

Keysbrook Mineral Sand  
Project  
Keysbrook, Western Australia  
  
Public Environmental Review  
  
Response to Submissions

Prepared for:

Olympia Resources Limited



O L Y M P I A  
RESOURCES LIMITED

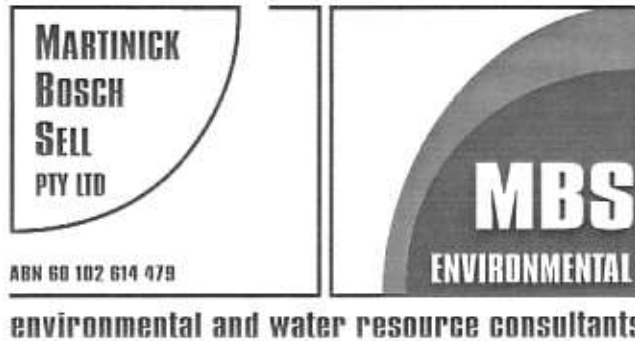
June 2007

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KEYSBROOK MINERAL SAND PROJECT,  
KEYSBROOK, WESTERN AUSTRALIA:  
PUBLIC ENVIRONMENTAL REVIEW  
RESPONSE TO SUBMISSIONS

PREPARED FOR

OLYMPIA RESOURCES LIMITED

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KEYSBROOK MINERAL SAND PROJECT,  
KEYSBROOK, WESTERN AUSTRALIA:  
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RESPONSES TO SUBMISSIONS

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## APPENDICES

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- Appendix 2: Issues Raised in Community Meetings
- Appendix 3: Fauna Study August to September 2006
- Appendix 4: Hydrological Report (2007)

# 1. INTRODUCTION

## 1.1 BACKGROUND

Olympia Resources Limited (Olympia) proposes to develop an open cut mineral sand mine and primary processing plant within an area of rural land near the small townships of Keysbrook and North Dandalup. Keysbrook is located approximately 70 kilometres south of Perth, on the eastern edge of the Swan Coastal Plain. Figure 1 shows the general site location and Figure 2 shows the detailed mine area. Main access to the project site is from the South Western Highway and Elliot Road or Readheads Road.

The mine area is 1,406 hectares. Of this, 1,184 hectares (84.2%) is open pasture and 222 hectares (15.8%) is remnant native vegetation in a range of conditions. The 222 hectares can be further divided into 182 hectares (13%) in a parkland cleared condition, scoring a rating of category 6 (completely degraded) in the WAPC (2000) Bush Forever rating scale and 40 hectares (2.8%), ranging from condition category 3 to 5.

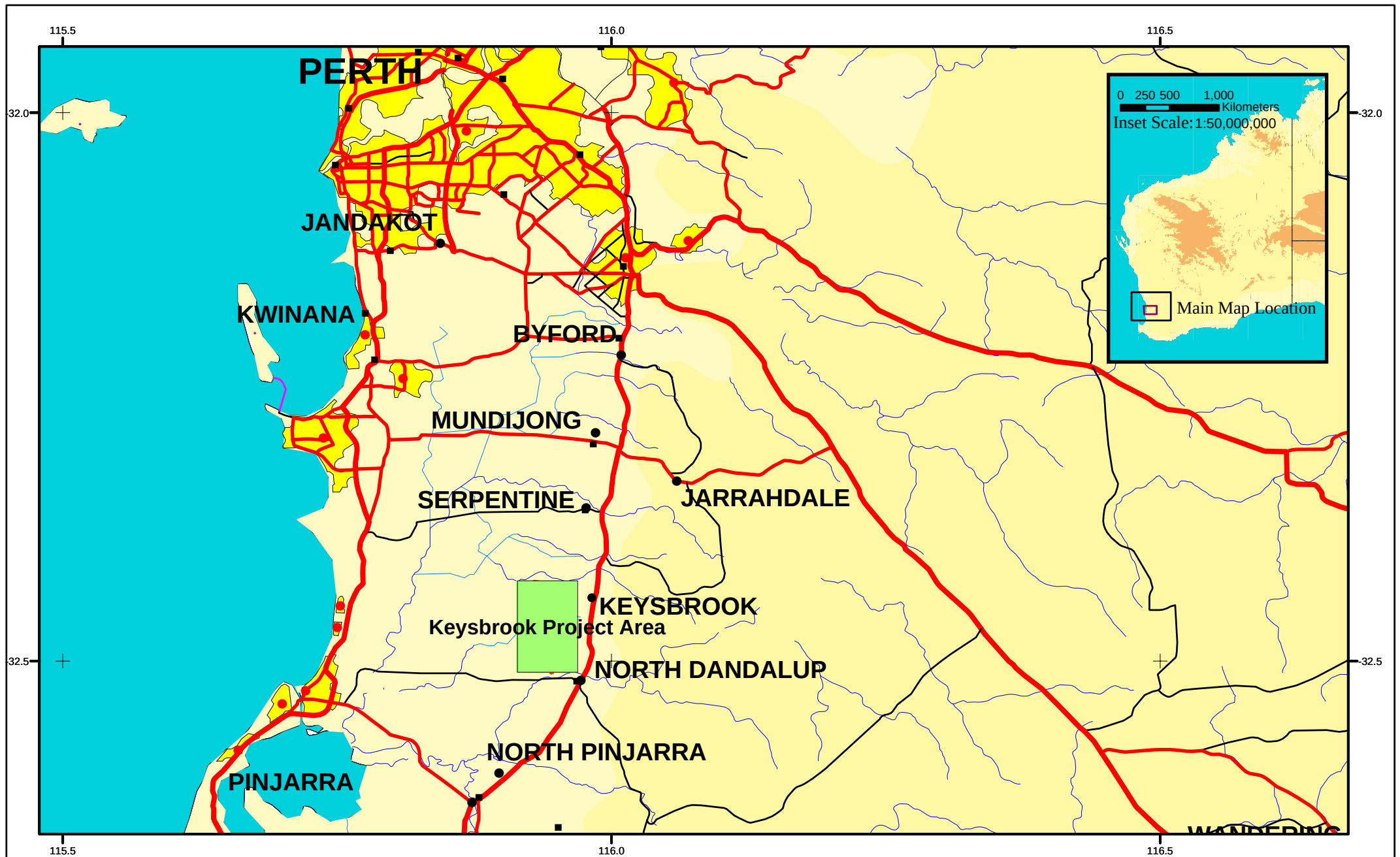
The proposal is being assessed as a Public Environmental Review (PER) under Part IV of the Western Australian *Environmental Protection Act 1986*. In addition, the proposal is considered to be a Controlled Action under the *Environment Protection and Biodiversity Conservation Act 1999*. The controlling provisions are wetlands of international importance and listed threatened species and communities

The PER is a public document and was subject to an eight week public review period from 26 June 2006 to 21 August 2006. During this time, government agencies, private organisations, community groups and the public were invited to make submissions to the Environmental Protection Authority (EPA). The deadline for the submissions was 21 August 2006. A total of 141 submissions were received. Nine from local and State government agencies, seven from community and industry groups, and one hundred and twenty five submissions were received from members of the public. One hundred and seventeen submissions from members of the public were consolidated into two by the EPA service unit (EPASU).

## 1.2 KEY ISSUES AND CONCERNS RAISED IN SUBMISSIONS

The key issues raised in submissions were as follows:

- Clearing of remnant native vegetation, including mature trees.
- Loss of fauna habitat.
- Adequacy of the rehabilitation plan, including the proposed list of species to be considered.
- Impacts of groundwater use on current and future groundwater users, wetlands and watercourses in the area.
- Risk that mining will mobilise nutrients and salts into waterways.
- Dust generation, particularly over summer.



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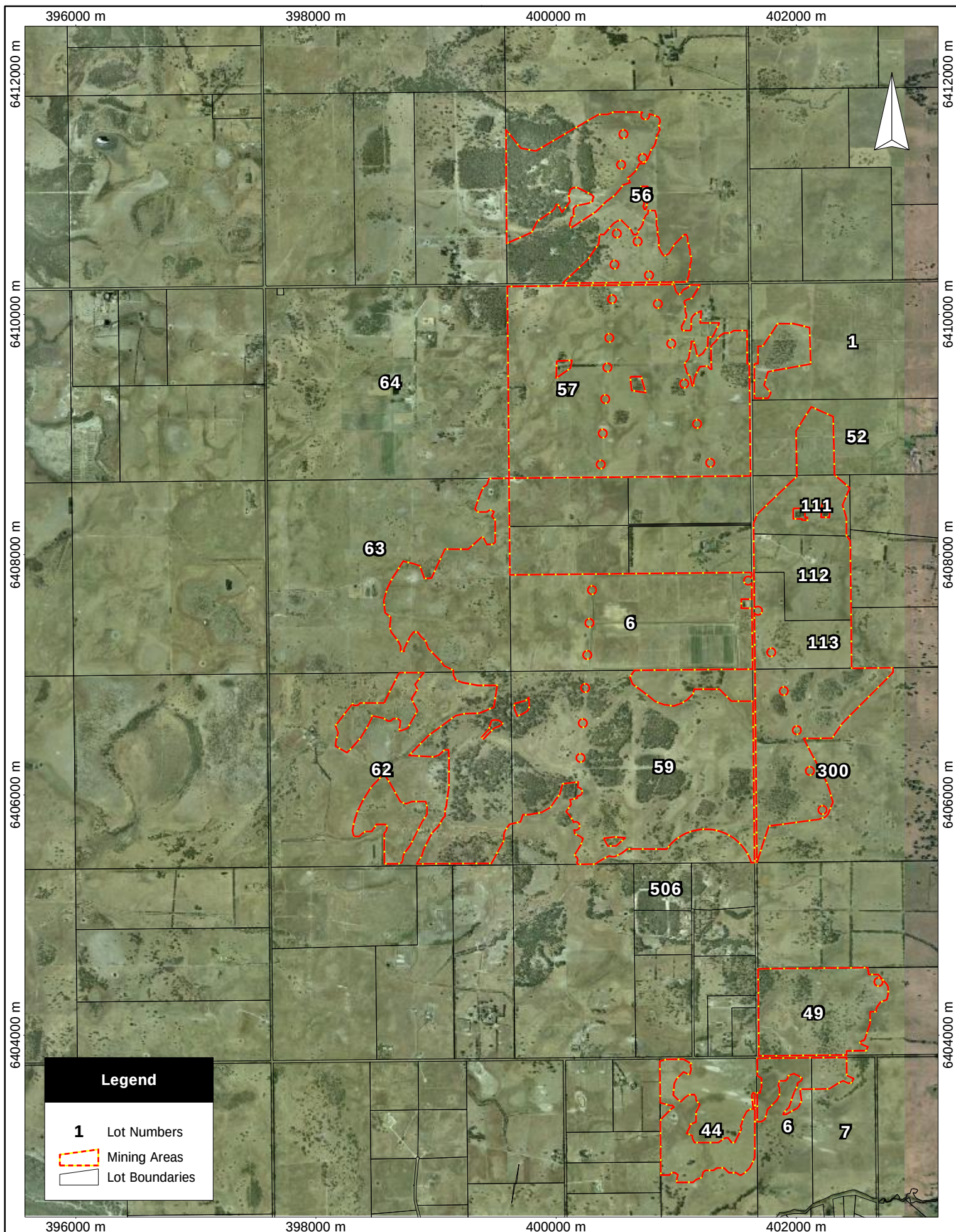
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**Olympia Resources**  
**Keysbrook Project**

**Location of Project**

**Figure 1**





- The possible generation of acidity from acid sulfate soil banks.
- Noise from the project.
- Loss of visual amenity.

### 1.3 OTHER ISSUES RAISED

Other issues that were raised included:

- Mining will reduce property values.
- Safety issues due to the increase in traffic on local roads and on the South Western Highway.
- The risk of spreading Dieback.
- Risk of soil erosion.
- Radiation concern from the mining activity.
- Impact on chosen rural lifestyle.
- The use of road verses rail for the transportation of the Heavy Mineral Concentrate (HMC) product.

### 1.4 PURPOSE OF THIS DOCUMENT

The purpose of this document is to provide the Proponent's response to the issues raised in submissions made on the Keysbrook Mineral Sand Project PER. The Environmental Impact Assessment (Part IV Division 1) Administrative Procedures 2002 state that the Proponent is required to prepare a summary of the pertinent issues raised in public and government agency submissions. A summary of submissions was prepared and submitted to the EPASU for review. Responses were received from the EPASU on 6 and 7 November 2006.

### 1.5 STRUCTURE OF THIS DOCUMENT

The structure of the Response to Submissions document is presented as follows:

- Section 1** Introduction to the document.
- Section 2** Outlines the number and source of submissions that were received.
- Section 3** Presents a revised project description, based on the outcome of amendments made as a result of further surveys and the public submissions to the PER.
- Section 4** Provides a glossary of abbreviations used in the document.
- Section 5** Presents revised environmental management documents and actions which were revised as a result of the submissions and the amended project description.

**Section 6** Provides individual responses to the issues raised in submissions. The appendices also provide additional information in response to submissions raised.

Each issue raised in the submissions is presented in summary. In many cases, a number of submissions were received on the same topic/issue. The response is provided immediately below. Where the identity of the submitter is known, this information is provided, to enable authors of the submissions to identify responses to their comments. The identity of authors from members of the public was removed by the EPASU before the submissions were provided to the proponent. Submissions have been identified in the document by the numerical value provided to the proponent by the EPASU.

It is strongly recommended that submitters read the entire chapter relating to their point, comment or question, as other relevant answers may be contained

Appendix 1 provides a complete list of all individual issues contained in the submissions received. These are sorted by each submitter and also sorted by topic. The Appendix also provides a cross reference to the response item number or numbers in Section 6 of the document that address the submission.

Appendix 2 provides details of community consultation and responses to questions from the community. This is specifically related to the response to item 6.13.30.

Appendix 3 provides the additional fauna report undertaken during August – September 2006.

Appendix 4 provides detailed responses on groundwater issues and additional modelling of water levels adjacent to wetlands, specifically related to item 6.4.3 but it also relates to other submissions on groundwater.

## 2. SUBMISSIONS TO THE PER

One hundred and forty one submissions on the PER were received, as listed in Table 1.

**Table 1: Submissions Received**

| Number | Submitter                         |
|--------|-----------------------------------|
| 1      | Department of Indigenous Affairs  |
| 2      | Water Corporation                 |
| 3      | Private                           |
| 4      | Radiological Council              |
| 5      | Private (Community submissions 1) |
| 6      | Private (Community submissions 1) |
| 7      | Private (Community submissions 1) |
| 8      | Private (Community submissions 2) |
| 9      | Private (Community submissions 1) |
| 10     | Private (Community submissions 1) |
| 11     | Private (Community submissions 1) |
| 12     | Private (Community submissions 1) |
| 13     | Private (Community submissions 1) |
| 14     | Private (Community submissions 2) |
| 15     | Private (Community submissions 2) |
| 16     | Private (Community submissions 1) |
| 17     | Private (Community submissions 2) |
| 18     | Private (Community submissions 2) |
| 19     | Private (Community submissions 1) |
| 20     | Private (Community submissions 1) |
| 21     | Private (Community submissions 1) |
| 22     | Private (Community submissions 2) |
| 23     | Private (Community submissions 1) |
| 24     | Private (Community submissions 1) |
| 25     | Private (Community submissions 1) |
| 26     | Private (Community submissions 1) |
| 27     | Private (Community submissions 1) |
| 28     | Private (Community submissions 1) |
| 29     | Private (Community submissions 2) |
| 30     | Private (Community submissions 1) |
| 31     | Private (Community submissions 1) |
| 32     | Private (Community submissions 1) |
| 33     | Private (Community submissions 1) |
| 34     | Private (Community submissions 1) |
| 35     | Private (Community submissions 1) |
| 36     | Private (Community submissions 1) |
| 37     | Private (Community submissions 1) |
| 38     | Private (Community submissions 1) |

| Number | Submitter                                     |
|--------|-----------------------------------------------|
| 39     | Private (Community submissions 2)             |
| 40     | Private (Community submissions 1)             |
| 41     | Greenacres Turf Farm                          |
| 42     | Department of Industry and Resources          |
| 43     | Private (Community submissions 1)             |
| 44     | Private (Community submissions 1)             |
| 45     | Private (Community submissions 1)             |
| 46     | Private (Community submissions 1)             |
| 47     | Private (Community submissions 1)             |
| 48     | Private (Community submissions 1)             |
| 49     | Private (Community submissions 1)             |
| 50     | Private (Community submissions 1)             |
| 51     | Private (Community submissions 1)             |
| 52     | Private (Community submissions 1)             |
| 53     | Private                                       |
| 54     | North Dandalup Primary School P&C Association |
| 55     | Conservation Council                          |
| 56     | Private (Community submissions 2)             |
| 57     | Private (Community submissions 2)             |
| 58     | Private (Community submissions 2)             |
| 59     | Private (Community submissions 1)             |
| 60     | Private                                       |
| 61     | Private (Community submissions 1)             |
| 62     | Private (Community submissions 2)             |
| 63     | Private (Community submissions 1)             |
| 64     | Private (Community submissions 2)             |
| 65     | Private                                       |
| 66     | Private (Community submissions 1)             |
| 67     | Department of Water                           |
| 68     | Private (Community submissions 2)             |
| 69     | Private (Community submissions 1)             |
| 70     | Private                                       |
| 71     | Private                                       |
| 72     | Private (Community submissions 2)             |
| 73     | Private (Community submissions 1)             |
| 74     | Private (Community submissions 1)             |
| 75     | Private (Community submissions 1)             |
| 76     | Private (Community submissions 1)             |
| 77     | Private (Community submissions 1)             |
| 78     | Private (Community submissions 1)             |
| 79     | Private (Community submissions 1)             |
| 80     | Private (Community submissions 1)             |
| 81     | Private (Community submissions 1)             |
| 82     | Private (Community submissions 1)             |

| Number | Submitter                                  |
|--------|--------------------------------------------|
| 83     | Private (Community submissions 1)          |
| 84     | Private (Community submissions 1)          |
| 85     | Private (Community submissions 1)          |
| 86     | Private (Community submissions 1)          |
| 87     | Private (Community submissions 1)          |
| 88     | Private (Community submissions 1)          |
| 89     | Private (Community submissions 1)          |
| 90     | Private (Community submissions 1)          |
| 91     | Private (Community submissions 1)          |
| 92     | Private (Community submissions 1)          |
| 93     | Private (Community submissions 1)          |
| 94     | Private (Community submissions 1)          |
| 95     | Private (Community submissions 1)          |
| 96     | Private (Community submissions 1)          |
| 97     | Private (Community submissions 1)          |
| 98     | Private (Community submissions 1)          |
| 99     | Private (Community submissions 1)          |
| 100    | Keysbrook North Dandalup Action Group      |
| 101    | Private (Community submissions 1)          |
| 102    | Private (Community submissions 1)          |
| 103    | Private (Community submissions 2)          |
| 104    | Peel Harvey Catchment Council              |
| 105    | Private (Community submissions 1)          |
| 106    | Private (Community submissions 1)          |
| 107    | Private (Community submissions 1)          |
| 108    | Wildflower Society                         |
| 109    | Landcare Serpentine-Jarrahdale             |
| 110    | Shire of Serpentine-Jarrahdale             |
| 111    | Private (Community submissions 1)          |
| 112    | Private                                    |
| 113    | Department of Environment and Conservation |
| 114    | Private (Community submissions 2)          |
| 115    | Private (Community submissions 1)          |
| 116    | Private (Community submissions 1)          |
| 117    | Private (Community submissions 1)          |
| 118    | Private (Community submissions 1)          |
| 119    | Private (Community submissions 1)          |
| 120    | Private (Community submissions 1)          |
| 121    | Private (Community submissions 1)          |
| 122    | Private (Community submissions 1)          |
| 123    | Private (Community submissions 1)          |
| 124    | Private (Community submissions 1)          |
| 125    | Private (Community submissions 1)          |
| 126    | Private (Community submissions 1)          |



| Number | Submitter                         |
|--------|-----------------------------------|
| 127    | Private (Community submissions 1) |
| 128    | Private (Community submissions 1) |
| 129    | Private (Community submissions 1) |
| 130    | Private (Community submissions 1) |
| 131    | Private (Community submissions 1) |
| 132    | Private (Community submissions 1) |
| 133    | Private (Community submissions 1) |
| 134    | Private (Community submissions 1) |
| 135    | Private (Community submissions 1) |
| 136    | Private (Community submissions 1) |
| 137    | Private (Community submissions 1) |
| 138    | Private (Community submissions 2) |
| 139    | Shire of Murray                   |
| 140    | Private (Community submissions 2) |
| 141    | EPA Service Unit                  |

### 3. REVISED PROJECT DESCRIPTION

In response to government, non government organisations and community submissions to the PER, additional on-site surveys and verification of computer modelling, as well as extensive community consultation, amendments to the mine area and management plans have been undertaken.

On-site surveys include scheduled fauna and heritage surveys and an additional acid sulfate soil survey. Computer generated models regarding dust, noise and groundwater impacts were verified, including the use of specific site data.

This has resulted in changes to the project description as shown in Table 2 and revisions to project management actions, outlined in Section 5.



**Table 2: Key Characteristics of the Keysbrook Mineral Sand Project**

| Element                                                                                                                                                                                                                                                                                                                                                                                                                     | Project Description in PER                                                                                                                                                                                                                      | Changes to Project Description                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Life of project.                                                                                                                                                                                                                                                                                                                                                                                                            | Up to 8 years.                                                                                                                                                                                                                                  |                                                                                                                            |
| Size of orebody: <ul style="list-style-type: none"> <li>Ore reserve.</li> <li>Grade.</li> <li>Product.</li> </ul>                                                                                                                                                                                                                                                                                                           | 34Mt.<br>2.7%.<br>0.92Mt HMC.                                                                                                                                                                                                                   |                                                                                                                            |
| Depth of mine pit.                                                                                                                                                                                                                                                                                                                                                                                                          | Average 2m. Maximum 5m below ground level on sandy dunes.                                                                                                                                                                                       |                                                                                                                            |
| Area of disturbance: <ul style="list-style-type: none"> <li>Native vegetation in good condition.</li> <li>Native vegetation parkland cleared.</li> <li>Cleared paddocks.</li> <li>Total mine area.</li> </ul>                                                                                                                                                                                                               | 60 ha      4.8%<br>244 ha     19.8%<br>930 ha     75.4%<br>1,234 ha   100%                                                                                                                                                                      | 40 ha      2.8%<br>182 ha     13%<br>1,184 ha   84.2%<br>1,406 ha   100.0%                                                 |
| Mine operation.                                                                                                                                                                                                                                                                                                                                                                                                             | 24 hours, 7 days a week.                                                                                                                                                                                                                        | Daytime mining only in the southern section of the project closer to residences, on Lots 6 (Readheads Road), 7, 44 and 49. |
| List of major components: <ul style="list-style-type: none"> <li>Topsoil removal and stockpiling.</li> <li>Mining in open cut pit.</li> <li>Dump hopper and screening plant.</li> <li>Heavy mineral primary processing plant.</li> <li>Clay fines thickener.</li> <li>Backfilling mined pits with clay and sand.</li> <li>Ground contouring, stabilisation, topsoil replacement and rehabilitation after mining.</li> </ul> | See conceptual mine illustration in PER Figure 3.<br><br>Mining will occur within a continually moving open pit of approximately 30 hectares in area.<br><br>The dump hopper, screening plant and heavy mineral concentration plant are mobile. |                                                                                                                            |
| Supporting Infrastructure components: <ul style="list-style-type: none"> <li>Transportable offices.</li> <li>Transportable storage facilities.</li> <li>Water storage dam (capacity 74,000 kL).</li> </ul>                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                 |                                                                                                                            |
| Processing: <ul style="list-style-type: none"> <li>Design rate.</li> <li>Annual rate.</li> <li>Process circuit water requirement.</li> <li>Make-up water requirement.</li> </ul>                                                                                                                                                                                                                                            | 600 tonnes per hour.<br>4.25 million tonnes per annum.<br>1,820 kL per hour.<br>220-240 kL per hour.                                                                                                                                            |                                                                                                                            |
| Waste: <ul style="list-style-type: none"> <li>Organic matter and coarse material (&gt;2mm).</li> <li>Fine clay and silt (&lt;53µm).</li> <li>Quartz sand.</li> <li>Trash from secondary processing.</li> </ul>                                                                                                                                                                                                              | Backfilled into mine voids.<br>Backfilled into mine voids.<br>Backfilled into mine voids.                                                                                                                                                       | Backfilled into mine voids.                                                                                                |

| Element                                                                                              | Project Description in PER                                                                | Changes to Project Description                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water supply: <ul style="list-style-type: none"> <li>Source.</li> <li>Annual requirement.</li> </ul> | Mine pit dewatering: Bassendean system.<br>Bore: Leederville aquifer.<br>2.0GL per annum. |                                                                                                                                                                                                                               |
| Pit dewatering: <ul style="list-style-type: none"> <li>Method.</li> </ul>                            | In-pit sumps.                                                                             |                                                                                                                                                                                                                               |
| Power supply.                                                                                        | Reticulated mains supply.                                                                 |                                                                                                                                                                                                                               |
| Self bundled fuel storage capacity.<br>Quantity used.                                                | 55,000 L.<br>2,000 kL per annum.                                                          |                                                                                                                                                                                                                               |
| Transport route and truck movements.                                                                 | See PER Figure 22.<br>Total truck movements of 12-14/day.                                 | HMC will be trucked via South Western Highway to Bunbury for secondary processing in Cable Sands existing plant at Koombaba Drive, Bunbury rather than Picton (as proposed in the PER). Truck movements will remain the same. |

Another change to the project description is the location of the secondary processing plant. Although not specifically a part of this proposal, the PER referred to secondary processing of heavy mineral concentrate (HMC) produced from Keysbrook at a plant to be constructed in Picton. The transport of HMC product to Picton via the South Western Highway is documented in the PER (Section 10.2 and route, Figure 22).

Olympia Resources has since entered into a life of mine toll treatment agreement for the Keysbrook mine with Cable Sands. Under the agreement, HMC produced at Keysbrook will be trucked to Bunbury for processing at Cable Sands' existing plant and then shipped directly from the Port of Bunbury. This removes the need for Olympia to construct another secondary processing plant in the Bunbury area. Haulage of HMC from the mine will follow the same route as outlined in the PER, (i.e. down the South Western Highway), but now going to the Cable Sands plant in Bunbury, rather than a location in Picton.

Further clarification has been requested from DEC on the description of different project stages. These are detailed as follows:

### Site Construction

Aspects included in site construction include the initial (one-off) activities associated with mobilising and assembling all the components of the primary processing plant, pipelines, locating the portable site offices, lunch room, ablution facility, screening plant, pumps, construction of any storage sheds, access roads, workshops and works associated with connection to mains power supply. This range of activities would normally be the subject of a Works Approval application.

**Site Operations**

Activities in this category are more related to the ongoing activities associated with the mining operations. This includes works associated with moving and relocating pipe lines, mining equipment and power services through the mine, progressive clearing and earthworks in advance of the mine pit, storage and transport of HMC and rehabilitation earthworks in completed areas.

## 4. GLOSSARY

The following terms and abbreviations are used in the document.

|                 |                                                                                                        |
|-----------------|--------------------------------------------------------------------------------------------------------|
| µm              | Micrometres                                                                                            |
| AHD             | Australian Height Datum                                                                                |
| ANZMEC/MCA      | Australian and New Zealand Minerals and Energy Council/ Minerals Council of Australia                  |
| ASS             | Acid Sulfate Soils                                                                                     |
| ASSMP           | Acid Sulfate Soils Management Plan                                                                     |
| ASX             | Australian Stock Exchange                                                                              |
| bgs             | below ground surface                                                                                   |
| CALM            | Conservation and Land Management (now Department of Environment and Conservation)                      |
| CC              | Conservation Council                                                                                   |
| CMEWA           | Chamber of Minerals and Energy WA                                                                      |
| CO <sup>2</sup> | Carbon Dioxide                                                                                         |
| CRP             | Conceptual Rehabilitation Plan                                                                         |
| CS              | Conservation Significance                                                                              |
| dB              | Decibel                                                                                                |
| DCP             | Decommissioning and Closure Plan                                                                       |
| DEC             | Department of Environment and Conservation                                                             |
| DEC:LWQB        | Department of Environment and Conservation Land and Water Quality Branch                               |
| DEH             | Department of Environment and Heritage (now Department of the Environment and Water Resources (DEWR)). |
| DEWR            | Department of the Environment and Water Resources                                                      |
| DMP             | Dust Management Plan                                                                                   |
| DNA             | deoxyribonucleic acid                                                                                  |
| DoA             | Department of Agriculture                                                                              |
| DoE             | Department of Environment (now Department of Environment and Conservation)                             |
| DoIR            | Department of Industry and Resources                                                                   |
| DOW             | Department of Water                                                                                    |
| DRF             | Declared Rare Flora                                                                                    |
| EP Act          | Environmental Protection Act                                                                           |
| EPA             | Environment Protection Authority                                                                       |
| EPASU           | Environment Protection Authority Service Unit                                                          |
| EPBC Act        | Environment Protection and Biodiversity Conservation Act                                               |
| EPP             | Environmental Protection Policy                                                                        |
| FCT             | Floristic Community Types                                                                              |
| FMP             | Fauna Management Plan                                                                                  |
| GL              | Gigalitre                                                                                              |
| Ha              | Hectare                                                                                                |
| HMC             | Heavy Mineral Concentrate                                                                              |
| kL              | Kilolitre                                                                                              |
| KNAG            | Keysbrook North Dandalup Action Group                                                                  |
| L               | Litres                                                                                                 |

|                  |                                                                                                                                                                                                                           |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| m                | metre                                                                                                                                                                                                                     |
| m <sup>3</sup> d | Cubic metres per day                                                                                                                                                                                                      |
| m <sup>3</sup> y | Cubic metres per year                                                                                                                                                                                                     |
| MBS              | Martinick Bosch Sell Pty Ltd (Environmental Consultants)                                                                                                                                                                  |
| MGA              | Map Grid of Australia                                                                                                                                                                                                     |
| Mt               | Million tonnes                                                                                                                                                                                                            |
| NGO              | Non Government Organisation                                                                                                                                                                                               |
| NMP              | Noise Management Plan                                                                                                                                                                                                     |
| NO <sub>x</sub>  | Nitrogen Oxide                                                                                                                                                                                                            |
| PDWSA            | Proclaimed Drinking Water Source Area                                                                                                                                                                                     |
| PER              | Public Environmental Review                                                                                                                                                                                               |
| PHCC             | Peel Harvey Catchment Council                                                                                                                                                                                             |
| PM <sub>10</sub> | any particulate matter with a diameter less than or equal to 10 micrometres                                                                                                                                               |
| PPG              | Peel Preservation Group                                                                                                                                                                                                   |
| PRI              | Phosphorous Retention Index                                                                                                                                                                                               |
| Ramsar           | The term used for the Convention on Wetlands of International Importance especially as Waterfowl Habitat. The Convention promotes wetland conservation throughout the world, signed in the Iranian city of Ramsar in 1971 |
| RIWI Act         | Rights in Water and Irrigation Act 1914                                                                                                                                                                                   |
| RMP              | Rehabilitation Management Plan                                                                                                                                                                                            |
| RMP              | Radiation Management Plan                                                                                                                                                                                                 |
| SJLC             | SerpentineJarrahdale Landcare Committee                                                                                                                                                                                   |
| SJS              | Serpentine Jarrahdale Shire                                                                                                                                                                                               |
| SO <sub>2</sub>  | Sulphur Dioxide                                                                                                                                                                                                           |
| SPP              | Statement of Planning Policy                                                                                                                                                                                              |
| SRE              | Short Range Endemic                                                                                                                                                                                                       |
| TAA              | Titrateable Actual Acidity                                                                                                                                                                                                |
| TEC              | Threatened Ecological Community                                                                                                                                                                                           |
| TPA              | Titrateable Peroxide Acidity                                                                                                                                                                                              |
| UWPCA            | Underground Water Pollution Control Area                                                                                                                                                                                  |
| VRMP             | Vegetation and Rehabilitation Management Plan                                                                                                                                                                             |
| VOC              | Volatile Organic Carbon                                                                                                                                                                                                   |
| WAPC             | WA Planning Commission                                                                                                                                                                                                    |
| WMP              | Water Management Plan                                                                                                                                                                                                     |
| WRC              | Water Resource Centre                                                                                                                                                                                                     |
| WS               | Wildflower Society                                                                                                                                                                                                        |

## 5. REVISED PROJECT MANAGEMENT

As a result of the submissions to the PER, the following amendments to the project are proposed.

