9W Located to the southeast of the WRRP deposits.

The predicted exceedances are shown in Table 10.

Table 10 Predicted Exceedances of Noise Limits

House	7W	8W	9W
Distance from Mine (m)	190	690	1220
Stages in which exceedances are predicted to occur			
Day	1	0	0
Evening	1	1	0
Night	1	1	1
Night*	2	2	1
Predicted Exceedance dB(A)			
Day	2.1	-	-
Evening	9.1	4.1	-
Night	11.1	7.1	0.6
Night*	17.6/5.4	13.6/1.5	7.1

* Predictions under worst case weather conditions

The modelling performed by HAS took into account a number of proposed noise mitigating measures including the following:

- Stockpiling of subsoil to form linear barriers running parallel to the pits and haul road;
- Placing stockpiles as close as possible to the noise source;
- Using broadband reversing alarms; and
- Undertaking proper and regular equipment maintenance including routine mechanical servicing of earthmoving equipment and ensuring bulldozer tracks are not loose.

The following additional mitigating measures were also considered:

- Noise treatment of earthmoving equipment including specialised exhaust systems and enclosures around engine cooling fans. It was determined that such measures would achieve a reduction in noise level at residences of the order of 3 dB(A);
- Construction of acoustic barriers at the residences; and
- Restriction of operating hours to Day and Evening periods.

Utilisation of these mitigating measures is not proposed because they are claimed to be either not feasible or insufficient to achieve compliance.

What is proposed is what has been termed “adaptive noise management”, consisting of the following in response to complaints in regard to noise:

- Step 1 Monitoring of noise levels to establish if noise goals are being met and, if not then proceeding to Step 2.
- Step 2 Negotiation with residents to determine acceptable noise mitigation measures, moving up (that is from 3 to 2 to 1) a noise mitigation hierarchy consisting of:
- Level 1 Reduce noise levels inside residences or relocate residents;
 - Level 2 Reduce noise levels outside of residences through installation of acoustic barriers;
 - Level 3 Rearrange mine operations during periods of nuisance noise.
- Step 3 Implementation of agreed noise mitigation measures and monitoring after each level of the noise mitigation hierarchy.

Noise during construction was not modelled as part of the noise assessment however it was noted that construction will occur simultaneously with mining, which has been modelled and noise emissions from construction sites will be significantly lower than those from the mining operation.

11.2 Issues

Noise related issues identified by the proponent, the acoustic consultant, submitters and the Inquiry include the following:

- The appropriate noise limits to apply to protect the amenity of the area;
- The adequacy of the noise assessment; and
- The adequacy of the proposed mitigating measures.

Each of these issues is discussed in the following.

11.2.1 Appropriate Noise Limits

The EPA submitted that N3/89 guidelines should be applied throughout the life of the project, including during construction, and suggested the following definition of construction:

“Construction noise includes the erection of buildings and structures and the construction of infrastructure such as roads and drainage and preliminary issues such as clearing of vegetation and the stockpiling of topsoil. Major non-mining activities such as the removal, stockpiling and replacement of overburden are continuous with the project and should not be considered as construction noise.”

The EPA also stated that construction should be subject to the outcomes of section 12 of the TG 302/92.

The DPI made the following comments in regard to noise limits and their application:

“Compliance with the applicable noise standards will be a condition of work plan approval. If noise standards are not met, DPI will require Iluka to modify their activities to achieve compliance and, if this is not successful, DPI could ultimately shut down the operation.”

The DHS submitted that:

- N3/89 served to protect the health of residents;
- No residents adjacent to the mining area should be subjected to noise levels in excess of the N3/89 limits; and
- If any relocation of residents is required to achieve those objectives, such relocation shall be on fair and reasonable terms to the residents.

At the Hearing, the proponent provided further information on the predicted exceedances indicating that:

- It should be assumed that the residence designated as 7W will be unoccupied. Negotiation of an agreement under which the residence would be unoccupied when noise levels exceed N3/89 limits is well advanced and formalisation of that agreement is imminent; and
- Residences 8W and 9W are in common ownership and the owners/occupiers have indicated that they do not wish to be relocated but would prefer, in the words of the proponent to *“manage the relatively short period of impact on their dwellings”*.

At the Hearing, the EPA reinforced its preference that noise emission be controlled such that the noise limits are complied with but also stated that:

“If the noise criteria is not practicable (after all feasible measures have been undertaken) then the preferred approach is:

- *temporary relocation of affected residences so they are not impacted;*
- *discussion with individual residences (presumably the owner/occupiers of those residences) as to whether the noise is acceptable (as individual reactions to noise are quite variable);*
- *building treatment to mitigate the worst effects such as protecting sleep; and*
- *financial compensation tied to specific outcomes that reduce noise impact – this is the **least preferred** option.”*

11.2.2 Adequacy of the noise assessment

The EPA noted that, while the effects of wind and temperature on noise propagation were considered for the Night, such effects in the Day and Evening were not assessed.

In response, Dr Nigel Holmes, of HAS, provided a review of the effects of wind in enhancing noise propagation that showed:

- Wind enhanced noise propagation could increase noise levels at residents by up to 3.5 dB(A); and
- If predicted noise levels for neutral conditions in the Day and Evening were increased by 3.5 dB(A) no additional exceedances would be predicted for the Kulwin operation but one additional exceedance would be predicted for residence 8W, located near the WRRP deposit.

The DPI stated that the noise assessment is considered to be of sufficient scope and acceptable rigour.

The Victorian Malleefowl Recovery Group (VMRG) expressed the view that the noise assessment should have considered the potential impact on native fauna.

11.2.3 Proposed noise mitigation measures

The EPA noted that, although exceedances of the recommended noise criteria are predicted, the analysis of practicable mitigating measures was not sufficient, in particular the option of day time only extraction.

In response, Dr Holmes provided:

- Advice from the proponent that restricting excavation activities to Day only would make the project economically unviable; and
- Re-iteration of the view that, while a wide range of possible mitigating measures were described, implementation of such measures would not result in noise levels in compliance with N3/89 limits.

The EPA also expressed the view that the proponent should present a clear commitment and strategy to protect the amenity of residents from noise impacts where exceedances cannot be eliminated by noise control, detailing specific measures to reduce noise impact.

The DPI provided the following comments:

“DPI will require detailed management plans to mitigate or otherwise address exceedances of noise limits as part of the work plan and will consult the EPA prior to approving the work plan.”

“While DPI supports the development of a noise management strategy, DPI believes that where an exceedance of noise limits has been identified, the second step should be to make all practicable efforts to reduce the noise rather than moving directly to the negotiation step. DPI would expect this to be reflected in the work plan.

“DPI suggests that the noise management strategy to be provided in the work plan include a degree of flexibility in the measures used.”

The DSE noted that the twenty-four hour operation of the mine, and therefore twenty-four hour noise and lighting, has the potential to disturb fauna and cause behavioural changes if not managed carefully. While acknowledging that it is proposed that some measures be taken to limit impacts during Malleefowl breeding season, the DSE stated that the effectiveness of these measures is unknown and recommended that monitoring of potential impacts should be performed.

11.3 Inquiry response

11.3.1 Appropriate noise limits

The Inquiry notes the agreement between the proponent and the regulatory authorities in regard to the use of N3/89 as the basis for the setting of noise limits to apply throughout the life of the project and joins in this agreement.

The Inquiry also accepts the suggestions of the EPA in regard to the application of TG 302/92 and the definition of construction activities.

The matters that are of significant concern to the Inquiry are not related to the limits that should be imposed but of the suggested application of those limits.

While the DPI and DHS express the view that strict compliance should be required, the proposal from the proponent is for exceedances to be allowed in some circumstances, in effect, by negotiation with affected residents. The EPA appears to support the view of the proponent to some extent albeit that the EPA recommend a different order in which actions would taken.

The Inquiry has serious doubts with the proposed approach. The doubts are founded in the Inquiry's strongly held view of the unacceptability of a situation where people are compensated, financially or in any other way, for suffering conditions that are considered unacceptable and still have to suffer such conditions.

The Inquiry believes that the N3/89 guidelines provide an appropriate balance between the legitimate needs of both industry and residents that

may be affected by noise emitted by industry. It is important to note that compliance with N3/89 guidelines does not result in elimination of adverse impact but limits it to what can be expected, and has been found, to satisfy most of the people most of the time. Noise levels in excess of those specified by N3/89 can be expected to be unsatisfactory to most people, most of time, an expectation that is supported by the past experience of the Inquiry.

The Inquiry therefore rejects the suggestion of a mitigating measure that requires residents to be subject to and to tolerate noise levels above N3/89 limits.

It can be, and has been, argued that, in this particular case, where only two residences in common ownership are involved and the owner/occupiers have indicated a willingness to suffer the consequences, exceedance of the N3/89 limits by agreement should be allowed. The Inquiry finds this argument unconvincing for the following reasons:

- While not expected, ownership and occupancy of the residences could change between now and when mining is completed, which would render the views of the current owners/occupiers irrelevant;
- Since the current knowledge of noise levels at residences is based on predictions, which may be subject to error, the possibility exists that other residences will be subject to noise levels in excess of the N3/89 limits;
- The determination of what is an appropriate outcome should be on the basis of what is appropriate not on the basis of what particular residents are likely to accept; and
- Conditions of operation should be applicable in all foreseeable circumstances.

While the suggestion of limit setting by negotiation alone is rejected, the Inquiry does not wish to suggest that the negotiation between the proponent and residents of appropriate means by which required outcomes are achieved are not to be encouraged. In fact, in many cases, such negotiation is essential.

The so-called adaptive noise management system proposed by the proponent and the views of others on that system are discussed in detail below but it is suffice to say at this stage that the Inquiry finds itself unable to recommend the acceptance of a system that could result in intentionally exposing residents to noise levels that would affect their amenity to an extent greater than that allowed by the N3/89 guidelines.

The Inquiry is of the view that some modification to the N3/89 Night limits could be allowed without compromising residential amenity. This view is

based on the belief, supported by the EPA in its submission to the hearing, that the primary purpose of the N3/89 Night limit is protection from sleep disturbance which can be provided by means other than the control of external noise levels.

It is accepted that, in some circumstances, inside amenity can be protected (by the installation of insulation, double glazed windows and the like) to an extent whereby protection against sleep disturbance is provided.

The work of Professor Griefahn shows that, providing the noise in a bedroom, from a single event, does not exceed a level of 47 dB(A), sleep disturbance is unlikely. It therefore follows that compliance with a limit on the maximum noise level in habitable rooms of 47 dB(A) would be a satisfactory substitute for compliance with the N3/89 Night limit. With such a limit it would be expected that a higher level of noise emission from the mine would be allowed.

The Inquiry considers that the substitution of an internal noise limit for the N3/89 Night limit requires the following:

- Agreement of the owners/occupiers of the residence for the application of the internal noise limit instead of the N3/89 Night limit;
- Independent assessment that maximum internal noise levels are not expected to exceed the limit; and
- Monitoring of compliance.

Monitoring of compliance with internal noise limits often creates a greater disturbance than the noise itself so it is advisable to convert the internal noise limit to an external noise limit by way of an allowance. It is widely accepted that the difference between external and internal noise levels is 15 dB(A) with closed windows and 10 dB(A) with open windows. As a result a limit on the maximum external noise level of 57dB(A) would be appropriate without modification to the residence. If modifications are made to the residence that enable windows and doors to be shut at night without adversely affecting the internal amenity, then a limit on the maximum external noise level of up to 62 dB(A) would be appropriate.

It is expected that the extent of modifications made to a residence, and as a result the external noise limit that would be applied, would be the subject of negotiation with the owner/occupier with the owner/occupier having the final say. The agreement of the owner/occupier is not seen as sufficient in itself to ensure adequate protection of amenity. It is important that the ability for the operator and the owner/occupier to agree on alternative noise limits does not become situation where compensation is paid for the "pain" it is agreed to suffer. It is therefore necessary that any proposal for a maximum

external noise limit greater than 57dB(A) is also subject to an independent assessment of internal noise levels with external noise at the proposed limit. The aim of the limit setting process must be the protection from sleep disturbance, not an agreement to suffer such disturbance.

11.3.2 Adequacy of noise assessment

While the noise assessment does not include consideration of potential noise impacts on fauna, the Inquiry is of the view that this does not seriously detract from the adequacy of the noise assessment as such impacts could be expected to be minor and, in any case, the proposed mitigation measures in relation to the Malleefowl during the breeding season are as much as could be reasonably expected.

With the inclusion of the information provided by Dr Holmes in response to the EPA's question in regard to noise levels under conditions favourable to noise propagation in the Day and Evening, the noise assessment is considered to be adequate.

11.3.3 Adequacy of proposed mitigating measures

The Inquiry is of the view that the noise assessment provided in support of the EES considered an adequately wide range of possible mitigating measures and that the debate is not about the measures considered but rather the depth of such consideration and the selection and rejection of mitigating measures.

It is apparent that the choice of mitigating measures to be applied is strongly influenced by the range of mitigating measures available, particularly if one of those measures is compensation for excessive noise, a measure considered to be unacceptable by the Inquiry. The remaining discussion is based on the assumption that the Inquiry's recommendations in regard to the application of noise limits are accepted.

The Inquiry is of the view that the selection of mitigating measures to be taken is, in the end, a matter for the operator, providing whatever measures they select result in compliance with prescribed noise limits, as a minimum. Faced with a situation where non-compliance is expected, or has occurred, the operator can choose between the following:

- Reduction of noise emissions by:
 - Modification of equipment or use of that equipment;
 - Installation of noise attenuation barriers at the mine site;
 - Modification of operating hours;
 - Not mining sections of the deposit;

-
- Reduction of noise levels at residences by installation of noise barriers at the residence;
 - Treatment of residences to protect internal amenity, thus enabling mining during the Night; and
 - Temporary or permanent relocation of residents.

Given that the prescribed limits specify the desired outcome, the operator can, quite reasonably, be expected to apply the mitigating measures that can be applied at the lowest cost and the Inquiry has no problem with such an approach, providing the required outcomes are achieved.

There is no doubt that the range of mitigating measures available could be used to produce the required outcomes, albeit that it may be at considerable cost to the operator.

Obviously, the last three of the possible mitigating measures listed previously would be subject to negotiation with residents and require the residents' consent. Obtaining such consent may require the payment of compensation and the operator would need to compare such costs with that of reducing noise emissions that could involve considerable expenditure on equipment or operation of that equipment in a sub-optimal way.

The proponent has indicated that restricting mine operating hours to Day only would seriously threaten the economic viability of the project and while the Inquiry has no reason to doubt this, this is not what is being asked for by requiring compliance with the recommended noise limits. The predictions provided by the proponent show that additional mitigating measures will be required during only one stage of six stages of the WRRP mine only and such measures would not be required at all times during the stage. It is difficult to see how such restrictions could threaten the viability of the project as a whole and the Inquiry is confident that, given a clear indication of the outcome required, the proponent will find a way to economically mine the deposit. If a portion of the deposit has to be mined at a greater cost, or even not mined at all, then that would be the product of the application of sound policy and therefore justified.

The Inquiry sees a number of fundamental problems with the "adaptive noise management" proposal described in the EES, including:

- It is reactionary in that the trigger for any action is a complaint followed by monitoring whereas, in some circumstances, it will be known that operating in the normal way will produce an exceedance of the prescribed noise limits. To wait until a complaint is made and noise monitoring confirms excessive noise levels would not be wise;

- It specifies that no action will be taken if monitoring results show compliance. Compliance with prescribed noise limits is a requirement but does not guarantee that adverse impact on amenity does not occur. If the opportunity exists to further reduce adverse impact by practicable means then it should at least be considered and in many cases taken; and
- Negotiation with owners/occupiers before application of mitigating measures at the mine is not required and in fact could delay action being taken. Landowners/occupiers need to be informed of what is being done at the mine site but negotiation about other mitigating measures does not need to commence until every practicable attempt has been to reduce the noise at its source.

As suggested by the DPI the Work Plan should contain a noise management strategy and the Inquiry believes that the strategy should:

- Be aimed at compliance with prescribed noise limits, or better;
- Include identification of potential non-compliance with prescribed noise limits and the development of detailed plans to prevent predicted non-compliance with prescribed noise limits;
- List potential noise mitigation measures that may be applied to reduce noise emissions and the circumstances under which they will be applied;
- List potential noise mitigation measures that may be applied at affected residences and the circumstances under which they will be applied;
- Describe a process for keeping residents of potentially affected residences informed of actions taken on site and enabling negotiations on actions that could be taken at residences; and
- Include noise monitoring that enables compliance testing and performance measurement.

11.4 Findings and recommendations

The Inquiry finds that:

- **Adequate protection of the acoustic amenity at residences will be achieved by:**
 - **Compliance with noise limits as specified in the *Interim Guidelines for Control of Noise from Industry in Country Victoria N3/89 (N3/89) during the Day and Evening as defined in N3/89;***
and
 - **During the Night, as defined in N3/89, compliance with:**
 - **Noise limits specified in N3/89; or**

- A maximum noise level resulting in the noise level in any habitable room being 47 dB(A) or less; and
- Application of guidance provided in section 12 of *Noise Control Guidelines* (TG302/92) including noise limits prescribed in that section.
- The noise assessment provided by the proponent and its acoustic consultant is adequate for the purposes of the Inquiry;
- There is a reasonable expectation that recommended noise limits can and will be complied with and the ultimate consequences of non-compliance will be borne by the mine operator; and
- The noise management system proposed is unsatisfactory because it is reactive, is not aimed at best practicable performance and requires negotiation with residents prior to action being taken at the mine site.

The Inquiry recommends that:

- The Work Plan not be approved unless it details a noise management strategy that:
 - Is aimed at compliance with prescribed noise limits, or better;
 - Includes identification of potential non-compliance with prescribed noise limits and the development of detailed plans to prevent predicted non compliance with prescribed noise limits;
 - Lists potential noise mitigation measures that may be applied to reduce noise emissions and the circumstances under which they will be applied;
 - Lists potential noise mitigation measures that may be applied at affected residences and the circumstances under which they will be applied;
 - Describes a process for keeping residents of potentially affected residences informed of actions taken on site and enabling negotiations on actions that could be taken at the residences; and
 - Includes noise monitoring that enables compliance testing and performance measurement.
- The following be included in the conditions attached to the approval of any Work Plan.
 - The licensee must ensure that noise levels at any sensitive receptor not exceed the noise limits specified in the *Interim Guidelines for Control of Noise from Industry in Country Victoria* N3/89 except if the licensee provides the District Manager with a proposal for the substitution of a limit on the maximum noise

level for the Night limit at a particular residence. Such proposals shall:

- Be for a limit on the maximum noise level outside the residence of no more than 62 dB(A);
- Include evidence of the consent of the owner and/or occupier of the residence to the application of the proposed noise limit;
- If the proposed noise limit is greater than 57 dB(A), include evidence that noise at the proposed limit will not result in a noise level in a habitable room of greater than 47 dB(A); and
- Include details of a monitoring program that will enable demonstration of compliance, or otherwise.

If the proposal is for a limit on the maximum noise level of 57dB(A) or less, the District Manager will approve the proposal providing he/she is satisfied with:

- The evidence of the consent of the owner and/or occupier; and
- The adequacy, assessed in consultation with the EPA, of the proposed monitoring program.

If the proposal is for a limit on the maximum noise level of greater than 57dB(A), the District Manager will approve the proposal providing that he/she is satisfied with:

- The evidence of the consent of the owner and/or occupier;
- The adequacy, assessed in consultation with the EPA, of the proposed monitoring program; and
- The evidence, assessed in consultation with the EPA, that noise at the proposed limit will not result in a noise level in a habitable room of greater than 47 dB(A).

Once the proposal is approved the licensee must:

- Ensure maximum noise levels at the residence during the Night do not exceed the approved limit; and
 - Implement the proposed monitoring program to the satisfaction of the District Manager.
- Management of noise emissions during construction activities, with such activities being defined by the District Manager in consultation with the EPA, will be in accordance with the guidance provided in Section 12 of *Noise Control Guidelines TG302/92* and resultant noise levels at sensitive receptors must comply with the limits described in the Schedule in that Section of the guidelines.

12. RADIATION

12.1 Description

Chapter 7.7 of the EES provides a summary of the assessment of potential radiation impacts based on the detailed assessment provided by Australian Radiation Services Pty Ltd (ARS). The report on the detailed radiation assessment (the ARS Report) was appended to the EES as Appendix J.

The EES states that:

- All heavy mineral sand deposits contain traces of the naturally occurring radioactive materials uranium and thorium;
- Concentrations of uranium and thorium in the heavy minerals are generally trace amounts with the exception of the mineral monazite; and
- Monazite typically contains 0.1 to 0.3% uranium and 5 to 7% thorium.

As a result, risks associated with heavy minerals are primarily a function of the monazite concentration in the various materials, intermediate products, by-products and products throughout the mining and processing stages.

The radiation assessment provided by ARS included the following:

- A background radiation survey;
- A test pit radiation survey;
- Soil sampling and radionuclide analysis;
- Groundwater radionuclide analysis;
- Ore radionuclide analysis; and
- Operations monazite balance.

The results of this work are summarised below:

- The background radiation survey showed effective dose rates ranging from 0.03 to 0.12 $\mu\text{Sv/h}$, averaging 0.065 $\mu\text{Sv/h}$, which are low dose rates when compared to the global average external dose rate of 70 $\mu\text{Sv/h}$. (Effective radiation dose is measured sieverts (Sv) and commonly in fractions of a sievert such as micro-sieverts (μSv) or milli-sieverts (mSv) where 1 μSv = 1 millionth of an Sv and 1 mSv = 1 thousandth of an Sv);
- The radiation survey conducted in the Kulwin test pit showed dose rates ranging from 0.075 to 1.438 $\mu\text{Sv/h}$, averaging 0.999 $\mu\text{Sv/h}$, which,

while higher than the background levels in the area, are low dose rates when compared to the global average external dose rate of 70 $\mu\text{Sv/h}$;

- Concentrations of radioactive constituents in soils below or at the lower end of the global range;
- Concentrations of radioactive constituents in groundwater typical of concentrations in non-potable saline groundwater in northwest Victoria; and
- Estimates of the radioactive concentrations in various materials as shown in Table 11.

Table 11 Radioactive Concentrations

Material	Monazite Concentration %	Radioactive Concentration *Bq/kg
Ore	0.17	470
Mining Unit Plant Oversize	0.03	70
Wet Concentrator Plant Feed	0.18	500
Wet Concentrator Plant Fines	0.01	20
Wet Concentrator Plant Sand	0.01	20
Heavy Mineral Concentrate	0.71	1990
Magnetic Concentrate	0.56	1560
Non-magnetic Concentrate	0.95	2660
Returns form Hamilton Plant	2.85	7965

* Radioactivity is measured in Becquerel (Bq) and radioactive concentration is expressed as Bq per unit weight or volume such as Bq/Kg or Bq/L.

The ARS report describes the regulatory framework relevant to radiation, which is said to include the *Health (Radiation Safety) Regulation 1994* and the following codes of practice:

- Radiation Protection Series Publication No. 1 (2002) - *Recommendations for Limiting Exposure to Ionizing Radiation and National Standard for Limiting Occupational Exposure to Ionizing Radiation* (ARPANSA 2002);
- Radiation Protection Series No. 9 (2005) – *Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* (ARPANSA 2005); and
- Radiation Protection Series No. 2 (2001) – *Code of Practice for the Safe Transport of Radioactive Material* (ARPANSA 2001).

The EES notes that:

On 1 September 2007, the Victorian Health (Radiation Safety) Regulations 1994 were replaced by the Radiation Regulations 2007 made under the Radiation Act 2005. The new Act gives effect to Victoria's commitment to the National Directory for Radiation Protection, which outlines a common approach to be undertaken by Commonwealth, State and Territory governments towards the management of radiation protection. The Act came into effect on 1 September 2007 and the purpose of the legislation is 'to protect the health and safety of all persons and the environment from the harmful effects of radiation.'

It is acknowledged in the EES that compliance with the codes of practice listed above will be required.

Under the *Radiation Act 2005* the *Radiation Regulations 2007* prescribes radiation dose limits for both occupational and public exposure. The relevant prescribed limits are as follows:

- Occupational Exposure 20 mSv/year in 5 consecutive years; and
- Public Exposure 1 mSv/year in a consecutive 12 month period.

The same dose limits are specified in Radiation Protection Series Publication No. 1 (2002) - *Recommendations for Limiting Exposure to Ionizing Radiation and National Standard for Limiting Occupational Exposure to Ionizing Radiation* (ARPANSA 2002).

The EES provides a description of the proposed avoidance, mitigation and management measures and the results of predictions made by ARS of exposures assuming that these measures are taken. The predicted radiation doses are shown in Table 12.

Table 12 Predicted Radiation Dosages

	Annual Dose mSv/annum
Mining operator	
External	3.0
Dust Inhalation	0.06
Total	3.06
Processing operator	
External	3.2
Dust Inhalation	0.23
Transport	
Driver	0.26
Loading/Unloading	0.18
Public	0.075

The EES also notes that:

- While the tailings storage facility is a potential source of radon emanation, the predicted impact on the radon concentration in the air one kilometre from the site is no greater than 1 Bq/m³, which compares with the Australian average radon concentration in the air of 10 Bq/m³;
- Groundwater contamination with radionuclides is not considered to be of significance as the long-term migration of radionuclides from mining by-products is expected to be minimal; and
- After mine closure and rehabilitation the gamma radiation field originating from the buried by-product material will be reduced to that of the natural background in the area. As a result a person residing over a rehabilitated mine area would not receive an annual effective dose greater than the background dose.

Radiation Protection Series No. 9 (2005) – *Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* (ARPANSA 2005), a code of practice that will need to be complied with, requires the development and implementation of a Radiation Management Plan (RMP) that includes a Radioactive Waste Management Plan (RWMP).

An RMP incorporating a RWMP has been prepared by ARS and was appended to the ARS report.

12.2 Issues

Radiation related issues identified by the proponent; the proponent's consultants, submitters and the Inquiry include the following:

- The adequacy of the radiation assessment; and
- The adequacy of the proposed mitigation and management measures and the acceptability of predicted impacts.

12.2.1 The adequacy of the radiation assessment

A number of submitters expressed views on the adequacy of the radiation assessment, including:

- The DHS advised that, in their view, the RMP and RWMP provided adequately address the required elements of radiation protection for the project and noted that the proponent has committed to address certain technical issues in the determination of inhaled radionuclide dose;
- The DPI stated that in their view the analysis of the existing situation and potential radiation exposures seems comprehensive;
- Mr Gil Hopkins expressed the view that there seems to be less concern for radiation hazards with this project than will all other mineral sand mines; and
- Ouyen Incorporated indicated that they considered that further clarification of the radiation risks was required.

In response, Mr Darren Billingsley, of ARS, stated that:

Radiation controls and measures proposed are consistent with current Victorian regulatory and National Codes of Practice for mineral sands operations. The Radiation Management Plan and Radioactive Waste management Plan (Appendix K) are consistent (at minimum) with plans currently in use for other recently commissioned Iluka operations in the Murray Basin Deposit (Douglas site), which have been approved by the Victorian DHS.

Estimated occupational radiation doses are presented (Table 7.33, EES) and annual dose limits are provided (Appendix K, Section 5.1) for comparison purposes. Members of the public exposure pathways are discussed on page 7-126 (EES).

12.2.2 The adequacy of the proposed mitigating and management measures and acceptability of the predicted impacts

The DPI stated that handling and disposal of monazite must be closely managed to minimise post closure risks and, while indicating acceptance that accidental exposure to radiation post mine closure is very unlikely, it was also stated that the DPI will require the Work Plan to include details of how monazite will be managed.

Mr Billingsley indicated his agreement with the DPI's view.

Mr Hopkins expressed concerns in relation to the potential for radioactive dust to impact on tank water supplies and the value of crops grown in the area.

In response Mr Billingsley advised that on-site and boundary dust monitoring is proposed as outlined in the ARS report.

12.3 Inquiry response

The Inquiry is of the view that the adequacy of the radiation assessment provided should not be judged by comparison with assessments of other mineral sands projects. Mineral sands projects vary consequently creating different ranges of risks requiring different assessments. The Inquiry agrees with the DHS and the DPI and considers the radiation assessment provided in this case to be adequate for this case.