### 5.1 REVISED PROJECT DOCUMENTATION

#### 5.1.1 Acid Sulfate Soils Management Plan (ASSMP)

The proponent has prepared an ASSMP. The ASSMP has been prepared in consultation with the Department of Environment and Conservation Land and Water Quality Branch (DEC:LWQB) and submitted to DEC. The ASSMP will ensure that Olympia's management of any potential Acid Sulfate Soil is proactive rather than reactive.

#### 5.1.2 Revised Vegetation and Rehabilitation Management Plan

The Rehabilitation Management Plan submitted with the PER has been revised. The revised Vegetation and Rehabilitation Management Plan incorporates changes as a result of submissions received, which include:

- An amended rehabilitation species list, including additional understorey species and excluding *Eucalyptus camaldulensis*.
- An amended Conceptual Rehabilitation Plan, agreed with landowners incorporating additional block plantings and changes to the mine exclusion areas.
- A proposed 'early planting' programme designed to ensure availability of feeding sites for Cockatoos and other birds throughout the life of the mine. Early planting of native vegetation in locations outside the planned mining limits will maximise growth before clearing of existing vegetation. It will allow Olympia to manage native vegetation over a longer time period. The early planting will also assist in retaining visual amenity for residents and visitors.
- Incorporation of the Vegetation Management Plan, Rehabilitation Management Plan and Decommissioning and Closure Plan documents, submitted with the PER, into a single, consolidated document dealing with the interrelated topics of vegetation, rehabilitation and completion criteria.

#### 5.1.3 Revised Fauna Management Plan

A revised Fauna Management Plan has been prepared. The revised plan incorporates results from a further fauna survey and changes such as detailing a schedule of relocation of potential Cockatoo nest hollows in advance of mining. Other changes include:

- The excision of an additional 5.55 hectares of good condition remnant vegetation in the north of Lot 56. This encompasses the potential Cockatoo nest tree identified in PER Figure 14, the location of the Cockatoo egg found in the Bamford 2006 survey and also locations of good condition vegetation, comprising understorey and a mid storey of

young *Banksia* and *Allocasuarina*, where Splendid Fairy Wren and Western Thornbill were sighted in the Bamford (2006) survey. The addition of this northern mine exclusion area also has the effect of increasing the buffer distance between the Conservation Category wetland and the mine boundary to between 50 and 200 metres on Lot 56, greatly enhancing the habitat value of this area.

- Exclusion of Lot 3 from the mine area.
- Modification to the southern mine exclusion area on Lot 56 to return a degraded portion into the mine area.
- Increase of the minimum buffer distance to all Conservation Category wetlands on the perimeter of the mine site to 50 metres.
- Increase of the buffer distance adjacent to Lots 505 and 506 to a minimum of 100 metres, which protects a potential Cockatoo nesting tree shown in PER Figure 14 and increases the buffer between the mine operations and a resident with sensitivity to chemicals.
- The list of further surveys, recommended in Bamford (2006), has been added to those already specified in Section 5 of the Fauna Management Plan.

#### 5.1.4 Revised Dust Management Plan

A revised Dust Management Plan has been prepared. The revised plan incorporates changes as a result of submissions on water use, includes data from the on site weather station and additional modelling of potential dust generation.

#### 5.1.5 Noise Management Plan

Olympia has prepared a noise management plan. The plan addresses the following items submitted by DEC: noise section during the submission period:

- Background (including legislative requirements and details of modelling undertaken).
- Management of noise during construction:
  - Identification of all noise sources and associated noise control measures.
  - Complaint management procedures.
- Management of noise during operations:
  - Identification of all noise sources and associated noise control measures (including operating conditions and buffers for mobile plant).
  - A monitoring regime for noise emissions.
  - Details relating to how a detected breach would be managed and rectified.
- Management of transport noise.
- Reporting of noise emissions.
- Model refining/verification.
- Review and continuous improvement programme.

- Commitment to “buy quiet”.
- Complaint management procedure.

### **5.1.6 Water Management Plan**

Olympia has prepared a Water Management Plan. The plan consolidates information and management actions contained within the PER, outcomes of the construction, testing and licensing of the abstraction bores and field verification of the model used in the PER.

### **5.1.7 Radiation Management Plan**

Olympia has prepared a Radiation Management Plan. The plan, which includes radiation waste management, is to be submitted to the State Mining Engineer for approval.

### **5.1.8 Vegetation Management Plan and Decommissioning and Closure Plan**

These two documents, produced in the PER have been amalgamated into the revised Vegetation and Rehabilitation Management Plan. The documents contained in the PER are now redundant.

## **5.2 REVISED MANAGEMENT ACTIONS**

The environmental management actions stated in the PER and summarised in Section 1.6 of the PER document are amended as follows.



**Table 3: Revised Management Actions**

| No.                         | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Amended Management Actions                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vegetation and Flora</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 9.1.4a                      | <p>A range of development options has been considered and reasonable steps taken to avoid native vegetation as required by element one of the EPA Position Statement 2:</p> <ol style="list-style-type: none"> <li>1. The primary processing plant, process water dam, supporting infrastructure and stockpiles have been located to minimise impacts on native vegetation by preferentially locating them in existing cleared areas.</li> <li>2. Listed EPP wetlands will not be disturbed by mining activities. All EPP wetlands are located on the periphery of the mine area. Mine planning will ensure the wetlands, plus an identified buffer zone, will be retained (PER Figures 11, 12 and 13).</li> <li>3. A remnant vegetation area of 33.7 hectares on Lot 56 that contains approximately half the mature trees with suitable hollows for cockatoo nesting, vegetation in good-very good condition has been excised from the mine area. With the addition of the vegetated non-mineralised exclusion areas and the EPP wetland exclusion area, a total of 48.7 hectares of the 108.1 hectares (45 per cent) of the vegetation on Lots 56 and 3 will not be disturbed. The 48.7 hectare exclusion area includes: <ul style="list-style-type: none"> <li>• 2.45 hectares of the 3.20 hectares (76 %) of the CcXp community (Table 33) inferred as FCT 3c. Only 0.75 hectares of this FCT will be impacted by the mining operation. Bennett (2004); pg 7, records the condition of both the 3c and 3a community types as degraded to completely degraded. The community type 3c was of a larger area than FCT3a but it also adjoined paddocks with most of the understorey replaced by pasture (weed) species.</li> <li>• 25.71 hectares of the 61.3 hectares (42%) of the BaBm community in Lots 56 and 3, attributed by Griffin (2005) as 21a/c. This also includes mature trees, potentially suitable as cockatoo nest sites (PER Figure 14). Only 40.2 hectares will be impacted by the mining operation.</li> </ul> </li> </ol> | <p>Amended buffers have been identified for all the former EPP wetlands. These are shown in Figure 2 of the response to submission document.</p> <p>The remnant vegetation areas remaining undisturbed on Lot 56 and Lot 3 are shown in Figure 3. 57.4 hectares (58.6%) of the 97.8 hectares of vegetation has been removed from the mine plan and will be conserved. 40.4 hectares (41.4%) will be impacted by the mining operation.</p> |

| No.          | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Amended Management Actions                                                                                                                                                                                        |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.1.4b       | Areas to be cleared will be delineated in the field with survey pegs and flagging tape before clearing commences. Company supervisors will oversee the clearing works.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                   |
| 9.1.4c       | <p>Olympia has prepared a Vegetation Management Plan. The plan establishes a recording, monitoring and reporting framework for site activities that may impact on vegetation. The plan includes:</p> <ul style="list-style-type: none"> <li>• Recording areas of vegetation cleared.</li> <li>• A schedule of any surveys and monitoring required to be undertaken. This will include monitoring the health of riparian vegetation in the EPP wetlands surrounding the mine area as mining passes these locations. Monitoring will continue until groundwater levels return to pre mining levels.</li> <li>• Preparing a rehabilitation plan that includes recording local seed collection, species used in rehabilitation, trials undertaken, plant relocation, fencing and weed control.</li> <li>• A reporting and review schedule for the plan.</li> </ul> | Combine the Rehabilitation Management Plan, the Decommissioning and Closure Plan and the Vegetation Management Plan into a consolidated document dealing with vegetation, rehabilitation and completion criteria. |
| <b>Fauna</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                   |
| 9.2.4a       | <p>Olympia has prepared a Fauna Management Plan which identifies:</p> <ul style="list-style-type: none"> <li>• Target areas for further surveys and possible fauna relocation programmes.</li> <li>• A schedule of any monitoring that is required.</li> <li>• A reporting and review schedule for the plan.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Olympia has prepared an amended Fauna Management Plan.                                                                                                                                                            |
| 9.2.4b       | Clearing of mature trees will only occur outside the known breeding season for cockatoos, to avoid any risk to hatchling birds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                   |

| No.                               | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Amended Management Actions                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Rehabilitation and Closure</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| 9.3.4a                            | <p>Olympia has prepared a Rehabilitation Management Plan which includes the following:</p> <ul style="list-style-type: none"> <li>• Progressive rehabilitation.</li> <li>• Seed collection.</li> <li>• Species selection for rehabilitation.</li> <li>• Detailed rehabilitation plans for each property.</li> <li>• Recording and monitoring of any trials undertaken.</li> <li>• Fencing.</li> <li>• Weed control.</li> <li>• A monitoring schedule for works completed.</li> <li>• A reporting and review schedule for the plan.</li> </ul> | <p>Combine the Rehabilitation Management Plan, the Decommissioning and Closure Plan and the Vegetation Management Plan into a consolidated document dealing with vegetation, rehabilitation and completion criteria.</p> <p>The plan includes: An amended rehabilitation species list, including additional understorey species and excluding <i>Eucalyptus camaldulensis</i>.</p> <p>An amended Conceptual Rehabilitation Plan, agreed with Landholders, incorporating additional block plantings and changes to the mine exclusion areas.</p> <p>A proposed 'early planting' programme, designed to offset mature vegetation removed during mining. The programme will ensure availability of feeding sites for Cockatoos, other birds and fauna throughout the life of the mine. Early planting of native vegetation in locations outside of the planned mining limits will maximise growth before existing vegetation is cleared. It will allow Olympia to manage native vegetation over a longer time. The early planting will also assist in retaining visual amenity for residents and visitors</p> |
| 9.3.4b                            | Selective application of herbicides will occur in the spring of the first year of planting to improve establishment of planted trees. Further application of herbicide in the second year will be undertaken if required.                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| No.               | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Amended Management Actions                                                                                                                                                                                        |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9.3.4c            | <p>Olympia has prepared a Decommissioning and Closure Plan which includes the following provisions:</p> <ul style="list-style-type: none"> <li>• Prior to shutdown, clean-up the process facilities and process any materials, including the run-of-mine ore storage pad.</li> <li>• Ensure that, once infrastructure is no longer required, it is removed.</li> <li>• The final open pit is to be backfilled to approximately pre-mining landform levels.</li> <li>• Salvage pumps and other equipment.</li> <li>• Remove all hazardous materials, machinery and equipment.</li> <li>• Remove remaining buildings and infrastructure, and dispose of any demolition waste off-site.</li> <li>• Decommission bores, seal and plug below ground.</li> <li>• Decommission non-essential roads including re-establishment of natural drainage lines.</li> <li>• Rehabilitate all disturbed areas as specified in the RMP.</li> </ul> | Combine the Rehabilitation Management Plan, the Decommissioning and Closure Plan and the Vegetation Management Plan into a consolidated document dealing with vegetation, rehabilitation and completion criteria. |
| <b>Acid Soils</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                   |
| 9.4.4a            | During operations Olympia will implement a monitoring programme to detect any changes in pH, electrical conductivity (EC) and TAA as a result of generation of acid soil effects.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Olympia has prepared an Acid Sulfate Soil Management Plan (ASSMP).                                                                                                                                                |
| 9.4.4b            | <p>A number of management measures are to be implemented that will serve to buffer against acid formation. These include:</p> <ul style="list-style-type: none"> <li>• Add a limestone bed in the water dam, to serve as a buffer to acidification of the water.</li> <li>• Add a limestone rubble-lined spillway for any surplus water requiring to be discharged during peak flow periods.</li> <li>• Add agricultural lime during the reseeding and fertilising programme, as part of the rehabilitation to pasture.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                   |
| 9.4.4c            | Trigger levels of key parameters will be defined. Olympia will prepare and implement an ASSMP if these are exceeded. Initial trigger levels are TAA > 60 milligrams per litre (as CaCO <sub>3</sub> ) and a pH variance >10% acid trend (reducing pH level) of background levels. These trigger levels will be reviewed annually against monitoring data to ensure their relevance and accuracy during the life of mine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                   |

| No.                    | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Amended Management Actions                                                                               |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| <b>Dieback Disease</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                          |
| 9.5.5                  | Implementing the management measures in Table 42 will minimise the risk of introduction and spread of the fungus in upland rehabilitation sites.                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                          |
| <b>Groundwater</b>     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                          |
| 9.6.4a                 | Olympia will prepare and implement a hydrocarbon management procedure in consultation with DoW.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                          |
| 9.6.4b                 | Olympia will prepare and implement a water operating strategy. The DOE site licence will also stipulate a monitoring and reporting requirement.                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                          |
| 9.6.4c                 | Olympia will implement measures to recycle as much water as possible.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                          |
| 9.6.4d                 | Monitoring groundwater quality will continue until such time that groundwater levels have recovered following cessation of operations, to provide post-closure data.                                                                                                                                                                                                                                                                                                                                                                                             | Olympia has prepared a Water Management Plan to address both surface and groundwater issues on the site. |
| 9.6.4e                 | Fuel storage and workshop facilities will be located on elevated ground to ensure a two metre separation distance to the highest water table level, thus complying with the Waters and Rivers Commission (WRC) guidelines.                                                                                                                                                                                                                                                                                                                                       |                                                                                                          |
| 9.6.4f                 | There will be no storage of hydrocarbons on the floor of the mine pit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                          |
| 9.6.4g                 | The primary processing plant will be located on elevated ground and have hardstand areas draining to sediment sumps to prevent uncontrolled drainage from the plant site.                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                          |
| <b>Surface Water</b>   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                          |
| 9.7.4a                 | Olympia will obtain the required permit to implement any diversions of minor watercourses around active mine areas.                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                          |
| 9.7.4b                 | <p>Olympia will manage impacts on surface water quality by implementing the following:</p> <ul style="list-style-type: none"> <li>• Isolating infrastructure areas that have the potential to contaminate surface water.</li> <li>• Constructing sediment sumps, silt and oil traps where necessary to remove sediments or pollutants from runoff before water enters local drainage.</li> <li>• Any spills of contaminants such as oil or fuel will be cleaned up immediately.</li> <li>• Monitor surface water quality around the active mine area.</li> </ul> |                                                                                                          |

| No.                 | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Amended Management Actions                                                                                                      |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 9.7.4c              | Surface water management structures will be designed and constructed to ensure minimum erosion potential. Diversion drains will be constructed so that water re-enters natural drainage lines at a velocity and depth that can be accommodated by the natural stream line without increased scouring.                                                                                                                                                                                 |                                                                                                                                 |
| 9.7.4d              | As a result of heavy rainfall events, there is the potential for increased turbidity off recently-rehabilitated areas that are not yet fully stabilised. Sedimentation basins will be constructed where required to reduce turbidity before release to the environment.                                                                                                                                                                                                               |                                                                                                                                 |
| <b>Air Emission</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                 |
| 9.8.4a              | If diesel emissions prove to be an issue, Olympia will employ selective mining near the property to mine only when prevailing wind blows away from the property.                                                                                                                                                                                                                                                                                                                      | In addition a buffer area of 400 metres from the dwelling of a neighbour with sensitivity to diesel fumes has been implemented. |
| 9.8.4b              | <p>The following management and mitigation measures will be implemented to minimise and control air emissions.</p> <ul style="list-style-type: none"> <li>Vehicles and power generating equipment will be regularly maintained and serviced to manufacturer's specifications to ensure efficient running of equipment and optimum fuel consumption, thereby minimising exhaust emissions.</li> <li>Emissions will be reported as part of the National Pollutant Inventory.</li> </ul> |                                                                                                                                 |
| 9.8.4c              | Any required permits will be obtained for burning conducted on-site. Burning will be scheduled to occur during periods when local wind forecasts show prevailing winds blowing away from adjacent residents.                                                                                                                                                                                                                                                                          |                                                                                                                                 |

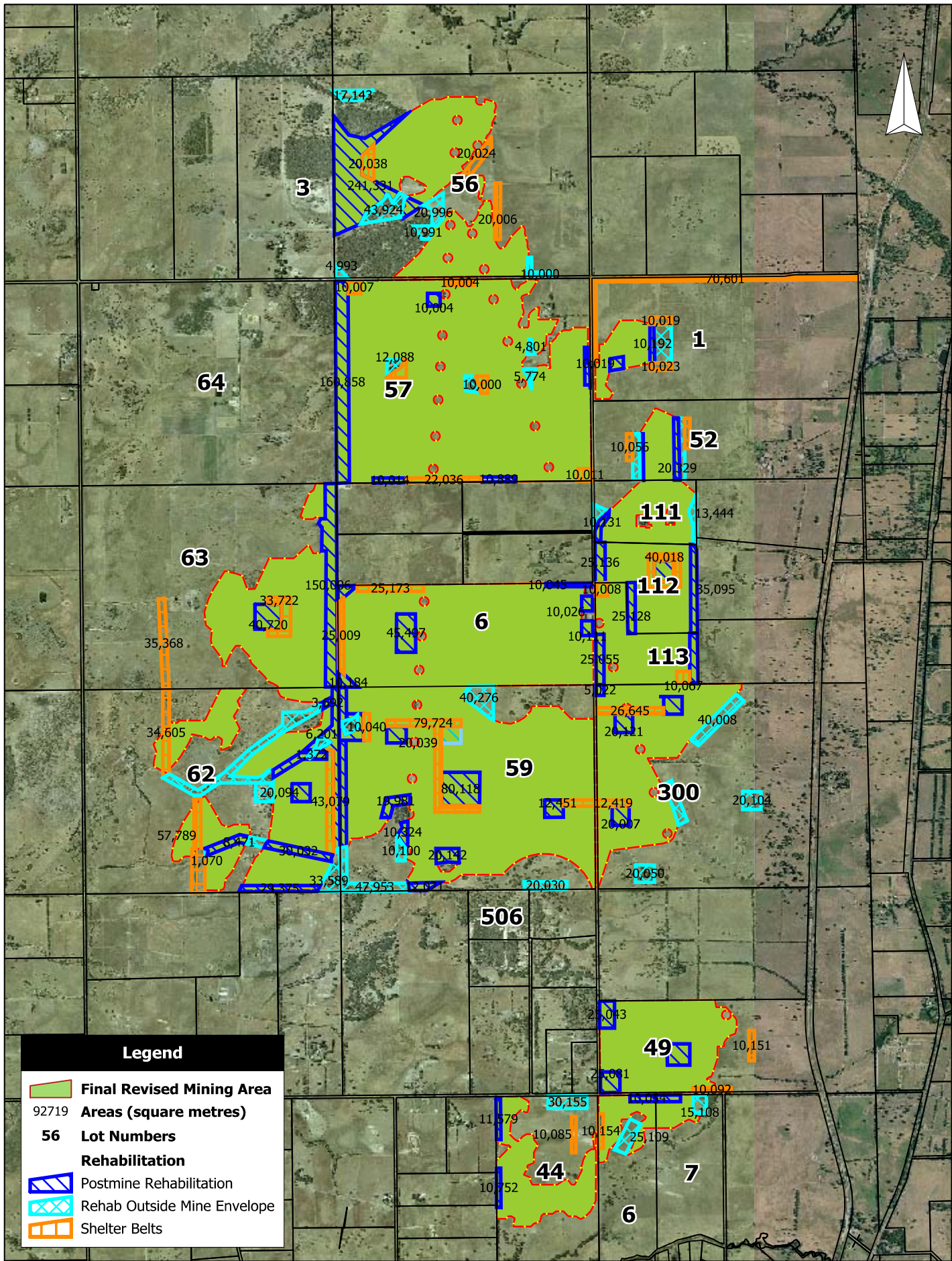
| No.                    | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Amended Management Actions                            |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <b>Dust Management</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |
| 9.9.4                  | <p>Olympia has developed a Dust Management Plan (DMP) to manage particulate emissions so they do not cause environmental or human health problems. Dust control measures will include:</p> <ul style="list-style-type: none"> <li>• Minimising clearing and open area.</li> <li>• Not stripping topsoil during periods of high winds.</li> <li>• Watering of internal traffic areas as required.</li> <li>• Growing of temporary ‘stubble’ crops to bind soil and decrease wind velocity at ground level.</li> <li>• Re-establishment of pasture as soon as possible after mining has been completed.</li> <li>• Using sprinkler systems around high activity infrastructure areas.</li> <li>• Installing a high wind warning system to enable the site to initiate dust control mechanisms in a timely manner.</li> <li>• Utilising clay and mulch to stabilise stockpile and non-vegetated backfill areas.</li> </ul> <p>The DMP includes:</p> <ul style="list-style-type: none"> <li>• Continuous wind monitoring on site linked to a warning system when threshold values are exceeded, to provide a proactive and real time management system.</li> <li>• The establishment of dust monitoring sites at strategic locations around the operation.</li> <li>• Regularly review monitoring data and investigate high results. Implement corrective actions to eliminate the causal factors.</li> <li>• Reporting of monitoring results will occur as required in the DoE operating licence, expected to be on an annual basis.</li> <li>• Regular communications will be held with adjacent landowners and a complaints management system, including investigation, action and feedback, implemented.</li> </ul> | Olympia has prepared an amended Dust Management Plan. |

| No.                   | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Amended Management Actions                    |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| <b>Noise</b>          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |
| 9.10.5                | <p>Olympia will implement the following noise management measures to ensure that:</p> <ul style="list-style-type: none"> <li>Noise control equipment on stationary and mobile equipment is operating correctly.</li> <li>Mine planning will take into consideration the noise model results, prevailing wind direction and time (day or night operation) to schedule the location of operating plant to comply with noise standards at adjacent noise sensitive premises.</li> <li>Noise emissions comply with the requirements of the <i>Environmental Protection (Noise) Regulations 1997</i> and the <i>Mining Act 1978</i>.</li> </ul>                                                                                   | Olympia has prepared a Noise Management Plan. |
| <b>Waste Products</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                               |
| 9.11.4                | <p>Olympia will implement management measures to minimise the potential for contamination of the surrounding environment due to general waste disposal as follows:</p> <ul style="list-style-type: none"> <li>There will be no on-site disposal of wastes.</li> <li>Wastes will be stored in appropriate containers and locations including bunded areas (for hazardous materials) and bulk bins or rubbish bins (for general domestic and office refuse).</li> <li>Wastes will be recycled where practicable.</li> <li>General domestic and office waste will be disposed to an approved off-site landfill.</li> <li>Effluent disposal systems will comply with local government health department requirements.</li> </ul> |                                               |



| No.                                       | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Amended Management Actions |
|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <b>Dangerous and Hazardous Substances</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                            |
| 9.12.4                                    | <p>Olympia will implement management measures to minimise the risk of contamination of soil, surface water and groundwater at the site:</p> <ul style="list-style-type: none"> <li>• Develop and maintain a register of all hazardous materials imported to the site or generated as a result of activities undertaken at the site. This will document the hazardous material name, location, approximate volume, storage method and where applicable, disposal method for the substance and containers.</li> <li>• Locate fuel storage areas and workshops to comply with the two metre minimum separation distance to groundwater as described in WRC Policy No 1.</li> <li>• Fuel storage areas and workshops will be bunded in accordance with DoIR and DoE requirements.</li> <li>• Treat runoff contaminated with hydrocarbons prior to discharge.</li> <li>• Clean up hydrocarbon spills and remove contaminated soil from site.</li> <li>• Transport hazardous wastes generated by the operation off-site to licensed waste disposal facilities. This is likely to include waste oil, grease and mobile equipment filters.</li> <li>• Bring hazardous materials to the site in bulk packaging wherever possible. This will minimise the number of containers and reduce the risk of spillage.</li> <li>• Complete major mechanical servicing and overhauling of mining equipment off-site. Conduct routine equipment and vehicle servicing activities including washdown on impermeable surfaces.</li> <li>• Obtain a Licence to Store Dangerous Goods for the storage of diesel fuel on-site.</li> </ul> |                            |

| No.              | Management Action in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Amended Management Actions                                                                                 |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>Heritage</b>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                            |
| 10.1.3           | <p>Olympia will avoid any unnecessary disturbance to any identified Aboriginal heritage sites. Management and mitigation measures that will be implemented to achieve this will include:</p> <ul style="list-style-type: none"> <li>• Conduct an Aboriginal heritage survey of the mine area, in conjunction with Aboriginal representatives, prior to site works commencing.</li> <li>• Comply with the requirements of the <i>Aboriginal Heritage Act 1972</i> and seek advice from the Department of Indigenous Affairs in the event that any Aboriginal heritage sites are identified during the life of the project.</li> <li>• Olympia will ensure that all its staff and contractors on site receive an induction that includes their obligations and responsibilities under the <i>Aboriginal Heritage Act 1972</i>.</li> </ul> | An Aboriginal heritage survey has been conducted of the whole of each Lot which includes area to be mined. |
| <b>Transport</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                            |
| 10.2.3a          | Olympia will obtain the necessary transport permits from the Shires of Murray and Serpentine Jarrahdale for transport on local roads, and Main Roads WA, for transport on the South Western Highway.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                            |
| 10.2.3b          | Olympia will consult with the Shire of Murray on any required signage, upgrading of local intersections or road pavement that is needed for safe movement of all traffic on local roads.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                            |
| 10.2.3c          | Olympia will consult with Main Roads WA on the intersection requirement of Readheads Road with the South Western Highway. Any required upgrade works will be undertaken to ensure safe traffic access and egress.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                            |



## **6. RESPONSE TO SUBMISSIONS**

### **6.1 FLORA AND VEGETATION**

#### **6.1.1 Threatened Ecological Communities**

The submission by DEC related to the inferred classification of particular Floristic Community Types (FCT) as Threatened Ecological Communities (TEC's) and the conservation value of these remnants. The submission by DEC supported the condition assessment reports provided by the proponent. A site inspection of the remnant vegetation that could possibly correspond to TEC's found the vegetation to be highly degraded.

Other submissions by Community 60, Community 2, SJLC express concerns the flora and fauna survey are inadequate, understate the flora statistics, have not been completed and are absent from the North Dandalup area and suggest that further floristic surveys be performed to verify the extent of the presence of declared rare or priority flora.

##### **Response**

The submissions related to the potential Threatened Ecological Community (TEC) types 20b, 3a and 3c recorded in the mine area. The DEC submission supported the proponent's assessments that the level of degradation of the communities was such that they could not be interpreted to contain intact TEC's. DEC agreed "the proposed impact on these areas from mining was not considered to be significant for conservation of the floristic biodiversity values, but may be significant for fauna conservation".

An additional targeted fauna surveys for bats, scheduled and reported in the Fauna Management Plan, has been undertaken. The results are included in the revised Fauna Management Plan.

The proponent does not consider the surveys to be inadequate.

#### **6.1.2 Fencing of Remnant Vegetation**

The DEC submission states the PER does not address the potential value of fencing remnant vegetation in areas that will not be mined as a means of protection and enhancement of this vegetation. In the absence of fencing, continued grazing by stock will further degrade these remnants and reduce available fauna habitat and local biodiversity. Community 70 comment that human induced revegetation approaches can not replace original natural ecosystems. Revegetation should be designed in more natural random clumpings.

##### **Response**

The point made that without fencing (of remnant native vegetation), continued grazing by stock will further degrade these remnants is acknowledged. The PER frequently makes reference to the past and present agricultural use of the land, however reference to fencing

is more usually stated in the context of rehabilitation. As demonstrated throughout the mine site, areas subject to continued grazing possess little, if any 'ability to regenerate' over the longer term. There is little, if any, evidence of native vegetation recruitment in these areas and as gradual decline in the existing vegetation continues, the result over time is an increase in degeneration not regeneration.

As discussed with DEC representatives during their site visit, the proponent considers fencing of both remnant areas not disturbed by mining and rehabilitated areas must be undertaken in the context of the current agricultural land use. Landowner engagement and support is vital in identifying where remnant vegetation and rehabilitation areas can be fenced to enable long term exclusion of stock. The proponent considers this outcome will achieve a better long term result for the remnant native vegetation areas than the current situation where all areas are unfenced and subject to ongoing, gradual, decline. Specific details of the shape and position of rehabilitation areas can be modified in the detailed annual rehabilitation program.

The proponent has undertaken meetings with landowners to obtain their agreement for the rehabilitation programme, which includes fencing of some native vegetation areas. Agreement from the landowners for the plan has been submitted to DEC.

### **6.1.3 Buffer Zones**

The submission by the SJLC expressed concern that reduction in buffers around TECs can increase disturbance (including increased runoff, light, soil disturbance) and the associated invasion of introduced species. Existing problem weeds may spread further into the TEC. Best practice indicates that buffers should be at least 500 metres. The submission recommended a sufficient vegetation buffer zone be placed around TECs.

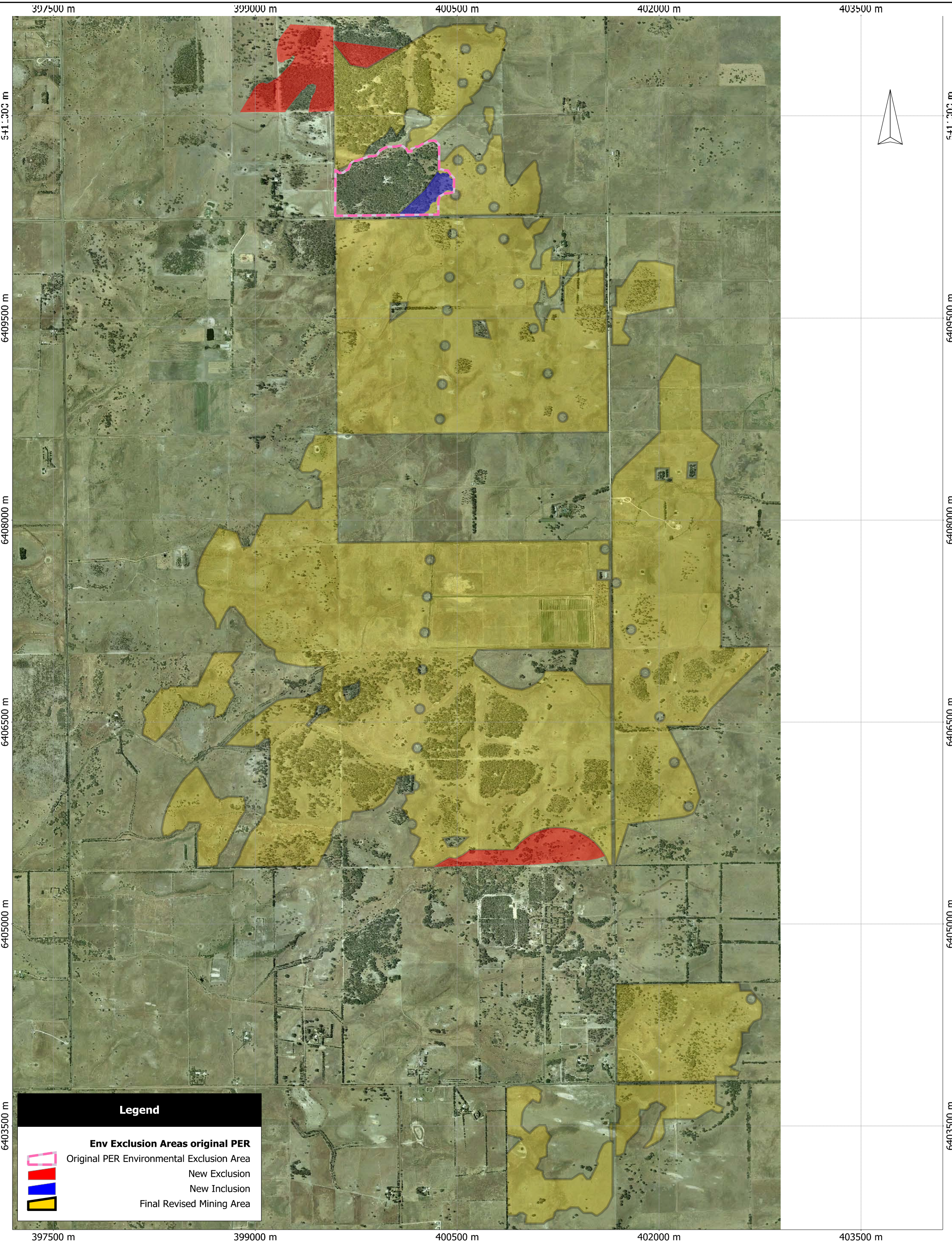
#### **Response**

The statistic analysis of the flora assessment data has determined that the inferred TEC 20b community cannot be confidently assigned to that category. It has greater similarities to Floristic Community Types (FCT) 21a and 21c, both of which are not TEC's.

The submission outlining proposed buffers to the inferred TECs does not acknowledge the historic and existing active agricultural land use of the area. Cattle grazing occurs throughout the proposed mine area. Pasture species exist throughout the native vegetated remnants. The proponent submits it is impractical to consider exclusion buffers, especially to the extent of 500 metres as proposed, in an actively farmed, private property, rural landscape.

The situation of Olympia's proposal overlying private property rural farmland has similarities to other locations in the State where mining lease activities overlies pastoral leases. The environmental assessment process on the mining proposal is limited to that proposal and does not impart limitations, restrictions and conditions on the ongoing activities of the pastoral leaseholder.







### 6.1.4 Environmental Exclusion Areas

The DEC submission requested provision of a map that identifies where the mineral resource has been foregone for environmental benefit.

#### Response

The original mining exclusion area is shown in Figure 4 of the PER. The revised mine plan (Figure 4) shows the changes to the PER Figure incorporating additional resource areas forgone and also re-inclusion of areas shown as excluded in the PER Figure, but now included in the amended mine area. The figure shows:

1. The original mine exclusion area on Lot 56, as submitted in the PER Figure 4, totalling 37.3 hectares.
2. The revised mine exclusion areas on Lot 56, consisting of an additional exclusion area in the north of 5.1 hectares and inclusion of a portion of the original exclusion area of 5.4 hectares.
3. This means the revised mine exclusion area, shown in Figure 4 of the PER has been reduced by 5.4 hectares from the original 37.3, to now total 31.9 hectares.
4. The exclusion of Lot 3, comprising 15.0 hectares of vegetated area in a total area that was to be mined of 27.8 hectares.
5. The exclusion of a buffer area in the south of Lot 59 of 18.9 hectares, although only 11.0 hectares is covered in Completely Degraded vegetation (Bush Forever category 6), with the balance cleared pasture.

### 6.1.5 Vegetation Offset Package

The submissions by DEC: Kwinana Peel Region and Conservation Council (CC) recommend a vegetation offsets package to compensate for the loss of the Bassendean Complex Central and South which is currently under the 30% biodiversity threshold and that all vegetation identified as being in Good or better condition be retained.

The Wildflower Society expressed a similar view, that the property owned by Olympia Resources should be fenced, completely rehabilitated and included in the conservation estate.

#### Response

The proponent considers the loss of vegetation as a result of the project is temporary and does not warrant an offset proposal.

The mining proposal comprises the progressive clearing of remnant Bassendean Complex vegetation, much of which has been assessed as completely degraded, with progressive rehabilitation following mining that uses seed sourced from the project area and surrounds. The stated rehabilitation outcome in the PER is to replace an equal area to that cleared.

This contrasts with clearing for other purposes such as agricultural, urban development or

infrastructure projects, where the area cleared is permanently used for another land use.

This point was further clarified in a meeting with the EPASU on 21 February 2007. The 'early planting' program, retention and protection of key bushland remnants in the mine area and the exclusion/avoidance of habitat, all detailed in the Vegetation and Rehabilitation Management Plan, were accepted as providing habitat offsets within the site.

In addition, the PER (Section 9.3.4) addresses the concept of offsets as proposed in the Preliminary EPA Position Statement 9 (2005). Eight principles are listed. The first principle states that "Environmental offsets should only be considered after all other reasonable attempts to mitigate impacts have been exhausted". Explanation of this principle includes that on site environmental impacts must first be addressed using the mitigation sequence of avoidance, minimise, rectify, reduce and offset in that order. Offsets are only then used to address any significant residual environmental impacts following mitigation considerations.

The proponent has made every reasonable effort to follow the mitigation sequence. This includes the following:

- Avoidance: Management Action 9.1.4a details the avoidance mechanisms to be implemented.
- Minimise: By minimising the areas required to be cleared during the project using internal procedures to ensure remnant vegetation areas and wetlands outside the mine area are not disturbed. This is detailed in Management Action 9.1.4b and 9.1.4c.
- Rectify: By implementing the principle to rehabilitate an equal area on site as disturbed, no long term reduction in vegetated area will occur. This is detailed in Management Action 9.3.4a.

By implementing the actions above, it is considered that no outstanding significant residual environmental impact remains to warrant consideration of an offsets strategy.

### **6.1.6 Current Conservation Effort**

The Shire of Serpentine-Jarrahdale (SJS) stated the areas of remnant vegetation onsite (particularly to the north) may warrant some further vegetation work, particularly given that they are possible significant FCTs and provide valuable fauna habitat and food. The DEC is likely to undertake a site visit to determine mechanisms for protection of FCT 3c and 3a located onsite.

SJS comments further that given the existing remnant vegetation onsite only accounts for approximately 4.9 % of the total land area, it is concerning that further efforts to conserve these areas have not been made. Clearing this additional vegetation will reduce species diversity in the area.

The SJLC and Community 2 submissions stated that Lot 56 is a potential location for



listed Declared Rare Flora (DRF) species, although this was not identified during the survey work undertaken. Further work may be required in this regard.

KNAG raised a similar concern, that the remaining 60 hectares, assessed as remnant vegetation with native under storey in a range of conditions, has much greater diversity of species than indicated.

### **Response**

The detailed flora survey did not locate any declared rare flora species.

Amendments to the mine plan have occurred which exclude a further 14.76 hectares of the northern portion of Lot 56 and all of Lot 3 (Figure 4). The proponent considers the proposal will not cause a reduction in species diversity of the area as the rehabilitation programme will use seed from vegetation on site as well as additional lowland species and upland understorey species that are currently absent or poorly represented throughout the site.

### **6.1.7 Vegetation on Lots 3 and 56**

The SJS and SJLC stated it is not clear from the documentation why one area of bushland in Lots 3 and 56 is to be cleared whilst the other area is not. Given that they represent less than 5% of the total mining area, consideration of retaining both areas of vegetation should be seriously considered. Submissions by Community 2, Community 65, and the WS raised similar comments on the bushland north of Elliot Road as being significant Cockatoo habitat and good quality native vegetation that should not be disturbed.

### **Response**

PER Management Action 9.1.4a includes the following text:

A remnant vegetation area of 33.7 hectares on Lot 56 that contains approximately half the mature trees with suitable hollows for Cockatoo nesting and vegetation in good-very good condition has been excised from the mine area. With the addition of the vegetated non-mineralised exclusion areas and the EPP wetland exclusion area, a total of 48.7 hectares of the 108.1 hectares (45%) of the vegetation on Lots 56 and 3 will not be disturbed. The 48.7 hectare exclusion area includes:

- 2.45 hectares of the 3.20 hectares (76%) of the CcXp community (Table 34) inferred as FCT 3c. Only 0.75 hectares of this FCT will be impacted by the mining operation. Bennett (2004); pg 7, records the condition of both the 3c and 3a community types as Degraded to Completely degraded. The community type 3c was of a larger area than FCT3a, but it also adjoined paddocks with most of the understorey replaced by pasture (weed) species.
- 25.71 hectares of the 61.3 hectares (42%) of the BaBm community in Lots 56 and 3, attributed by Griffin (2005) as 21a/c. This also includes mature trees, potentially suitable as Cockatoo nest sites (PER Figure 14). Only 40.2 hectares will be impacted by the mining operation.

The proponent acknowledges that some mature trees will be lost as a result of mining.

40.4 hectares of the 97.8 hectares of vegetation on Lots north of Elliott Road (41.4%) will be impacted by the mining operation. 57.4 hectares (58.6%) has been removed from the mine plan and will be conserved.

### **6.1.8 Description of the Floristic Community Types**

The submission by the Peel Harvey Catchment Council (PHCC) on the PER section on vegetation and flora stated the section should describe FCT 3a and 3b as well as FCT 21a, 21b and 21c and outline the area remaining, area currently protected and area the PER proposes to clear.

#### **Response**

Table 19 of the PER lists and describes FCT's identified within the mine area including 3c, 3a, 20b and 21c. Table 34 identifies the area and condition rating of each community type within the mine area.

### **6.1.9 Percentage of Remaining Vegetation**

The CC raised concerns that no indication is given in the PER or flora assessment of the percentage remaining of each vegetation type that is proposed to be cleared, this is vital information to assessing its conservation status. Potential TEC's should be excluded from the mine area, rehabilitated and reconnected to areas of remnant vegetation as part of the projects commitment to net environmental benefit.

#### **Response**

The PER included information on the landform and vegetation community types in Tables 11, 32 and 33 and in text within Section 9.1.4. Specifically, pages 129-131 identify the Bassendean Complex as already below the 30% Commonwealth target and above the Bush Forever 10% target.

The issue of potential TEC's is addressed in item 6.1.1.

The general issues of rehabilitation are further addressed in response 6.2.12. The Vegetation and Rehabilitation Management Plan includes the principle of corridor linkages to connect remnant vegetation islands not disturbed by the mining operation, stream zones and replanted areas. The following points in the Rehabilitation Management Plan should be noted:

- The plan includes a consultation and review schedule to ensure its continued currency.
- The Conceptual Rehabilitation Plan, as the title suggests, is a concept. It is not the only design able to achieve the replacement of the area cleared. Modifications to this concept plan are anticipated and this process is built in to the consultation and review processes of the Rehabilitation Management Plan.

### 6.1.10 Cockatoo Population

The CC raised the concern that the proponent has simply written off the possibility of the project impacting on breeding or feeding habitat of endangered Cockatoos, despite this being an issue recognized by the Department of Environment and Water Resources (DEW) for this project, and an issue of increasing media and public focus on other projects in recent times. The PHCC and SJLC stated the losses of feeding and breeding habitat are recognised as key threatening processes. Given the amount of potential Cockatoo habitat in the project area, the proponent should be required to produce a scientifically based Cockatoo management plan for the project. The PHCC further comment that the State and Commonwealth listing for Carnaby's, Forest Red-tail and Baudin's Black Cockatoos should be recorded. It should also detail exactly how many potential hollows and feeding trees occur across the site and how many will be lost due to clearing for the proposal.

Community 70 and Community 2 submissions raised similar concerns on the loss of feeding and breeding areas for Cockatoos. The KNAG submission raised a similar comment on the small number of Cockatoo nest sites identified on the mine area.

#### Response

The proponent disagrees that it has dismissed the possibility of impact on breeding and feeding habitat of Cockatoos. The proponent has implemented measures to excise important potential breeding areas from the mine plan. There will be a progressive short term reduction of food source as a result of progressive clearing over the eight year mine life, but this will be progressively replaced by rehabilitation using native species. The proponent considers the impact on Cockatoo species is manageable, with the mitigation measures proposed resulting in minimal long term impacts.

The Wilcox 2005 survey conducted identified feeding, evidence of past nesting sites and potential nesting sites of Cockatoo species on the site. The Bamford (2006) survey identified feeding and a broken egg (evidence of breeding) on the site. Locations with concentrations of nesting trees have been excluded from the mine area. Progressive loss of feeding habitat, specifically Marri, Jarrah, Sheoak and Banksia over the eight year mine life will be progressively replaced with the rehabilitation of these species using seed collected from the site. Over the eight years of the project life, trees planted in the early stages, especially Marri and Jarrah, will be sufficiently established to be setting seed. As the rehabilitation areas age, the food source will progressively re-establish.

A proposed 'early planting' programme is designed to ensure availability of feeding sites for Cockatoos and other birds throughout the life of the mine. The early planting will also assist in retaining visual amenity for residents and visitors.

There will not be removal of the entire 222 hectares of remnant vegetation from the commencement of operations. The most consolidated portion of remnant vegetation, on Lot 56 is not scheduled to be accessed until year seven of the eight year mine life.

There are also locations outside the immediate mine area that contain remnant vegetation which include potential nest sites. These will not be impacted by the proposal. The submission by the Keysbrook North Dandalup Action Group (KNAG) provided

photographs of two such trees outside the mine site, indicating that potential nest sites and feeding areas within the greater area are not restricted to the mine footprint.

Figure 17 from the PER shows the proximity of additional major food supplies from the Darling Scarp and Plateau and other remnants on the Swan Coastal Plain. The Cockatoo species are highly mobile and known to easily travel the four to five kilometres to these sites.

Other mitigation measures include potential nest sites from individual trees removed during mining to be remounted into remnant vegetation areas that will not be disturbed, resulting in minimal loss of potential nest sites in the area.

Discussion with Ron Johnstone at the WA Museum has confirmed the Museum has records of Carnaby's Cockatoo successfully utilising nest boxes in the wheatbelt of WA. They also have records of the Glossy Black Cockatoo on Kangaroo Island successfully utilising nest boxes. The utilised nest boxes are both of wooden and plastic construction.

There is currently no recording of Forest Red Tail or Baudin's Cockatoos utilising nest boxes. The Water Corporation has commenced a two year trial in the south west using the same design as successfully used on Kangaroo Island. No data is available at this time.

The above information demonstrates that cockatoos do utilise constructed nest boxes.

The current terminology of 'relocated hollows' used in the PER and the Fauna Management Plan is intended to describe that a potential cockatoo nest site in a tree that is to be removed will be 'relocated' to a suitable tree in as close proximity as possible. This can occur by either cutting the nest site out of the existing tree and remounting it in the replacement tree or mounting a constructed nest box in the replacement tree. The latter option caters for the possibility that damage to the existing potential nest site may occur when felling the tree.

Therefore, by a combination of either remounting existing potential nest sites or mounting constructed nest boxes, Olympia is confident that there will be no decrease in possible nest sites within the immediate area.

The State and Federal listing of Cockatoos is addressed in item 6.3.10.

### **6.1.11 Recommended Site Visits**

The CC submission stated during the assessment process the Conservation Council undertook a site visit with the proponent and consultant. On this visit it was noted that much of the grazed woodland was of a higher quality than is asserted by the proponent, and a number of potential hollows were easily spotted from the car that do not appear on the proponents maps. Hence, the Conservation Council recommends that the EPA undertake a site visit during the assessment of the project.

**Response**

The proponent considers the detailed quadrat survey and assessment of vegetation condition provided in the PER to be more quantifiable than casual observations made during a site visit of short duration. The DEC have supported the methodology and general findings of the vegetation assessments (item 6.1.1).

The potential nest site survey by Wilcox (2005) targeted hollows of a size considered suitable by Cockatoo species. The literature review and discussion with R Johnstone from the WA Museum found that hollow openings of 20 to 30 centimetres were generally required. This information is included in the survey report. Not all hollows in trees were recorded in the survey, only those that matched Cockatoo requirements.

The EPA conducted a site visit on 16 October 2006.

**6.1.12 Remnant Vegetation Condition**

The CC raised the concern that much of the areas of heavily grazed remnant vegetation that is rated at 6 were more likely 5. Although the under-story was largely removed, the areas were far from being almost completely without native species - with several tree and large shrub species present in a relatively dense canopy - and a programme of fencing, minimal under-story replanting and potentially weed management would see these areas return to reasonable native vegetation. Some areas marked as 5 also appeared to retain some vegetation structure or an ability to regenerate from adjacent vegetation rated at 3.

Submissions by Community 70, SJLC and the PHCC contained similar statements suggesting that no remnant areas within the mining area should be cleared, fencing of all native revegetation areas, establishing regulated management agreements with the landowners to ensure that landowners are penalised for any passive or active clearing or destruction of the revegetation areas and proponent responsibility for management of the revegetation areas for a period of not less than 20 years.

**Response**

The proponent submits the statements of “programs of fencing, minimal understorey replanting and potentially weed management would see these areas return to reasonable native vegetation”, “fencing all native revegetation”, “permanent protection and fencing, “landowners being penalised for any passive or active clearing of revegetated areas” and “at least 20 years management by the proponent” do not acknowledge the historic and existing active agricultural land use of the area.

The situation of Olympia’s proposal overlying private property, rural farmland has similarities to mining lease activities overlying pastoral leases in other locations in the State. The environmental assessment process on the mining proposal is limited in scope to that proposal and does not impart limitations, restrictions and conditions on the ongoing lawful activities of the other land use operators.

As demonstrated throughout the mine site, areas subject to continued grazing possess little, if any ‘ability to regenerate’ over the longer term. There is little, if any,

evidence of native vegetation recruitment in these areas and as gradual decline in the existing vegetation continues, from a range of factors, the result over time is an increase in degeneration not regeneration.

The underlying restorative principles in the submissions by the Conservation Council, Community 70 and the Peel Harvey Catchment Council cover many elements included in the proponent's Vegetation and Rehabilitation Management Plan. As discussed with Conservation Council and Wildflower Society representatives during the site visit, the proponent considers such works must be undertaken in the context of the current agricultural land use. Landowner engagement and support is vital in identifying where remnant vegetation and rehabilitation areas can be fenced to enable long term exclusion of stock. The proponent considers this outcome will achieve a better long term result for the remnant native vegetation areas than the current situation of ongoing, gradual rural decline.

### 6.1.13 Net Biodiversity Loss

The CC and Wildflower Society state there would be a net loss of mature trees, flora and fauna habitat and species diversity through this project as it is currently presented.

#### Response

The proponent acknowledges some loss of mature trees will occur as a result of the project. The proponent disagrees there will be a net loss of biodiversity as seed from vegetation on site will be collected for use in rehabilitation. As shown in the statistical analysis of the flora assessment data, there is already a significant reduction in species diversity in the mine area. This is principally a result of grazing removing the understorey component.

The proponent considers the biodiversity of the area will increase as the rehabilitation plan will also include understorey species in fenced areas and increased lowland species, now mostly absent from the site.

### 6.1.14 Translocation of *Xanthorrhoea* and *Kingia* Species

The CC submission expressed concern the proponent is soft on the transplanting of *Xanthorrhoea* and *Kingia sp* by claiming that trials for relocation will be conducted. There is no need to conduct trials for this species, relocation is now a standard practice, and the success rate is improving, however that is a poor replacement for the destruction of *in-situ* functioning ecosystems.

The submission by KNAG also raised the issue of potential loss of *Kingia australis*, stating the species *Dasypogon bromeliifolius* and *Kingia australis* were both linked by DNA and had been in existence for 120 million years.

#### Response

This is acknowledged. Transplanting of *Xanthorrhoea* and *Kingia sp*. is detailed in the Vegetation and Rehabilitation Management Plan and will be undertaken. This will

ensure minimal net loss of individuals from the area and conservation of biodiversity.

The majority of the remaining individuals of these species occur in a pasture setting. Such a condition is not considered as an in-situ functioning (natural) ecosystem. The proponent considers consolidated transplanting in conjunction with rehabilitation using a range of tree and understorey species and fencing from stock, will provide a more sustainable outcome in maintaining the presence of these species in the locality than the existing situation.

### 6.1.15 Groundwater Abstraction and Tree Death

The Community 2 submission expressed concern that there is not very much water in the ground already, and groundwater abstraction associated with the mine may kill the trees.

#### Response

The proponent does not consider that groundwater abstraction will cause vegetation death in adjacent vegetation. Dewatering of the superficial Bassendean layer will produce localised drawdown during winter to a level similar to the natural summer water table. Modelling of the extent of water table drawdown beyond the confines of the open pit show drawdown levels less than 0.4 metres to a distance of a few hundred metres during winter. These levels recover shortly after mining is completed.

During summer, as the water table is naturally at the level of the pit floor, there will be no need for further dewatering of the superficial groundwater level. This is supported by information from exploration drilling and also recent work undertaken by Rockwater in specific locations on the site. Sections from Rockwater (2007) are reproduced below to clarify this point:

(Rockwater (2007), pg 7)

*On Section 1 the Bassendean Sand is unsaturated in summer/autumn. The water table – at near-minimum elevation (May 2007) – lies at 0 to 1.5 m below the top of the Guildford Formation (Fig. 7). Relative levels in May were 29.9 m AHD at bore KWT1D, 31.27 m AHD at KWT1E, and 29.69 m AHD at KWT1F. Given the planned mining base elevation of 29.8 m AHD at Section 1, there can be no discernible lowering of the summer water table at the wetland.*

*Test holes intersected dry Bassendean Sand, in the southern half of Section 2, but in the northern half the sand extends below the water table elevation of up to 27 m AHD recorded in the Guildford Formation (Figure 8). In the southern part of the section the water table in May 2007 slopes downwards to 25 m AHD below the wetlands.*

*Mining in the northern part of Section 2 will lower water levels at the mine edge, to about 26 m AHD, which is about 1 m higher than the summer water level beneath the wetland. Thus, the wetland water table would not be affected by mining in the dry season.*

It is expected that most native vegetation obtain their water supply from root systems within the Guildford and upper Leederville formations, not the superficial Bassendean sands which dry out over summer. Charts 4 and 5 in the PER show the summer water table to be between two and three metres below ground level. This is the base of the Bassendean sand (interface of Bassendean and Guildford layers). As the superficial layer is shown to desiccate, it is expected that native vegetation obtains their summer water requirements from layers below the desiccated Bassendean sand, where the summer water table would be located.

This is further supported by field observation of the annual pasture species, which have shallow root systems and die out over the summer months. If water tables were maintained in the superficial (Bassendean) profile over summer, perennial pasture species and green grass over the summer period would result. This is only evident in small areas of the very lowest profiles within the mine area. In addition, field observation of shallow drilling for acid sulfate soil testing confirms groundwater levels generally between 1.5 and 2.5 metres, supporting the levels shown in Charts 4 and 5.

Drawdown from the Leederville aquifer is shown in the PER (Appendix 4, Figure 22) and explained in greater detail in response 6.4.5. Predicted levels of drawdown beyond about two kilometres from the production bores after eight years of pumping are anticipated to be two metres or less. The effect of pit dewatering and abstraction from the Leederville bores is not anticipated to impact the superficial Bassendean zone. The groundwater monitoring programme developed will include vegetation health, to ensure that no negative impact occurs.

### 6.1.16 Clearing of Floristic Community Types

The SJLC submission stated “The statement on p.90 of the PER: ‘Bennett (2004) concluded the vegetation condition of FCT 3a and 3c (quadrats 11, 7 and 8) were recorded as mainly degraded to completely degraded and are not considered worthy of conservation’ is inconsistent with Table 19 (p.85) which describes the condition of FCT 3c to be good to degraded (Rating 4-5).

The submission by Community 70 raised similar concerns on the condition of FCT’s, providing extracts from the PER, with a conclusion that FCTs with vegetation condition classed as Good, that is, “Retains basic vegetation structure or ability to regenerate it”, should remain uncleared

#### Response

The general description given of “mainly Degraded to Completely degraded” is not inconsistent with the assessment undertaken. The description of quadrats 7 and 8 in Section 3.1.1 of the Bennett (2004) report, inferred as FCT 3c, states “This vegetation unit merged into remnant areas of the Low Open Woodland of *Corymbia calophylla* over Tall Shrubland of *Pericalymma ellipticum* over a Low Shrubland of *Hypocalymma angustifolium*. Table 3 of the report lists quadrants 4, 6 and 12 in addition to quadrants 7 and 8 in the Good to Degraded (4-5) category, without specifically nominating any of the quadrants within that range. Some variation in locations is expected. The report (page 12) further describes the two FCT’s (3a and 3c) as “Both of these FCT’s are



degraded and of too small an area to be considered worthy of conservation. Table 34 of the PER shows areas of 0.25 hectares and 0.75 hectares respectively within the mine area. The PER (page 127) shows 2.45 hectares of FCT 3c is outside the mine area and will not be disturbed.

Response 6.1.7 is also relevant to this item.

### 6.1.17 The Extent of Clearing and Rehabilitation

The CC submission noted that the proponent has reserved some of the remnant vegetation to the north of the proposed project area, the proponents claim that the remaining areas of remnant vegetation may “need” to be cleared during the mine is unsubstantiated. The proponents plans to clear this remnant vegetation is also at odds with the Native Vegetation Clearing Principle (e), and possibly (b) for its importance to Cockatoos, and possibly other fauna, birds and bats.

According to the proponent’s figures, the entire site of the proposed mine is 1,234 hectares, made up of 930 hectares of open pasture, 244 hectares is parkland cleared remnant vegetation and 60 hectares is good quality remnant vegetation. Of this the proponent intends to clear 930 hectares of open pasture, all parkland cleared remnant vegetation and 30 hectares of good quality remnant vegetation. Two hundred year old marris, habitat logs and parkland cleared vegetation will be replaced by a limited range of quick growing native vegetation, which will be quickly affected by the dieback made active in the soil by the proponent’s soils management plan. The result will be the replacement of patches of currently unmanaged (but easy to do so) precious remnant vegetation with roadside shelter belts and very little prospect of survival in a meaningful way.

Other submissions raise similar concerns on the extent of clearing for the project. The SJLC state that the areas proposed to be cleared are significant as they comprise remnant stands of native vegetation in an area that has been extensively cleared. SJS state “the vegetation and fauna assessment recommended that all practical measures be undertaken to ensure that the regional connectivity of habitat is maintained. Clearing of further vegetation does not achieve this goal”. KNAG states “Olympia seeks to bulldoze a combined total of 304 hectares of bush and parkland cleared farmland. There are thousands of mature Jarrah trees within this remnant bushland. There is no plan to preserve any of this save for a “*billboard strip of bush*” on Elliott Road that happens to be close to an owner’s house.

There is no plan to return the parkland cleared areas back to their original state, but to plant an artificial looking series of straight lines that will be a visible scar from the SW highway, Railway line and the tourist drives from the Darling Scarp. The flora studies are incomplete and no studies have been undertaken in the area that straddles Readhead Road”.

The Community 1 and KNAG submissions raised a number of similar points on clearing areas, the flora studies have not been completed and are absent from the North Dandalup area, the project will see the complete destruction of all mature Jarrah and Marri

trees which means that there will be no nesting hollows for several hundred years across a 1200 hectare area.

Community 1 raises issues on the rehabilitation programme including the planned re-vegetation into straight lines along the fences will be highly artificial and not a re-establishment of the previous natural bushlands setting. The objective of ‘avoidance or management of adverse impacts’ being at odds with bulldozing hectares of 100-200 year old trees and salinity encroachment in the Nambeelup Catchment, especially near Elliott Road and Hopeland Road intersection if Lot 56 and Lot 3 are cleared.

### **Response**

The PER detailed the extent of clearing required to implement the project. As a result of the additional fauna survey and site inspection of wetlands adjacent to the mine boundary, modifications to the mine area have occurred. These are detailed in Table 2. There are substantial areas of remnant vegetation that will not be disturbed by the project and these will be augmented by rehabilitation planting and fencing.

The proponent disagrees with the view expressed that the rehabilitation will comprise “*roadside shelter belts and very little prospect of survival in a meaningful way*” and “*billboard strip of bush*”. More detailed responses to submissions on the rehabilitation programme are provided in Section 6.2.

## **6.1.18 General Flora and Fauna Loss**

There were many submissions dealing with aspects of the protection of vegetation, loss of flora and habitat for fauna. These included:

Community 70 and Community 2 submissions state there would appear to be different rules for the clearing of land for developers to that of farmers. Developers can bulldoze all the vegetation, whereas farmers are very restricted. Also, when more than 90% of the Swan Coastal Plain has already been cleared, it is vandalism to clear these remnants. The view expressed is that the area of parkland cleared remnant vegetation’ and remnant vegetation in good condition be excised from the proposed mining area. The Wildflower Society stated the proposal, if approved, will involve significant loss of flora and habitat for native fauna species. Similar submissions were made by SJLC, Community 60, Community 65 and Community 1.

### **Response**

The proponent acknowledges that some clearing of remnant vegetation will occur as a result of implementing the project. Section 5.3 of the PER discussed the land systems of the project area. Table 11 shows that almost all the vegetation proposed to be cleared is in the Bassendean Complex. The rehabilitation programme also proposes to include lowland species, more reflective of Guildford Formation (Pinjarra Plain) and Southern River Complex, both of which are very poorly represented in the mine area.

The proponent considers the commitments to rehabilitate with native species and exclude areas from grazing by stock will mean there will not be a significant loss of remnant

vegetation from the area.

The exclusion of remnant vegetation areas is addressed in item 6.1.7.

### **6.1.19 Vegetation Remaining on the Swan Coastal Plain**

Various submissions quote figures on the percentage of remaining native vegetation, however, they differ on the dataset used. Most common was the reference to clearing on the entire Swan Coastal Plain. Other references include:

Community 1, KNAG, Community 2. The remnant vegetation is the last of less than 3% of the Jarrah bushlands remaining on the Swan Coastal Plain. On the Coastal Plain the sandy rises are the only places these trees have managed to survive.

The PHCC and SJLC quoted references of the Pinjarra Plain, portion of the Swan Coastal Plain it is widely accepted that less than 5% of the remnant vegetation remains, with some estimates as low as 3%. Other references quoted The Swan Coastal Plain is one of the most drastically altered environments in the south-west of Western Australia. Large sections of the plain, particularly on the eastern side, are over 95% cleared. Other references quoted the series of Marri (*Corymbia calophylla*), dominated plant communities (TEC 3a, 3b & 3c) occurring on heavy soils between Waterloo (near Bunbury) and Bullsbrook are considered to have been some of the most extensive on the eastern side of the Swan Coastal Plain. This community type has probably been reduced by at least the 97% estimated for vegetation of the eastern side of the Swan coastal plain as a whole.

#### **Response**

Reference to the extensive clearing on the entire Swan Coastal Plain is noted. The aerial photographs of the mine area confirm the project site is in a location already substantially cleared.

However, the scale of the Swan Coastal Plain and the number of vegetation communities represented relative to the mine area should be recognised. For example; EPA Bulletin 1108, Table 5 shows the percentage remaining of the Bassendean Complex-Central and South on the entire Swan Coastal Plain as 27.0, however the percentage remaining in the Greater Bunbury Region Scheme area is 39.3. The Bush Forever (2000) document, Table 4 shows the percentage remaining in the Perth Metropolitan Area portion of the Swan Coastal Plain as 24.

The proponent considers data on the vegetation complexes within the mine area and measures proposed to avoid specific locations and rehabilitate using local provenance seed demonstrate clearing for the project is not considered to be a permanent removal of native species from the area.

### **6.1.20 Retaining Remnant Vegetation**

KNAG and Community 60 express concern about clearing of mature trees in the parkland cleared farmland and 60 hectares of good condition bushland. KNAG comments

that there are thousands of mature Jarrah trees within the remnant bushland. KNAG further comments that there is no plan to preserve any of this save for a “billboard strip of bush” on Elliott Road that happens to be close to an owner’s house.

### **Response**

Not all remnant vegetation in the project area will be cleared.

Remnant vegetation areas within the property boundaries of the Lots being mined that are not inside the mine boundary will not be cleared. These remnants will be augmented with additional planting, transplanted with Kingia’s and Grasstrees and have possible Cockatoo nest sites relocated to suitable trees.

Fifty two hectares of bushland on properties north of Elliott Road will be excluded from mining operations.

Although Olympia cannot mine without clearing the land, they commit to revegetating an equal area of native vegetation once mining is finished. A major rehabilitation programme is planned to restore environmental benefits such as native vegetation corridors, improved shelter belts and revegetated drainage lines.

### **6.1.21 Area to be Cleared**

Community 1 states that Olympia will be clearing an area which totals 1,234 hectares of remnant and parkland cleared vegetation, not 304 hectares.

### **Response**

The proponent disagrees with the assertion that the entire mine area is to be considered remnant vegetation - in a parkland cleared state. EPA Guidance Statement 51, Table 3 on the consideration of the characteristics of proposal areas in defining the scale and nature of impacts on biodiversity, describe Situation 1 as “the area and its immediate surrounds do not support native vegetation”. The description states *“The area of the proposal and adjacent areas that could be impacted by off-site impacts from the proposal do not support native vegetation (see Keighery 1994). Areas that could be impacted are in a completely degraded condition (Keighery 1994)”*.

The Guidance Statement 51 response is “the guideline statement is not applicable. It is not expected that the proposal will need to address flora or vegetation factors”.

Using Guidance Statement 51, the 930 hectares of cleared pasture and the 244 hectares of Completely Degraded vegetation, a total of 1,174 hectares of the total mine area of 1,234 hectares (95%), is defined as *“the area and its immediate surrounds do not support native vegetation”*.

### **6.1.22 Future Impacts**

Community 2 asks what will happen in eight years time the proposed lifespan of the mine? Could the proponent leave an area of DEAD Land? Nobody can really ascertain what the end result of this massive clearing will do to this country. Native flora are

not just of intrinsic value but also help to improve air quality and encourage rainfall.

**Response**

The proponent considers the assessments undertaken for flora, fauna, acid sulphate soils, hydrology, dust, noise, and radiation have provided a detailed understanding of the environmental factors associated with the project. All the investigations have concluded that impacts from the proposal are not significant and can be adequately managed.