In light of the fact that the EES and supporting documents provide definitive statements of the maximum allowable dose rates and definitive predictions of what dose rates can be expected, the Inquiry is at a loss to understand what further clarification of radiation risks could be provided.

While the DPI is correct in the assertion that appropriate handling and disposal of monazite is required to minimise post closure risk, the Inquiry finds that the methods proposed are adequate and does not understand the DPI's particular concern in regard to this matter. To say that the Work Plan must detail how the monazite will be managed is self evident as the Work Plan must describe how all things are to be managed.

While the Inquiry does not believe that the response provided on the matter of the potential impacts of radioactive dust on tank water supplies and crops went any way toward answering the question, the Inquiry is of the view that the issue is not of significant concern. The reasons for this view are as follows:

- Predicted dust deposition rates outside the mine site are relatively low; and
- Only a small fraction of the dust deposited would be radioactive because:
 - Data contained in the ARS report shows that less than 4% of the dust generated would be from activities that could generate dust of higher radioactivity than background levels;
 - The heavy mineral fraction of the ore, which carries the radioactivity, is in relatively coarse and dense particles that are significantly less likely to be lifted and transported as dust than other components of the ore; and
 - The vast majority of the handling of heavy mineral concentrates will be done when the concentrate is wet.

In light of the above the amount of radioactive dust that might be deposited on roofs and crops is considered to be trivial.

The Inquiry takes considerable comfort in the knowledge that the provisions of the *Radiation Act 2005* and the associated *Radiation Regulations 2007* require compliance with relevant codes of practice that will require the development and implementation of a RAM incorporating a RWMP. The fact that such plans have already been prepared to the apparent satisfaction of the relevant regulatory authority provides further comfort that potential radiation impacts will be effectively managed and maintained at an acceptable level.

12.4 Findings and recommendations

The Inquiry finds that:

- **The radiation assessment provided in support of the EES is adequate and provides soundly based estimates of potential impacts;**
- **The legal requirements under the *Radiation Act 2005*, which include compliance with relevant codes of practice, will result in the development and implementation of appropriate Radiation Management and Radioactive Waste Management Plans; and**
- **The implementation of the required plans can be expected to result in the minimisation of impacts from radiation to an extent where occupational and public dose levels will be well below prescribed limits.**

13. VISUAL AND LANDSCAPE CHARACTER

13.1 Description

An assessment of the visual and landscape character impacts was undertaken in preparing the EES and included in Volume 2, Appendix L. The key findings and conclusions are identified in Section 7.8.2, pages 7-129 to 7-141 of the EES.

The EES describes the existing landscape as having the following three features:

- Dune formations, strongly defined patterns of near-permanent water bodies. These elements have a high scenic quality rating;
- Moderately-defined patterns of vegetation and ephemeral waterbodies. These elements have a high scenic quality rating; and
- Expanses of virtually flat landforms, extensive areas of similar vegetation and an absence of waterbodies. These elements have a low scenic quality rating.

Visual modification to the landscape will occur as a result of:

- Stockpiles (maximum height of 15 metres);
- Site office and amenity buildings;
- Overburden dumps and stockpiles;
- Mine pits;
- Water and tailings facilities;
- The pre-concentrator plant and wet concentrator plant;
- General infrastructure such as fences, power and telephone lines, signage, internal haul roads and laydown areas; and
- Night lighting.

A visual impact assessment was undertaken using the Visual Management System developed by the US Forestry Service whereby the visual impact resulting from a combination of visual modification and viewer sensitivity is assessed.

Specifically, viewer sensitivity and visual modification from viewpoints at residences and the Mallee and Calder highways were undertaken. Since the visual assessment was undertaken, Iluka decided that it would not divert

these two highways and therefore the roadside vegetation would be retained.

Two dwellings would be subject to high visual impact at the Kulwin deposit (3K(u) and 6K(u)). Iluka has purchased both these dwellings.

Five dwellings would be subject to high visual impact at the WRRP deposit, (2W(o), 6W(o), 7W(o), 8W(o) and 9W(o)). Iluka has purchased 6W(o) and the Inquiry was advised it is close to purchasing 7W(o).

One dwelling subject to a medium visual impact identified in the assessment at the WRRP deposit was 3W(o).

The EES includes a number of key recommendations to mitigate visual impact, as follows:

- Existing vegetation along road sides and close to residences will be retained;
- The MUP to be positioned inside the pit;
- While new plants are growing to screen the mining activities, stockpiles will be positioned to screen internal pit operations and the processing plants;
- Building materials will be non-reflective and bluish, olive-green and ochres (i.e. colours that mimic those found in the landscape);
- Infrastructure such as buildings and workshops will be located between 1 and 3.5 km from occupied residences located at highly sensitive viewpoints;
- Where possible, construction and operations will be staggered to confine mine activities (including night lighting) to areas behind the mine material stockpiles or to areas that are not directly visible from nearby occupied residences;
- Fixed or stationary light sources will be shielded to reduce spill in the vicinity of residences and the Mallee and Calder highways;
- During rehabilitation, regular slopes and sharp transition angles will be varied and rounded to provide a more natural appearance;
- Where possible, topsoils and subsoils will be put back in a place that reduces surface colour contrast (created by lighter subsoils and clays); and
- Rehabilitated areas will be monitored as described in Section 8.3.1 to ensure vegetation is healthy and tall enough to provide an effective screen, and that individual plants are replanted if necessary.

The assessment acknowledges that using vegetation to screen the mine will have a limited short-term benefit and that the proponent will establish a

community comment and complaint procedure that will enable local residents to raise queries or complaints directly with site management and have additional mitigation measures if required.

Mr Peter Hack prepared a brief expert witness statement, which documented the changes to the design of the mine. He stated that that the visual impacts of the mine are slightly reduced due to:

- The reduced area of disturbance due to the optimisation of the mine design;
- The location of the Mining Unit Plant within the pit reduces the need for six separate locations external to the pit with approximately 29 ha of disturbance;
- The wet concentrator plants are now proposed for two locations rather than potentially four. Residence 6K is now unoccupied, removing one sensitive viewpoint of visual impact; and
- The retention of the current alignments of the Mallee and Calder highways will reduce the visual impacts on road users and allow for the potential establishment of long term visual screen planting. However, it is noted that there will be a gap of approximately 10 metres at each point where the deposit intersects the highways to allow for the construction of an access road along the sides of the deposits.

13.2 Issues

Issues concerning visual impact identified by the proponent's consultants and Inquiry include the following:

- Whether the visual impacts are acceptable; and
- Whether the proposed mitigation and management measures are appropriate.

13.3 Inquiry response

The two mine locations are in relatively isolated areas, and high visual impacts are confined to two dwellings at the Kulwin deposit (3K(u) and 6K(u)) and five dwellings at the WRRP deposit (2W(o), 6W(u), 7W(o), 8W(o) and 9W(o)).

The Inquiry was advised that Iluka had purchased the two dwellings at the Kulwin deposit, and had purchased 6W(o) at the WRRP deposit and was close to purchasing dwelling 7W(o).

With the purchase of the two dwellings at the Kulwin deposit, the dwellings will be unoccupied and any visual impact will not be relevant.

The purchase of dwelling 6W(o) and the strong prospect of purchasing dwelling 7W(o) at the WRRP deposit will also address the visual impact of the mine from these dwellings.

High visual impact is therefore confined to three dwellings at the WRRP deposit - 2W(o), 8W(o) and 9W(o).

As noted above, the EES states that due to the transitory nature of the mine the visual impact will be limited to defined periods of time. The Inquiry agrees the temporary nature of the visual impact reduces the adverse amenity impact.

With the limited part that vegetation screening can play in the semi arid environment, the Inquiry agrees with the EES that strong reliance cannot be placed on screening by vegetation.

Accordingly, the Inquiry supports the proposal in the EES that the proponent establish a community comments and complaints procedure and that additional measures be undertaken to improve screening where required.

The decision to not divert the Mallee and Calder highways results in the retention of the roadside vegetation at these points, and the Inquiry agrees that this will reduce the visual impact of the mine for the wider community at these locations.

Despite the high visual impact of the three dwelling at the WRRP deposit, the Inquiry notes that none of the residences of these dwellings lodged submissions objecting to the proposal. It appears to the Inquiry that, despite the high visual impact of the mine, these residents accept the net benefits of the proposal.

13.4 Findings and recommendations

The Inquiry finds that:

- **The project will result in significant visual impacts to three dwellings (2W(o), 8W(o) and 9W(o)) at the WRRP deposit during mine operations;**
- **Placement of the stockpiles and other attenuation measures will be important to reduce visual impacts during mine operations;**
- **Rehabilitation of the mine will eventually ameliorate the visual impacts; and**
- **The community comments and complaints procedure to be implemented by Iluka will provide an opportunity for local residents to have any concerns relating to visual impacts to be investigated and addressed if required.**

14. ROADS, TRAFFIC AND TRANSPORT

14.1 Description

The roads, traffic and transport issues were considered in the preparation of the EES and included in Volume 2 Appendix M. The key findings and conclusions are identified in Section 7.9, pages 7-142 to 7-152 of the EES.

Main traffic issues identified in the EES include:

- Traffic generation;
- Increased road maintenance;
- Changes to road safety;
- Access restrictions;
- Changed amenity;
- Responsibility for local road diversions and detours; and
- Native vegetation clearance and cultural heritage.

No local roads will be used by operational mine traffic. Iluka will construct its own roads alongside the pits with direct access to the two main roads, the Mallee Highway and Calder Highway.

The EES identifies a range of primary avoidance, mitigation and management measures to address traffic related issues.

Mr Wintershoven's of Arup for the proponent provided a brief expert witness statement identified some additional mitigation measures that should be considered.

The proponent acknowledged that a Transport Management Plan, developed in consultation with VicRoads, Mildura Rural City Council and emergency services, will be required and that the Plan will include:

- Preferred traffic routes, access points and signage requirements;
- Worksite speed limits;
- Restrictions on the operation of B-double haul trucks through towns;
- Management of road closures, traffic detours and lane closures;
- Emergency vehicle access;
- Contractor traffic safety and operational requirements; and
- Clearance of native vegetation.

14.2 Issues

Issues concerning roads, traffic and transport identified by the proponent's consultants, submitters and the Inquiry include the following:

- Whether VicRoads' concerns are able to be adequately addressed; and
- Rail option to haul HMC to Hamilton for further processing and then to port.

Two submissions were received on transport, traffic and road matters.

VicRoads submitted that it needs to be satisfied that:

- The mine related traffic will not have a detrimental impact on the safety and level of service of the Arterial Road Network; and
- A traffic hazard will not be created where the mine's access intersect with the Mallee and Calder highways.

VicRoads considers that based on the traffic volumes estimated in the EES that the mine should not impact significantly on the level of service of any of the Arterial Roads, and that a range of safety measures will need to be implemented at the intersections, such as staggered right turn lanes, intersection lighting, advanced warning signs, linemarking, and flashing amber lights as trucks enter the highways.

Mr Gil Hopkins submitted at the Hearing that Iluka should use rail transport to haul the HMC to port rather than rely on road transport.

14.3 Inquiry response

The Inquiry considers that the EES identifies the range of measures that will be needed to address road, traffic and safety issues, and notes that the details of such matters will be included in the Transport Management Plan that must be submitted as a component of the Work Plan.

Use of rail instead of road to transport HMC to Hamilton is a more difficult issue to resolve. At the request of the Inquiry, Iluka's General Manager of the Murray Basin, Mr Peter Beilby, provided an update of discussions with relevant Government agencies on exploring the transport of HMC to Hamilton.

He advised that there were a number of upgrades that would need to occur before haulage via rail to Hamilton could occur, including an additional rail loading facility.

The Inquiry considers that significant environmental benefits could be achieved if a feasible rail option could be selected. It would also accord with

the State Government's *Growing Victoria Together* policy, which includes the following target:

- *The proportion of freight transported to and from ports by rail will increase from 10% to 30% by 2010.*

However, it is understood that there would need to be significant improvements to the rail infrastructure between the site and Hamilton for the rail option to be seriously pursued by Iluka. Iluka advised the Inquiry that it is committed to working with relevant government agencies to continue to explore the rail option.

14.4 Findings and recommendations

The Inquiry finds that:

- **The Work Plan should include a requirement for a Transport Management Plan developed by a working group comprising Iluka, VicRoads, Mildura Rural City Council and relevant emergency service organisations; and**
- **Iluka should continue its commitment to work with relevant State government departments to pursue the transport of HMC to Hamilton by rail.**

The Inquiry recommends that:

- **The Work Plan not be approved unless it contains a Transport Management Plan:**
 - **That is developed by a working group comprising Iluka, VicRoads, Mildura Rural City Council and relevant emergency service organisations; and**
 - **Includes actions to be taken to investigate the option of transporting HMC to Hamilton by rail.**

15. CULTURAL HERITAGE

15.1 Description

An assessment of cultural heritage impacts was undertaken in preparing the EES and included in Volume 3, Appendix O. The key findings and conclusions are identified in Section 7.10, pages 7-152 to 7-180 of the EES.

Cultural heritage issues were considered for Aboriginal cultural heritage and Non-Aboriginal cultural heritage by Andrew Long & Associates.

Ten registered Aboriginal places were identified within the activity area, and two registered Aboriginal places were identified in the vicinity of Kulwin salina 1 and Kulwin salina 3.

Three Aboriginal places are believed to be of high scientific significance due to the range of Aboriginal activities represented and the potential for the places and objects to represent a variety of different phases of Aboriginal occupation.

Other Aboriginal registered sites of medium to low significance also exist in the area.

The Non-Aboriginal (historic) sites consisting of homesteads are located in the mine area. These sites are of low to moderate scientific significance but are of local historical importance.

Since the EES was prepared, the *Aboriginal Cultural Heritage Act 2006* was proclaimed. Under this Act, a Cultural Heritage Management Plan (CHMP) must be approved before a work plan is approved under the MRSD Act.

The Inquiry received advice that a CHMP was approved by DPCD (Aboriginal Affairs Victoria (AAV)) on 24 January, 2008. A copy of the CHMP was provided to the Inquiry.