**6.1.23 Old Growth *Corymbia calophylla***

KNAG, comments that the very best of the old growth *Corymbia calophylla* grow on the sand rises or dunes on the eastern side of the Swan Coastal Plain and fall within the boundaries of the proposed sand mining project of Olympia Resources.

**Response**

The statement by KNAG is subjective, as no definition is provided as to what constitutes “the very best” or how it was measured.

The inference that the project site contains the very best of the remaining *Corymbia calophylla* on the eastern side of the Swan Coastal Plain is unsubstantiated.

The responses to items 6.1.19 and 6.1.20 are also relevant to this point.

**6.1.24 Current and Future Remnant Vegetation Management**

Community 70 suggest that all native vegetation areas to remain and be permanently fenced and regulated management agreements to be signed with the landowners with Olympia Resources. Preferably covenants should be placed on rehabilitated land. Proponent should be responsible for revegetated areas for 20 years.

**Response**

The responses to items 6.1.2 and 6.1.12 are also relevant to this point.

**6.1.25 Loss of Wildlife Habitat**

Community 2 and PHCC are concerned regarding the loss of habitat for wildlife including Bandicoot, Cockatoos, other native animals and plants in an already extensively cleared area.

**Response**

Other responses detail the progressive clearing of small areas over the eight year mine life, in combination with progressive rehabilitation, which minimises disturbance and loss of habitat. Responses on the impact to specific fauna, such as Bandicoots and Cockatoos are provided in item 5.1.3 (Quenda) populations is addressed in response 6.3.2 and 6.1.10 respectively.

### 6.1.26 Cockatoo Nesting Site Conservation

KNAG and Community 65 ask how will the proponent “save” Cockatoo nesting sites. Quote: “Selectively remove any large mature trees within the annual mine plan that contain potential Cockatoo nesting sites.”

There are hundreds of very old trees (at least 100 years old or more) within the sites to be cleared, not the few mentioned in the mining proposal. The greater percentage of these trees display several nesting sites per tree. How do the proponents propose to selectively remove and save so many?

#### Response

This is addressed in response 6.1.10.

### 6.1.27 *Kingia australis* Conservation

Community 2 and KNAG state that an issue of major concern is the protection of the *Kingia australis*. This plant is critically endangered and approximately only 86 hectares of this plant are growing at present. The school children have spent many hours researching these plants and are extremely serious about protecting the small remaining number of plants. These plants have yet to be successfully propagated for regrowth. The piece of remnant bush to be cleared for sandmining encompasses a number of these rare and endangered plants.

#### Response

This is addressed in Section 6.1.14.

### 6.1.28 Nearby Landcare Projects

Community 60 comment that there may be detrimental effects on nearby high quality conservation protected, native bushlands. Government funded and local Landcare programs - revegetation efforts will be desecrated.

#### Response

Olympia has identified Landcare projects carried out in the vicinity of the mine site and found that none of these projects fall within the mine site.

### 6.1.29 Preventative Measures

Community 65, KNAG Quote: “Reporting any non-compliance with respect to land clearance...” There should be fencing around trees that need to be protected, allowing an extra buffer zone for systems prior to commencing development, so that non-compliances are stopped before they start. Reporting after the fact will not bring the trees back.

#### Response

Acknowledged. This will be the case. Reporting of non-compliance is a requirement of government.

### 6.1.30 Flora and Fauna Surveys

Community 60 and CC comment that the flora and fauna survey are inadequate, with an inaccurate species lists. Removal of habitat for birdlife is not addressed. Flora diversity and condition ratings appear underestimated and incorrect.

#### Response

This is addressed in response 6.1.1, 6.1.11 and 6.1.25. The proponent does not agree that surveys have been inadequate.

### 6.1.31 Elliott Road Vegetation

Community 65. All remnant vegetation north of Elliott Rd should be excluded from mine. It is not clear why one area has been excluded and the other included. 'Good or better' should be retained. Submissions from Community 70 and also SJLC raised similar points; that FCT 20b with vegetation condition classed as Good, that is, "Retains basic vegetation structure or ability to regenerate it", should remain uncleared.

#### Response

This is addressed in responses 6.1.7 and 6.1.9.

### 6.1.32 Clearing Approval

Community 2 raise the issue that clearing bans have protected vegetation from destruction to date, but they are now under threat because of a low grade mineral ore deposit. If farmers are being refused permission to clear land, how can we justify wholesale clearing for mining, especially when it is so close to the metropolitan area?

#### Response

The clearing of land either by farmers or by industry is carried out under Government regulation, and environmental approval must be obtained, either in the form of a clearing permit or approval from the EPA.

In addition, the PER states "Clearing for the project is temporary, with rehabilitation following mining". The intention of the statement is to indicate that unlike clearing for other purposes, such as agricultural development or infrastructure projects, where the alternative land use results in a permanent loss of the vegetation removed, the project will rehabilitate areas to restore vegetation in the mine area.

### 6.1.33 Tree Surveys

PHCC requested that as part of this assessment process a tree survey be undertaken for the entire mining area. This survey should tag each tree, including all paddock trees, obtain a GPS point by which the location of each tree can be determined, identify the species, the health, approximate age and habitat features such as hollows, stags and loose bark. This survey will then allow a determination of the habitat provision, including *inter alia* roosting, feeding and breeding habitat for Black Cockatoos, that the entire proposed

mining area, including the parkland cleared areas, provides for the Cockatoos and other threatened species.

The SJLC raised a similar concern and that a more detailed assessment of trees is undertaken.

### **Response**

The proponent considers the flora surveys undertaken sufficiently assess the condition rating of the remnant vegetation areas. The survey methodology was supported by DEC. The fauna surveys have specifically targeted possible Cockatoo nesting sites and acknowledge that feeding on Marri occurs throughout the mine areas as well as remnant vegetation areas outside the mine area.

Further detail on the fauna assessment is provided in response 6.3.1. Further detail on the rehabilitation plan to return Marri and Jarrah early in the mine life, to minimise loss of this food source, is provided in response 6.2.28.

### **6.1.34 Clearing Permit Analysis**

The PHCC states Table 6: “Legislation, Policies and Guidelines Applicable to the Proposal” (p. 36) states that, “The project is being formally assessed under Part IV of this Act. {EP Act 1986} Any works approvals or licences required for the project are issued under Part V of the Act.” We believe that the PER should address all remnant vegetation, including that in parkland cleared areas, of the mining area in respect to the 10 Principles in Schedule 5, Part V of the Act. This would enable a more detailed analysis of the values under threat by this proposal. Section 9.1.2 (p.121) notes that with respect to, “The Environmental Protection (Clearing of Native Vegetation) Regulations 2004 that areas subject to the formal environmental approvals process do not require a separate clearing permit”. Hence, although Table 6 implies a separate clearing permit will be obtained this is in fact not the case. Thus, we request the PER provides the analysis as per the Schedule 5 Principles.

### **Response**

The PER is correct in stating the formal level of environmental assessment for the project, if approved, would also constitute an Area Clearing Permit. There is no intention in Table 6 of the document to imply that a separate permit is required. The assessment document includes details of flora and fauna assessments, surface water, groundwater and wetlands. The proponent considers the information presented in the PER satisfies the provisions required under the Clearing Regulations.

### **6.1.35 Flora Assessment of Parkland Cleared Areas**

The PHCC expressed concern that the PER flora and vegetation assessments have focused in the areas of remnant vegetation on certain Lots, as indicated in the “Vegetation and Fauna Assessment” document where they “focussed mainly on ... the properties belonging to the Mostert, Linga, Princi, Delborello and Thorn families”, and do not appear to have assessed the values of the trees in the “parkland cleared” (PER p.5) areas.



**Response**

The other properties in the mine area were assessed and found to comprise remnant vegetation in condition category 6 - completely degraded. Remnants were also generally in smaller, more isolated pockets. All were subject to grazing. The more detailed assessments focussed on the properties containing more consolidated remnants, with greater diversity and in better condition.

## 6.2 REHABILITATION

### 6.2.1 Native Species Rehabilitation

DEC comments that re-establishment of native species and original (threatened) plant communities in disturbed areas of native vegetation through rehabilitation is not adequately addressed.

The return of native species is one of the principles outlined on page 141 of the PER and the RMP. In addition to using the existing local native species, Olympia's rehabilitation objective is to enhance biodiversity within the mine area by returning species currently absent or poorly represented. The objective however would benefit from a clearer statement regarding making the return of original plant communities (to the extent practicable) a priority.

DEC recommends that consideration be given to the suite of plant species occurring within the original plant communities in some of the rehabilitation areas using seed of local provenance. DEC can assist by providing suitable species lists for rehabilitation plantings and locations where native seed can be collected.

**Response**

Acknowledged. An important principle in the PER (Section 9.3.4: point 5) on the return of local native species states: "Olympia's rehabilitation objective is to enhance biodiversity within the mine area by returning species currently absent or poorly represented. Most riparian vegetation has been cleared through the mine area. By implementing corridor linkage planting, both upland and lowland species will be replanted, rather than the dominance of the existing upland community remnants. This will be achieved by collecting seed from remaining lowland species on site (such as *Melaleuca preissiana*) as well as collecting seed from species such as *Eucalyptus rudis* and other species within a radius of 10 kilometres from the site".

The VRMP includes consultation and review provisions during the life of mine. Table 6 in the RMP was notated as "\*subject to change", in anticipation of amendment of the species list as a result of the consultative process or availability of seed. Olympia will consult with Government agencies, landowners and other stakeholders to further develop this list.

The VRMP has been revised to accommodate this and other comments arising from submissions to the PER.

### 6.2.2 Use of Mulched Material

The DEC questions the use of mulched material in the rehabilitation process, as use of this material can have deleterious effects for rehabilitation by consuming soil nitrogen, inhibiting some native species establishment and potentially contain dieback if sourced from infected areas. They recommend the use of chip mulch in areas where native vegetation occurs or is to be re-established should be discussed with the DEC in the process of development of native vegetation and rehabilitation management plans for the project

#### Response

The use of mulch sourced from chipped vegetation cleared on site would generally be restricted to the following uses:

1. Surface soil stabilisation against wind erosion around the plant site and other infrastructure areas where activity would render the use of hydromulch ineffectual.
2. Covering long term topsoil stockpiles, noise and visual bunds.
3. Localised rehabilitation in high wind scour sites such as the increased traffic and wear areas at gate locations in fence lines.

Long term topsoil stockpiles refer to infrastructure areas such as the processing plant and site access road, where the infrastructure is located for extended periods of time. Topsoil stripped from active mining areas will be either returned directly or stockpiled over the summer period when it is impractical to respread it at that time.

The temporary stabilisation of the large areas of backfilled pits over the dry summer months, is more practically achieved by applying a clay sealing layer, sourced from the separation of clay in the processing plant, or spray application of hydromulch.

The proponent commits to only mulching vegetation from dieback free areas to ensure dieback is not spread as a result of transfer of infected mulch.

### 6.2.3 Closure Criteria

The PHCC and DEC: Kwinana-Peel Region submissions raise that closure criteria be developed in the Decommissioning and *Closure Plan prior to the preparation of the EPA report and recommendations bulletin*.

#### Response

The Decommissioning and Closure Plan (DCP) was prepared and submitted with the PER.

In response to comments received on the related issues of flora, rehabilitation and close, the DCP was amalgamated into the revised VRMP. This plan contains target closure criteria. These targets are subject to ongoing review in subsequent versions of the Management Plan, to incorporate results of rehabilitation research and monitoring.

#### 6.2.4 Mining Proposal Process

The Department of Industry and Resources (DoIR) submission commented that the proponent has committed to reinstating the area subjected to mining to pre mining condition i.e. pasture land returned to pasture and remnant vegetation returned to remnant vegetation which appears to be generally acceptable.

The Department also notes that Keysbrook Minerals Sand Project proposal submitted by Olympia Resources Limited is located on private land where the mineral rights remain with the private land holder. As such the project is therefore exempt from the provisions of the *Mining Act 1978* and *Mining Regulations 1981*. It is not known if the proponent proposes to lodge a Mining Proposal as per the DoIR Mining Proposal Guidelines. Community 60 raised a question on the DoIR assessment processes relative to the proposal.

##### Response

The comment on rehabilitation is noted. At this time, the proponent does not intend to submit a Mining Proposal to the Department of Industry and Resources.

#### 6.2.5 Water Management

Department of Water (DoW) comments that insufficient information is provided within the Rehabilitation Management Plan in regards to ground and surface water management. Table 6 of the Rehabilitation Management Plan is deficient in defining location, and parameters and frequency to be monitored. More detail is required.

##### Response

The Vegetation and Rehabilitation Management Plan has been prepared to address the process of rehabilitation on site. Management of groundwater and surface water are more specifically addressed in PER Sections 9.6 (Groundwater) and 9.7 (Surface Water) respectively.

The Vegetation and Rehabilitation Management Plan, Table 7 (7a.1 and 7a.3) provides information on monitoring parameters and frequency of rehabilitated landforms against erosion (surface water) and chemical and physical parameters anticipated to be included in DEC Licence conditions (both groundwater and surface water).

A Water Management Plan has been prepared containing details of groundwater assessment and modelling. It is considered this document provides the additional detail required.

#### 6.2.6 Herbicide Use

The DoW submission raised concerns about the lack of detail in the PER, VMP and RMP on the use of herbicides to control weeds. The submission provides details on the regulation of herbicide use in PDWSA and then acknowledges the project area is not in a proclaimed Drinking Water Source Area. All practical protective measures are advocated for use of herbicides in this location.

**Response**

The proponent disagrees there is a lack of detail on weed management and agrees that all practical protective measures will be implemented in undertaking any weed control activities on the site.

The RMP Section 4.5 states “The majority of the mine area is to be returned to its pre mining land use of pasture. In these areas, weed management is to be restricted to the control of declared pest plant species. For the areas rehabilitated with native vegetation, weed infestation can inhibit establishment and survival of planted trees and seedlings, decreasing the effectiveness of the rehabilitation programme. Selective application of herbicides will occur in the spring of the first year of planting to improve establishment of native species. Further application of herbicide in the second year will be undertaken if required”.

The VMP Section 6 states “Advice on the most effective control means for weed species may be sought from DoA. All weed control activities shall be recorded in the Weed Control Form, including the weed species, location, date and the type of control methods used”.

Discussion with the Department of Agriculture and Food has occurred. At this point in time (with no mining actually taking place and no outbreak of declared weeds) the Department considers no active role is required. The Department’s website contains a range of reference material on weeds that provides sufficient information at this point in time. This includes Peirce J.R and Pratt R.A (2002) *Declared Plant Control Handbook*. Plant Industry Biosecurity Program. Department of Agriculture Western Australia. Reviewed October 2005.

During operation, should problem weeds be identified, advice from the Department’s regional field officers will be sought. The proponent considers it has established the scope of weed management activities, keeping of records of all activities and a consultation mechanism with the relevant government agency.

**6.2.7 Revegetation Timescale**

The Shire of Murray stated that revegetation of mined areas shall commence no later than one month after completion of works within any area. Where this is outside peak growing periods, the applicant shall undertake additional watering and maintenance to ensure survival rates are maintained. The Shire supported the principles of no net loss of vegetation over the site, relocation of mature plants, seed collection from vegetation on site and / or endemic to the area, as well as seedling replacement in the rehabilitation process.

**Response**

The proponent does not support the out of normal growing season revegetation practices proposed. The submission is not specific on whether irrigation over summer should apply, and if so, if it should apply to rehabilitated pasture, native vegetation, or both. Other submissions are critical of the amount of water to be used for the project and water used for irrigation of rehabilitation areas over summer would add significantly to

this demand. Mulch, clay applied as a protective layer, binding grass crops and water sprays will be used to stabilise exposed soil prior to rehabilitation.

The Shire of Murray's support of the rehabilitation principles contained in the proponents RMP is acknowledged.

### 6.2.8 Rehabilitation Goal

The Serpentine-Jarrahdale Shire comments that the proposed approach to rehabilitation is to return the site to its current agricultural use, and that some further comment should be provided with respect to the remnant vegetation onsite proposed to be cleared and the ultimate aim for rehabilitation of these areas.

The PHCC comments that the PER is proposing to clear the majority of the remnants and then establish corridors through this cleared landscape to the small remaining remnant on Lot 56. This seems to be a paradox within the proposal/PER and with the proposed mitigation measures.

#### Response

The land tenure of the mine site is privately owned, rural zoned land, under a number of individual landowners. All the land is currently actively used for agriculture, predominately cattle grazing. The objective of the rehabilitation process is to return this land to its original use i.e. to agricultural use under the individual landowners.

The proponent's objective for the native species rehabilitation areas is to obtain landowner support for a plan that provides for rehabilitation and for long term stock exclusion from these areas.

The native species areas are intended to:

- Establish corridor connections between remnant vegetation areas undisturbed by the mining process.
- Develop a combination of corridor and block plantings.
- Improve species diversity and abundance over the current status by rehabilitating both upland and lowland landforms and include a range of understorey species, now absent or very poorly represented due to grazing impact.

In addition, it is recognised that tree shelter areas for stock are required in the rural landscape, so it must be acknowledged that some planting areas will need to be accessible to stock. Rehabilitation using conventional Landcare practices, successfully undertaken throughout the region for many years, will be included in the Rehabilitation Plan.

Currently, none of the remnant vegetation areas through the site have any level of protection from stock. The fragmented nature of much of the remnant vegetation areas makes fencing of individual blocks impractical and disruptive to normal farm activities.

### 6.2.9 *Kingia australis* Rehabilitation

Community 2 comments that one species listed in the rehabilitation programme has never been successfully propagated and hence is not a feasible prospect. It would appear it was only added because it exists presently and quantities will be destroyed in the mining process.

KNAG comments that 100-year-old trees and grass trees (*Kingia australis*) cannot be replaced. It just takes too long for them to grow to present impressive stature and to provide the ecological values of mature vegetation.

#### Response

The Community 2 submission does not specify the species involved. The proponent assumes the species referred to is *Kingia australis*. These and *Xanthorrhoea preissii* will be directly transplanted into rehabilitation areas.

### 6.2.10 Revegetation Species List

The PHCC stated that values lost through clearing mature revegetation are not re-gained with no net loss by revegetating an equivalent area. A much healthier and diverse revegetation outcome can be achieved by using a full range of native species: tall trees, tall shrubs, medium and small shrubs, herbs, grasses and sedge. The Wildflower Society and Community 65 submissions raises a similar view that due to poor native seed in the predominantly pastured topsoil, the rehabilitation plan will need to include a full range of native species. The PHCC requested that the source of seed should be identified.

#### Response

The proponent acknowledges that some mature trees will be lost as a result of mining. 40.4 hectares of the 97.8 hectares of vegetation on Lots north of Elliott Road (41.4%) will be impacted by the mining operation. 57.4 hectares (58.6%) has been removed from the mine plan and will be conserved.

Mature *Kingia australis* and *Xanthorrhoea preissii* will be directly transplanted into rehabilitation areas.

Local seed will be used in the rehabilitation to return the same species. Seed from nearby areas will be collected to re-introduce species poorly represented in the immediate area due to clearing.

The revised Vegetation Rehabilitation Management Plan includes a greater diversity of species for rehabilitation.

### 6.2.11 Mostert Property Vegetation

KNAG and Community 65 state that all of the vegetation on the Mostert property should be retained in area 7. Area 7 should not be mined due to the good quality vegetation remaining in this area.

**Response**

The proponent acknowledges that some mature trees will be lost as a result of mining. 40.4 hectares of the 97.8 hectares of vegetation on Lots north of Elliott Road (41.4%) will be impacted by the mining operation. 57.4 hectares (58.6%) has been removed from the mine plan and will be conserved.

Currently, no remnant vegetation on properties within or surrounding the mine area is protected from stock, which graze throughout the properties.

By fencing the preserved area and by rehabilitating and fencing areas after mining, the proponent is confident of providing an improved long-term outlook for the survival and diversity of flora and vegetation in the area, including Lot 56.

**6.2.12 Rehabilitation Plan**

Many comments were received on various elements of rehabilitation associated with the mine area.

Community 1, Community 70 and KNAG comment that the planned re-vegetation will be planted in artificial straight lines along the fences, will be highly artificial and not a re-establishment of the previous natural bushlands setting. Parkland cleared areas should be returned to their original state. This will leave a visible scar from the SW highway, railway line and the tourist drives from the Darling Scarp that will be dominated by more competitive non-local species. The lack of thought used in this plan has left a massive exposed land area on the southern margin of lot 300.

Community 2 states that some areas of remnant vegetation which will be bulldozed, with the total loss of flora and native fauna. The area may (if not too acidic) be replanted, but only a small percentage of existing flora will be represented, and the token strips left will not support native fauna of any size.

The PHCC, SJS, and SJLC submissions raised concern that a reduction in remnant vegetation will reduce the connectivity for fauna in an already fragmented landscape and the rehabilitation list needs to include more species. The CC, Community 65 and Wildflower Society raised similar views that a more detailed rehabilitation species list be developed.

**Response**

The revised VRMP provides greater detail on the rehabilitation methods and species list. The Conceptual Rehabilitation Plan (CRP) achieves the objective of replanting the same area as that cleared over the mine area during the life of the operation”.

This design is conceptual and demonstrates relative areas and functions of different elements of rehabilitation. The ongoing review of the VRMP during the life of the mine may produce variations within individual properties, while maintaining the overall target for the total mine area.

The revised Vegetation and Rehabilitation Management Plan has incorporated comments made in the submissions to the PER and ongoing consultation with landowners.

As with the initial plan, the Figure presented in the revised document is not intended to be absolutely definitive. It is intended to demonstrate the principles of the rehabilitation plan which are to:

- Augment remnant vegetation areas that will not be disturbed by mining.
- Rehabilitate areas outside the mine envelope as a matter of priority, to maximise the establishment and growth period of this vegetation during the life of mine.
- Provide corridor connectivity between remnant areas.
- Establish stream zone plantings.
- Provide a combination of 'block' and 'corridor' areas.
- Provide areas that will be accessible to stock as well as fenced areas to exclude stock.

The proponent is confident that a rehabilitation plan developed in consultation with the landowners concerned will produce the best opportunity of preserving and increasing vegetation and flora diversity and sustainability into the future.

### 6.2.13 Rehabilitation Species List

Community 1, Community 2, Community 60, Community 65, PHCC, Community70, SJLC and KNAG comment that one of the tree species listed for planting *Eucalyptus camaldulensis* has been removed from the recommended Landcare planting list as it is classed a pest. Community 2 comments further that Olympia has no track record in the area of rehabilitation, and given their revegetation list includes eastern states eucalypts, I am very sceptical about their ability to reinstate the land.

#### Response

The PER (Section 9.3.4, page 146) states “the preliminary rehabilitation plan proposes to select rapid-growing species, in addition to the native species, to provide a fast-growing windbreak for both the slower-growing native species and the paddock. Heights of 10-15 metres are anticipated to be achieved within five years, achieving protection rates of between 10-24 %of the paddock, as indicated by the shaded cells in Table 37.”

The species *Eucalyptus grandis*, *Eucalyptus botryoides* and *Eucalyptus camaldulensis* in Table 6 of the Rehabilitation Management Plan were included for that purpose. Planting of these species were intended to be “in addition to the native species”, in locations that would be accessible to stock in the longer term.

As a result of feedback from the community, *E. camaldulensis* will be removed from the proposed planting list.

Additional native species have been included in the VRMP.



### 6.2.14 Surface Stabilisation

Community 1 and CC submissions question that placing a layer of clay on the surface to aid moisture retention as stated will require blending, otherwise it will encourage water runoff. KNAG raised a concern that using the clay fraction to hold the surface will make the underlying quartz sand unstable.

#### Response

This is addressed in PER Section 9.3.4, page 145 as follows; “In autumn, the clay capping layer is incorporated into the underlying sand using standard agricultural machinery, prior to spreading of topsoil and seeding. The concentration of clay within the surface zone has been used in other sand mining operations and has been shown to have additional benefits in increased pasture productivity by increasing the water and nutrient holding capacity within the pasture root zone. This also achieves objectives outlined in the Statement of Planning Policy (SPP) 2.1 by reducing the export of nutrients in the Peel Harvey catchment.”

### 6.2.15 Vegetation Corridors

KNAG and Community 65 quote “minor corridor linkages following internal fence lines and drainage...” and comments that the PPG is adamant that aerial photographs do not show minor corridor linkages of vegetation rather the forest canopy at present is seen as extensive tree cover in random blocks to the north and south of the mine site while scattered areas of under storey shrub and sedges indicate damp lands, sump lands, creeks, floodplain and palusplain.

#### Response

The sentence referred to in the submission referred to proposed rehabilitation areas as shown in Figure 2 of the Rehabilitation Management Plan.

### 6.2.16 Long Term Protection of Rehabilitated Areas

KNAG asks will revegetation be covenanted? If not, how will it be guaranteed, managed and maintained in the long-term by private owners? Permanent exclusion of livestock from these covenanted areas is necessary. Community 70 and SJS made similar comments on the ultimate, longer term, management of these areas.

#### Response

It is not intended to establish covenants over remnant vegetation areas left undisturbed or rehabilitation areas. The area of the mine site is privately owned land actively used for agricultural purposes, predominately cattle grazing. The proponent is confident that a rehabilitation plan developed in consultation with the landowners concerned will produce the best opportunity of preserving and increasing vegetation and flora diversity and sustainability into the future.

### 6.2.17 Wetland and Drainage Line Rehabilitation

Community 65 and KNAG state that:

- a) All relocated drainage lines and wetlands require full rehabilitation, which must include large trees, tall and medium shrubs, rushes and sedges indigenous to the area.
- b) This is necessary to assist in the filtration of unknown quantities of nutrients laid down by 60 to 100 years of farming practices.
- c) If it is to be a bushland corridor, it needs to be more than just a minor corridor along a fence line three trees wide.

#### Response

Only minor drainage lines through the mine area will be disturbed. The majority of these are cleared open pasture. In most cases, these drainage lines are not defined creek lines, but are actually the “broad imperfectly to poorly drained flats and ill defined stream channels” as defined in Department of Agriculture mapping (see PER Table 12.). In the majority of cases, these areas will be returned to pasture. Re-contouring of the landform after mining will re-create the pre-existing drainage pattern.

The issue of stored nutrients within the mine profile is addressed in response 6.6.1.

The issue of rehabilitation dimensions is addressed in response 6.2.12.

### 6.2.18 Restoration of Landforms

Community 1, SJS and KNAG comment that as there is no digital terrain model for the area and there is no on ground mapping of the wetlands in the PER, it is not possible to re-establish the area as existed previously. There is no on ground mapping of wetlands presented in the PER. It is not possible to re-establish existing landforms if they are not initially understood.

#### Response

The proponent has stated the restored landform will be similar to, but not exactly the same as the current surface levels. The restored landform will re-establish the major drainage pathways through the pasture areas towards the existing major and medium watercourses that will not be disturbed (PER Figure 9).

### 6.2.19 Loss of Biodiversity Representation

Community 2 state that there area also some areas of remnant vegetation which will be bulldozed, with the total loss of flora and native fauna. The area may (if not too acidic) be replanted, but only a small percentage of existing flora will be represented, and the token strips left will not support native fauna of any size.

**Response**

Clearing of remnant vegetation will be carried out progressively over the eight year life of the mine, not all at one time. The response to item 6.2.12 and the revised Vegetation Rehabilitation Management Plan provide additional information in response to this point.

**6.2.20 Long Term Planning and Preventing Salinity**

Community 2 comment that the long term planning for this corridor of land must be seriously considered. KNAG comments that overgrazing and neglect have degraded much of this land. If mining was to occur then it should be returned in better condition than before. This should include a much larger area to be permanently re-vegetated to prevent the increase in salinity already seen on the western margin of the mine-site.

**Response**

Landowners involved in the project have been extensively involved in the rehabilitation planning for the project. The Rehabilitation Management Plan will aim to rehabilitate, at a minimum, the same area cleared for the project.

The issue of salinity on the western margin of the mine site is addressed in response 6.6.2.

**6.2.21 Current Tree Planting**

Community 2 comment that they find it hard to understand that already Olympia is planting trees when the proposal is still being considered by the EPA.

**Response**

The trees have been planted with the agreement of the landholder, with the aim of providing a partly grown shelter belt to protect pasture and enhance visual amenity. If the mine does not proceed, the community will still enjoy the trees for many years to come.

**6.2.22 Irreplaceable Tree Hollows**

Community 1, PHCC and Community 2 comment that:

- a) While revegetating the proposed mine area with a greater area of local species would be a bonus, it would come at the expense of a number of older established trees. While these trees may not have hollows for nests, they will be the next generation of hollows unless they are knocked down.
- b) Much of the proposed mining area is open parkland, with grazing areas surrounding many fine trees, mainly Jarrah and Marri. Olympia may replant such trees, but with the decreasing rainfall it is very unlikely that they will be replaced with trees of comparable size.

The PHCC, KNAG, SJLC, SJS and WS raised a similar concern that species relying on old hollows will be disadvantaged for decades to come.

**Response**

The revised Rehabilitation Management Plan includes remounting possible Cockatoo nest hollows from trees removed during mining onto trees in remnant areas that will not be disturbed. The following extract of information presented in the PER (Appendix 8, page 2) is relevant to this point:

- The Forest Red-tailed Black-Cockatoo - nest hollows have been located between eight and 14 metres above the ground, with an entrance diameter of 12 to 41 centimetres.
- Carnaby's Black-Cockatoo - nest hollows are between 2.5 and 12 metres above the ground and have an entrance diameter of 23 to 30 centimetres.

Relocating suitable hollows will minimise any potential loss of nest sites as a result of implementing the project. Artificial nest hollows will be used to replace any potential hollows damaged or destroyed during clearing, ensuring there is no loss of potential nesting sites.

The proponent considers Jarrah and Marri can be successfully rehabilitated in the area.

**6.2.23 Burning of Trees**

PGCC suggest that any trees that need to be cleared and are not “economic” should be used in rehabilitation areas as protection for smaller species rather than burnt.

**Response**

Acknowledged. Logs and stumps will be placed into rehabilitated areas to provide habitat for ground dwelling fauna. Potential Cockatoo nesting hollows will be relocated. The minimum possible wood will be burnt.

**6.2.24 Roadside Replanting**

Community 1 suggests that the eastern end of Readheads Road from the processing plant to the South West Highway should be widened to accommodate two lanes and verge to be re-planted with indigenous species.

**Response**

The road would be upgraded to the standards required by the Shire of Murray.

It is envisaged that minimal clearing would be required for this work. The existing road, while only having a single vehicle width sealed has very wide gravel shoulders between the edge of the current seal and the drains on either side of the road. The remaining vegetation within the road verge is confined to the two strips between the outside edge of the roadside drain and the farm fence. It is anticipated that any required upgrading of the road can be accommodated within the existing cleared portion of the road between the current roadside drains.

Additional tree planting along the roadside will be undertaken.

### 6.2.25 Future Subdivision and Soil Stability

KNAG states that the use of the clay fraction to hold the surface layers from erosion will mean that the underlying quartz sand will be inherently unstable. This will make the land useless for any future housing, road and infrastructure developments. Community 1, Community 60 and Community 2 also raised the issue of subsequent use of the land for urban development and the stability of the replaced soils for this purpose.

The KNAG submission also raised major damage to buildings was caused on the Swan Coastal plain during the Meckering earthquake and this was on land that has been undisturbed for 10,000 years. This describes the end product after mining as a 1,234 hectare tailings dam full of free draining quartz sand that has been slurried into position by mine waste water of which two gigalitres per annum is lost into the Nambeelup drainage. KNAG further comments that the proposal to slurry the tailings back to the pit, after removing much of the clay for bunding and surface erosion control, will result in a highly unstable quartz sand that will be too unstable to build on. It should be understood that this area is part of a major growth corridor and much of it will eventually be used for housing and that the land will be unstable and thus unavailable for any future building developments. Lastly, KNAG suggests that “It is not valid to simply return it to farmland after mining. If mined, all of the area must be compacted back to building standards”. This has not been possible in the Joshua Brook subdivision in Capel Shire and building restrictions have been placed over all mined areas.

The CC submission raised the concern that many sand mines require large areas of solar drying cells in order to manage the fine clays produced in the separation process.

#### Response

The proponent disagrees with the assertions made in the submission. Only a portion of the clay fraction will be used to stabilise the surface, the remainder will be mixed with sand tailings and returned to the mined areas. The use of clay as a stabilising cover layer will only occur during specified periods in the year (see PER Table 35). The clay used as a temporary erosion control will be incorporated into the sand during rehabilitation. The returned sand will have a consistency and stability similar to the current material.