15.2 Issues

No submissions were received in relation to cultural heritage issues.

15.3 Inquiry response

With DPCD (AAV)'s advice that a CHMP had been approved, cultural heritage matters have been resolved.

15.4 Findings and Recommendations

The Inquiry finds that:

- **With DPCD (AAV)'s advice that a CHMP had been approved, cultural heritage matters have been resolved.**

16. REHABILITATION

16.1 Description

Landform, Soils and Mine Materials and Rehabilitation were considered as part of the preparation of the EES and are included as Appendix S, *Northern Murray Basin Project – Rehabilitation Assessment and Plan for the Ouyen Deposits*. The Landform, Soils and Mine Materials assessment is summarised in the EES in Section 7.13, pages 7-208 to 7-226 and the Rehabilitation assessment is summarised in the EES in Section 7.14, pages 7-226 to 7-243.

The following includes several general descriptions which are summaries derived from information contained in Appendix S and the EES.

The current use of the proposed mine site is predominately agricultural with approximately 80% of the land being used for that purpose. The remaining 20% supports remnant vegetation of varying quality and held under varying land tenures. The agricultural land is mainly cleared open country with numerous dunes and associated swales. The native vegetation generally occurs in small patches along roadsides and as isolated remnants on farms.

16.1.1 Agricultural land

Cereal production is the main agricultural activity with wheat, barley, and triticale as the main crops. Oat and cereal rye crops are also grown as well as some crops of field peas and feed lupins. Livestock numbers are dominated by sheep, with a much smaller number of beef cattle.

16.1.2 Native vegetation

While the area contains small patches of native vegetation, there are substantial areas of native vegetation in nearby reserves. The Piccaninny Bushland Reserve and the Kulwin Flora and Fauna Reserve are located at the northern end of the Kulwin deposit and the F1 Block and McBains Bushland Reserve are located mid-south of the WRRP deposits.

The existing native vegetation is limited in area, is generally in poor condition, occurs in disconnected patches and provides limited habitat for native fauna. Further information on the existing native vegetation is contained in the Chapter on Biodiversity and Habitat in this report.

16.1.3 Soils

Previous broad scale soil surveys and the more recent specific site soil surveys have identified the landforms and soil types that occur in the project area. The four land systems that occur in the Project area are briefly described on page 7-211 of the EES:

A general description of the soils is given in Appendix S on page 4 in the following terms:

The soils of the Mallee are complex and within the Ouyen area range in texture from sands, and sandy loams to clays, often dominated by carbonates and primarily transported by aeolian processes. Topsoil in the area is generally sand textured, and subsoils are frequently saline and can be sodic. Carbonate layers or nodules are present and acid-forming materials may exist below the water table (EGi, 2004). Boron is present in some soils at concentrations potentially toxic to plants. Refer to Section 5 for a detailed description of baseline soil characteristics in the Project area.

The soil analyses indicate that the soils of the project area are typical of the Mallee area. The soils are often problematic for plant growth, especially in the swales. The topsoils are thin, especially on the dune ridges, and subsoils are commonly saline and often calcareous with some areas exhibiting sodicity in the subsoil, which negatively affects soil structure. Boron levels can also be at levels that impact on plant growth.

More detailed soil sampling and chemical analyses will be needed prior to the removal of topsoil and subsoil to identify soil characteristics for use in managing excavated soils to prevent the rehabilitation being compromised.

16.1.4 Soil management

The EES describes the general approach to the preservation of topsoils and subsoils as a series of actions – refer page 7-244. The following are abbreviated versions of the most relevant actions with respect to rehabilitation:

- Final landforms will approximate the topography that existed prior to mining operations;
- Topsoil and subsoil will be stripped and stockpiled separately using conventional earthmoving equipment;
- The depth of soil stripping will be determined during operations and in accordance with protocols to be detailed in the soil and landform environmental procedure;

- Saline soils will be stockpiled and replaced separately to non-saline soils and their salinity levels regularly monitored;
- Dune and hummock subsoil stockpiles will separate the highly saline swale soils from the lower saline ridge and midslope soils to avoid possible contamination. Swale material may be highly saline from frequently overlying or intersecting with shallow watertables;
- Physical and chemical soil analyses will be conducted ahead of soil stripping operations to provide a baseline of existing soil conditions and to determine soil management (which may include the addition of gypsum or lime) during soil replacement;
- Topsoil will be stockpiled on a topsoil base and subsoil stockpiled on a subsoil base;
- Topsoil stockpiles will have a maximum height of 5 m for soils supporting agriculture and 2 m for soils supporting native vegetation. Subsoil stockpiles will have a maximum height of 10 m;
- Soils will be replaced as soon as possible to reduce compaction and retain vital organic components such as cryptogams.; and
- Topsoil and subsoil will be stripped from all disturbed areas including roads, carparks, workshop and laydown areas to prevent possible hydrocarbon contamination and assist successful rehabilitation.

Detailed descriptions of the procedures for stripping of topsoil and subsoil are provided in the EES on page 7-231. These procedures are based on the land unit involved and the expected rehabilitation of the land for either agriculture or native vegetation.

The collection of the top layer of soil from existing native vegetation areas that are to be cleared is especially important as this layer contains the seed bank that will be useful in the rehabilitation of native vegetation areas. After clearing, native vegetation plant material is to be collected and transported to rehabilitation sites or spread on stockpiles of topsoil that will be used for the revegetation of native vegetation. Some brush, habitat logs and especially trees with suitable nesting hollows will be harvested and retained for rehabilitation purposes.

The stripping depth of the topsoil and subsoil will take into account any significant variations in soil characteristics such as elevated salinity, the occurrence of calcium carbonate and elevated boron levels. Stripping will be done in discrete phases so that topsoil and subsoil from individual properties can be stockpiled separately and later returned to the same properties. This applies to both soil for agricultural land and soil for native vegetation re-establishment.

16.1.5 Stockpiles

Appendix S provides a great deal of specific information on stockpiling of the materials – see page 82.

Separate stockpiles will be needed for topsoil, subsoil, non-saline overburden and saline overburden. The stockpiles will be located on similar material, viz. topsoil on topsoil, subsoil on subsoil from which the topsoil has been removed, and overburden on overburden from which the topsoil and subsoil have been removed.

The surfaces of stockpiles need to be stabilised to prevent erosion of the stockpiled materials, especially erosion by wind. Stockpile slope angles will be kept low and ripping will be strategically used to stabilise stockpile surfaces to minimise erosion. Drainage from the stockpiles, particularly saline drainage from soils and from overburden, needs to be collected to prevent contamination of non-saline materials. The drainage will be directed back into the mine pit.

Natural crusting of the surface of stockpiles may provide adequate protection against wind erosion and prevent dust problems. If natural crusting is inadequate, a number of stabilisation techniques can be used. These include physical stabilisation such as mulches, chemical stabilisation using dust suppressants or soil binding agents, and vegetation such as sowing of a cover crop of rye corn.

For topsoil, the preference is for vegetation using a cover crop or through volunteer establishment of vegetation from surrounding crops. But if stockpiling occurs in the dry period of the year, a chemical stabiliser may be needed following the sowing dry of the cover crop. A similar approach might be used with subsoil while overburden may not readily support vegetation, especially if it is saline. The design of the larger overburden stockpiles (up to 15 metres) can also assist in stabilising the surfaces of these stockpiles.

If topsoil and subsoil are stockpiled during the wetter periods of the year they can be treated with soil ameliorants as indicated by soil chemical analyses. Sodic material can be treated with gypsum and this should improve soil structure and reduce the level of compaction. Nutrient deficiencies can be overcome by application of an appropriate fertiliser regime. Cultivation should only occur when the soil is moist – not wet or dry – to minimise the detrimental effect of the cultivation on soil structure.

16.1.6 Rehabilitation

A Rehabilitation Plan will be required as part of the Work Plan and a bond will be required to ensure that the Rehabilitation Plan is carried out, even if the proponent fails to complete the rehabilitation. The Rehabilitation Plan will provide the operating framework and the specific procedures to ensure that rehabilitation is undertaken to meet the objectives of the restoration of the land affected by the mining.

The overall objective of the rehabilitation proposal is described by the rehabilitation consultants on page 112 of Appendix S:

The proposed approach for the NMB Project is to return the site to a use similar to that before mining. In the case of agricultural land (the majority of the Project area), the end use objective will be to return the land to a productivity level comparable with that prior to the commencement of mining. Similarly, the end use objective for vegetated freehold and public land will be to restore native vegetation in accordance with the Native Vegetation Management – A Framework for Action (2003).

Effective rehabilitation of soils is primarily dependant on the way in which the materials are returned to the mined area. In general terms, the materials need to be replaced in the reverse order to the order in which they were removed. The EES describes the replacement on page 7-233 as follows:

The sequence of replacement into the mine voids (see Figure 4.3) will be as follows (from the pit base to the surface):

- *Saline overburden and oversize material from the MUP: saline overburden (with the exception of material from the start up pit) will be placed directly into the closest available void behind the MUP forming a working platform on which mining byproducts can be deposited. In some areas of the pit, non-saline overburden may be required to build the working platform to a minimum design level with respect to the watertable.*
- *Mining by-products: mining by-products will be allowed to settle and dry (estimated to take three months) sufficiently enough to support mobile plant.*
- *Non-saline overburden.*
- *Subsoil.*
- *Topsoil.*

Revegetation will follow using agricultural crops and pasture or native vegetation.

In general, the subsoil and topsoil layers will have a combined thickness of approximately one metre unless the existing soil depth is less than 1 m, or the soils are returned to low lying areas due to their high salinity. Opportunities to improve soil productivity will be explored where possible.

At the end of mining there will be an unavoidable increase in height of the restored mined area. It has been estimated that the increase in “bulk” of the mined material will be 5-10% of the original volume and that over time there will be a consolidation of around 5%. On this basis the EES states (page 7-242) that the height of the mined area will be about 1 metre higher than prior to mining. The increase in bulk provides an opportunity to slightly modify the pre-mining landforms by reducing the slopes of dunes and hummocks and raising the base of swales to increase their height above the saline watertable.

16.1.7 Revegetation trials

Revegetation trials are proposed during the operations phase of the mines to assess different rehabilitation techniques and build on the results of recent stockpile management trials conducted for the Kulwin test pit site.

The intention of the trials is listed in the EES on page 7-238 as follows:

- *Develop rehabilitation methods that will enable at least pre-mining productivity levels to be achieved.*
- *Optimise site rehabilitation techniques to enable handover of the land as soon as possible after mining is complete.*
- *Protect valuable natural resources on private and public land.*
- *Develop a better understanding and a measure of the changes to biodiversity above and below ground using different rehabilitation treatments (e.g., cropping, grazing and native vegetation).*
- *Develop techniques to achieve net conservation gain.*

More specific information about the trials, including trial location, timing and design are provided in Appendix S. This covers both agricultural land and native vegetation replacement. Trials will be subject to regular monitoring involving visual assessments and quantitative measures such as measurements of dry weight of plant growth.

16.1.8 Revegetation of agricultural land

Appendix S provides the following comments on page 102.

Prior to the disturbance of agricultural land, a baseline agricultural productivity assessment should be conducted for each property to be impacted by mining operations. Revegetation of crop and pasture should be conducted in close consultation with landholders and should be designed to meet key criteria, including the following:

- *Adequate vegetative cover of the soil surface to ensure soil protection.*
- *Use of species with resilience and tolerance to the local environment and climate.*
- *Ensuring that soil condition and productivity are sufficient to at least achieve pre-mining production.*

The proponent will explore opportunities to improve low-lying (high salinity) areas by increasing the depth of soil above the water table, eg by utilising soils from higher elevated and lower salinity areas within the same property boundary.

16.1.9 Revegetation of native vegetation

For native vegetation on **private land**, Appendix S provides the following comments on page 103.

The restoration of native vegetation on private land presents options and opportunities. In any case, consultation should be undertaken with landholders to derive the best possible outcome. The work is to be conducted in conformity with the Native Vegetation Management – A Framework for Action (2003). However, the principle of restoring the environment to at least pre-mining conditions will be adhered to. The options are:

- *Reinstatement of vegetation as it was previously placed.*
- *Revegetation of other sites on the farm and protection of remnant native vegetation to enhance habitat and farm shelter values.*
- *Conservation of remnants elsewhere by land purchase with Conservation Covenant Agreements or by Local Government Planning Scheme controls.*

The first option poses an issue in relation to cost and successful management particularly for isolated trees and small patches (<5 ha). Moreover, this option may not present the best opportunity for fauna habitat and flora movement, unless connected with other nearby

remnants. In addition, the long term survival of the restored remnant may be threatened by agricultural activities and climatic factors, such as wind exposure.

The second option has numerous advantages and is preferred because it may be possible in many instances to achieve multiple and common rehabilitation objectives in conformity with the Native Vegetation Management – A Framework for Action (2003).

The third option of Conservation Covenant Agreements is also favourable as it provides opportunities to protect threatened habitat within the Mallee ecosystem.

For native vegetation on **public land reserves, roadsides and railway land**, Appendix S provides the following comments on page 103:

Revegetation of public lands will be undertaken to ensure that the objectives of the land managers and the community are met. Under the Native Vegetation Management – A Framework for Action (2003), revegetation of these areas can be used as off-sets for private land disturbance. Net gain can be achieved by increasing the quality of the vegetation.

Revegetation surveys of public lands will be undertaken to ensure that the objectives of the land managers and the community are met (refer below).

Three methods of revegetation of native vegetation will be considered. These are: natural regeneration, direct seeding and seedling establishment. The results of natural regeneration can be variable, as they are very dependant on seasonal conditions. Direct seeding can be effective for some species while the transplanting of seedlings is generally very effective.

With all three options, weed control and the control of pest animals, such a rabbits, will be important. Areas should be fenced to keep out farm stock.

16.1.10 Revegetation of Tailings Storage Facility

The EES on page 7-237 states that at the completion of ore processing at each mine, the tailings storage facility will be decommissioned in compliance with the DPI's *Environmental Guidelines: Management of Tailings Storage Facilities*, (2004). After being allowed to dry, the area will be ripped and gypsum applied and capped with at least 2 metres of non-saline overburden and shaped to blend with the surrounding topography. The subsoil and topsoil stripped from the area prior to construction of the facility will be placed on top of the overburden cap and a cover crop or pasture sown. Since the final surface of each facility will be at least 2 metres higher than the original land

surface (the areas were selected because they were low lying and saline) the rehabilitated land is expected to be more productive than when it was in its original state.