The Peel Region Scheme shows the project area as zoned Rural. The proponent is not aware of any planning documents that indicate future large scale urban development for the project area. The intention of the rehabilitation plan is to return the land use to its existing agricultural use.

The reference to backfilled areas at another mineral sand mine does not acknowledge the differences between the two projects which makes the comparison irrelevant. The Keysbrook deposit has a clay content of approximately eight percent. This is substantially different to many of the deposits in the Capel area that have clay contents between 20-50%. These high clay content sites have traditionally stored the separated clays in separate ‘fines dams’. The geotechnical properties of these discrete storage areas have generally been unsuitable for residential building construction. Comparison of the two scenarios is not relevant.

### 6.2.26 Revegetation Species Selection

Community 65 and KNAG comment that the species list supplied for revegetation is inadequate. Three of the species listed are from the eastern states and two local species are difficult to propagate and very slow growing (including the *Kingia australis*). This leaves only 12 indigenous species, all of which are tall trees. There are no understorey species included. No introduced species should be used in revegetation. *Eucalyptus camaldulensis* from the eastern states has been found to cross-pollinate with our eucalypts and so degrade our indigenous species. If the recommended species list is to be used, then there will be great loss of native vegetation. A much healthier and diverse revegetation outcome can be achieved by using a full range of native species: tall trees, tall shrubs, medium and small shrubs, herbs, grasses and sedge.

#### Response

The submission is addressed in the responses to items 6.2.9, 6.2.12 and 6.2.13.

### 6.2.27 Time for Rehabilitation Establishment

Wildflower Society comment it is important to recognise that any planted vegetation will take years to establish fully and to grow sufficiently to replace the composition and structure of the original vegetation. Community 2 make similar comments on the time required for rehabilitation to reach maturity.

#### Response

It is acknowledged that rehabilitation will take time to fully develop. There are many examples of Landcare planting, now over 20 years old, in the area. The proponent considers the progressive rehabilitation proposed, which includes transplanting of mature species such as *Kingia australis* and fencing of some areas to exclude stock will provide a more sustainable long term outcome than the present situation where no areas are excluded from grazing.

### 6.2.28 Vegetation Establishment

Many submissions were received on elements of rehabilitation dealing with, time to reach maturity, corridor linkages, species selection and the area 'unrehabilitated' at any one time.

Submissions by KNAG, Community 2 and Wildflower Society raise concerns on the time delay of rehabilitation. It states the (rehabilitation) plan fails to comprehend the rate of mining at 150 hectares per year. Given the best case scenario it will take three years of fast growing eastern states varieties to achieve any sort of protection against the elements. This means that at least 450 hectares of a barren sterile landscape will be exposed at any one time. Fauna will simply not survive in this environment. The Community 2 submission raised similar concerns on the time taken for rehabilitation to establish and withstand the long dry summers, rabbits, grasshoppers and fires. Add to that, the dust impact of the infamous easterly winds.

The SJS submission raised a similar concern but relating to visual impact of the mining operation. The submission states “Whilst it is acknowledged that mining will be restricted to 30 hectare areas and that rehabilitation will be progressive, the topography of the landscape lends itself to the operations being visible from the surrounding region. Some discussion is warranted on this matter”. Community 2 submission raised the concern that the effect of other Landcare and planting programmes will be reduced because of the clearing associated with the proposal.

Community 65, PHCC and the SJLC raised issues on the rehabilitation species list, the pattern of corridor plantings in the Conceptual Rehabilitation Plan, weed control and infill planting to occur for at least five years.

### **Response**

The proponent considers the submissions have failed to understand the nature of the rehabilitation programme outlined in the PER and the Rehabilitation Management Plan. The details have been further developed in the Revised Vegetation and Rehabilitation Management Plan. The response to item 6.2.12 and 6.2.13 is also relevant to this submission. The following additional points are made in response to the submission:

1. Three quarters of the entire mine area is pasture, and the rehabilitation plan aims to return pasture to this approximate area. Pasture seeding is a standard agriculture practice, practiced annually in the area with variations such as seeding oat crops for hay. The proponent considers areas resown to pasture will establish quickly following seeding in mid to late May, such that there will be no visual difference between a restored mine area sown to pasture and unmined pasture areas within a few months of seeding. The proponent will also reseed pasture areas in the second growing season following mining to ensure a fully developed and stable pasture is returned to the landowner.
2. Rehabilitation using both local native species and ‘Landcare’ species will occur in locations immediately outside the mine area as soon as practicable. This will allow the maximum time for these areas to establish over the life of mine. Areas planted in year one will have the eight years of the life of mine to establish, with the proponent providing management to these areas. For example, areas planted in the northern portion of the mine area, where mining will not commence until year 7, will have rehabilitated areas already six years old when mining commences in the immediate area to enable fauna to relocate.
3. Post mining, additional planting in the mined areas will expand on these earlier plantings as well as develop new rehabilitated areas on restored mine areas.
4. A proposed ‘early planting’ programme designed to ensure availability of feeding sites for Cockatoos and other birds throughout the life of the mine. The early planting will also assist in retaining visual amenity for residents and visitors.

The proponent considers rehabilitation measures proposed in the PER and supporting documents will achieve a successful rehabilitation outcome that will not result in “450 hectares of a barren sterile landscape exposed at any one time.”

The issue of dust is addressed in response 6.9.3.

The extent of the visual impact of the operation depends greatly on the exact location of the mine during the eight year life of plan. Much of the area of the large rural properties on which the mine will be located are not visible from adjacent roads. The South Western Highway is approximately four kilometres away from the project site, other rural properties between the highway and the railway line providing a visual barrier.

It is acknowledged that there will be locations on the site where the activity will be visible from adjacent roads and houses. The rapid mine progression through the landscape will mean these views are temporary.

### **6.2.29 Bond**

Community 53 comments that the PER does not define or set out the size of any rehabilitation bonds. It has been standard practice for the Department of Industry and Resources to require the operators of a mine to arrange for either cash deposits or banker's guarantees as bonds to ensure that there are funds available to complete any necessary rehabilitation work in the event of the insolvency of the company.

#### **Response**

The project is not on land the subject of a mining lease. The VRMP details the rehabilitation bonds proposed for native vegetation rehabilitation works.

### **6.2.30 Topsoil Removal**

Community 2 commented that this sand area is very fragile and different to the heavy clay soil. The top couple of inches are where all the good soil is. There is no way that this precious topsoil can be separated when digging two metres of soil for the extraction of the minerals. This is of great concern as the loss of the topsoil would render this land almost useless for the future of pasture growing.

#### **Response**

The PER, Section 4.2 describes that topsoil will be separately removed prior to mining and either directly returned to a completed area under rehabilitation or stockpiled for use in future rehabilitation. Only topsoil from dieback free areas will be used in dieback free areas.

### **6.2.31 Tree Guards and Soil Testing**

The PHCC raised the issue that the rehabilitation plan needs to consider the use of tree guards. In regard to the rehabilitation of pasture areas the PER has only considered the re-instatement of annual pastures and has failed to consider the use of perennial pastures. "We suggest that Olympia address the use of perennial pastures within the pasture element of their rehabilitation plan". They also request nutrient testing be undertaken.

#### **Response**

The use of tree guards will be considered for planted trees in the rehabilitation programme.



The Rehabilitation Management Plan states “The reseedling of pasture areas will be undertaken using standard agricultural machinery and practices. Advice from DoA will be sought on the most appropriate suite of species and application rates”. The consultation will include advice on both annual and perennial pasture species and fertiliser application rates.

Results of soil testing for nutrients is addressed in item 6.6.1

## **6.3 FAUNA**

### **6.3.1 Fauna Surveys**

Many submission were received dealing with aspects of the fauna surveys undertaken and fauna management.

The DEC, EPASU submissions raised concerns that the regional conservation significance of the areas of native vegetation had not been fully assessed. The PER stated that additional fauna surveys were to be conducted and the PER would take into account the results of this survey.

Although the proponent is proposing rehabilitation which is suggested to result in a no net loss in the area of remnant vegetation in the mine area, it will be many years until this rehabilitation will provide suitable habitat for fauna species of conservation significance, with no guarantee of the current suite of species returning. Consideration therefore needs to be given to measures to retain the habitat values of remnant vegetation in the area for birds and other fauna as far as possible and to the provision of fauna related offsets to mitigate the impacts of the project on fauna habitat. The submission stated that offsets may be considered to mitigate on fauna habitat value.

The Conservation Council submission stated the proponent should be required to produce a scientifically based Cockatoo management plan for the project. The Murray Shire requested the Cockatoo nesting tree on the boundary of Lot 506 be retained. Community 1, Community 2, and PHCC raised similar concerns that the fauna studies have not been completed. Further advice from Ron Johnston from the museum should be sought on the Cockatoos. KNAG and the Wildflower Society raised similar concerns on the potential impact on Cockatoos and kangaroo populations

#### **Response**

Olympia fully acknowledges that the Keysbrook project area, situated on the eastern side of the Swan Coastal Plain, is in a region that has been extensively cleared of native vegetation. As a result, all native vegetation remnants are considered significant for the conservation of flora and fauna.

The EPA (2003) Guidance Statement 10 provides details on the Swan Coastal Plain. It highlights the area has high natural values, is the most densely settled area of the State and, together with the Wheatbelt, is the most heavily cleared area of the State.

Guidance Statement 10 states that only 22% of the Swan Coastal Plain in System 6 and System 1 remains vegetated with more than 97% of the heavier more fertile soils on the eastern side of the Swan Coastal Plain having been cleared.

Therefore, any additional decrease in vegetation remnants is likely to result in further reduction to fauna populations. Olympia sees the restoration of vegetation remnants as critical in mitigating any long term effects from the project. Early planting of replacement vegetation areas is a key component of the overall rehabilitation strategy, in an effort to provide alternative habitat for fauna relocation.

In addition, avoidance of remnant vegetation areas has also been implemented to provide habitats of individual blocks up to 37 hectares as refuge habitat islands.

An additional fauna survey was conducted by MJ Bamford (2006) with the report being submitted to DEC. The additional fauna survey by Bamford (2006, page 16) provided the following conclusions:

- The fauna of the project area is depauperate due to extensive clearing, fragmentation and degradation of native vegetation. Despite this there is still fauna present, including some species that are of at least regional conservation significance and a small number of species of gazetted significance under legislation.
- A limiting factor for fauna is the poor condition of remnant vegetation, due largely to ongoing grazing by livestock that removes understorey. Virtually any native vegetation, and even non-native vegetation that is not subject to grazing, is significant. This includes road and rail verges within and outside the lease, as well as discrete remnant areas.
- Information on fauna, and especially on birds, indicates that the main areas of remnant vegetation are of similar value, with no remnant being particularly outstanding in the suite of species it supports. Detailed information from the Lot 56 remnant suggests that the northern area may be slightly more important for significant birds; this is also the area where an egg of the Red-tailed Black-Cockatoo was found, and is close to Dirk Brook where a possibly significant invertebrate, the mite *Tillia davisae*, has been recorded.

Excerpts from the Bamford report (2006, pages 4 and 5) are provided below that found:

- Of the 59 bird species recorded, 19 are of conservation significance. These include the Red-tailed Black-Cockatoo (forest sub-species) and Peregrine Falcon, listed under the *WA Wildlife Conservation Act*, the Rainbow Bee-eater (a widespread species listed as migratory under the federal *Environment Protection and Biodiversity Conservation Act*), and 16 species listed as having declined in the Perth area by Dell and Banyard (2000).
- The Cockatoo, falcon and bee-eater are wide-ranging birds that require some native vegetation, but are largely independent of the condition of the understorey and are not likely to be restricted in their movements by fragmented habitat. The Red-tailed Black-Cockatoo is of particular significance because it may breed in the area.

- In contrast, the 16 species listed as having declined in Perth are mostly sedentary and occur in understorey vegetation; therefore the condition and distribution of remnant vegetation is especially important for them. The presence of these species indicates that the remnant vegetation in the project area is providing habitat for them and that the remnants are not so isolated that the species have become locally extinct. This suite of mostly sedentary, understorey-dependent species is well-represented, albeit at low levels of abundance, on almost all properties. The Lot 56 remnant had slightly better representation of these species.

The mine plan has been amended to reflect findings of this report, plus other changes as a result of other submissions. The changes to the mine plan have been incorporated into the revised Vegetation and Rehabilitation Management Plan. A summary of the changes are as follows:

- The excision of an additional 5.1 hectares of good condition remnant vegetation in the north of Lot 56. This encompass the potential Cockatoo nest tree identified in the PER (Figure 14), the location of the Cockatoo egg found in the Bamford 2006 survey and also locations of good condition vegetation, comprising understorey and a mid storey of young Banksia and Allocasuarina, where Splendid Fairy Wren and Western Thornbill were sighted in the Bamford (2006) survey.
- The addition of this northern mine exclusion area also has the effect of increasing the buffer distance between the Conservation Category wetland and the mine boundary to between 50 and 200 metres on Lot 56.
- Modification to the southern mine exclusion area to remove degraded portions from the area and include them in the mine area.
- Increase of the minimum buffer distance to all the Conservation Category wetlands on the perimeter of the mine site to 50 metres.
- Increase of the buffer distance adjacent to Lots 505 and 506 to a minimum 100 metres which protects the potential Cockatoo nesting tree shown in the PER (Figure 14).

The proponent considers the fauna surveys conducted have satisfactorily addressed the issue of fauna and identified that:

1. The majority of the mine area is depauperate due to extensive clearing, fragmentation and ongoing grazing of remnant native vegetation areas that has removed almost all the understorey.
2. Despite this there is still fauna present, including some species that are of at least regional conservation significance and a small number of species of gazetted significance under legislation. The 16 species listed as having declined in Perth are mostly sedentary and occur in understorey vegetation. This suite of species is well-represented, albeit at low levels of abundance, on almost all properties that have significant areas of remnant native vegetation. The proponent considers the progressive clearing and rehabilitation during the eight year mine life will allow sufficient time, especially for the understorey species in the rehabilitated areas, to establish to a level to provide habitat for these species to recolonise mined areas.

3. In addition, existing remnants that will not be mined will be fenced to exclude stock, have relocated nest hollows mounted in trees and also have supplementary planting of understorey species, to increase the ability of these remnants to maintain these populations during the life of the mine.
4. The revised Fauna Management Plan has a consultation and review schedule to ensure periodic survey information and the outcomes of mitigation measures targeted at minimising impacts to fauna are integrated into revisions of the Management Plan.

Point 3 above is relevant to inclusion of specific species such as Cockatoos. This mechanism addresses submissions by the Conservation Council that a specific Cockatoo Management Plan be prepared.

### 6.3.2 Quenda Management

The DEC, PHCC and Community 2 submissions stated that no measures for the management of the local Quenda population have been proposed in the PER.

#### Response

The initial fauna survey (MBS 2004) identified the characteristic diggings of the Quenda in an area of dense vegetation surrounding a wetland on Lot 64. This Lot was subsequently removed from the mine area. The wetland and surrounding vegetation will now not be disturbed by the mining operation. No other evidence of Quendas was found on any of the other Lots within the mine area.

The Bamford (2006) survey, page 13 states “No excavations were found on the lots surveyed inside the mine area (Lots 56, 62, 59 and 300) in 2006. It is likely that there is insufficient dense ground level habitat to support this species in these areas.”

Quendas have been sighted outside the mine area. The Bamford (2006, page 13) report states “Kevin Thorn (pers. comm.) reported the presence of Quenda on the western part of his property (Lot 62) and along Hopelands Rd. There is some dense ground-level habitat (both native understorey and introduced grasses) in these areas, which lie west of the mine area. Quenda are also reported by residents from road and rail verges in the area, where there is dense, low vegetation formed mostly by introduced plant species such as *Watsonia*. Quenda are known to utilise areas infested by weeds where these are sufficiently dense to provide cover (M. Bamford pers. obs.).”

Neither of the two fauna surveys have identified evidence of Quendas within the current mine area. The degraded nature of most of the site, and specifically the removal of most of the understorey by grazing, as noted in the survey reports, has effectively removed their preferred habitat from the mine area. The proponent considers that no specific management measures are warranted for Quendas in the mine area.

### 6.3.3 Underestimation of Faunal Values

The EPASU, submissions stated the PER does not provide adequate information to enable the interested public to reasonably evaluate the likely impacts of this proposal on

faunal biodiversity values. Moreover it makes technically incorrect and invalid statements that significantly understate the biodiversity values of the project area.

DEC and EPASU state that the PER dated June 2006 has not adequately addressed fauna values in the project area and the level of survey is significantly below the level expected according to EPA Guidance 56.

SJLC, CC and Community 1 comment that the fauna surveys were inadequate, that the PER understates the fauna statistics and some cases does not include species, that the studies are selective and not representative

### **Response**

The PER and the Fauna Management Plan contains the results of initial fauna surveys and the scope of work for additional surveys to be conducted. The scope of this work was determined in consultation with the EPASU.

As described in the response to item 6.3.1 above, the result of the Bamford (2006) survey was submitted to DEC (which incorporates the EPASU).

The other survey scheduled in the Fauna Management Plan (the bat survey) has also been conducted and is reported in the Fauna Management Plan.

The proponent considers the level of surveys undertaken is consistent with EPA Guidance Statement 56 and sufficiently describes the fauna on the site.

### **6.3.4 Vertebrate Fauna Inventory**

The EPASU stated specifically, the fauna assessment needs to provide an inventory of vertebrate fauna species occurring in the study area, based on actual survey of remnants in the project area, as well as assessment of appropriate literature records. The regional and local conservation value of the area for conservation significant species occurring or likely to occur within the project area, including *Environment Protection and Biodiversity Act* 1999 listed species, Scheduled Fauna (as listed under the *WA Wildlife Conservation Act* 1950) and CALM Priority fauna, and birds listed in Table 15 by Government of Western Australia (2000) as having special conservation significance on the Swan Coastal Plain as they are either habitat specialists with a reduced distribution on the Swan Coastal Plain or they are wide-ranging species with reduced populations on the Swan Coastal Plain needs to be determined. The PHCC also raised questions on the listing of significant species.

### **Response**

PER Table 24 lists the species listed under State or Commonwealth Acts. Appendix 5 of the PER (MBS 2004), Section 5.3 provides information on the fauna expected to occur and observed in the mine area. Appendix 8 of the PER (Wilcox 2005) provides additional observations of bird species. The Bamford (2006) survey (Table 9) provided further information on fauna observed, and also tabled the compilation of sightings in the 2004, 2005 and 2006 surveys.

### 6.3.5 Fauna Survey Scope and Intensity

EPASU stated the fauna survey scope and intensity needs to be in accordance with the Environmental Protection Authority's (EPA) Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia. The regional conservation value for fauna of all natural areas affected by the proposal also requires reference to the Criteria in Guidance 10.

#### Response

The scope of surveys to be in accordance with EPA Guidance Statement 56 is addressed in the response to item 6.3.3 above.

The regional conservation value of the natural areas affected by the proposal with reference to Guidance Statement 10 is provided in the PER in Tables 32 and 33. Table 1 of Guidance Statement 10 contains criteria for the determination of the regional significance of natural areas and includes elements of both flora and fauna. The applicability of the exclusion guidelines given in the PER Tables 32 and 33 is therefore considered also relevant to fauna.

### 6.3.6 Additional Fauna Survey Results

The EPASU stated the current PER proposes to undertake additional surveys "during June 2006". The results of these surveys have not been provided and accordingly it is not possible to adequately assess the fauna values of the project area.

The Conservation Council raised the issue that the potential for impact on bats should be assessed. It is likely that the old trees across much of the vegetated area are utilised by bats as well as birds. Scarcity of information is not an excuse; this should be obtained by the appropriate surveys.

#### Response

The Bamford (2006) survey report was submitted to DEC. Subsequently, a site visit with members of the EPA and the DEC (including the EPASU) was held on 16 October 2006 and the findings of the survey were discussed. The proponent has incorporated outcomes of the survey report, DEC consultation and a further targeted survey for bats in the revised Fauna Management Plan.

### 6.3.7 Fauna Habitat Value

EPASU comments that Page 7 of the Executive Summary in the PER states that the "majority of the area to be mined (95%) has been either totally or parkland cleared for agricultural purposes, with the remaining native vegetation areas highly fragmented." This statement understates the importance of faunal habitats in the project area as was revealed through a single brief site visit on 25 July 2006 when two areas with significant habitat were visited. The value of other areas was not determined as access to other areas had not been organised prior to the visit.

**Response**

The sentence contained in the submission is a statement of fact about the proportion of the mine area that has been dramatically altered. The sentence makes no statement about the value of faunal habitat. The results of the fauna surveys indicate the significant species that have been observed on the site, and the important habitats identified.

**6.3.8 Habitat Areas and Recolonisation**

The EPASU stated that during the visit a large area of contiguous or near contiguous habitat was examined on Lot 56 and in a relatively short period of time at least eight bird species listed as significant on the Coastal Plain (Bush Forever Table 15) were recorded. Another remnant with similar canopy species was visited on Lot 59 and at least four regionally significant bird species were recorded.

The significance of the remaining vegetation in the proposal area as fauna habitat reflects the density and diversity of plant species in the canopy, the range of upland and lowland (including wetland) environments represented and the close proximity of a series of patches of remnant bushland/vegetation that are ecologically linked, and contrast with the surrounding more extensively cleared environments.

The PER presents no fauna information on these or similar areas, and does not recognise their value for fauna especially regionally significant declining bird species. A survey of the faunal values of these areas needs to be undertaken as part of the PER to determine their regional significance. Areas determined as regionally significant habitat should be removed from areas proposed for mining.

From a single short duration of only a few hours site visit to only some of the remnants the following significant bird species were observed: Weebill, Broad-tailed and Yellow-rumped Thornbills, Scarlet Robin, Forest Red-tailed Black Cockatoo, Splendid Fairy-wren, Golden Whistler, Yellow-throated Miner, Black-faced Wood-swallow and Common Bronzewing. These are mainly sedentary habitat specialist species, indicating that they have maintained populations despite decades of isolation through extensive clearing of the surrounding areas for agriculture etc.

The PHCC commented on the time lag for rehabilitation to reach maturity and the ability for some species to recolonise these areas.

**Response**

The proponent disagrees that the PER does not present faunal information over the mine area. PER Table 25, and Appendix 5, Table 24 presents the bird species observed, including those listed as significant on the Coastal Plain (CS3 in the Tables). In addition, Appendix 8, Table 3 also presents bird observations listed against specific properties surveyed.

The tables in the documents cited list most of the species identified in the DEC site inspection, recorded in both the first and second surveys. The PER provides a range of management measures to minimise impact to these species. The revised Fauna Management Plan and revised Vegetation and Rehabilitation Management Plan

integrate changes to the original documents as a result of the 2006 survey and ongoing consultation with regulatory agencies and stakeholders.

In the mine area to the north of Elliott Road, only 40.4 hectares of the 97.8 hectares of vegetation (41.4%) will be impacted by mining operations. 57.4 hectares (58.6%) has been removed from the mine plan and will be conserved.

### 6.3.9 Fauna Recolonisation

The EPASU state a number of unsubstantiated statements have been made without supporting data or data sources: e.g. comments that recolonisation of fauna will occur when areas cleared for mining are rehabilitated. This ignores the inability of many poorly dispersing fauna species to recolonise areas once they are locally exterminated by clearing and habitat isolation. The PHCC raised similar points, on the loss of habitat for significant species.

The PHCC commented on the habitat loss for endangered and priority listed species.

#### Response

The proponent disagrees with this statement. There are numerous scientific papers on the subject of faunal recolonisation of rehabilitated areas after mining, with supporting data demonstrating that fauna recolonise rehabilitated mine areas. The PER (Section 9.2.4, page 136) includes a review by Kimber et al (1999).

The proponent also disagrees with the assertion that the progressive clearing of remnant vegetation areas over the eight year mine life will produce local extermination of the faunal (specifically bird) species discussed. The PER details management measures that include remnant areas left undisturbed during the mining process, progressive rehabilitation and a proposed 'early planting' programme designed to ensure availability of feeding sites for Cockatoos and other birds throughout the life of the mine. Early planting of native vegetation prior to mining and in the early years (subject to landowners approval) at the planned mining limits will maximise growth before clearing of existing vegetation.

These management actions will provide vegetated habitat for these species to maintain their presence in the mine area.

The Bamford (2006) survey found the 16 species listed as having declined in Perth are well-represented, albeit at low levels of abundance, on almost all properties that have significant areas of remnant native vegetation. The wide distribution of these species through the mine area means that vegetated areas not being disturbed by mining can function as refuges for these species, and vegetated areas impacted early during the mine life can be rehabilitated and provide recolonisation potential prior to disturbance to other areas during the eight year period.



### 6.3.10 Fauna Status (EPASU)

The EPASU state some statements in regard to Priority fauna species are incorrect. The Forest Red-tailed Black Cockatoo is a Schedule 1 listed species not a Priority species, the Quenda is given an incorrect Priority status (it is given correct status in Table 24 but incorrect on page 94 and page 133). The Forest Red-tailed Black Cockatoo is described as “potential presence” and then as “directly observed”.

#### Response

The incorrect listing of the Forest Red-tailed Black Cockatoo in the executive summary is noted. It is correctly listed in PER Table 24 and 25.

The correct and incorrect listings of the Quenda is noted.

The reference to “potential presence” of the Forest Red-tailed Black Cockatoo is from the database searches (PER Table 24) that indicated the Short-billed (Carnaby’s) Black Cockatoo (*Calyptorhynchus latirostris*) and the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*) are “expected to occur”. A survey was undertaken to identify Cockatoo species and potential breeding sites in October 2005.

The next paragraph described the outcome of the survey that found the only species of Cockatoo “directly observed” during the survey was the Forest Red-tailed Black-Cockatoo. The presence of the Baudin’s Black-Cockatoo was inferred through the presence of Marri nuts that were marked distinctively by feeding birds.

### 6.3.11 Corridor Linkage Criteria (EPASU)

The EPASU state a statement is made that there are no established corridor linkages within the mine area. No criteria are provided to define corridor linkages. For many species not only does the project area contain significant habitat remnants for regionally significant species, but numerous dispersal features including remnants of various sizes as well as scattered or clumped trees in paddocks. All of these facilitate movement for a range of species.

#### Response

The statement was intended to refer to the lack of continuous vegetation through the mine area. The sentence preceding the comment in the submission provides a context for the statement - it states “The remnant vegetation areas in the mine area are fragmented”.

### 6.3.12 Non-Mammalian Species

The EPASU state on Page 91: The section on Regional Surveys and Information is extremely limited. The only comments made are in reference to mammals which typically for this region are largely absent. Reptiles, amphibians, birds, and invertebrates are not discussed at all. The PHCC, SJLC and DEC raised a similar point, that the regional conservation significance has not been fully assessed.

KNAG and Community 1 comments that there is a reference to a survey by Ninnox carried out at West Kingia in which only four mammal species were identified. What was not quoted was that in the same survey 28 amphibian and reptile species were identified and 56 species of birds were identified.

**Response**

The PER identifies five surveys that have been conducted on the coastal plain within a radius of approximately 25 kilometres from the project site. The PER (Section 9.2.4, page 136) states “When compared to the project site, these areas collectively have vegetation in better condition, are less fragmented, are larger and are not subject to horticultural and grazing pressure. The habitats of the project site would arguably contain fewer fauna than the regional survey sites.”

The proponent considers there are no regional surveys that have been conducted of locations in comparable condition to the project area: i.e. fragmented remnant vegetation in a grazed rural landscape that comprises 75% pasture. The Kingia West location is not comparable to the project site as it is not 75% cleared and actively grazed. It would be expected that locations with significantly better vegetation condition and more complete understorey would contain a greater number of species.

**6.3.13 Fauna Listing**

The EPASU state Table 24 page 92, and page 94. Incorrect status for Forest Red-tailed Black Cockatoo.

**Response**

The incorrect (Priority 3) listing and the correct (CS1) listing in Table 24 is noted.

**6.3.14 Local Significance**

The EPASU comments that on Page 94: It is incorrect to state that Conservation Significant (CS3) species are only of local significance. Most of them are of regional significance on the Swan Coastal Plain. It is not true that most reptiles could be found anywhere in the project area. Most would be found in particular habitat remnants.

**Response**

The description given in the PER for CS3 species is “Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution”. This description is considered appropriate.

The sentence on reptile distribution in the project area is noted. The latter part of the sentence in the PER referred to states “, but some have more specific habitat requirements”.

### 6.3.15 Conservation Significance Status

The EPASU comment on Page 95: No list is provided of the 40 bird species of conservation significance. Table does not include that number. Yellow-throated Miner in Table 25 should be denoted as conservation significant.

#### Response

This is incorrect. The PER Appendix 5, Table 24 lists the birds expected to occur, as identified from database searches, and those observed. Not including the CS3 listing of the Yellow-throated Miner is acknowledged.

### 6.3.16 Cockatoos in the Project Area

The EPASU comment Page 97: Some statements on cockatoos are incorrect. Recent studies show that Forest Red-tailed Black Cockatoo breeds frequently on the southern part of the Swan Coastal Plain in the region of the project area. Community 2 also comment that landowners report seeing large numbers of Black Cockatoos

#### Response

The potential for the Forest Red-tailed Black Cockatoo to breed in the region of the project area is acknowledged in the PER as follows:

- PER Section 5.10.5, page 97: “The Forest Red-tailed Black-Cockatoo may similarly utilise remnants in the area for feeding, but additionally this species may breed in suitable nest hollows in the region.”
- PER Section 5.10.5, page 98: “However, it is possible that low numbers of any of the Cockatoos may breed in the area. Most potential hollows identified were on Lot 56. This property appeared to have the largest trees, and has a higher potential to support breeding Cockatoos than any of the other properties.”
- PER Appendix 8, page 2: “There is a breeding population of Red-tailed Black-Cockatoos close to the Keysbrook area (R. Johnstone, pers. comm.).”

### 6.3.17 Bush Forever Status

The EPASU comment Page 129: The statement that “clearing for the project is temporary” is a misstatement. Clearing habitat of mature trees that are hundreds of years old and planting young trees cannot be described as temporary. The statement that “The site was not included in the BushPlan-Bush Forever process as worthy of conservation” is misleading. Much privately owned land in the region was not accessible to the Bush Forever process and accordingly the conservation values were not known. Community 2 submission asked why Lots 56 and 3 were not included in Bush Forever.

#### Response

The complete sentence in the PER states “Clearing for the project is temporary, with rehabilitation following mining”. The intention of the statement is to indicate that unlike clearing for other purposes, such as agricultural development or infrastructure projects, where the alternative land use results in a permanent loss of the vegetation removed, the project will rehabilitate areas to restore vegetation in the mine area.

The proponent considers that the statement that the site was not included in the BushPlan-Bush Forever process as worthy of conservation is not misleading. The PER (Section 9.1.4, page 129) states “Bush Forever (2000) Volume 1 Map Sheet No 2 shows the northern half of the mine area (that includes the major consolidated block of vegetation on Lots 56 and 3) as Bassendean Complex-Central and South. Map Sheet No 82 shows this vegetation as “Other Native Vegetation”. Bush Forever (2000) Volume 1, Table 4 records Bassendean Complex \_Central and South as 13% proposed protection – above the 10% target for the study.”

It is a statement of fact that the specified lots in the mine area are within the Bush Forever study area and they have not been designated as a Bush Forever site through that process. The proponent is not providing any subjective statement on the possible reason for the non inclusion of the subject land as a Bush Forever site.

### 6.3.18 Typographical Errors

EPASU identified the following typographical errors in the PER Appendix 5.

#### Comment

Page 27. *lunulata* is misspelt.

#### Response

The incorrect spelling as *lunullata* in the table is acknowledged.

#### Comment

Page 28. White-breasted Sea-Eagle is not expected to occur in the project area and should be deleted.

#### Response

The White-breasted Sea-Eagle was identified in the *EPBC Act* search as potentially occurring in the region. It was included in the table for this reason.

#### Comment

Page 31. Grey Currawong is placed in the wrong family.

#### Response

Acknowledged. The Grey Currawong should have been placed in the family Artamidae.

#### Comment

Page 33 Western Grey Kangaroo was recorded in several sites, but on page 34 (Table 26) it is not included as recorded.

#### Response

The omission is noted.

**Comment**

Page 35 (Table 27): The Mardo and Grey-bellied Dunnart are incorrectly listed as “extinct in the region”. These species should be transferred to species “recorded or expected to occur in the region” in Table 26 on Page 34.

**Response**

The error is noted.

**6.3.19 Bird Nesting Hollows**

Community 1 and Community 2 comment that Cockatoo are not the only birds to use the remnant vegetation for nesting, and the removal of so much vegetation will severely impact on all of these. Birds tend to be territorial and will use the same tree for years. There are Wedge-tailed Eagles in the area, which require very large and mature trees to nest. The CC comment that additional fauna surveys should be conducted.