16.1.11 Revegetation of infrastructure areas

Besides the rehabilitation of land directly disturbed by the mining, other areas of each mine site will also need rehabilitation. These other areas include the areas where stockpiles had been placed, the on-site dams, the infiltration basins and the areas on which infrastructure has been established, eg offices, car parks, processing plant and access roads.

16.1.12 Criteria and monitoring

Closure criteria have been developed for each stage of vegetation development. A 4-stage process has been prepared for agricultural land and a 5-stage process for native vegetation. Further details are provided in Appendix S in Tables 37 and 38.

The time frame for agricultural land will be shorter as the productivity criteria are more easily established for annual crops and pasture. Criteria are likely to be achieved in a few years, depending on climatic conditions. The time frame for native vegetation will be much longer, eg 10 years or until the closure criteria have been achieved. The re-establishment of ecological values of EVCs may be a very long process but the rehabilitation consultants are of the view that achievement of stability of the land should be clearly observable by 10 years.

Regular monitoring of rehabilitated areas is proposed, especially during the first 12 months. This will help ensure that any problems, eg nutrient deficiencies in agricultural crops, extent of weed invasions in native vegetation, are quickly identified and corrective action taken. On-going monitoring will be less frequently than in the first year with native vegetation being monitored after 1, 2, 5 and 10 years after project completion.

16.1.13 Final Concept Plan

The EES on page 7-241 provides information about the final concept plan:

The final concept plan will be established in consultation with landowners, to provide a basis for rehabilitation activities throughout the life of the Project. The plan will detail the end use and the general characteristics of the site at the completion of rehabilitation. The final concept plan will form part of the detailed rehabilitation plan which will be part of the mining work plan.

The success of the proposed rehabilitation program will be measured by the extent to which rehabilitation closure criteria are achieved. Examples of these criteria, specifically adapted for the characteristics of the Project area, are listed in Appendix S.

Closure criteria will be further developed in consultation with landholders, relevant government authorities, community and other stakeholders. This consultation will ensure that there is broad agreement on the end objectives and the basis for measuring the achievement of each objective.

Long-term monitoring will be conducted after Project completion and continued until closure criteria are achieved and the rehabilitation bond is returned.

16.2 Issues

The rehabilitation issue identified by the proponent, the rehabilitation consultant, submitters and the Inquiry were:

- Landform, soils and materials management;
- Rehabilitation of the tailings storage facilities;
- Rehabilitation trials and their assessment;
- Contingency measures if trials and rehabilitation fail;
- Re-establishment of native vegetation; and
- Communication of the results of rehabilitation.

Apart from matters relating to landform, soils and mine materials, most of the submissions focussed on issues relating to the re-establishment of native vegetation.

16.2.1 Landform, soils and materials management

The DPI raised the following matters in its written submission:

- *DPI will require details of topsoil management for areas of native vegetation and agriculture in the work plan.*
- *DPI will require details of topsoil, subsoil and saline and non-saline overburden stockpiling techniques to be described in the work plan.*
- *DPI will require an assessment of whether separate management of subsoil components is warranted in the work plan.*
- *DPI will expect a commitment to identify, in consultation with the landowner, any opportunities to get an improved final landform e.g., by reducing the steep faces on sand dunes to give better profile for future cropping activities, to be included in the work plan.*

The rehabilitation consultant responded by referring to sections in Appendix S that covered these matters and stated that he supported the details being included in the Work Plan.

The DSE raised the following matters in its written submission:

- *The body of the EES and Rehabilitation Plan (included as Appendix S of EES) provide conflicting estimates of the degree of swell or increase in topographical elevation once overburden and mine by-products are returned to the mine void. The Rehabilitation Plan (page 95 of Appendix S) cites swell of as 4 – 6 metres before settling to provide a final swell of about 2 – 4 metres. The body of the EES cites a swell of 1 metre.*
- *Similarly, the statement that topography will be followed where possible in terms of the final landform is fairly non-committal. The expressed view that a raised landscape could be beneficial raises some concern that thinking in regard to the final landform may be too simplistic.*

The rehabilitation consultant responded by advising that:

- The estimates of change in topographical elevation in the two documents are not directly comparable. The calculation of increase in topographical elevation in the EES was based on updated figures regarding volumes of materials and these were not available at the time of preparing Appendix S. Also, the estimate in Appendix S was calculated for a specific location where the maximum pit depth occurred whereas the EES data refers to the entire mine area rather than a specific location.
- The statement in Appendix S that *"Final landforms will approximate the topography that existed prior to mining operations (eg. Dunes and swales)"* should have the following additional statement: *"Ensure that the variation in elevation with distance along the pits closely matches the topography profile that existed prior to mining operations with final landforms conforming to pre-mining terrain characteristics as closely as possible."*

16.2.2 Rehabilitation of the tailings storage facilities

The DPI raised the following matters in its written submission:

- *DPI suggests that Iluka identify alternative end use options for the tailings storage facility or alternative sources of topsoil if the final surface is too saline to support pasture.*
- *DPI will require a material balance in the work plan to explain how rehabilitation materials will be provided for the pit void and capping*

the tailing storage facilities, particularly regarding volumes of saline and non-saline overburden.

The rehabilitation consultant responded by advising that:

- At the time of preparation of Appendix S, the tailings storage facility was not part of the project design. The suggested mitigation measures (by DPI) should be added to those in the EES regarding rehabilitation of the tailings storage facility and be incorporated into subsequent revisions of the Rehabilitation Plan.
- Updated quantities of material to be disturbed by the project were provided in the EES on page 4-9 and it is agreed that a material balance should be provided in the Work Plan.

16.2.3 Rehabilitation trials and their assessment

The DPI raised the following in referring to information provided by the proponent that *“revegetation trials have been underway at the project for some time”*:

- *DPI will require that any results and recommendations from the trials be incorporated into the rehabilitation plan within the work plan.*

The rehabilitation consultant responded by advising that:

- The results and recommendations from the rehabilitation trials will be incorporated into the Work Plan during the annual review of the Rehabilitation Plan and will then become part of the Work Plan.

The Victorian Malleefowl Recovery Group (VMRG) raised the following matter in its written submission:

- *The suggested trials for revegetation need to be questioned. It is possible that all trials fail and therefore the revegetation requirements will not be met. Consequently there may be no agreed way to successfully revegetate and restore the mine area to meet the requirements of the Native Vegetation Management Framework.*

The rehabilitation consultant responded by advising that:

- Appendix S specifies that weekly maintenance inspections will be conducted for at least 12 weeks (page 110), and that monitoring and maintenance will be conducted using the broad criteria set out for rehabilitation and mine closure. *“Unsuccessful rehabilitation at mine sites is usually caused by a lack of sufficient field trials and monitoring. These factors are critical to ensure that revegetation will be successful within the local environmental setting of the project.”*

Bird Observation and Conservation Australia (BOCA) raised the following matter in its written submission:

- *Trials of revegetation techniques are only to be carried out after mining has commenced (Appendix S, section 7.5.3). This presupposes that Iluka will be able to successfully revegetate the site. The proposed trials will only assess the germination and growth of plants for 12 weeks, an inadequate time frame for comparing revegetation techniques (direct seeding vs seedlings) or for assessing the long term success of a revegetation technique.*

The rehabilitation consultant responded by advising that:

- The requirement for revegetation trials to be conducted during operations is sufficient, as it is supported by completion criteria for revegetation. The specified monitoring period for the revegetation trials of at least 12 weeks will be sufficient to identify any general maintenance issues for the provision of successful revegetation. In addition, monitoring of all rehabilitated areas will be undertaken for at least 12 months or until rehabilitation has stabilised.

16.2.4 Contingency measures if trials and rehabilitation fail

The VMRG raised the following matter in its written submission:

- *The information in the EES does not address the implications of adverse long term monitoring results or failure of revegetation at pit site. There is an assumption that monitoring will only be required for a limited time and the proposed revegetation will be successful in the short to mid term. A much longer view may need to be incorporated into the monitoring phase to take account of climate change and extended drought conditions. Monitoring may need to continue for a time period in excess of ten years.*

The rehabilitation consultant responded by advising that:

- The requirement to meet completion criteria means that successful revegetation is a condition of site closure. Appendix S states that: *"decommissioning will continue for a period of time until it is demonstrated that closure criteria are achieved."*

BOCA raised the following matter in its written submission:

- *The EES does not provide clear contingencies for failure of revegetation plans.*

The rehabilitation consultant responded by advising that:

- This has been sufficiently dealt with through the provision of contingency measures and closure criteria for rehabilitation.

The Mallee Catchment Management Authority (MCMA) raised the following matter in its written submission:

- *Page 115 of Appendix S lists proposed maintenance activities for failed rehabilitation, which does not include replacement of dead seedlings. If plants fail to survive, they should be replaced in addition to the listed works.*

The rehabilitation consultant responded by advising that:

- The contingency measures for when rehabilitation has been unsuccessful state that appropriate action should be implemented which may include replacement of vegetation. The mine rehabilitation completion criteria for native vegetation also ensure that plants that fail to survive will be sufficiently replaced.

16.2.5 Re-establishment native vegetation

The DPI raised the following matter in its written submission:

- *DPI will require a commitment to develop completion criteria to determine when rehabilitation has been achieved to the required standard in the rehabilitation plan as part of the work plan. DPI will consult the landowner and the council prior to releasing the rehabilitation bond.*

The rehabilitation consultant responded by advising that:

- Completion criteria for rehabilitation have been developed for the project - see Tables 37 and 38 in Appendix S.

The VMRG raised the following matters in its written submission:

- *Revegetation will be long term and will need to take account of climate change and drought. This is a very long term process that may take a minimum of 10 years and a maximum of 30 or more years. Is Iluka prepared to commit to such a long haul?*
- *Revegetation on public land needs guaranteed funds for the long term in the same way as the guaranteed bond agreement between Iluka and the DPI for restoration of agricultural land. This guarantee fund for public land is essential for long term restoration, especially to address areas of unsuccessful initial and subsequent plantings in order to return the mine area to its pre mining state, and to ensure the required planting numbers in offset areas are met.*

- *The revegetation plan needs to address the implications of potential mine closure before the completion of project.*

The rehabilitation consultant responded by advising that:

- With regard to the length of time required for rehabilitation, the vegetation in rehabilitated areas would be expected to reach a sufficient state of development to allow assessment of its ongoing persistence within a 10 year timeframe post mine closure. Monitoring will need to continue beyond the 10 year timeframe if required, until the ecological completion criteria are satisfactorily met. Appendix S states *"decommissioning will continue for a period of time until it is demonstrated that closure criteria are achieved."*
- With regard to guarantees for the revegetation of public land, he believes that this issue is sufficiently dealt with in the legislative requirements for the project. The *Mineral Resources and Development Act 1990* states that *"Prior to commencing site works a Rehabilitation Bond must be lodged by the licensee with the DPI. The amount of the Rehabilitation Bond is decided by the DPI after consultation with the local council and the owner of the land. The DPI may also at a future date, after consultation with the licensee, impose an additional rehabilitation bond upon the licensee if it is deemed that the amount of the original bond is insufficient."*
- With regard to early mine closure, this has been addressed sufficiently in Appendix S through the requirement for progressive rehabilitation of disturbed areas, the provision of completion criteria as well as the requirement for revegetation trials.

BOCA raised the following matters in its written submission:

- *The proposal to monitor the success of revegetation works 'on a regular basis' for 12 months (Appendix S, section 7.6) and then at 1, 2, 5, and 10 years (Appendix S, section 7.8.5) is unacceptable. As this is a semi-arid environment and the likelihood of failure of revegetation is high, monitoring needs to be conducted monthly in the first year and then annually for the next 10 years. Monitoring must also be conducted beyond 10 years.*
- *The revegetation plan seems to be centred on the establishment of fast-growing acacias to provide cover and food for Malleefowl. However, these acacias are also short-lived and will not provide suitable habitat for Malleefowl and other species of the Victorian Mallee Bird Community in the long term. Any revegetation plan must ensure that a suitable succession of species occurs and leads to a high level of species diversity in the long term. Any species used in*

the revegetation plan must be indigenous to the area and of local provenance.

The rehabilitation consultant responded by advising that:

- With regard to the monitoring of revegetation, it is agreed that there is value in specifying that monitoring of rehabilitated areas is to be conducted at least on a “monthly” basis for the first 12 months and then ongoing until rehabilitation has stabilised. It is considered that the vegetation in rehabilitated areas would be expected to reach a sufficient state of development to allow assessment of its ongoing persistence within a 10 year timeframe post closure.
- With regard to species diversity, the required completion criteria address these concerns sufficiently. The completion criteria for native vegetation in Table 37 of Appendix S state the requirement that “A representative range and frequency of local eucalypt and acacia and other species are present. Shrubs, ground cover and microbiotic soil crusts present (Compare with undisturbed sites).”

The Victorian National Parks Association (VNPA) raised the following matters in its written submission:

- *Monitoring of the success of the regeneration and amelioration where required is also essential and should continue for several decades, given climate change and prolonged drought, not merely for a few years.*
- *In addition, the revegetation proposed is very ambitious involving 100,000 seedlings over a large area. In this difficult climate much watering and replacement of failed regeneration will be required. Considerable resources will be required for this and a substantial bond is required.*

The rehabilitation consultant responded by advising that:

- With regard to monitoring of revegetation, it is considered that the vegetation in rehabilitated areas would be expected to reach a sufficient state of development to allow assessment of its ongoing persistence within a 10 year timeframe post closure. Monitoring will continue beyond the 10 year timeframe if required, until the completion criteria are satisfactorily met.
- With regard to the magnitude of the revegetation, he believes that this issue is sufficiently dealt with in the legislative requirements for the project. The *Mineral Resources and Development Act 1990* requires that prior to works commencing a Rehabilitation Bond must be lodged by the licensee with the DPI. The amount of the Rehabilitation Bond is decided by the DPI after consultation with the local council and the

owner of the land. The DPI may also at a future date, after consultation with the licensee, impose an additional rehabilitation bond upon the licensee if it is deemed that the amount of the original bond is insufficient.