**Response**

Fauna surveys conducted in June 2004 and September 2006 included observation and recording of fauna including bird species other than Cockatoos. No evidence of Wedge-tail Eagles using the area for nesting was found. It is acknowledged that Wedge-tails may use the farmland for feeding, but this has not been observed. See Fauna Management Plan, PER Appendix 5.

Additional fauna surveys are addressed in item 6.3.6.

**6.3.20 Cockatoo Habitat Surveys**

There were a number of submissions dealing with aspects of the Cockatoo survey and loss of potential nest sites.

KNAG, Community 1, CC and Community 2 feel that the number of Cockatoo and potential nesting hollows in the area appear to be significantly underestimated and that studies have been inadequate and carried out at the incorrect time of the year and that Baudin’s and Carnaby’s Cockatoos have been sighted in the area.

The Community 70 and SJLC submissions stated that as *Corymbia calophylla*, *Banksia attenuata* and *Banksia ilicifolia* have been surveyed in the proposed mining area the value of the remnant vegetation as feeding and nesting habitat for Carnaby’s Cockatoos and Forest Red-tailed Black-Cockatoos must be further researched.

**Response**

Numbers of Cockatoos sighted during the surveys have been reported. The numbers of potential nesting hollows is also addressed in response 6.1.10. The survey by Wilcox (2005) targeted possible nest sites for Cockatoos, not all hollows.

The proponent does not consider that the surveys conducted have been inadequate and carried out at the incorrect time of year.

The Wilcox (2005) report noted the presence of Baudin's Black Cockatoo in the area, not by direct observation, but by the presence of distinctly marked Marri nuts.

Community input regarding the numbers of Cockatoos observed in the area by residents, but not observed during fauna surveys conducted in June 2004 and September 2006 is noted.

### **6.3.21 Cockatoo Nesting Hollows**

Community 2 and Community 60 are concerned that the removal of mature Jarrah and Marri trees means that there will be no nesting hollows and that rehabilitation will not compensate for the loss of habitat.

#### **Response**

The surveys conducted in June 2004 and September 2006 found most evidence of potential nesting sites north of Elliott Rd (see PER Figure 14). 57.4 hectares (58.6%) has been removed from this area and will be conserved.

The relocation of potential nest hollows is addressed in Section 6.2.22.

### **6.3.22 Fauna Studies and Kangaroo Population**

Community 1 Community 2 and KNAG feel that Kangaroo numbers have been underestimated and that clearing and mining will cause movement to other farms causing damage to fences and crops and that associated kangaroo culling operations will result in hundreds of deaths.

The KNAG submission states that comments made by MBS Environmental at a public meeting on 26 July 2006 were that there were only about 30 or 40 kangaroos in the project area. A licensed shooter routinely shoots this amount on a single night on one property on a regular basis. Most landholders will testify to counting 70 kangaroos in a single mob.

#### **Response**

There has been no specific survey undertaken of kangaroo numbers over the entire mine area. Kangaroos are highly mobile. As the active mine area is only a very small proportion of the total mine area at any one time, it is considered there will be sufficient undisturbed area for kangaroos to relocate. The response at the public meeting referred to the numbers of kangaroos sighted in individual groups, not the number anticipated over the entire mining area.

Clearing for the project is undertaken in a sequential process in advance of mining activities. With over 80% of the mine area in cleared pasture, the vast majority of the 'clearing activities' will involve stripping of pasture and topsoil. The extent of clearing will usually be confined to areas of approximately five to ten hectares at any one time, in order to minimise cleared areas that would be subject to erosion.

By nature, this clearing is also occurring immediately in front of the active mine pit, a location already subject to a high level of human activity, noise associated with vehicle movement and pumps and lights for operations at night. It is anticipated that mobile animals will naturally move away from this level of activity, so additional clearing in advance of the mine front will have negligible additional impact to the kangaroo population.

Community input regarding the significant numbers of kangaroos often observed in the area by residents, but not observed in the same quantity during fauna surveys conducted in June 2004 and September 2006 is noted. Consultation with landowners will help determine the most effective course of action should problems with kangaroos eventuate.

### 6.3.23 Invertebrate Surveys

The submission by the SJS asks if invertebrates were considered in the studies.

#### Response

The fauna surveys focussed on vertebrates, including amphibians, reptiles, birds and mammals. The large pasture areas and remnant vegetation areas predominantly without ground cover due to grazing indicated degraded habitat for invertebrates. This is supported from the following excerpt from Bamford (2006) on reptiles:

Although the fauna assessment (MBS Environmental 2004) suggested that 39 reptile and 10 frog species might be present, only one reptile species (the arboreal skink *Cryptoblepharus plagiocephalus*) and three frog species were recorded during initial studies. Intensive searching for reptiles on 7 September in the Lot 56 remnant located only two additional reptile species, the skink *Hemiergis quadrilineata* and the Bobtail *Tiliqua rugosa*. *H. quadrilineata* was found to be common under logs and mats of dead leaves, with seven specimens captured. A number of other reptile species had been expected to be found during this searching, suggesting that the reptile assemblage is depauperate, probably due to the degradation of habitat by trampling and grazing by cattle. Even the common arboreal gecko *Christinus marmoratus*, for which there was suitable habitat, appeared to be absent.

A trapping survey in late spring/early summer would produce some additional reptile species, but it does seem likely that habitat degradation has badly affected the reptile assemblage. In addition to the species mentioned above, reptiles likely to persist in the project area include Gould's and Rosenberg's Goannas *Varanus gouldii* and *V. rosenbergi*, the Bearded Dragon *Pogona minor*, the skinks *Menetia greyii* and *Lerista elegans*, and snakes such as the Dugite *Pseudonaja affinis* and Tiger Snake *Notechis scutatus*. These and any other reptiles present may be largely confined to where the impact of livestock has been least, such as along road verges and in some of the remnants on Lot 64.

The Bamford (2006) survey considered short range endemic (SRE) invertebrates. The report concluded:

“The project area does not have a natural pattern of rare, discontinuous habitats likely to have given rise to short range endemic invertebrates and therefore the likelihood of such species being present is low. The WA Museum has no records of invertebrate species believed to be SREs from the region, although there is a mite (*Tillia davisae* Mideopsidae) known from only one record from Dirk Brook, which runs along the north of the project area (Harvey 1990). The species is small (0.5 millimetres) and probably occurs within waterlogged soil along the margins of the creek.

During the visit of 7 September, two isopods (slaters) were found in a dead Balga (“blackboy” *Xanthorrhoea* sp.) in Lot 56. These were probably one of the species widespread, but now in fragmented populations across the Swan Coastal Plain south of Perth. However, the species has yet to be identified”.

## 6.4 GROUNDWATER

### 6.4.1 Water and Rivers Commission Statewide Policy No. 10

The DoW submission stated that Water and Rivers Commission Statewide Policy No. 10 – Use of Operating Strategies in the Water Licensing Process was not included in the Relevant Legislation and Guidelines and should be included in Table 6.

#### Response

The proponent considers the Policy referred to is more applicable to the water licensing process. This is a process to be implemented subsequent to the environmental assessment process, so is not specifically relevant for inclusion into the PER Table 6.

### 6.4.2 Groundwater Modelling

The DoW submission on pit dewatering stated “only numerical modelling has been used in the hydrogeological report to predict changes in groundwater levels as a result of the Keysbrook project. More information is required regarding this in the form of pump test data to validate the model, given that it is acknowledged in the PER that there is hydraulic connection between aquifers, and the project is located within a recharge area for the Leederville and Yarragadee aquifers. Concern is raised and more information is required as to the potential for leakage between the Superficial and Leederville Aquifer from dewatering activities.” The SJS raised the same issue.

The following submissions raised similar topics:

Community 65 states “no mining should be allowed if there is even the slightest chance that the Leederville aquifer and Ramsar listed wetlands are adversely impacted”. Community 70 and Community 2 raised the issue of reducing rainfall and runoff will reduce recharge to the aquifers and the extraction of the required water would drop the aquifer water level below sea level. Community 1 commented that a numerical model was constructed to represent aquifers of the Bassendean Sand, Guildford Formation by Rockwater Pty Ltd., to predict changes in groundwater levels as a result of the



operation at the Keysbrook project. Theories and assumptions on paper are fine, but that's all they are, theories. When things go wrong, it will be the landholders who will pay the price. PHCC raised a similar issue, that more detailed work on drawdown effects to local wetlands.

Community 1 further states that 'Olympia admits that the superficial aquifer will be affected by pit dewatering leading to bore levels dropping in the surrounding area', but they assume that this will not extend beyond the boundary of the resource area. This needs to be demonstrated" and that "pit dewatering causing water table draw down will have a disastrous impact on the ground water supply and the wetlands". KNAG comment that the amount of water required for processing has been underestimated.

### **Response**

The pit dewatering is not achieved using bores to lower the groundwater level below the pit floor. Pit dewatering will be implemented by a 'passive' system that directs inflow water via drains on the pit floor to recovery sumps.

In regard to the project's location within a recharge area for the Leederville and Yarragadee aquifers, the following information on the Leederville aquifer is relevant, sourced from Department of Environment Fact Sheet 4 (July 2003): South West Yarragadee Blackwood Groundwater Area:

- The Leederville Geological Formation covers the area west of the Darling Scarp from Lancelin in the north to south of the southern coast of the state. It is bounded to the west by the granitic rocks of the Leeuwin Complex. This formation extends 400 kilometres from north to south and is about 50 to 60 kilometres wide. It is continuous across this whole area, although the thickness of the formation varies considerably, to a maximum of 350 metres near Donnybrook.
- The Leederville Formation is at the surface over most of the Blackwood Plateau.
- The water in the aquifer comes from two sources of 'recharge'.
- Most recharge occurs on the extensive areas of the Blackwood Plateau where the Leederville aquifer forms the ground surface.
- On the Swan Coastal and Scott River Plains, some recharge of the Leederville aquifer occurs by leakage from the overlying superficial aquifers.

The information from Fact Sheet 4 determines the Leederville aquifer covers an area of approximately 20,000 to 24,000 square kilometres and that most of the recharge occurs over the Blackwood Plateau.

The proponent considers the open pit dewatering activities over a 30 hectare (0.3 square kilometre) area of this aquifer, (which is 0.0015 to 0.00125% of the aquifer area) located in a 'minor' recharge area will have an insignificant effect on the recharge potential of the Leederville aquifer.

Additional assessment work and modelling (Rockwater 2007) has been undertaken as is reported in the Water Management Plan. The work confirms extraction from the Leederville Aquifer of the quantity of water required can be undertaken with minimal

impact to adjacent wetlands and other groundwater users.

### 6.4.3 Dewatering Effects

There were many submissions on the issue of drawdown effects on the Leederville and Superficial aquifers.

The DoW submission on pit dewatering stated “buffers of 20 metres have been proposed around major and minor watercourses and the effect of winter dewatering of mine pits adjacent to drainage lines is said to have a negligible effect on the creek flow, however the dewatering impact on groundwater (base flow) contribution to streams has not been demonstrated. It is not clear that dewatering will not impact on native retained vegetation, existing groundwater users and EPP wetlands.

Further, the DoW submission expressed concerns the modelling estimates potential impacts at the pit edge and at distances much further away from the pit. The model does not provide an indication of the drawdowns in the EPP rated wetlands adjacent to the mine areas nor to the drainage features with only 20 meter buffers. Drawdown at these specific distances and the impacts to these sites need to be assessed further.

The PHCC and DEC Kwinana Peel Region submission raised similar issues, expressing concerns on the dewatering effects on the wetlands adjacent to the site. They acknowledge the PER states that dewatering effects are within normal seasonal water level fluctuations however, if dewatering occurs in winter, this could potentially affect the ephemeral hydrological regime resulting in vegetation death and degradation of the wetland. The submission required clarification between the statement made in the PER that “Listed EPP wetlands will not be disturbed by mining activities” and statements that the wetlands will be affected by dewatering.

Similar points were raised in the following submissions:

- Wildflower Society and Community 1. If the wetlands are starved for water during the winter, they cannot store sufficient moisture to carry them through summer and they may not recover. Increasing population in the Mandurah-Peel region causes increasing pressure on the wetlands. This will be increased by mining, and will be detrimental to the environment.
- Community 2. The Nambeelup-Sub-Catchment is in an environmentally sensitive area and for approval to be granted would be seen as hypocritical.
- KNAG. The PER does not clearly explain the direct impacts that will occur on “Major”, “Medium” and “Minor” watercourses. The proposed 20m buffers (insufficient) imply that no direct (within 20m) impacts will occur on the Major and Medium watercourses but this needs to be made clear. Actual impacts, extent, methods of impact on the minor watercourses must be detailed so that the affects can be understood and assessed.
- Community 2. Olympia is mining right up to Conservation Category Wetlands, with little or no buffers, their dewatering and mining activities will definitely interfere with these very important eco-systems.

- Community 60, SJLC and Community 65 raise concerns that diversions of watercourses will affect the adjoining or interconnected wetlands. Past experiences have shown considerable loss of damp land vegetation when natural flows are altered/diverted. Disturbing the natural water flows has been seen to render many wetlands defunct.
- KNAG. The PER appears only to consider EPP wetlands, other significant wetlands will be affected. Waterways buffer should be 30 metres. Waterways should be permanently fenced and conservation covenants established. There has been no detailed ground mapping of wetlands. The wetlands shown have been identified by aerial photography as is obvious by the fact that those identified stop at fenced boundaries because cattle grazing has removed the vegetation evidence. The lack of a detailed digital terrain model prevents the identification of wetlands and subtle drainage patterns. This means that they can never be recovered after mining.
- Anonymous 1 asks what will they do when the wetlands around the area also become dry? We heard no satisfactory response to this question.

### Response

The statement in the PER that the wetlands will not be disturbed (nor the major and medium watercourses) refers to physical disturbance by mining. The PER acknowledges that minor short term affects to the water table at these locations may result. However, the exact quantum will be dependent on the time of year and hence existing ground water level at the wetland at that time. This is described in more detail below.

The effects of dewatering with respect to stream flow will be local to the area actually being mined and restored during a seasonal recharge period (affecting the shallow aquifer). The PER states that approximately 30 hectares of ground will be open at any time. PER Table 4 shows the lateral rate of progress will average about 12 hectares per month. Mining would thus take about three months to pass a particular point. In that time, the advancing area will be drained to near the base of the superficial aquifer. If dewatering at a location starts at the end of the winter recharge period, the required water level reduction will be at maximum compared with other times of the year.

Behind the advancing mining operation, the area will be backfilled with a slurry of 40 to 45% density by weight. Much of the contained water will drain to the excavation and be re-used; a proportion of it will be retained as interstitial moisture and contribute to recharging the water table behind the mining operation.

Under natural conditions groundwater will contribute stream-flow for periods when the water table is higher than the creek invert. This period of base flow would vary depending on creek depth; six months would be a reasonable average value. In six months the length mined would be about 1,000 metres. Given the backfilling operation, this provides water table restoration, and some dewatering ahead of mining. It is reasonably estimated that 1,500 metres of reduced groundwater base-flow would apply, for one recharge period at any one location. A worst-case scenario would apply where, rarely, a mining block abuts creeks on two sides; in this case there would be double the effect.

Rates of groundwater contribution to stream flow before and during mining/dewatering have been estimated using a numerical model (Figure 5 and Table 4). From the modelling it is calculated that the reductions in stream flow arising from mining/dewatering are in the range of zero to 250 cubic metres per day and are mainly less than 60 cubic metres per day. These would be very minor amounts in the hydrology of the area.

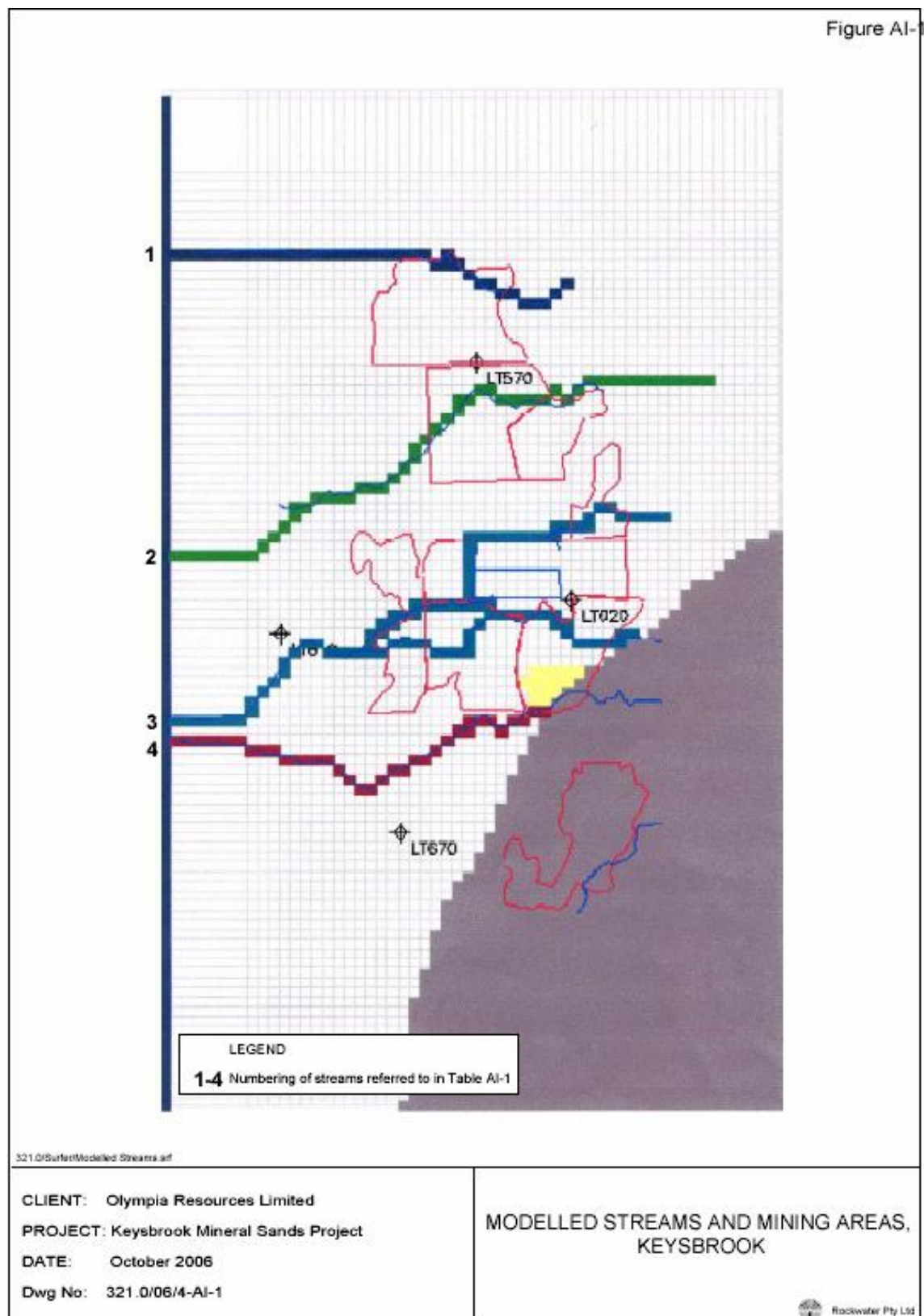
**Figure 5: Main Streams in the Mine Area**

**Table 4: Main Streams in the Mine Area**

Four main streams numbered from one (north) to four (south).  
Positive flows are from groundwater to stream.

| Total Months | Stream No. | Calc Flows (m <sup>3</sup> /d) |        | Difference (m <sup>3</sup> /d) | Combined change (m <sup>3</sup> /d) |
|--------------|------------|--------------------------------|--------|--------------------------------|-------------------------------------|
|              |            | Pre-mining                     | Mining |                                |                                     |
| 2            | 4          | 207                            | 206    | -1                             | -1                                  |
| 5            | 3          | 700                            | 698    | -2                             | -2                                  |
| 5            | 4          | 314                            | 314    | 0                              |                                     |
| 9            | 3          | 614                            | 608    | -6                             | -6                                  |
| 12           | 3          | 544                            | 538    | -6                             | -6                                  |
| 15           | 3          | 271                            | 465    | 194                            | 194                                 |
| 15           | 4          | 173                            | 173    | 0                              |                                     |
| 18           | 3          | 367                            | 349    | -18                            | -18                                 |
| 18           | 4          | 199                            | 199    | 0                              |                                     |
| 21           | 3          | 642                            | 615    | -27                            | -27                                 |
| 24           | 3          | 560                            | 526    | -34                            | -34                                 |
| 27           | 3          | 285                            | 267    | -18                            | -18                                 |
| 30           | 3          | 379                            | 347    | -32                            | -32                                 |
| 33           | 3          | 650                            | 602    | -48                            | -48                                 |
| 36           | 3          | 567                            | 537    | -30                            | -30                                 |
| 39           | 3          | 291                            | 266    | -25                            | -25                                 |
| 42           | 3          | 384                            | 358    | -26                            | -26                                 |
| 45           | 3          | 654                            | 654    | 0                              | 0                                   |
| 48           | 3          | 570                            | 579    | 9                              | 9                                   |
| 51           | 3          | 293                            | 246    | -47                            | -47                                 |
| 54           | 3          | 387                            | 342    | -45                            | -47                                 |
| 57           | 2          | 524                            | 522    | -2                             | -2                                  |
| 61           | 2          | 578                            | 547    | -31                            | -31                                 |
| 64           | 2          | 398                            | 358    | -40                            | -40                                 |
| 67           | 2          | 438                            | 396    | -42                            | -42                                 |
| 70           | 2          | 692                            | 637    | -55                            | -55                                 |
| 73           | 2          | 728                            | 671    | -57                            | -57                                 |
| 76           | 1          | 453                            | 454    | 1                              | -53                                 |
| 76           | 2          | 543                            | 489    | -54                            |                                     |
| 79           | 1          | 481                            | 472    | -9                             | -9                                  |
| 82           | 1          | 656                            | 629    | -27                            | -27                                 |
| 85           | 1          | 681                            | 635    | -46                            | -91                                 |
| 85           | 2          | 863                            | 818    | -45                            |                                     |
| 86           | 1          | 689                            | 639    | -50                            | -95                                 |
| 86           | 2          | 872                            | 827    | -45                            |                                     |
| 89           | 1          | 705                            | 549    | -156                           | -205                                |
| 89           | 2          | 892                            | 843    | -49                            |                                     |
| 92           | 1          | 728                            | 555    | -173                           | -173                                |
| 98           | 1          | 776                            | 610    | -166                           | -166                                |

The most effect that the operation will have on areas of remnant vegetation or wetlands is that the area will receive a slightly diminished annual oscillation of the water table; normally the latter rises about between one and two metres from near the base of the shallow aquifer (Bassendean Sand) to near the ground surface. Under the dewatering/mining scenario the oscillation is likely to be reduced by up to 0.3 metres in the mining phase and increased similarly in the backfill phase. Given that annually the water level at the wetlands falls to about one metre below ground surface, the vegetation is unlikely to suffer significantly as a result of one four month period of water levels being slightly lower than the high part of the normal cycle.

It should be noted that this scenario applies to mining during the peak winter water levels. If mining occurs near the wetland in the four months over summer, there will be negligible effect on the water table below the wetland.

The Conservation Category wetlands located on the perimeter of the mine site are also all located on nominated major and medium watercourses (PER Figure 9). These watercourses will not be disturbed by mining, so stream flows will continue uninterrupted through the mine area and the wetlands. The groundwater component of the hydrology of these wetlands, as it relates to the effect of mining in close proximity to the wetlands, is addressed in detail below.

A plan of the Lot 62 EPP Wetland and the proposed mining and buffer areas is shown in Figure 6. At the closest point, there is 17 metres between the mine edge and the wetland outline, a further 32 metres to dense vegetation, and a further 10 metres to the creek bed.

A cross section incorporating part of the wetland is presented in Figure 7. It shows the base of the Bassendean Sand aquifer in this area and the winter/summer groundwater levels extrapolated from the closest monitoring bores (LT 570, 610, 620 and 670). Elevations of the bed of the creek and wetland are estimated. Mining is planned to extend to one metre depth below ground surface (bgs) at the edge of the mine, and 1.6 metres bgs at a distance of 135 metres from the edge.

Two scenarios were modelled: (1) dewatering/mining in the vicinity to commence in May, i.e. at the beginning of winter rains, and (2) dewatering/mining in the vicinity to commence in September, i.e. after winter. The results are presented in Figure 8 and also Figure AII-3 of Appendix 4 as hydrographs of the groundwater levels at the wetland; under natural conditions in an average year, and with the proposed dewatering/mining.

With winter mining, the groundwater level at the wetland will be about 0.05 metres to 0.2 metres lower than usual during winter and 0.05 metres to 0.2 metres higher than usual during the following dry period (as a result of seepage from backfill).

With mining after winter, the groundwater level at the wetland will be about 0.1 metres to 0.26 metres lower than usual for four months, then 0.01 metres to 0.45 metres higher than usual during the following eight months (as a result of seepage from backfill).



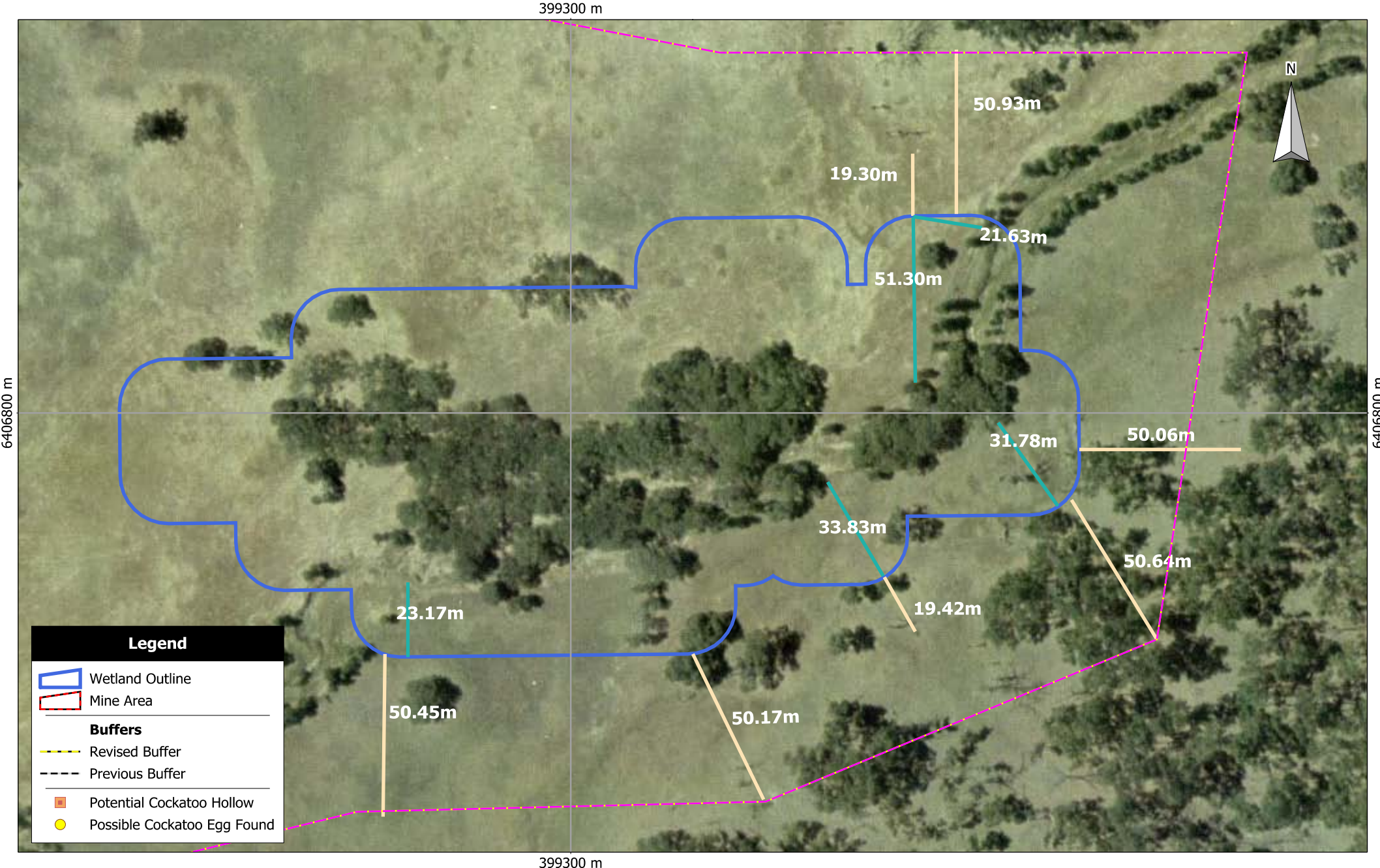
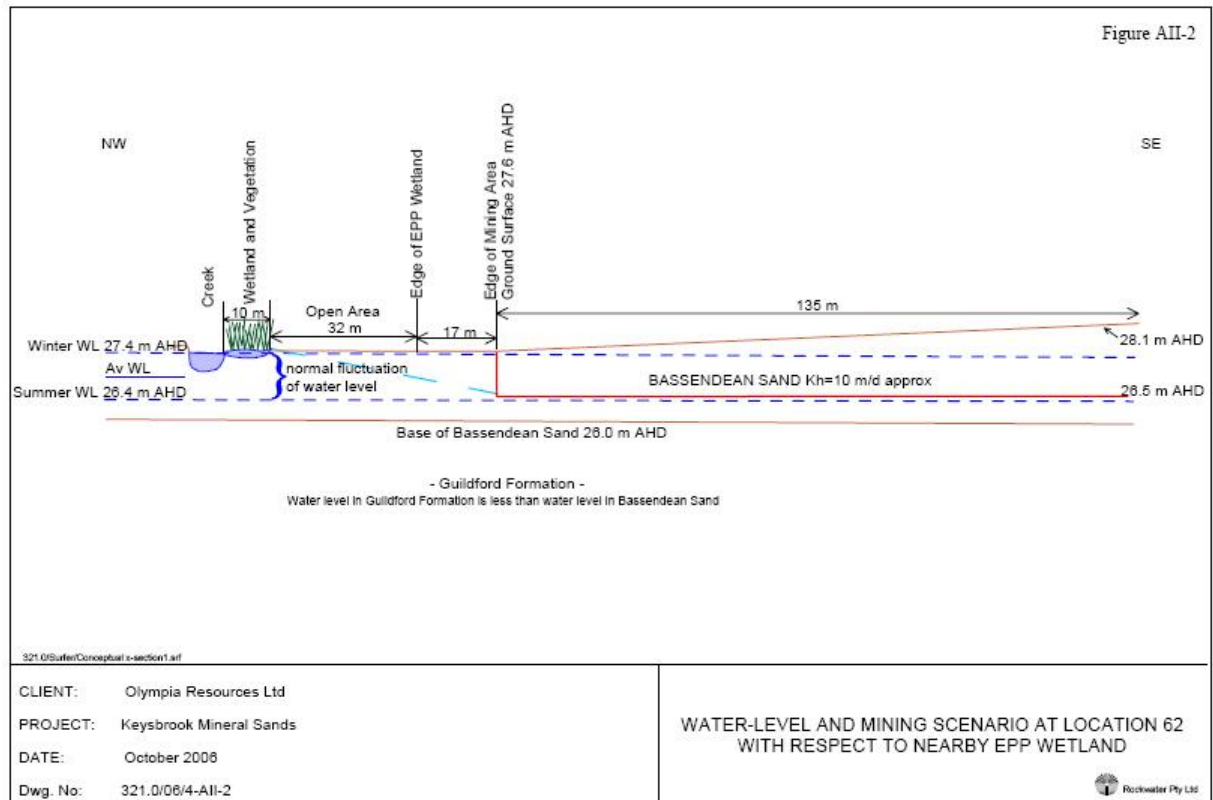
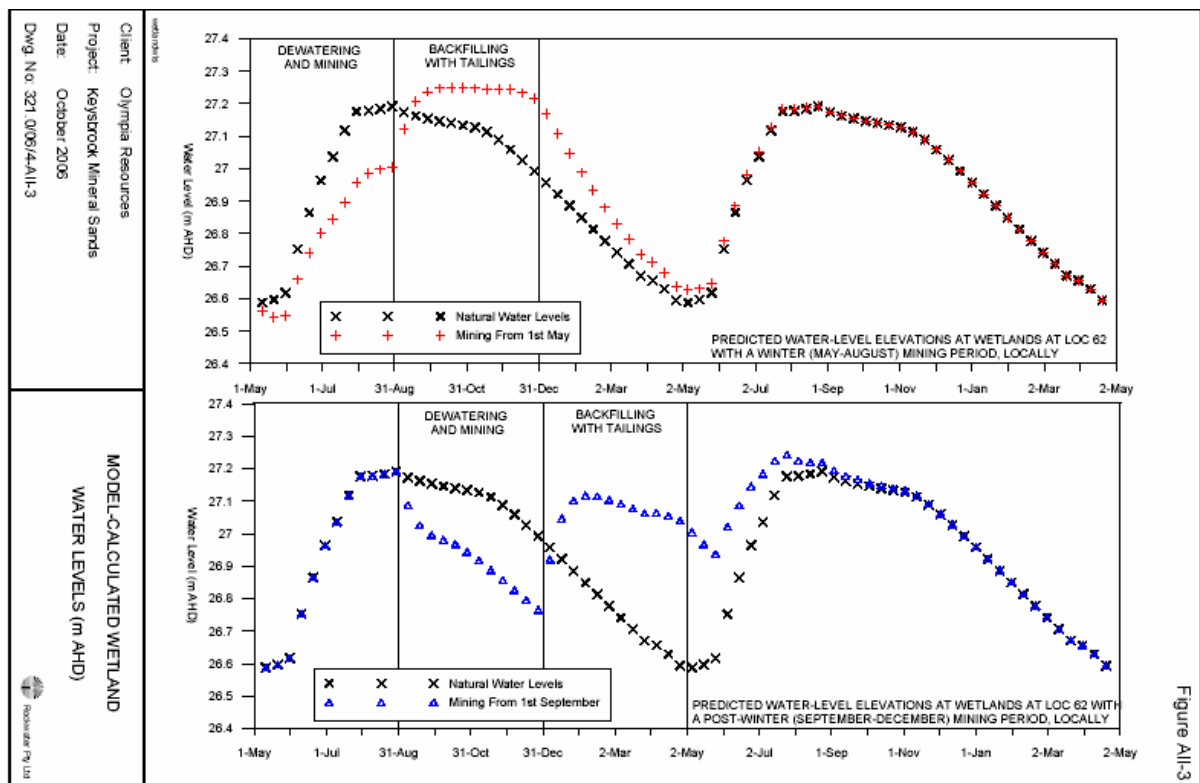




**Figure 7: Mining near Conservation Category Wetland on Lot 62****Figure 8: Hydrographs of Groundwater Levels**

The calculated results indicate that lowering of water levels at the wetland will not be severe, less than 0.3 metres for the four months of dewatering/mining, and the water level lowering will only occur once. While the model predicts higher than usual water levels in the post-mining period, whether these actually occur will depend on the mining geometry and the backfill-drainage set-up.

The models show that water table levels return to the pre mining state within three to four months following mining and backfilling.

The conclusion from the assessment undertaken shows:

- There will no long term effects to the hydrological state of a wetland, where mining is conducted close to the wetland boundary. The entire cycle of mining, backfilling and recovery of the water table to pre mining levels occurs within a 12 month period.
- There is a small short term lowering of the water table (less than 300 millimetres) during the dewatering period followed by a short term elevation of the water table (less than 500 millimetres) during backfilling.

It should be noted that the model results are compared against average water table levels. As shown on the PER Charts 4 and 5, seasonal variation to both the highest winter and the lowest summer levels occur. The modelled variations to average water levels are seen to be within the normal variations of water levels shown since 1975 in the two charts.

The proponent has modified the mine plan shown in the PER to ensure the minimum buffer distance to the Conservation Category wetlands on the perimeter of the mine area is 50 metres.

Additional field assessment and modelling work undertaken (Rockwater 2007) verifies the minor and short term effect of mining in close proximity to wetlands.

#### **6.4.4 Site Water Storage Dam**

The DoW, PHCC, Community 53 and the DEC Kwinana Peel Region submissions raised concerns on the site water requirements which state a Site Water Storage dam with a storage capacity of 74,000 kilolitres is proposed to be constructed near the thickener and primary processing plant. From the figures provided, it is not clear exactly where this is located. Construction details and full dimensions should also be provided.

Figure 5 proposes Water Dam discharge during periods of high rainfall. What is considered to be high rainfall? Further information is required as the location of the sedimentation basin and discharge point. Will licenses be required from the Department of Water?

The PHCC ask that the dams are designed so that they do not draw water from the superficial aquifer or release nutrients or sediment to the aquifers. Design details should also include an outline of the source and quantity of limestone required, any off-site impacts related to obtaining this limestone and how the limestone will be managed upon

decommissioning of dams.

### **Response**

Figure 4 of the PER shows the proposed locations of the primary processing plant. The water storage dam will be located close to the plant.

At this point in time, there are no construction details for the water storage dam. It is anticipated that dimensions will be about 150 metres by 100 metres by five metres deep. The dam will be constructed by excavating approximately two to 2.5 metres (to the base of the Bassendean Sand unit) and using the excavated material to construct a three metre high dam wall. The dam will have a plastic liner.

Surplus excavated material will be used to fill the plant site area as required, to provide the minimum two metre separation distance to groundwater for the storage of hydrocarbons, as specified in the WRC Water Quality Protection Note: Extractive Industries within Public Drinking Water Source Areas (PDWSAs) (2000) and Statewide Policy No. 1 for Construction and Silica Sand Mining in PDWSAs (1999).

When the plant site is moved, the excavated material will be returned to the excavation and the pre mining landform reinstated.

PER Table 9 shows the project to have a significant water deficit, hence the requirement for a water abstraction licence of up to two gigalitres. Under normal circumstances, there will be no requirement to discharge water. However, the calculations are based on average values for rainfall recharge. To cater for possible situations of additional water from heavy rainfall events or extended plant shutdowns, a surplus of water above dam storage capacity may occur. In such situations, discharge of the surplus water is required. A discharge licence will be obtained from DEC. Any discharge water will be passed through the process water dam to settle sediment before discharge to the environment.

It is not anticipated the dam itself will require Department of Water licensing. As the dam will be lined, it will not in itself be abstracting water from or recharging the superficial formation, as commented upon by the PHCC. Water filling the dam will be from pit dewatering, Leederville bores and process water recycling. The first two will be licensed. Any discharge from the dam will be licensed by DEC.

Limestone, generally as sub 75 millimetre product, will be used on site for a number of purposes including road base on the internal access roads used by road vehicles and source of pH buffer material for acid soil neutralisation. This material will be sourced from nearby commercial quarries in the Mandurah, Rockingham, Kwinana region. At completion of operations, the internal access ways will be deep ripped and rehabilitated.

## **6.4.5 Impact on Aquifers**

There were many submissions dealing with aspects to drawdown on the Leederville and Superficial aquifers from the proposed mining and bore water extraction.

The DoW submission stated that more information is required as to the impact of dewatering of the superficial aquifer and extraction from the Leederville aquifer on the Leederville aquifer. Regional Water and Rivers Commission monitoring bores in the Serpentine and Murray Groundwater Areas show decreasing water levels in both the Leederville and Yarragadee aquifers.

There are concerns that reductions in recharge to the Leederville aquifer may have unacceptable effects to surrounding users with licensed bores that abstract from the Leederville aquifer.

PER Appendix 4, Figure 3 shows 25 production bores completed in the superficial aquifer and 11 production bores completed in the Leederville aquifer which are 2,000 meters or less from the proposed mining areas. It is highly recommended that the proponent conduct a risk analysis of potential impacts to the local bores in the event that the drawdowns estimated by the numerical model are underestimated. Depending on the availability of construction data, each bore should be assessed separately regarding screened interval, available drawdown and current trends in local groundwater levels. Superimposed on this information should be gradational scenarios where drawdown impact is incrementally increased to define failure thresholds.

The hydrological report (PER Appendix 4) states that mining/dewatering operation causes “negligible” change in groundwater level in the Leederville aquifer. From Figure 22 of the report it can be concluded that the impacts to licensed bores in the Leederville aquifer after eight years of mining operation is a reduction in water levels of 0.5 to two meters. It is assumed that recharge to the underlying Leederville aquifer will be reduced as a result of dewatering the superficial aquifer. There are concerns that “negligible” change in water levels in the Leederville aquifer is incorrect and understated.

Similar submissions were received from Community 1, Anonymous 1, PHCC, KNAG, and Community 65 commenting that the water studies have failed to factor in the declining rainfall and run-off reducing the recharge to the aquifers, the water studies failed to include numerous borehole logs that show a decline in water levels and the effects on the proposed UWPCA need to be determined.

Community 2 and CC raise similar points on the large drawdown on the Leederville aquifer. ‘The PER states that the operating mine will require 1.82 megalitres per hour to be drawn down from the Leederville aquifer, a total of 15,899 megalitres per year’. There are no calculations on how this annual drawdown will affect the water table in the immediate area of the mine bore field. What is the local effect of this proposal?

## **Response**

### ***Superficial Aquifer***

The proposed local and temporary dewatering of the Superficial aquifer will affect only those water-supply drawpoints that utilise the Superficial aquifer. Because the aquifer is shallow and thin, most such drawpoints are excavations such as ‘soaks’ and ‘drains’ that probably extend to the base of the aquifer.

The pit dewatering modelling shows only localised water table reductions in the superficial formation around the open pits. Many of the known shallow

groundwater sources are on properties to be mined, and these owners will not require the watering points during mining operations.

Shallow watering points on properties adjoining the mining operation may be temporarily affected by lowered water levels for one season. Olympia will identify all such installations within 500 metres of proposed mining operations and provide substitute water supplies at locations where existing supplies are significantly reduced as a result of mining/dewatering.

#### *Leederville Aquifer*

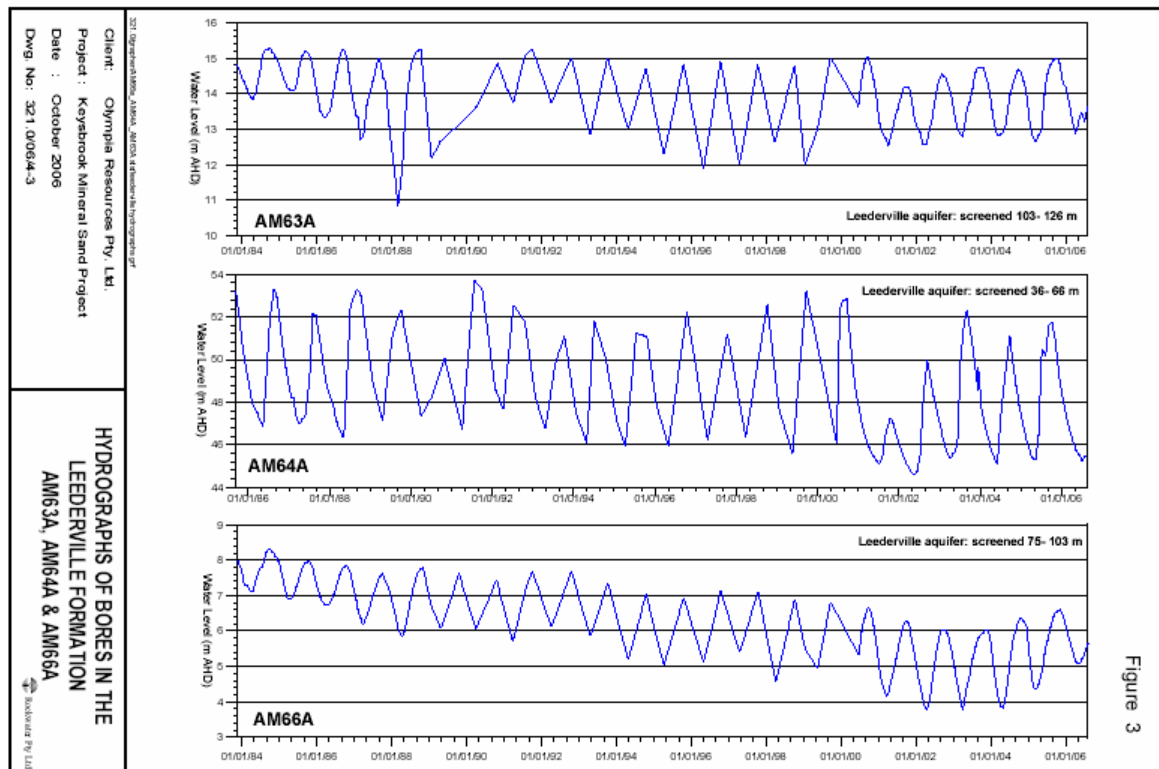
Thirteen bores constructed into the Leederville Formation are licensed for groundwater production based on information from the Department of Water. All but one of them are located in the southern sector of the project environs. They lie south of 6405500 metres N (MGA) (Fig 1). One of the bores lies within the proposed mining area at 401439 metres East 6407349 metres North on Lot 6 Westcott Road, Keysbrook (it is 86 metres deep and was test-pumped at 2990 cubic metres per day).

Three monitoring bores screened in the Leederville Formation in the project vicinity are AM63A, AM64A and AM66A. Water level monitoring over the past 25 years in these bores (Figure 9) shows that water levels have reduced by small amounts over this period, 0.7 metres to 1.8 m total, or 0.03 metres to 0.07 metres per year. In two of the bores, there have been rises of water in the past few years, about 0.4 metres in AM63A and 0.9 metres in AM66A.

The above evidence conflicts with statements by others that there have been severe water level reductions in the Leederville aquifer.

Further site assessment and modelling has been undertaken on the two constructed production bores on site (Rockwater 2007). The results of this work are included in the Water Management Plan.

The results indicate that extraction from the Leederville Aquifer, at the depths, the production bores are tapping, is not anticipated to result in significant drawdown for other bore users.

**Figure 9: Hydrographs of Leederville Formation Bores Am63A, Am64A and Am66A**

### 6.4.6 Water Abstraction Licence

The DoW submission on water licensing stated that it is proposed that water will be taken from the Superficial aquifer during pit dewatering and from the Leederville aquifer for additional process requirements. Licenses under the *Rights in Water and Irrigation Act 1914* will be required for the construction of wells and to take water in both of these instances. The Department of Water can make no guarantee that either licence will be issued at the conclusion of the assessment process. Additional information may be requested, if required. An Operating Strategy in accordance with Statewide Policy No. 10 – The Use of Operating Strategies in the Water Licensing Process will be required.

A plan should be developed to deal with existing groundwater licenses that will be within the mining area. Temporary transfers may be required to ensure water entitlements are maintained for existing licensees. At the completion of mining all new bores constructed will require a Permit to Construct or Alter Wells. It is expected that developments that are re-established after mining will require new development plans using best management practice and efficient irrigation systems.

Community 112 comment that the proponent predicts that there will be no impacts on surrounding groundwater users from the mining activities. Again the proponent has only considered existing groundwater abstraction and has not considered potential future users. It is not possible for the proponent to predict where and when additional groundwater licences will be granted but it is not unforeseen that additional licences will be granted before mining operations cease.

**Response**

Acknowledged. The PER Section 9.6.4 describes the water licensing process and requirement for an Operating Strategy.

The Community 112 submission is correct in stating it is not possible for the proponent to predict possible future users. As the proponent has done, any future applicant request an abstraction allocation will be required to demonstrate the availability of the required water and their use will not impact other licensed users.

**6.4.7 Abstraction Volumes**

The DoW submission on groundwater abstraction recommended that the proponent refine their estimates of their processing water requirements. It is also strongly recommended that the abstraction volumes be limited to what is required for safe mining conditions.

Submissions that also comment on water usage include KNAG and Community 65, which comment that using sprinkler systems around high activity infrastructure areas for dust control will contribute to further depletion of the Leederville aquifer. Community 1 comments that the prevailing winds will require more water for dust suppression. Community 1 further comments that Olympia requires 1,820 kilolitres per hour for the mining and processing, of which it estimates 220 kilolitres per hour will come from the bore. This equates to 5,280 kilolitres per day, or 36,960 kilolitres per week of bore water. This does not include the water required for continual reticulation to keep 30 to 60 hectares of the mined or rehabilitated sand 'in a moist state' to avoid wind erosion nor watering of the roadways and infrastructure areas. Surely this valuable water resource could be better used and apportioned in a fairer manner? Community 2 expresses similar concerns.

**Response**

The additional hydrological investigations and modelling (Rockwater 2007) has refined the estimates of water use. The result of this work is reported in the Water Management Plan. The Water Management Plan includes a site water budget.

The requirements under present planning conditions are for a total amount of two gegalitres per year. The abstraction volumes will be limited to the shortfall between recycling and pit dewatering volumes and what is required for mining and processing.

**6.4.8 Groundwater Modelling Verification**

The DoW submission on the numerical model in the PER Appendix 4 approximates the local hydrogeology and applies aquifer parameters that are accepted by DoW as being representative of the aquifer units on a regional scale. It should be noted that the consultant pointed out limitations in the report regarding aquifer parameters which are approximate, and therefore the predictions must also be taken as approximate. The DEC Kwinana Peel Region submission raised similar concerns the modelling outcomes are not verified by field monitoring data. Submissions from the PHCC, Community 1 and the CC raised similar issues, that modelling should be repeated using only hydraulic parameters that are calculated from field-testing of the mining area.

**Response**

Additional hydrological investigations and modelling (Rockwater 2007) has refined the estimates of water use and local area impact. The result of this work is reported in the Water Management Plan.

**6.4.9 Cumulative Effects on Groundwater Abstraction**

The DoW submission expressed concern that the model takes into account only those pumping bores associated with either mine dewatering or processing supplies. The model does not take into account the collective impacts of the local bores abstracting from the Superficial aquifer and from the underlying Leederville aquifer. There is also an increase in abstraction from the Leederville aquifer from new users in this region which could add to the collective regional impacts. The cumulative impact of the mine operation and surrounding users could have significantly more impact than what is estimated in the model. The model may underestimate the impacts to the Leederville aquifer as a result of the mining operation.

The hydrological report states that mining/dewatering operation causes “negligible” change in groundwater level in the Leederville aquifer. From Figure 3 and from Figure 22 it can be concluded that the impacts to licensed bores in the Leederville aquifer after eight years of mining operation is a reduction in water levels of 0.5 to two meters. It is assumed that recharge to the underlying Leederville aquifer will be reduced as a result of dewatering the superficial aquifer. There are concerns that “negligible” change in water levels in the Leederville aquifer is incorrect and understated.

Potential effects for current and future use of groundwater have also been raised by the following submissions. Community 1, Community 112, CC, Greenacres Turf Farm and KNAG comment that the water studies have failed to address the existing current licensed users, massive future developments in the area immediately adjacent to the proposed mine in the immediate future, and their subsequent demand for water. Community 1 adds that trees throughout the area are already dying because of a lowering of the water table over the years due to a reduction in our rainfall. Wetlands are also drying at an alarming rate. Community 71 submits that potable water is precious and the 220 kilolitres per hour for 365 days of the year for eight years that Olympia wish to use for mining should be kept for domestic use and the mine project should be rejected.

**Response**

The issue of the surrounding bores is addressed in response 6.4.8. Modelling conducted by Rockwater (2006) includes the collective impacts of local bores abstracting from the Superficial aquifer and from the underlying Leederville aquifer. The monitoring programme proposed in the Water Management Plan will identify any impacts as a result of water abstraction. Should impacts be noted that indicate an effect from ‘cumulative use of the aquifer, this will be addressed in the annual Aquifer Review process.



#### **6.4.10 Recharge to the Leederville Aquifer**

The DoW submission expressed concerns regarding the potential for upward flow from the Leederville aquifer during dewatering of the overlying superficial aquifer. The hydrogeologic report in PER Appendix 4 commented that the (semi-confined) Leederville formation was recharged from the overlying (unconfined) Superficial aquifer. The potential for impact on recharge to the Leederville should be more thoroughly assessed.

The modelling simulated recharge from rainfall as being 0.36 millimetres per day for the wet season and zero millimetres for the dry season. It should be noted that the dewatering of the superficial aquifer during the wet season will impact on recharge to the underlying Leederville formation under the foot print of the dewatered area. The impact to water levels in the Leederville aquifer as a result of the reduction in recharge has not been adequately assessed.

##### **Response**

Additional hydrological investigations and modelling (Rockwater 2007) has refined the estimates of water use and local area impact. The result of this work is reported in the Water Management Plan. This work included results of investigations of water levels and recharge between the Superficial and Leederville aquifers.

Behind the advancing mining operation, the area will be backfilled with a slurry of 40% to 45% pulp density by weight. Much of the contained water will drain to the excavation and be re-used; a proportion of it will be retained as interstitial moisture and contribute to recharging the water table behind the mining operation.

#### **6.4.11 Impacts on Surrounding Water Users**

DoW expressed concerns that reductions in recharge to the Leederville aquifer may have unacceptable effects to surrounding users with licensed bores that abstract from the Leederville aquifer.

Figure 3 of the PER Appendix 4 shows 25 production bores completed in the Superficial aquifer and 11 production bores completed in the Leederville aquifer which are 2,000 meters or less from the proposed mining areas. It is highly recommended that the proponent conduct a risk analysis of potential impacts to the local bores in the event that the drawdowns estimated by the numerical model are underestimated. Depending on the availability of construction data, each bore should be assessed separately regarding screened interval, available drawdown and current trends in local groundwater levels. Superimposed on this information should be gradational scenarios where drawdown impact is incrementally increased to define failure thresholds.

KNAG commented that the Greenacre Turf Farm employs approximately 20 people plus sub contractors and is strictly restricted to 150 megalitres per year. This is essentially a sustainable industry and could grow if extra water was allocated. Whereas the Olympia mining is unsustainable and requires more than 10 times the water. Other similar horticultural industries and nearby future housing developments could make much better use of this water than Olympia. KNAG further comment the PPG is adamant that the quality of water in the Leederville aquifer should be protected at all costs.

Consideration should be given to the risk of contamination from, nutrients, minerals or chemical filtration or residues from mineral sand extraction. It would only take one disastrous decision or mistake to reach the point of no return.

**Response**

The drawdown and recharge of the Leederville aquifer is addressed in responses 6.4.2 and item 6.4.5.

In regard to submissions on the preferential allocation of water to one applicant over another, the proponent's comment is that as the State's custodian of water resources, the DoW is the agency responsible for water allocation and licensing.

The proponent will submit an application to DoW for construction of bores and an allocation of water as detailed in the PER.

**6.4.12 Drainage Design**

Community 1, Community 53 and SJS comment that the PER does not show any drainage design work to cope with the outflows from dewatering, nor calculations of the amount of water to be removed from the pits. There may be substantial drain overflow arising from the dewatering discharge. The proposal is to take water from dewatering, during winter, and divert it to the processing plant. Where will the surplus dewatering from pits move into the existing drainage system? The current drainage is not designed to cope with the dewatering required for 24 hours per day dewatering. Community 2 comment that there is not very much water in the ground already, and groundwater abstraction associated with the mine may kill the trees.

**Response**

The PER Section 4.3.3 and Table 9 describe the general dewatering parameters for the project. Under normal operating circumstances there will be no discharge of dewatering water from the site. The project operates in a significant water deficit, hence the need for a groundwater abstraction licence of up to two gigalitres per year.

Table 9 shows the modelled pit dewatering quantities range from 134 – 2,397 kilolitres per day, representing between 3 – 45% of the site's daily water needs.

The main source of water loss is the water held by the sand when it is pumped back into the pit void. A significant amount of water immediately separates from the sand when it is pumped back to the pit void. This water is quickly collected in pit drains and pumped back to the water dam and recycled. The remainder is held in the wet sand. Some slowly drains out onto the pit floor, is collected in drains and makes up a portion of the quantities reported in PER Table 9 of the Average Pumping Rate. Some of the water drains back into the Guildford and Leederville aquifers in a return to the normal hydrological process referred to as 'leakage' by DoW in item 2. Some is held by the sand and recharges the 'groundwater level' at this location.

### 6.4.13 Water Abstraction Licence 2

The DoW submission states the PER provided a chapter on “environmental management” with a sub chapter on “groundwater”. This section addresses groundwater and surface water issues, assessment, management and monitoring in very general terms. These sections are considered to be within the scope of the PER, but highly deficient in supplying the level of detail necessary as required for groundwater licensing. The proponent should be made aware that the operation will require a rigorous groundwater monitoring programme due to the volume of water required for dewatering and processing, the density of local bores and the vicinity of EPP rated wetlands.

#### Response

Noted. The separate process of water abstraction licensing is also addressed in item 6.4.1.

Additional hydrological investigations and modelling (Rockwater 2007) has been undertaken. The result of this work is reported in the Water Management Plan.

### 6.4.14 Downstream Water Quality

The DoW expressed the concern it is unclear as to what impacts the discharge of excess water into drainage channels will have on downstream areas in regards to water quality. During the peak of the wet season, discharge into drainage channels may have significant impacts in regard to flooding and water quality issues. The impacts to downstream users in regard to water quantity and quality have not been adequately addressed.

Community 1 comment that additional water being directed into already saturated neighbouring properties adds an extra burden on properties around the mine site and risks contaminating Nambeelup Creek, which flows through several properties and is used for much of the year by some cattle. Community 2 comment the water drawn is to be used to 'flush' the minerals from the sand, with no plan to collect this water other than a surface pond. The water table reaches the surface in winter in North Dandalup. There will be a seepage/flow of this water into local waterways with an unknown and unplanned effect. Nearby residence could easily be subject to inundation through any localised addition to the water table in winter.

#### Response

PER Table 9 shows the project to have a significant water deficit, hence the requirement for a water abstraction licence of up to two gigalitres. Under normal circumstances, there will be no requirement to discharge water. However, the calculations are based on average values for rainfall recharge. In situations of additional water from heavy rainfall events or extended plant shutdowns, a surplus of water above dam storage capacity may occur. In such situations, discharge of the surplus water is required. A discharge licence will be obtained from DEC. Any discharge water will be passed through the process water dam to settle sediment before discharge to the environment.

### 6.4.15 DoW Comments

DoW: Water Source Protection Branch submission detailed the following issues:

#### Comment

1. The main concern with the proposal is that it will not be able to achieve the minimum two metre separation to groundwater table in accordance with WRC Statewide Policy No.1 – Policy and Guidelines for Construction and Silica Sandmining in Public Drinking Water Source Areas.

#### Response

This is acknowledged and addressed in the PER Section 9.6.4, pages 157-158.

It is also relevant to note the following statements made by the submitter that acknowledge “the proposed mining area is located in the unproclaimed Karnup-Dandalup Underground Water Pollution Control Area (UWPCA) and adjoining Water Reserve...” Also, “our Branch recognises that the UWPCA and Water Reserve are not proclaimed Drinking Water Source Areas, but they have been identified as future Public Drinking Water Sources, so all practical protective measures should be taken to protect this potential drinking water source.”

The proponent considers the submission by the DoW Water Source Protection Branch contains conflicting information. On the one hand they acknowledge the area is not a proclaimed water reserve, “so all practical protective measures should be taken to protect this potential drinking water source” and on the other quote specific policy and guidelines documents that are applicable to proclaimed water reserves. The proponent considers the PER addresses these issues in the sections stated above.

#### Comment

2. Point 2 “The Department of Water Kwinana Peel-Regional office ... should be contacted with regards to the *RIWI Act* licensing requirements for diverting watercourses, dewatering and groundwater abstraction.....on the aquifers”. The proponent should apply for a licence under *RIWI Act* not only for diverting watercourses and abstracting groundwater, but also for the dewatering process of the pits (see Table 1, p. 15, groundwater, Environmental Management, p.25, Management Action, Groundwater 9.6.4b).

#### Response

This is addressed in the PER Section 9.6.4, page 156 as “application is required to be made under the *Rights in Water and Irrigation Act 1914* to construct a bore or well.” The PER Section 9.7.4, page 161 states “under the *Rights in Water and Irrigation Act 1914*, a permit is required to alter the bed or banks of a watercourse. Olympia will obtain the required permit to implement any diversions of the minor watercourses around active mine areas (Management Action 9.7.4a).” Olympia will apply for the required permits.

#### Comment

3. “Underground fuel and chemical storage in P2 areas of Public Drinking Water Areas is prohibited via by-laws..., in PER, now on p 25, point 9.6.4e,

Management Actions, Groundwater, the proponent should be encouraged to install the fuel storage tanks above-ground, as underground fuel and chemical storage in P2 areas in proclaimed Public Drinking Water Source Areas is prohibited via by-laws.”

**Response**

The PER Section 9.6.4, page 158 states “Olympia will prepare and implement a hydrocarbon management procedure to address issues described in *Water Quality Protection Guideline 7 - Mechanical Servicing and Workshop Facilities* and *Water Quality Protection Guideline 10 - Above Ground Fuel and Chemical Storage*. The on ground fuel storage and workshop facilities will be located on elevated land to ensure a two metre separation distance to the highest water table level, thus complying with the guidelines (Management Action 9.6.4e).”

**Comment**

4. “There should be a contingency plan in place for the transport routes through the proposed Public Drinking Water Area in case of events such as a truck roll over or fuel spill.” This comment has not been taken into consideration in the PER.

**Response**

Acknowledged. The site safety and emergency response procedures have not yet been developed. It is anticipated these site specific documents and procedures would be prepared prior to operations commencing. Olympia will prepare accident/incident and emergency response procedures for events that may occur within the mine area, prior to commencement of operations.

Response to vehicle accidents such as truck rollovers that occur on public roads would occur through the respective emergency services (police, fire brigade, ambulance).

**Comment**

5. “Potential impacts should include other impacts such as dust, accidents, chemicals, lubricants, engine oil etc not just hydrocarbons”. This comment has not been considered in the PER.

**Response**

This is incorrect. Dust is addressed in Section 9.9 of the PER. Accidents will be addressed in the site procedures described in response 5.4.15 (4). Chemicals are addressed in Sections 9.7.4 and 9.12 of the PER. Lubricants and engine oil are also hydrocarbons and are dealt with in the PER as such.

**Comment**

6. “What issues will be addressed in the Water Management Strategy? ....”. In PER, now p 25, 9.6.4b. This comment has not been addressed in the PER.

**Response**

The section in the PER states “the abstraction licence will require the preparation of a Groundwater Operating Strategy that will define a monitoring regime for ongoing

review of drawdown effects. Olympia will prepare and implement an operating strategy and site licence monitoring and reporting requirements (Management Action 9.6.4b).

The content of the operating strategy will follow the Water and River's Commission Statewide Policy No.10: Use of Operating Strategies in the Water Licensing Process (May 2004).

#### **Comment**

7. "Any spills should also be reported to the appropriated authorities. This should form part of a contingency plan, or part of the Hydrocarbon Management Procedure." It is not clear from the PER whether this comment has been taken on board.

#### **Response**

Section 9.7.4 of the PER, page 162 states: "Minor spillage that occurs as a result of accidents or breakdowns will be addressed and reported through Olympia's accident/incident report procedure. Spillages will be removed and disposed off-site." The accident/incident report form contains provisions for reporting the incident to relevant Government agencies.

#### **Comment**

8. This branch would like to see further details of the numbers, locations, types and approximate proposed usage rates of effluent disposal systems. In PER, now p27, 9.11.4, p.58, section 4.15 and Section 4.16.1. This comment has not taken into consideration.

#### **Response**

The effluent disposal systems will be located at the primary processing plant locations, shown in Figure 4 of the PER. PER Section 4.15 specifies the type as a Biocycle system. Other details have not yet been determined. The PER Section 4.11 states the total site workforce will be approximately 30-35 people, working over two shifts. The size of the unit or units required will be determined in consultation with the Health Department and the relevant Local Government.

The proponent understands application for on site effluent disposal systems is required to be submitted to the Local Government for approval. It is unclear what regulatory input is required by the Department of Water in this process.

#### **Comment**

9. Most recommended documents were added to table 6, p 36 and section 9.7.2, p 159, apart from WAPC's Statement of Planning Policy 2.7 Public Drinking Water Source Policy. WAPC's draft Statement of Planning Policy 2.9 Water Resources is also of relevance to this project proposal. This draft Policy provides measures to protect, conserve and enhance surface and groundwater catchments which have been identified for existing and future human consumption. The policy also addresses the importance to take into consideration the potential adverse impacts that development may have on catchment areas.

**Response**

WAPC's Statement of Planning Policy 2.7 was not included in Table 6 of the PER as it does not apply to the project area. Point 3 of the document, titled Application of the Policy states "This policy applies to proclaimed PDWSAs throughout Western Australia."

**Comment**

10. "Page 58, Section 4.6, Construction of containment bunding to statutory and guideline requirements for all hazardous and potential contaminating material will occur". In PER, now on p.58, section 4.17. This statement has only been partially considered in this section.

**Response**

The proponent considers it has adequately addressed the issue of storage of hazardous materials in Sections 4.17.1, 9.6.4 and 9.12 of the PER.

**Comment**

11. "Page 62, 4.17 Induction and training needs to include making employees aware that they are operating within the proposed Karnup-Dandalup UWPCA and Water Reserve." In PER, now on p. 59, section 4.19. This statement has not been considered in the PER, but our Branch is of the opinion that the proponent should be made aware of the importance of addressing this issue in their training programs.