16.2.6 Communication of the results of rehabilitation

The DSE raised the following matter in its written submission:

- *The reliance on 'revegetation technique testing' during the mining operation and the inability of the EES to draw on examples of successful revegetation of like mine sites does not provide a high level of confidence that adequate revegetation will be achieved.*

The rehabilitation consultant responded by advising that:

- The rehabilitation requirements of every site will be different. Unsuccessful rehabilitation at mine sites is usually caused by a lack of sufficient field trials and monitoring. Appendix S has identified the importance of revegetation trials during the early phases of the project to optimise site rehabilitation techniques.

The Mallee Catchment Authority raised the following matter in its written submission:

- *We believe all results from revegetation trials should be shared with relevant stakeholders upon request to assist in similar works being carried out by various bodies and individuals in the region.*

The rehabilitation consultant responded by advising that:

- The current requirements for consultation and disclosure regarding rehabilitation are sufficient. Appendix S states that the rehabilitation objectives will be developed in consultation with all stakeholders prior to and during the mine site rehabilitation. The proponent may choose to make the results of the revegetation trials available during these consultations; however, this is not believed to be required under current legislation. However, it is recommended that the proponent report results of rehabilitation to relevant land managers on a regular basis.

Other issues

The EPA was concerned that the EES does not outline the proposed rehabilitation of the seepage basins post active mining. How the seepage basins are rehabilitated may impact on groundwater levels and associated impacts that differ from the mining phase, eg no mine void to act as a drawdown from groundwater. The EPA recommended that the mine closure

plan has an assessment of the impact of rehabilitation of the seepage basins on groundwater levels.

The rehabilitation consultant responded by saying that:

The EES Report was completed prior to the details of the infiltration basins being included in the project design. The decommissioning of the infiltration basins will be as per the EES (page 7-237). The details of rehabilitation of infiltration basins will need to be incorporated into subsequent revisions of the Rehabilitation Plan.

I support the proposed assessment being part of the mine closure plan.

Other submitters who raised rehabilitation matters and which elicited a response from the rehabilitation consultant were:

- Mr Gil Hopkins re replacing the strata in the correct order, inclusion of the collection and deposition of leaf litter and the current lack of rehabilitation trials.
- WWF – Australia re the need to locate stockpiles outside areas where amethyst hairstreak butterfly habitat occurs.
- Ouyen Incorporated re who would conduct the detailed monitoring programs.

16.3 Inquiry response

The Inquiry acknowledges that a number of well prepared and extensive submissions were received that raised the range of matters regarding rehabilitation and that have been summarised above. The following commentary by the Inquiry deals with each of the issues.

The submissions concentrated on the rehabilitation of native vegetation with only limited reference to the rehabilitation of agricultural land. However comments on landform, soils and materials management were generally not specific to either native vegetation or agriculture.

16.3.1 Landform, soils and materials management

DPI was the submitter that provided the most commentary on landform, soils and materials management although Mr Gil Hopkins was also concerned about replacing the disturbed materials in the correct order and DSE questioned the commitment to restore the original landforms.

The requirement raised by the DPI for details of topsoil, subsoil and saline and non-saline overburden stockpiling techniques to be described in the

Work Plan seems very appropriate to the Inquiry. The Inquiry notes that the rehabilitation consultant supports this information being in the Work Plan.

DSE were somewhat sceptical about whether the final landform would approximate the topography that existed prior to mining. The Inquiry observes that the rehabilitation consultant advised that he would recommend the statement in Appendix S be amended to make the intention clearer by the use of additional wording.

The Inquiry accepts in principle the desirability of restoring the pre-mining landforms as far as practical, bearing in mind the desires of the individual landowners. Since the width of the rehabilitated mine will be quite narrow, eg based on a pit width of 45 to 100 metres, it is difficult to see how any great deviation in the original landform could occur. The rehabilitated land will need to “match up” with the existing landform on either side of the mine pit.

The increase in elevation of the rehabilitated area

The DSE has drawn attention to differences in the degree of elevation of the land following rehabilitation. The figures for elevation vary from 1 metre in the EES to as high as 4 – 6 metres (before settlement) in Appendix S. While there is no doubt that there will be a “swelling” of the material that has been replaced in the mine void, the differences in the estimated increase in the elevation of the rehabilitated land appears far greater than could be explained by “settlement” of the materials.

The Inquiry finds that the concern raised by the DSE is an appropriate one and that the newer estimate included in the EES may be more realistic than the estimates in Appendix S, which were based on different data. The estimated increase in elevation may need revision depending on the results of a material balance in the Work Plan as required by DPI for the rehabilitation of the tailings storage facilities.

The Inquiry notes that the rehabilitation consultant has stated that the updated estimate of change in topographical elevation will need to be incorporated into subsequent revisions of the Rehabilitation Plan.

16.3.2 Rehabilitation of the tailings storage facility

The DPI has quite rightly, in the view of the Inquiry, raised concerns about the rehabilitation of the tailings storage facilities. As was pointed out in the EES, these facilities will be located in low lying, saline areas. Although it is proposed to provide 2 metres of non-saline overburden to cover the tailings, the use of the original subsoil and topsoil from the each tailings area will mean that the rehabilitated soils will still exhibit their original tendency to

saline characteristics, notwithstanding the potential to treat the soils with gypsum (The Inquiry notes that it is intended to rip and then apply gypsum to the dried mining by-products but there is no direct mention of applying gypsum to the soils).

The Inquiry finds that DPI's concern that the establishment of pasture over the rehabilitated tailings storage facilities may not be the best option for the rehabilitation to be a reasonable concern. Perhaps the sowing of some more saline-tolerant plant species, including some species of native vegetation, might provide a more persistent cover than pasture.

The DPI is also concerned about the source of large volumes of non-saline overburden required for rehabilitating the tailings storage facilities, viz. *2,240,000 m³ of material at Kulwin and 1,200,000 m³ of material at WRRP*. Clearly, these are large volumes and the rehabilitation consultant acknowledges that the quantities of material to be disturbed have changed since Appendix S was prepared. Therefore DPI's requirement for a material balance in the Work Plan to explain how rehabilitation materials will be provided for the pit void and the capping of the tailing storage facilities, seems very appropriate and is supported by the Inquiry.

The Inquiry notes the response by the rehabilitation consultant that the commitments relevant to the rehabilitation of the tailings storage facilities contained in the EES will need to be incorporated into subsequent revisions of the Rehabilitation Plan.

16.3.3 Rehabilitation trials and their assessment

The Inquiry notes that concerns were expressed about trials and revegetation technique testing by several submitters – DPI, VMRG and BOCA. These concerns were quite varied:

- The need to ensure that information from current trials at the Kulwin test pit are included in the Rehabilitation Plan;
- The possibility that all trials fail; and
- The limited time during which trials on 'revegetation technique testing' will be assessed.

The rehabilitation consultant has responded to each of the concerns that have been raised. These responses included referring the submitter to the appropriate section of Appendix S as well as accepting some ideas for inclusion in the Rehabilitation Plan. However, the Inquiry particularly noted comments by the consultant that unsuccessful rehabilitation at mine sites is usually caused by a lack of sufficient field trials and monitoring. The

consultant also emphasised the importance of revegetation trials during the early phases of the project to optimise site rehabilitation techniques.

The Inquiry finds that on-site trials will be useful, particularly as the more detailed assessments of trials are likely to be superior in obtaining objective data compared to observations and monitoring of large areas of revegetation. In this respect, the Inquiry notes the intention to use such design techniques as Latin Squares and series of test strips to assess parameters where there are identifiable gradations in the land, eg slope, soil characteristics, etc.

The Inquiry acknowledges that such trial techniques are probably more adaptable to experiments involving agricultural land than for land being rehabilitated with native vegetation.

16.3.4 Contingency measures if trials and rehabilitation fail

Some submitters, eg VMRG and BOCA, were concerned about the effect of failure of the revegetation trials and the rehabilitation techniques. The impacts of climate change and drought were mentioned in this context. This concern raised the question of contingency planning for such adverse effects on the proposed rehabilitation plans.

The rehabilitation consultant responded to these submissions by referring the submitters to the contingency measures in Appendix S for when monitoring of rehabilitation indicates that treatments have been unsuccessful or inadequate. The Inquiry notes that the regular monitoring of rehabilitation trials will take place; more intensely, eg weekly, for at least 12 weeks and then less frequently. The Inquiry also notes that rehabilitated areas will be monitored for some years, eg 1, 2, 5 and 10 years, and longer if needed until key criteria have been achieved.

The Inquiry is of the view that the proposed monitoring regime and the maintenance regime should be adequate to ensure that an acceptable rehabilitation of the land can be achieved. How successful the rehabilitation will be in terms of revegetation will be dependant on the closure criteria that are to be further developed. Successful re-establishment of native vegetation may be one objective but the re-establishment of the ecological values of EVCs is more complex and longer-term objective.

16.3.5 Re-establishment of native vegetation

A number of the submitters expressed concern that the re-establishment of native vegetation will be a long term process and would require much longer monitoring than 10 years. This need for extended periods of monitoring also raised issues about how the long-term monitoring would be assured after the

closure of the mines, the funding required to complete the revegetation and who would undertake the monitoring.

The Inquiry notes that DPI will require a bond from the proponent to ensure that the costs of rehabilitation are covered and that if necessary, the DPI can require an additional bond if the initial bond is shown to be insufficient. The Inquiry also notes that the rehabilitation consultant stated in a number of his responses to submitters that the requirement to meet completion criteria is a condition of site closure. He also expressed his view that the vegetation in rehabilitated areas would be expected to reach a sufficient state of development to allow assessment of its ongoing persistence within a 10 year timeframe post closure.

In the view of the Inquiry, there is no doubt that the re-establishment of native vegetation is a long-term process. The Inquiry also accepts that the process would be affected by climate change and the impacts of an extended drought. However these are not matters that will prevent rehabilitation; they are much more likely to affect the form of rehabilitation achieved. The Inquiry expects that after 10 years of monitoring and contingency actions, the native vegetation will be sufficiently established to provide a persistent cover of the land. Whether the completion criteria are achieved at that time will be dependant on what will be specified in the finalised closure criteria.

16.3.6 Communication of the results of rehabilitation

The MCMA was keen to have the results of vegetation trials shared with various bodies and individuals in the region who undertake similar revegetation works. DSE also raised the matter of communication of revegetation information when it queried the reliance on 'revegetation technique testing' rather than drawing on examples of successful revegetation of similar mine sites.

The Inquiry was surprised that more evidence of successful rehabilitation was not provided by the proponent, especially as it has substantial experience in rehabilitating mined land. In saying this the Inquiry acknowledges that there is a reference on page 7-238 in the EES to drawing on experience at the proponent's Douglas mine and the Murray Basin Titanium's Wemen mine.

The Inquiry acknowledges that its members took the opportunity to inspect the proponent's Douglas mine to see, inter alia, the progress of rehabilitation at that mine site. The Inquiry is aware that similar inspection opportunities were accepted by local stakeholders to visit the Douglas mine site and the Wemen mine site near Robinvale.

16.4 Findings and recommendations

The Inquiry finds that:

- The basis of the proposed rehabilitation, with its emphasis on landforms, soils and materials management, appears sound;
- The proposal to use soil sampling to identify soil characteristics, especially the identification and subsequent separation of soils exhibiting detrimental levels of salinity, boron and sodicity and to place them lower in the restored soil profile, appear practical;
- The conduct of field trials will be useful in determining actions to improve the rehabilitation of land and to optimise rehabilitation techniques for native vegetation;
- Long term monitoring well beyond 10 years after mine closure may be required to fully assess the re-establishment of the ecological values of EVCs;
- The closure criteria need further development utilising consultations with affected landholders, relevant government authorities and other stakeholders to determine more specific criteria than are currently provided in Appendix S;
- There are realistic expectations that rehabilitated agricultural land will be as productive after a few years as the land was prior to mining and that land affected by materials detrimental to plant growth has the opportunity for its productivity to be improved above pre-mining levels;
- Rehabilitating land for the re-establishment of native vegetation should be successful;
- The sharing of relevant data and experiences of vegetation trials with various bodies and individuals in the region is desirable; and
- The rehabilitation of the tailings storage facilities requires further assessment, including a revised materials balance for the source of non-saline overburden, and to determine the most appropriate future use of the rehabilitated tailings sites.

The Inquiry recommends that the Work Plan not be approved unless it contains:

- An adequate rehabilitation plan for agricultural land and native vegetation land based on the information and guidance provided in the report *Northern Murray Basin Project – Rehabilitation Assessment and Plan for the Ouyen Deposits*.

PART C: EVALUATION AND ASSESSMENT

17. TERMS OF REFERENCE

17.1 Potential Environmental Effects

The Inquiry's terms of reference require it to:

- inquire into and make findings regarding the environment effects of the proposed project, including impacts on relevant matters under the EPBC Act; and
- recommend any modifications to the project as well environmental mitigation and management measures that are needed to achieve acceptable environmental outcomes.

Below are the Inquiry's key findings and additional mitigation and management measures recommended to address the potential environmental impacts:

17.1.1 Surface water and water supply

Findings

- Given the implementation of the surface water management measures proposed and the application of guidance provided by EPA Publication 480 *Environmental Guidelines for Major Construction Sites*, impacts on surface waters will be acceptable;
- The proposed supply of freshwater by a combination of treatment of saline water from the site and water supplied via the Northern Mallee pipeline is sound and the statutory approval regime can be expected to ensure implementation without significant risk to the environment; and
- Surface water impacts will have no effect on Ramsar sites.

Additional mitigation and management measures

- Sediment management will be conducted in conformance with EPA Publication 480 *Environmental Guidelines for Major Construction Sites*.

17.1.2 Groundwater

Findings

- No adverse impacts are expected from the lowering of the watertable by dewatering and mining;
- Impacts on groundwater quality will be minimal and are extremely unlikely to adversely impact on the beneficial uses of groundwater

protected under the *State Environment Protection Policy (Groundwaters of Victoria)*;

- Predicted impacts on groundwater levels and quality will have no impact on Ramsar sites;
- The water balance estimate and the prediction of infiltration basin performance provided in expert evidence to the Inquiry are sound and acceptable;
- In all likelihood the proposed infiltration basins will provide sufficient water disposal capacity for the project without adverse impact in terms of salinisation of the root zone or surface;
- Monitoring of infiltration basin performance, particularly in terms of the impact on groundwater levels, is required and should be designed to enable detection of departures from predicted performance such that action to prevent adverse impacts can be taken;
- Monitoring of suspended solids in the infiltration basins is unlikely to provide valuable information on infiltration basin performance; and
- The impacts on groundwater flow caused by changes in the aquifer properties within the mining void will be negligible.

Additional mitigation and management measures

- A monitoring program that will enable assessment of infiltration basin performance in such a way that any rise in the watertable below the basins can be detected; and
- The establishment and definition of action trigger levels plus descriptions of actions to be taken in the event of trigger levels being reached.

17.1.3 Biodiversity and habitat

Findings

- The decision by Iluka to review the size of the project and reduce the amount of native vegetation to be removed from 500 ha to 256 ha will avoid the removal of some existing native vegetation;
- Despite the areas of native vegetation to be removed, there is policy support in the planning framework to support the sand mining project;
- Having regard to the Framework's requirements, the Inquiry considers that removal of vegetation of both very high conservation significance and high conservation significance may be justified in this matter because:
 - The economic significance of the project (which is estimated to be \$1000 million) and other socio-economic benefits of the project to the region;

- The provision of offsets, including the prospect of actually improving habitat for the threatened species; and
- The additional offset in the form of a financial contribution of \$300,000 to the VMRG to assist in the implementation of the National Malleefowl Recovery Plan.
- Iluka has identified a range of appropriate measures to minimise the extent of native vegetation removal and therefore satisfies the Framework's guidelines. Further opportunities to minimise vegetation loss should be included in the Environment Management Plan's (EMP) Vegetation Management Plan;
- The Inquiry considers the offset calculations developed in the EES are in accordance with the Framework's guidelines, and notes that that DSE did not seriously question the proposed offsets identified in the EES;
- Having regard to the proposed revegetation and the apparent adaptability of the Regent Parrot to access alternative flight paths, the Inquiry considers that the Murray Basin Mineral Sands 2 project will not have a significant adverse impact on the Regent Parrot species;
- Having regard to the fragmented nature and lack of protection of the Malleefowl habitat to be affected by the WRRP mine, as well as the offset management programs required under the Framework, the Inquiry considers that the proposed project will not have a significant adverse impact on the Malleefowl species. Further, the Inquiry considers the \$300,000 funding to be provided by Iluka will provide further opportunities to assist in the recovery of the Malleefowl species in the region;
- It is not necessary that the funds to be provided by Iluka for the conservation of the Malleefowl are directly made to the DSE to manage the program, however any final funding arrangement must be to the satisfaction of the DPI (as the State Government department responsible for approving the Work Authority);
- The Malleefowl conservation program to be developed by the funding should be overseen by a committee comprising the proponent, the DSE, Parks Victoria, the DEWHA and the VMRG; and
- The Native Vegetation Management Plan should include details as to how the Amethyst Hairstreak Butterfly habitat can be avoided and that opportunities to enhance the Bitter-bush Blue Butterfly habitat should be developed.

Additional mitigation and management measures

- That the Work Plan not be approved unless the EMP contains the following:
 - Native Vegetation Management Plan including:

- Native Vegetation Offset Plan; and
- Native Vegetation Clearance Plan.
- Weed Management Plan;
- Pest Management Plan; and
- Wildlife Management Plan.

17.1.4 Air quality

Findings

- The results of on-site monitoring conducted by the proponent show that background PM₁₀ concentrations of PM₁₀ can exceed the assessment criterion for PM₁₀ without contributing from mining.
- The results of modelling predict that the concentration in the air of:
 - PM₁₀ at sensitive receptors near the Kulwin mine can be expected to remain below the criterion for this indicator as specified in the *Protocol for Environmental Management – Mining and Extractive Industries*;
 - PM₁₀ at sensitive receptors near the WRRP mine can be expected to exceed on some days the criterion for this indicator as specified in the *Protocol for Environmental Management – Mining and Extractive Industries*;
 - PM_{2.5} concentrations and the rate of dust deposition at all sensitive receptors near both mines can be expected to remain below the criteria for these indicators as specified in the *Protocol for Environmental Management – Mining and Extractive Industries*;
 - The concentration of respirable crystalline silica as PM_{2.5}, heavy metals and the products of the combustion of diesel fuel at all sensitive receptors near both mines can be expected to be significantly below the criteria for these indicators as specified in the *Protocol for Environmental Management – Mining and Extractive Industries*;
- Except for PM₁₀ concentrations at the sensitive receptors to the south of the WRRP mine, the predicted margin by which compliance with the relevant criteria will be achieved provides significant confidence that emission control to achieve an acceptable result is possible;
- The prevention of exceedances of the PM₁₀ criterion at the nearest sensitive locations near both mines will require the use of real-time monitoring and the implementation of an effective reactive management strategy;
- In order to satisfy the requirements of the *State Environment Protection Policy (Air Quality Management)* and the *Protocol for Environmental*

Management – Mining and Extractive Industries the proponent needs to provide evidence in the Work Plan that the controls proposed for all relevant air quality indicators, as specified in the *State Environment Protection Policy (Air Quality Management)* are “best practice and “maximum extent achievable” for indicators specified as Class 3 indicators; and

- Monitoring requirements specified in the *Protocol for Environmental Management – Mining and Extractive Industries* must be satisfied.

Additional mitigation and management measures

- Adequate information in the EMP to satisfy the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries* to identify and evaluate “best practice” controls for all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and “maximum extent achievable” controls for indicators specified as Class 3 indicators;
- A dust emission management strategy that includes actions that are considered “best practice” for all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and “maximum extent achievable” controls for indicators specified as Class 3 indicators; and
- A monitoring program in the EMP that satisfies the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries*.

17.1.5 Greenhouse gas emissions

Findings

- Compliance with relevant sections of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency* is required;
- The magnitude of the proposed energy and water consumptions are such that the requirements of the *Environment Protection (Environment and Resource Efficiency Plans) Regulations 2007* will need to be satisfied and participation in the Commonwealth’s *Energy Efficiency Opportunities* (EEO) program will be mandatory;
- The greenhouse gas emissions from the mining activities are far greater than from the transport of HMC to Hamilton for further processing, about six times greater in magnitude;
- The much greater greenhouse gas emissions from the mining than from the transportation indicate that it is likely that there will be more opportunities for greenhouse gas reductions at the mines;
- The information provided in the EES and supporting documents identifying and committing to “best practice” does not satisfy the

requirements of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency*; however these requirements will need to be satisfied in the Work Plan;

- The use of rail rather than road to transport the HMC to Hamilton does not appear to be a realistic option at this time due to rail infrastructure limitations; however the rail option could be a preferred option in the future because of its lower greenhouse gas emissions; and
- The EES has not considered renewable and alternative energy supplies as these matters were not included in the Assessment Guidelines for the proposal.

Additional mitigation and management measures

- An Energy Consumption and Greenhouse Gas Emission Plan that demonstrates compliance to the satisfaction of the EPA, with the requirements of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency*;
- Plans to meet the requirements of both the Victorian *Environment and Resource Efficiency Plans* and the Commonwealth's *Energy Efficiency Opportunities* programs when relevant thresholds for energy use are reached;
- A Transport Management Plan that includes actions to be taken to investigate the option of transporting HMC to Hamilton by rail; and
- An Environmental Management Plan that includes actions to be taken to give consideration to the use of renewable and alternative energy supplies.

17.1.6 Noise

Findings

- Adequate protection of the acoustic amenity at residences will be achieved by:
 - Compliance with noise limits as specified in the *Interim Guidelines for Control of Noise from Industry in Country Victoria N3/89* (N3/89) during the Day and Evening as defined in N3/89; and
 - During the Night, as defined in N3/89, compliance with:
 - Noise limits specified in N3/89; or
 - A maximum noise level resulting in the noise level in any habitable room being 47 dB(A) or less; and
 - Application of guidance provided in section 12 of *Noise Control Guidelines* (TG302/92) including noise limits prescribed in that section.

- The noise assessment provided by the proponent and its acoustic consultant is adequate for the purposes of the Inquiry;
- There is a reasonable expectation that recommended noise limits can and will be complied with and the ultimate consequences of non-compliance will be borne by the mine operator; and
- The noise management system proposed is unsatisfactory because it is reactive, is not aimed at best practicable performance and requires negotiation with residents prior to action being taken at the mine site.

Additional mitigation and management measures

- The Work Plan not be approved unless it details a noise management strategy that:
 - Is aimed at compliance with prescribed noise limits, or better;
 - Includes identification of potential non-compliance with prescribed noise limits and the development of detailed plans to prevent predicted non compliance with prescribed noise limits;
 - Lists potential noise mitigation measures that may be applied to reduce noise emissions and the circumstances under which they will be applied;
 - Lists potential noise mitigation measures that may be applied at affected residences and the circumstances under which they will be applied;
 - Describes a process for keeping residents of potentially affected residences informed of actions taken on site and enabling negotiations on actions that could be taken at the residences; and
 - Includes noise monitoring that enables compliance testing and performance measurement.
- The following be included in the conditions attached to the approval of any Work Plan.
 - The licensee must ensure that noise levels at any sensitive receptor not exceed the noise limits specified in the *Interim Guidelines for Control of Noise from Industry in Country Victoria N3/89* except if the licensee provides the District Manager with a proposal for the substitution of a limit on the maximum noise level for the Night limit at a particular residence. Such proposal will include each of the following:
 - Be for a limit on the maximum noise level outside the residence of no more than 62 dB(A);
 - Include evidence of the consent of the owner and/or occupier of the residence to the application of the proposed noise limit;

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- If the proposed noise limit is greater than 57 dB(A), include evidence that noise at the proposed limit will not result in a noise level in a habitable room of greater than 47 dB(A); and
 - Include details of a monitoring program that will enable demonstration of compliance, or otherwise.

If the proposal is for a limit on the maximum noise level of 57dB(A) or less, the District Manager will approve the proposal providing he/she is satisfied with:

- The evidence of the consent of the owner and/or occupier; and
- The adequacy of the proposed monitoring program, assessed in consultation with the EPA.

If the proposal is for a limit on the maximum noise level of greater than 57dB(A), the District Manager will approve the proposal providing that he/she is satisfied with:

- The evidence of the consent of the owner and/or occupier;
- The adequacy, assessed in consultation with the EPA, of the proposed monitoring program; and
- The evidence, assessed in consultation with the EPA, that noise at the proposed limit will not result in a noise level in a habitable room of greater than 47 dB(A).

Once the proposal is approved the licensee must:

- Ensure maximum noise levels at the residence during the Night do not exceed the approved limit; and
 - Implement the proposed monitoring program to the satisfaction of the District Manager.
- Management of noise emissions during construction activities, with such activities being defined by the District Manager in consultation with the EPA, will be in accordance with the guidance provided in Section 12 of *Noise Control Guidelines TG302/92* and resultant noise levels at sensitive receptors must comply with the limits described in the Schedule in that Section of the guidelines.

17.1.7 Radiation

Findings

- The radiation assessment provided in support of the EES is adequate and provides soundly based estimates of potential impacts;
- The legal requirements under the *Radiation Act 2005*, which include compliance with relevant codes of practice, will result in the development and implementation of appropriate Radiation Management and Radioactive Waste Management Plans; and
- The implementation of the required plans can be expected to result in the minimisation of impacts from radiation to an extent where occupational and public dose levels will be well below prescribed limits.

17.1.8 Roads, traffic and transport

Findings

- The Work Plan should include a requirement for a Transport Management Plan developed by a working group comprising Iluka, VicRoads, Mildura Rural City Council and relevant emergency service organisations; and
- Iluka should continue its commitment to work with relevant State government departments to pursue the transport of HMC to Hamilton by rail.

Additional mitigation and management measures

- The Work Plan not be approved unless it contains a Transport Management Plan:
 - That is developed by a working group comprising Iluka, VicRoads, Mildura Rural City Council and relevant emergency service organisations; and
 - Includes actions to be taken to investigate the option of transporting HMC to Hamilton by rail.

17.1.9 Rehabilitation

Findings

- The basis of the proposed rehabilitation, with its emphasis on landforms, soils and materials management, appears sound;
- The proposal to use soil sampling to identify soil characteristics, especially the identification and subsequent separation of soils

exhibiting detrimental levels of salinity, boron and sodicity and to place them lower in the restored soil profile, appear practical;

- The conduct of field trials will be useful in determining actions to improve the rehabilitation of land and to optimise rehabilitation techniques for native vegetation;
- Long term monitoring well beyond 10 years after mine closure may be required to fully assess the re-establishment of the ecological values of EVCs;
- The closure criteria need further development utilising consultations with affected landholders, relevant government authorities and other stakeholders to determine more specific criteria than are currently provided in Appendix S;
- There are realistic expectations that rehabilitated agricultural land will be as productive after a few years as the land was prior to mining and that land affected by materials detrimental to plant growth has the opportunity for its productivity to be improved above pre-mining levels;
- Rehabilitating land for the re-establishment of native vegetation should be successful;
- The sharing of relevant data and experiences of vegetation trials with various bodies and individuals in the region is desirable; and
- The rehabilitation of the tailings storage facilities requires further assessment, including a revised materials balance for the source of non-saline overburden, and to determine the most appropriate future use of the rehabilitated tailings sites.

Additional mitigation and management measures

- An adequate rehabilitation plan for agricultural land and native vegetation land based on the information and guidance provided in the report *Northern Murray Basin Project – Rehabilitation Assessment and Plan for the Ouyen Deposits*.

18. MATTERS OF COMMONWEALTH INTEREST

As noted above, under the EPBC Act an action (which includes a project, a development, an undertaking and an activity or series of activities) which will have, or is likely to have, a significant impact on a matter of national environmental significance must be referred to the Commonwealth Environment Minister for a decision on whether the action is a 'controlled action' requiring assessment and/or approval under the EPBC Act.

The Minister's delegate advised Iluka on 27 July, 2004 that the project was a 'controlled action' on the basis that the project could have a potential to impact on:

- Listed species and communities; and
- Wetlands of international importance.

On 24 September, 2004 the Minister accredited the EES process as the assessment process for this project under the EPBC Act.

It should be noted that despite the accreditation the Commonwealth retains its decision making powers and will be required to issue an approval under the EPBC Act following completion of the Victorian assessment process.

Specifically, the species listed in the EPBC Act relevant to the project include:

- Malleefowl – vulnerable;
- Regent Parrot – vulnerable;
- Swift Parrot – threatened;
- Hooded Robin – threatened; and
- Major Mitchell's Cockatoo – threatened.

The Inquiry considers that the project will not have a significant impact on any listed threatened or vulnerable species under the EPBC Act provided the relevant mitigation measures (specifically, the offsets) identified by Ogyris and Wildlife Profiles are implemented.

Further, the Inquiry considers that the \$300,000 Iluka proposes to contribute to assist in the Malleefowl recovery program will benefit the species.

In regard to potential impacts on wetlands of international importance, the Inquiry finds that the project will not have any impact of any wetland of international importance.

The Inquiry recommends that:

The Victorian Minister for Planning advise the Commonwealth Minister for Environment, Water, Heritage and the Arts that the Iluka Murray Basin Stage 2 Mineral Sands project will not have a significant impact on:

- any listed threatened species under the EPBC Act provided the relevant mitigation measures identified by the proponent's flora and fauna experts are implemented; or
- any wetland of international importance.

PART D: CONCLUSIONS AND RECOMMENDATIONS

19. CONCLUSIONS AND RECOMMENDATIONS

In broad terms, the Inquiry concludes that the proposed sand mine facilities will have acceptable environmental impacts subject to compliance with the additional mitigation and management measures that have been provided in consolidated form in Chapter 18. Specifically, the Inquiry considers that impacts on water (both quality and availability), air quality and noise can be mitigated and managed to acceptable levels; that native vegetation offsets can be provided in accordance with the principles of the Native Vegetation Framework and that the site can be rehabilitated to a condition similar if not better than the existing condition of the land.

The Inquiry acknowledges that there are a number of significant issues to be resolved through the approval mechanisms particularly the Work Authority and the Work Plan and Works Approval. However, the Inquiry is confident that the process will be successful given the proponent's willingness to cooperate with relevant government departments and agencies and to engage with local farmers and landowners.

Moreover, the Inquiry considers that the Environment Review Committee (ERC) will be an important mechanism for continued communication between Iluka, government departments and agencies and the local community to monitor compliance with the statutory requirements. As stated by the DPI, the proponent has a powerful incentive to comply with the statutory requirements because the ultimate course of action DPI could take is to require closure of the mine operation. Given the approach of the proponent thus far, the Inquiry doubts whether matters would reach this point.

The Inquiry has collated the recommendations from the proceeding chapters and has grouped them into specific subject issues. It therefore recommends the following:

Overall recommendation

1. That the Minister for Planning should approve the proposed Murray Basin Stage 2 sand mine project subject to the additional mitigation and managements measures recommended below.
2. That the Minister for Planning should recommend approval of Works Approval Application WA63046 Murray Basin Stage 2 project – Kulwin deposit.

Environment Review Committee

3. The DPI establish an Environmental Review Committee (ERC) to monitor the environmental impacts, and should be set up, function and operate having regard to the recommendations of the DPI discussion paper on ERC's.

Surface water and water supply

4. That the following be included in the conditions attached to the approval of any Work Plan:
 - Sediment management will be conducted in conformance with EPA Publication 480 Environmental Guidelines for Major Construction Sites.

Groundwater

5. That the Work Plan not be approved unless the EMP contains:
 - A monitoring program that will enable assessment of infiltration basin performance in such a way that any rise in the watertable below the basins can be detected; and
 - The establishment and definition of action trigger levels plus descriptions of actions to be taken in the event of trigger levels being reached.

Biodiversity and habitat

6. That the Work Plan not be approved unless the EMP contains the following:
 - A Native Vegetation Management Plan including:
 - A Native Vegetation Offset Plan
 - A Native Vegetation Clearance Plan
 - A Weed Management Plan;
 - A Pest Management Plan; and
 - A Wildlife Management Plan.

Air quality

8. That the Work Plan not be approved unless it includes:
 - Adequate information in the EMP to satisfy the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries* to identify and evaluate “best practice” controls for all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and “maximum extent achievable” controls for indicators specified as Class 3 indicators;

- A dust emission management strategy that includes actions that are considered “best practice” for all relevant indicators specified in the *State Environment Protection Policy (Air Quality Management)* and “maximum extent achievable” controls for indicators specified as Class 3 indicators; and
- A monitoring program in the EMP that satisfies the requirements of the *Protocol for Environmental Management – Mining and Extractive Industries*.

Greenhouse gas emissions

9. That the Work Plan not be approved unless it includes:
 - An Energy Consumption and Greenhouse Gas Emission Plan that demonstrates compliance to the satisfaction of the EPA, with the requirements of the *Protocol for Environmental Management – Greenhouse Gas Emissions and Energy Efficiency*;
 - Plans to meet the requirements of both the Victorian *Environment and Resource Efficiency Plans* and the Commonwealth’s *Energy Efficiency Opportunities* programs when relevant thresholds for energy use are reached;
 - A Transport Management Plan that includes actions to be taken to investigate the option of transporting HMC to Hamilton by rail; and
 - An Environmental Management Plan that includes actions to be taken to give consideration to the use of renewable and alternative energy supplies.

Noise

10. The Work Plan not be approved unless it details a noise management strategy that:
 - Is aimed at compliance with prescribed noise limits, or better;
 - Includes identification of potential non-compliance with prescribed noise limits and the development of detailed plans to prevent predicted non compliance with prescribed noise limits;
 - Lists potential noise mitigation measures that may be applied to reduce noise emissions and the circumstances under which they will be applied;
 - Lists potential noise mitigation measures that may be applied at affected residences and the circumstances under which they will be applied;
 - Describes a process for keeping residents of potentially affected residences informed of actions taken on site and enabling negotiations on actions that could be taken at the residences; and

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- Includes noise monitoring that enables compliance testing and performance measurement.
11. That the following be included in the conditions attached to the approval of any Work Plan:
- The licensee must ensure that noise levels at any sensitive receptor not exceed the noise limits specified in the *Interim Guidelines for Control of Noise from Industry in Country Victoria N3/89* except if the licensee provides the District Manager with a proposal for the substitution of a limit on the maximum noise level for the Night limit at a particular residence. Such proposal will include each of the following:
 - Be for a limit on the maximum noise level outside the residence of no more than 62 dB(A);
 - Include evidence of the consent of the owner and/or occupier of the residence to the application of the proposed noise limit;
 - If the proposed noise limit is greater than 57 dB(A), include evidence that noise at the proposed limit will not result in a noise level in a habitable room of greater than 47 dB(A); and
 - Include details of a monitoring program that will enable demonstration of compliance, or otherwise.

If the proposal is for a limit on the maximum noise level of 57dB(A) or less, the District Manager will approve the proposal providing he/she is satisfied with:

- The evidence of the consent of the owner and/or occupier; and
- The adequacy of the proposed monitoring program, assessed in consultation with the EPA.

If the proposal is for a limit on the maximum noise level of greater than 57dB(A), the District Manager will approve the proposal providing that he/she is satisfied with:

- The evidence of the consent of the owner and/or occupier;
- The adequacy, assessed in consultation with the EPA, of the proposed monitoring program; and
- The evidence, assessed in consultation with the EPA, that noise at the proposed limit will not result in a noise level in a habitable room of greater than 47 dB(A).

Once the proposal is approved the licensee must:

- Ensure maximum noise levels at the residence during the Night do not exceed the approved limit; and

-
- Implement the proposed monitoring program to the satisfaction of the District Manager.
12. Management of noise emissions during construction activities, with such activities being defined by the District Manager in consultation with the EPA, will be in accordance with the guidance provided in Section 12 of *Noise Control Guidelines TG302/92* and resultant noise levels at sensitive receptors must comply with the limits described in the Schedule in that Section of the guidelines.

Roads, traffic and transport

13. The Work Plan not be approved unless it contains a Transport Management Plan that:
- is developed by a working group comprising Iluka, VicRoads, Mildura Rural City Council and relevant emergency service organisations; and
 - includes actions to be taken to investigate the option of transporting HMC to Hamilton by rail.

Rehabilitation

14. That the Work Plan not be approved unless it contains an adequate rehabilitation plan for agricultural land and native vegetation land based on the information and guidance provided in the report *Northern Murray Basin Project – Rehabilitation Assessment and Plan for the Ouyen Deposits*.

Appendix A Terms of Reference

TERMS OF REFERENCE

INQUIRY UNDER *ENVIRONMENT EFFECTS ACT 1978*

MURRAY BASIN STAGE 2 MINERAL SANDS PROJECT

1. BACKGROUND

Iluka Resources Limited proposes to develop a mineral sands mine in north-western Victoria. The project is expected to produce approximately 2.4 million tonnes of dry, heavy mineral concentrate. The project focuses on two main areas of mineralisation: Kulwin deposit, about 28km east of Ouyen and 40km west of Manangatang; and Woomack, Rownack, Rainlover and Pirro deposits about 20km south-east of Ouyen. The footprint of the project area is approximately 2,300 hectares.

Ore will be mined and processed onsite to produce heavy mineral concentrate, which will be transported to Iluka's mineral separation plant at Hamilton for processing into rutile and zircon for sale on the world markets. The total life of the project will be approximately 13 years.

On 18 January 2004, the Victorian Minister for Planning determined that an Environment Effects Statement (EES) was required for this project under the *Environment Effects Act 1978*. The EES and Works Approval application were placed on public exhibition from 19 February until 3 April 2008.

The project requires an average water supply of 30m³/hour and up to 60m³/hour, which will be sourced from two on-site reverse osmosis desalination plants. The plants will be supplied by saline groundwater pumped as part of mine dewatering. A Works Approval under the *Environment Protection Act 1970* is required, primarily due to the capacity of the proposed reverse osmosis plants.

The primary Victorian approval for this project is the Work Authority under the *Mineral Resources (Sustainable Development) Act 1990*. Applications for a Work Authority and a proposed Work Plan under this Act will be considered by the Minister for Energy and Resources. The Work Authority can be granted after the mining proposal has been assessed under the *Environment Effects Act 1978* by the Minister for Planning.

The project also requires approval under the Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act). The Commonwealth Government has accredited the Victorian EES process to assess the relevant impacts under the EPBC Act. The controlling provisions under the EPBC Act are:

- Sections 16 and 17B (Wetlands of international importance); and
- Sections 18 and 18A (Listed threatened species and communities).

The Minister for Planning has appointed an Inquiry for the Murray Basin Stage 2 Mineral Sands Project under section 9(1) of the *Environment Effects Act 1978*. After the Inquiry provides its report to the Minister for Planning, the Minister will prepare an Assessment of the environmental effects¹ of the project under the *Environment Effects Act 1978*, inform the relevant Victorian statutory decisions as well as the decision under the EPBC Act.

2. TASK

The Inquiry is required:

- i. To inquire into and make findings regarding the potential environmental effects of the proposed project, including impacts on relevant matters under the EPBC Act.
- ii. To recommend any modifications to the project as well as environmental mitigation and management measures that are needed to achieve acceptable environmental outcomes, within the context of applicable legislation and policy.
- iii. To recommend whether the project should proceed in light of its expected effects, assuming the measures recommended under (ii) were implemented.

3. METHOD

The Inquiry must consider the exhibited EES and Works Approval application, any submissions received in response to the exhibited EES and Works Approval application, the proponent's response to submissions and other relevant information provided to or obtained by the Inquiry.

The Inquiry must conduct a public hearing and make other such enquiries as are relevant to its consideration of the potential environmental effects of the proposed Murray Basin Stage 2 Mineral Sands Project. The Inquiry must be conducted in accordance with the following principles:

- The Inquiry hearings will be conducted in an open, orderly and equitable manner, in accordance with the rules of natural justice, with a minimum of formality and without the necessity for legal representation.
- The Inquiry process will aim to be exploratory and constructive, where adversarial behaviour is minimised.
- Parties without legal representation will not be disadvantaged – cross-examination will be strictly controlled and prohibited where considered not relevant by the Inquiry chairperson.

The Inquiry will meet and conduct hearings when there is a quorum of at least two of its members present including the Inquiry chairperson.

¹ Under the seventh edition of the *Ministerial guidelines for assessment of environmental effects* (June 2006), environment for the purposes of assessment includes the physical, biological, heritage, cultural, social, health, safety and economic aspects of human surroundings, including the wider ecological and physical systems within which humans live.

4. OUTCOMES

To prepare a report for the Minister for Planning outlining:

- The Inquiry's response to the matters detailed in section 2;
- Relevant information and analysis in support of the Inquiry's recommendations; and
- A description of the proceedings conducted by the Inquiry and a list of those consulted and heard by the Inquiry.

5. TIMING

The Inquiry is required to report to the Minister for Planning in writing within eight weeks of its last hearing date.

6. FEES

The members of the Inquiry will receive the same fees and allowances as a panel appointed under Division 1 of Part 8 of the *Planning and Environment Act 1987*.

APPROVED:



JUSTIN MADDEN MLC
Minister for Planning

DATE: 1 MAY 2008

Appendix B List of submitters

Submitter	Organisation (if any)
Mr Neil Macfarlane	Mid Murray Field Naturalists Inc
Ms Anne Stokie	Victorian Malleefowl Recovery Group
Mr Gil Hopkins	
Mr Richard Hunter	Bird Observation & Conservation Australia
Ms Jenny Barnett	Victorian National Parks Association
Mr Graham McKechnie	Ouyen Inc Committee
Mr Andrew Rouse	WWF Australia
Mr Phillip Stevens	Mallee Catchment Management Authority
Mr Kimberley Dripps	Department of Sustainability and Environment
Mr Jeff Rigby	GWM Water
Ms Jan Bowman	Department of Human Services
Mr Richard Bolt	Department of Primary Industries
Mr David O'Sullivan	VicRoads
Mr Jeff Cummins	Environment Protection Authority

Appendix C Site inspection tour map



Appendix D Regulatory framework for proposal