**Response**

The site induction has not yet been prepared. It will include environmental requirements. The location of the mine site within the proposed Karnup Dandalup UWPCA will be included in the induction.

**Comment**

12. "Page 78, 5.7.4 Water Quality data for the bores should refer to a map with the bore locations on it ..." In the PER, now on p 78, section 5.6.1.4. This comment has not been considered in the PER.

**Response**

This is incorrect. The location of the four bores listed in Table 17 of the PER is shown in Figure 9.

**Comment**

13. "Figure 9 – this map should include the Karnup-Dandalup proposed boundary...." This map has not been included in the PER. A map showing the boundaries and priority classification of the proposed Public Drinking Water Source Areas should be included in the PER.

**Response**

This is incorrect. The proposed Karnup Dandalup UWPCA is shown in Figure 17 of the PER. The scale of Figure 9 is inappropriate to include this boundary.

**Comment**

14. “Page 118 – the environmental impacts list should include pollution to the public and private water sources, particularly the proposed Public Drinking Water Source Areas (PDWSA)”. This statement has partly been incorporated, but there is no referral to the proposed PDWSA. The proponent should be advised that the proposed PDWSA is considered in their management approach.

**Response**

The impacts list includes the following points related to ground and surface water quality:

- Potential impacts to groundwater quantity and quality as a result of abstraction for water supply and pit dewatering.
- Potential pollution to surface and groundwater sources.
- Surface water (quality).

The proponent considers this sufficiently identifies the main environmental factors and impacts associated with the Keysbrook project.

The proposed PDWSA has been considered in Section 9.6 of the PER.

**Comment**

15. “Page 120 – the list of plans and procedures to be prepared should include the Hydrocarbon Management Procedure...” The Hydrocarbon Management Procedure has not been referred to in Section 9.2, p120. This procedure is important to prevent any surface and groundwater pollution in the future drinking water source area. Therefore this procedure should be listed under Section 8.2.

**Response**

The “included” list of procedures on page 120 is not intended to be exhaustive. Management Action 9.6.4a provides for the preparation and implementation of a hydrocarbon management procedure. It is considered the issue of a hydrocarbon management procedure is adequately addressed in the PER.

**Comment**

16. “Within the mine cell, where the pit floor will be within the minimum separation zone, the screening plant and all transfer pumps are electrically powered” should be included in Table 2, p. 25 under 9.6.4 (f). This is an important management action and should not be overlooked.

**Response**

The statement that the equipment involved is electrically power is a statement of fact. There are no specific ‘management actions’ required to implement the condition. It is considered the statement in the PER is sufficient to address the issue.



### 6.4.16 Groundwater Modelling Assumptions

KNAG and Bioscience submissions expressed concern on the assumptions used in the groundwater model to predict the effect of drawdown on the Leederville aquifer from the proposed abstraction bores. KNAG further state that the amount of water required has not been adequately represented and cannot be supplied from the proposed source without severe depletion of the resource. There has been no heed taken of the dramatic reduction of rainfall and surface run off in the last 30 years. Community 1 and Community 2 also raised similar concerns, that the water use will seriously impact on adjacent landholders.

#### Response

In Davidson (1995, p.102) it is stated that the hydraulic conductivity (permeability) value for sandstone beds in the Leederville aquifer is about 10 metres per day as derived from pumping tests. The value for siltstone/shale beds is assumed to be about  $1 \times 10^{-6}$  metres per day.

Average values for the whole aquifer thickness in an area depend on the proportion of sand and siltstone/shale – commonly 50/50, giving an average permeability of five metres per day.

An additional variation is the lateral continuity of the interbedded lenses, giving rise to Davidson's estimate of average 1.5 metres per day north of the Swan River and 0.5 metres per day south of the Swan River.

The above effects and values change from place to place. Rockwater's selection of a value of five metres per day for the Leederville Formation is believed to be reasonable, given the fact that a bore in the neighbourhood yielded 2,990 cubic metres per day when test-pumped.

The results of the pumping test of this production bore at 401288 metres East 6410264 metres North (WIN ID 20024619, GWL 54303), provide an indication of the permeability applicable to the Leederville aquifer in this vicinity – within the project area. The following data from the WIN database apply:

- Aquifer (Leederville Formation) depth; 31 to 83 metres below ground surface.
- Aquifer Thickness: 52 metres.
- Pumping test rate: 2,994 cubic metres per day.
- Duration: 7 hours (0.3 day).
- Final drawdown: 27.8 metres.

Calculations using Jacob's modified this equation for drawdown in the aquifer indicate that if permeability was 0.5 metres per day the water-level drawdown should have exceeded 150 metres at seven hours pumping. Drawdown of 20 metres is indicated, if the permeability was five metres per day. Given the measured drawdown value of 27.8 metres (inside the bore, thus including 'well losses'), the permeability value of five metres per day is seen to be very realistic for this location. Also, it is noted that the Department of Water has stated, with reference to the Rockwater evaluation:

“The numerical model in Appendix IV approximates the local hydrogeology and applies aquifer parameters that are accepted by DoW as being representative of the aquifer units on a regional scale.”

Whether the permeability of the Leederville Formation in the project area is five metres per day or a little less does not alter the viability of the aquifer in providing a water supply of two gigalitres per annum for the Keysbrook Mineral Sand Project. If the actual permeability is lower than the value adopted, the drawdown cones will be steeper and cover smaller areas than previously calculated. The locations and numbers of production bores and their individual pumping rates can be selected to reduce the drawdown impacts at existing bores in the Keysbrook area.

Additional site hydrological investigations and modelling have been undertaken (Rockwater 2007) and are reported in the Water Management Plan. The results verify that the required water can be abstracted from the Leederville aquifer with minimal impact.

#### **6.4.17 Additional Bore Fields and Pipeline Access**

Community 1 submit “if they move the processing plant to that section of the mine (adjacent to Readheads Road), they will have to run kilometres of water pipe across private property and under the road or put in a fourth artesian bore”. KNAG and Community 1 add there has been no mention of the fact that Olympia will require an addition bore field near Elliott Road because pipe access will not be granted by the property owners between the northern mine site and the southern mine site.

The Community 112 and PHCC submission raised similar concerns in that the PER, Figure 5 is just a schematic representation of the piping infrastructure that will need to be installed in order to link the ground water bores, the pit-de-watering and the processing water recycling, to the water storage dam in each of the (three) mine processing locations. This schematic representation does not permit assessment of the potential impacts of the installation and operation of the piping infrastructure.

#### **Response**

Access for water pipelines from the abstraction bores is proposed via the Westcott Road reserve. No access to private property will be required. No additional bores will be required if this proposal is granted.

To access the mine areas south of Readheads Road, water, ore slurry and sand tailings pipelines will be placed under the road. This will require purpose built culverts. Application to the Shire of Murray will be sought to implement these works.

The mobile nature of the open pit through the mine area means that pipeline systems are also constantly moving with the infrastructure. Pipes will generally be black polyethylene pipes placed on the ground surface. Where pipelines cross vehicle access roads or farm gates they will be buried at a safe depth to provide access.

### 6.4.18 Adjacent Bores

The Community 1 submission expressed concern that out of date information was used for the location of existing bores. The surrounding landowners are dependant on these bores for water. Who will pay the cost of many of these bores having to be re-drilled to a deeper depth, assuming the Water and Rivers Commission would allow this. What would landholders do for water while waiting for these permits and the availability of drilling rigs? Some bores, cannot be deepened without considerable cost because they are sitting on granite, which dictated the bore depth initially.

#### Response

Figure 10 shows the location of the thirteen bores constructed into the Leederville Formation licensed for groundwater production based on information from the Department of Water. All but one of them is located in the southern sector of the project environs. One of the bores lies within the proposed mining area on Lot 6 Westcott Road. It is 86 metres deep and was test-pumped at 2,990 cubic metres per day.

Response 6.4.5 also provides details of the modelling that indicates water level reductions of less than two metres are predicted in the southern bores after eight years of pumping. Olympia will liaise with owners of Leederville bore licenses throughout the mine life. Should significant water level reductions be attributed to the project water drawdown, Olympia will undertake remedial works to ensure a continued supply from the bore. This may entail deepening the existing bore or if the bore is at base rock level, constructing a second bore. Should these options be required, they will be investigated on a case by case basis with the landowner.

A survey of bores in the vicinity of the mine has been carried out (Rockwater 2007) and is included in the Water Management Plan.

### 6.4.19 Flocculent Use

The PHCC and SJS submissions commented that the PER does not detail whether the flocculent used during processing has the potential to affect the environment. Further, it does not indicate whether it will remain as part of the soil profile and/or enter the superficial aquifer, and so eventually the waterways and estuary. This information must be provided.

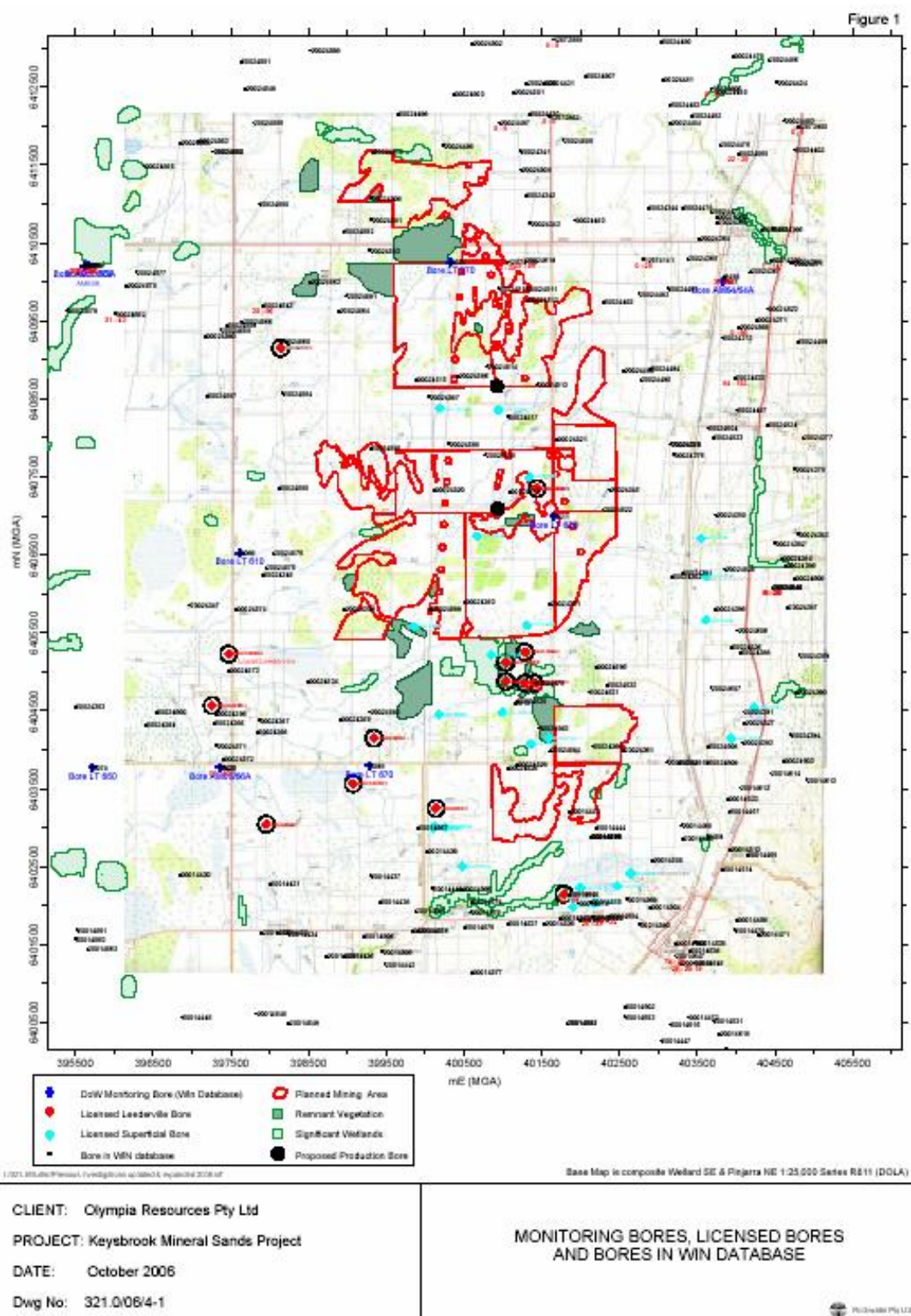
#### Response

The PER contains the following points regarding the flocculant:

- Section 4.6.2: Flocculants will flocculate the clay and it will drop to the bottom of the thickener to be pumped out as thickened clay underflow.
- Section 9.7.4: The flocculant used in the process has a chemical classification of Non Hazardous. As such, there are no specific regulations or standards covering the storage of this material.

In summary:

1. The flocculant is irreversibly adsorbed onto solid particles. It combines with the fine particles in suspension and becomes part of the sediment that drops out of the water column.
2. Negligible flocculant residues are expected in the supernatant water.
3. The flocculant is biodegraded in the soil sediment. The rate of breakdown depends on factors including concentration, temperature, and soil bacteria. Breakdown could be expected in timeframes between days to weeks. The action of the flocculant is not a temporary activity, where it is subsequently re-released (whole) back into solution in the water column. Even if this were the case, the activity of the flocculant would then recombine with fine particles in a repeat of its initial action.
4. When combined with particles in the soil sediment the absorption process is virtually irreversible, which eliminates the flocculant's soil mobility by leaching or percolation into the ground-water aquifer.

**Figure 10: Monitoring Bores, Licensed Bores and Bores in WIN Database**

### 6.4.20 Water Quantity Requirements

The Community 1, Community 2 and Community 53 submissions raised concerns on the quantity of water used in the process, with concerns the quantities described are under estimated. The slurry water recovery system is not described and the water required for continual reticulation to keep 30 to 60 hectares of the mined or rehabilitated sand 'in a moist state' to avoid wind erosion, watering of the roadways and infrastructure areas are not included.

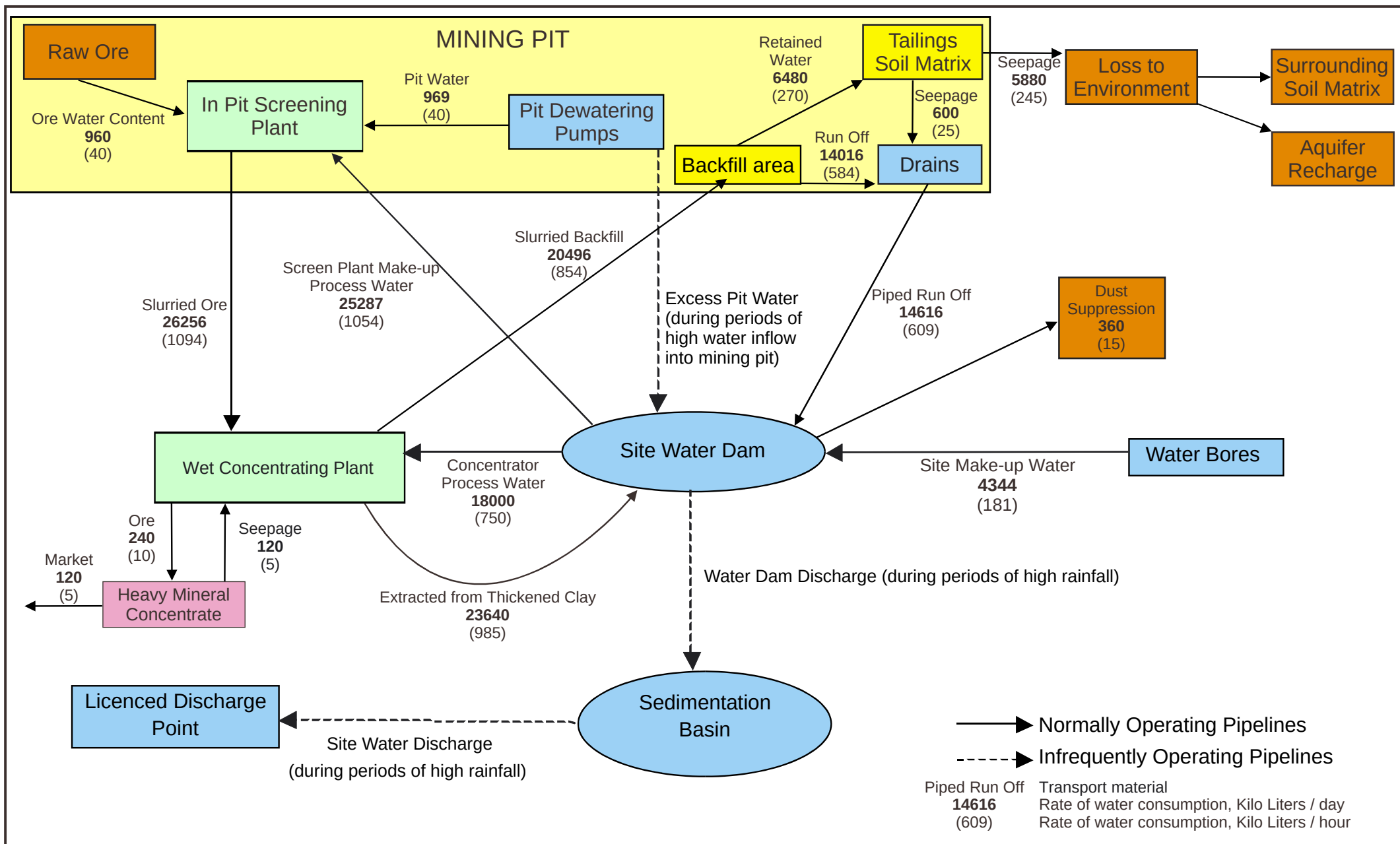
#### Response

The water use in the process has been accurately described in the PER. The output of pit dewatering model is shown in Table 9 of the PER. The water use is based on design parameters for the processing plant and industry experience based at other mines. The site water balance model is shown in Figure 11.

The sand and clay tails are pumped back into the pit void at approximately 45% density. Water segregates out of the tails immediately upon entering the backfill pit, is collected in in-pit drainage, taken directly to a collection sump and pumped to the water storage dam for reuse. Experience at other mineral sand mines is that approximately 70% of the water is recovered in this phase. As the Keysbrook deposit has a much lower clay content than many other mineral sand operations, the tails material is much coarser and freely draining. It is anticipated the 70% figure from other sites is a conservative estimate for Keysbrook.

The remaining water is held in the tails matrix. Over time it continues to seep out of the pit floor and walls to recharge the Bassendean and Guildford horizons of the Superficial formation. Some water seeps back out into the open pit, is collected in the pit drainage system which is dewatering the pit and forms a component of the quantity shown in Table 9 of the PER. The remaining water is held by the backfilled material.

As described, the tails material is returned to the pit void as a slurry. There is no continual reticulation required to keep it in a moist state. Water use for dust suppression is factored in to the overall water use for the mine.



### 6.4.21 Underground Streams

Community 2 stated that underground streams which flow from east to west and usually are a water source for windmills will be mined out and permanently lost.

#### Response

The proponent disagrees with this statement. The profile to be mined is the Bassendean sand layer. This sand layer contains an unconfined aquifer during the winter, which reduces to the base of the profile during summer. This shallow sand layer does not supply the water source for windmills, especially over summer, as it is dry. Summer water supply is sourced from the deeper profiles not subject to mining such as the Guildford Formation and the Leederville formation.

### 6.4.22 Seasonal Groundwater Levels and Water Abstraction

The PHCC submission raised that the PER states, “in summer the groundwater level will usually be below the level of the pit floor”. We argue that aerial photography for the mining area, which is taken in summer, shows stock-watering soaks that contain water. These demonstrate the summer groundwater level and we suggest that dewatering is highly likely to be required in summer.

#### Response

The PER Table 9 shows that dewatering over summer does occur. Most of this water comes from the draining backfill area of the pit. Exploration drilling indicated the summer water table was generally at the base of the Bassendean Sands. The mineralised zone does not extend below this layer. The farm dams and soaks seen on aerial photography usually extend into the clayey Guildford Formation, not the sandy Bassendean layer, in order to be able to hold water over the summer period. These dams are below the mine pit floor level.

### 6.4.23 Greenacres Turf Farm

Greenacres Turf states that the proposed Leederville two gigalitre water license is offensive as Greenacres has been negotiating for over 14 years and could better utilise the allocation and employ more local people.

#### Response

The proponent, as with any individual or business operation must seek licensing from the DoW to access groundwater. The proponent is not aware of the specific circumstances of Greenacres Turf Farm. The proponent will employ approximately 35 people during mining and a similar number during the construction phase of the project.



## 6.5 SURFACE WATER

### 6.5.1 Stream Baseline Information

DEC: Kwinana Peel Region comment that monitoring section of the PER states that results will be compared with existing baseline data. No detail of this baseline data is supplied such as location of monitoring sites, monitoring frequency, parameters and source. The DEC would expect to see baseline data determined from two years pre development monitoring

#### Response

The Surface Hydrology Report (PER Appendix 9) shows that 38% of the Nambeelup Brook gauging station's catchment is within, or upstream of the project area.

Comparison of flows from the five year data collection period from the Nambeelup Brook gauging station was compared with the 27 year period from the Dirk Brook Kentish Farm gauging station and found to be closely representative. The gauging station records data from a catchment with a predominantly agricultural land use. This is consistent with the project site.

The PER, Management Actions 9.7.4b and 9.7.4d specify that monitoring will be undertaken. The specific parameters and frequency of monitoring are expected to be defined in the site's DEC operating licence, DoW groundwater abstraction licence and the Water Operating Strategy.

The nutrient parameters stated in the submission that require monitoring are considered by the proponent to be more reflective of fertiliser applications from agricultural land use activities being undertaken throughout the proposed mine location and surrounding area. The mineral sand mining process uses no fertilisers in the production of heavy mineral concentrate. Fertilisers will only be applied in the rehabilitation process, in consultation with the Department of Agriculture. It is anticipated such applications would be no different to those normally applied by the landowner. The issue of possible nutrient effects from the mining process is also addressed in response 6.6.1.

### 6.5.2 Other Water Uses and Values

DoW: Kwinana Peel Region comments that while surface hydrology has been discussed, ecological water requirements, social water values and aquatic flora and fauna have not been identified.

#### Response

The proponent provides the following response to the points raised:

**Ecological Water Requirements** have been addressed by avoidance of major wetlands on the perimeter of the mine area and the major ephemeral creek lines flowing through the mine area. The modelling of pit dewatering shows superficial groundwater impacts to be

very localised and within seasonal water table fluctuation levels. This is further addressed in Section 6.4.3 and in the Rockwater (2007) report.

Specific **social water values** are not identified in the submission. The project area is located on privately owned rural landholdings, predominantly used for cattle grazing. All surface water flows in the mine areas are ephemeral. The proponent considers there are no wider social values for surface water that are applicable within the immediate mine area that could be affected by the proposal. EPA (1993), also referenced as Bulletin 686, contains the following information related to the limitations of the document in applying to wetlands on private land in rural settings. *Applicability to rural settings one of the criticisms of early versions of the wetland evaluation method is that it does not work well for wetlands on private land in rural settings. The evaluation method works well in identifying public human-use values but less well in defining private human-use value.*

Within the mine area, **aquatic flora and fauna** were not considered to warrant specific assessment. The mine profile comprises sandy dunal rises that are permanently above the water table. The lowland mineral profile occupies predominantly cleared pastureland. This profile is subject to seasonal water logging, but groundwater levels are approximately two metres below surface during summer. The existing severely altered nature of this landscape was considered to not warrant any specific assessment of aquatic flora and fauna.

### 6.5.3 Water and Nutrient Management Plans

DoW: Kwinana Peel Region considers that a Water Management Plan should be approved for the project prior to the start of mining, defining proposed ground and surface water monitoring locations, frequency and parameters. The PHCC requested the establishment of a detailed Nutrient Management Plan.

#### Response

The proponent has prepared a Water Management Plan. The plan consolidates information and management actions contained within the PER, outcomes of the construction and testing of the abstraction bores. The Water Management Plan includes details of the monitoring schedule and parameters, which includes the major nutrients.

### 6.5.4 Existing Baseline Data

Submission by DEC Kwinana Peel Region refer to the PER statement that water quality results will be compared with existing baseline data. No monitoring locations are included within the PER or baseline monitoring results. It is recommended that Olympia Resources should undertake two years pre-development monitoring particularly of groundwater levels. DEC Kwinana Peel Region comment that baseline monitoring is needed to determine the hydrological nature of the nearby wetlands and their geomorphology.

#### Response

Specific monitoring locations on site are defined in the Water Management Plan. Monitoring data will be compared to baseline data collected from such sources as

the Nambeelup Brook gauging station, Dirk Brook Kentish Farm gauging station, assessment of water quality in Dirk Brook and associated agricultural drains adjacent to the northern boundary of the project area by the Water and Rivers Commission (2002) and the four Lake Thompson bores (See PER Table 17 and Figure 9).

The proponent does not support the assertion that two years additional pre development data is required, particularly of groundwater levels. The baseline data sources above have data periods spanning many years. The four Lake Thompson bores provide 30 years of groundwater monitoring levels, as shown in the PER, Charts 4 and 5. The baseline data referred to is already collected and in the public domain.

### **6.5.5 Wastewater**

The Community 1 submission expressed concern on what disposal system will be in place to protect the water table from pollutants generated from the bunded washdown pad, which will be used for maintenance of contractors' vehicles? What disposal system will be in place to protect the water table from pollutants from fuels and oils?

#### **Response**

The PER, Section 9.12.4 addressed the management of polluted wastewater from infrastructure areas. Washdown of equipment will be done on hardstand areas, (either limestone roadbase or concrete) and directed to a sediment sump. Wastewater will be treated through a hydrocarbon separation system prior to discharge to an infiltration basin. Hydrocarbons will be stored in either self bunded (double lined) bulk tanks or in bunded compounds. Waste oil and fuel and oil filters will be stored in sealed containers and sent off site for recycling.

### **6.5.6 Alterations to Surface Flow Regime**

The SJS submission stated that given the excavations that are occurring (down to 5 metres in places) it is likely that topography of the mining area will be modified. Some comment should be provided regarding whether this will have any impacts on the surface flow regime across the site, and whether ponding localised/water retention will occur and whether there will be any impacts associated with this.

The PHCC and KNAG comment that diversions of surface water courses will impact adjoining wetlands. Past experiences have shown considerable loss of damp land vegetation when natural flows are altered/diverted. Disturbing the natural water flows has been seen to render many wetlands defunct.

Community 65 and Community 70 raised a similar concern, that diversion of the minor watercourses will affect adjacent wetlands and land. Community 70 propose that Olympia should provide a supplementary report on when and how surface water drainage will be diverted prior to the EPA consideration of the proposal.

#### **Response**

PER Section 4.3.2 states "the average pit depth will be two metres, with depth increasing to five metres on hills and ridgelines". Thus the deeper pit profiles are reflective of

the surface topography, with the deeper profiles resulting from the elevated sand dunes, rather than an increased depth of excavation. The elevated locations are not subject to the surface flow regimes raised in the submission.

In the low lying landforms, pit depth will average two metres, with a minimum of one metre. In these locations, the PER Section 4.3.2 states “temporary diversion drains and/or low bund walls where required will be constructed around the mining pit to prevent any surface stormwater from minor drainage channels entering the pit. Given the general flat topography of the mine site, drains or bund walls will generally need to be less than one metre and they will be backfilled to natural ground level during pit rehabilitation. These diversions will divert surface flows around the active pit and return the flows to the natural drainage path immediately downstream of the pit. The only location this process affects is the open pit itself. Surface water flows continue to flow down their normal path below the open pit.

During rehabilitation, Section 9.3.4 of the PER, page 144 states “restoration of pre-mining surface features such as drainage lines will occur and construction of erosion control structures as may be required.”

The proponent considers the above points address the concern that there will be no localised ponding that will create any impacts to surface water management.

### **6.5.7 Seasonal Groundwater Levels**

The Community 53 submission raised concerns that no detailed investigation had been undertaken on the water drainage off the mine site. The submission stated in mid winter in an average year the water table in low areas is at the surface or within inches of the surface, and at the end of summer is no more than 1.5 to two metres below the surface. The PER does not contain any piezometer water level test points on the proposed mine sites and provides no records or investigations relating to water levels, other than generalized statements. The proposed pit will be more than two metres below the surface. The evidence of water table levels shows that the mine pits will be one to two metres below the water table in winter, and in summer there is likely to be some water inflow into the mine pits.

#### **Response**

The average annual range of water table levels stated by the submitter is supported by the data in the PER, Section 5.6.1.2, Charts 4 and 5. The location of four piezometers on the site are shown in PER Figure 9 as “DoE Bores”. The data from two of these are presented in the PER charts. Records of groundwater levels date from 1975.

PER, Table 9 shows modelled pit dewatering rates. Contributions to summer inflow include the slow release of water from the pit backfill area. This is further described in item 6.4.12.

### 6.5.8 Hydrological Modelling Assumptions

The submission from the DEC:LWQB stated that advice that the mining is restricted to within the seasonal water table variation, expected to be at 1.5 to two metres below ground level was not supported by any hydrological information or modelling to substantiate this assumption.

#### Response

This is incorrect. The information is provided in the PER Charts 4 and 5.

### 6.5.9 Impacts of Waterway Contamination

Community 1 and Greenacres Turf Farm submissions stated that Olympia admits that surface runoff could result in contamination of surface water with sediment and they envisage capturing and treating this water prior to release from their catchments. During a normal wet winter while the surface water is at ground level, this will be difficult to contain, leading to polluted water entering surrounding creeks, drains and flat areas. It also poses the risk of contaminating Nambeelup Creek, which flows diagonally through several properties, and is used for much of the year by some cattle. Olympia plans to divert some of the minor watercourses around the mine pits during winter. This will mean additional water being directed into already saturated neighbouring properties. Because of poor drainage and water logging, the flats are already very acidic and saline, despite the spreading of lime. This additional water will add an extra burden on properties around the mine site. Community 60 expressed a similar concern that waterway contamination is not adequately addressed

#### Response

Section 9.7.4 of the PER addresses the issue of sediment control off newly rehabilitated areas at the commencement of winter. During the first year of rehabilitation, the use of low contour banks is proposed to retain water on the newly tilled ground and provide controlled overflow for surplus water. Shallow drains diverting upstream water around newly rehabilitated areas will allow for the pasture species to establish root systems to prevent soil erosion.

If required, additional contour banks may also be constructed downstream of newly rehabilitated locations, in existing stabilised paddock areas, to enable the grassed areas to act as sediment filters, prior to discharge of surplus water. In the second seeding year, when the majority of the paddock has stabilised, these structures are levelled out and reseeded in the second year seeding programme. It is considered this methodology will minimise any sediment leaving the mine area.

Temporary diversion of minor water courses around an active pit or newly rehabilitated area will return the water flow to its usual course, immediately downstream of the pit or rehabilitation area. The diversion will not create any 'additional' water downstream flowing in areas it would not ordinarily flow.

### 6.5.10 Nambeelup Brook Catchment Area

Community 1 states there is conflicting data as to whether there is 78% (main text p80) or 38% (Appendix 9 p7) of the Nambeelup Brook gauging station catchments area “within or upstream of the project area”.

#### Response

The correct information is given in Appendix 9, being “the gauging station has a catchment area of 114.95 square kilometres, of which 43.89 square kilometres (38%) is within or upstream of the project area”.

The error in the PER text is noted.

## 6.6 NUTRIENTS AND SALINITY

### 6.6.1 Nutrient Mobilisation

There were many submissions dealing with aspects of nutrient leaching and mobilisation of stored nutrients in the soil profile.

Submissions from Community 1, Community 2, Community 53, Community 60, Community 65, CC, Greenacres Turf Farm, PHCC and KNAG raised concerns of possible effects of nutrients mobilised from nutrient banks and salts stored in the soil profile. The submissions state that nutrients and salts mobilised via the mining process have the potential for off-site impacts to areas such as Nambeelup Creek and the Peel Harvey Estuary, or impacts on the Leederville aquifer if they are exported in surface or groundwater; that the studies into nutrient and salt levels in the soil are inadequate, and residual levels underestimated. Community 2 further states concern about arsenic contamination.

The PHCC further states that all water quality monitoring and management needs to consider not only nutrients in solution (filterable reactive Phosphorus) but also those carried by sediment especially in respect to the clay fraction (particulate Phosphorus) of the soils that are being mined.

#### Response

Table 38 of the PER provided nutrient analysis on a number of sites and compared them to reference levels for agricultural soils. In order to mimic the homogenisation of the soil profile as a result of mining, as raised in the Conservation Council submission in ASS (item 6.7.4), a composite sample of the two metre sand profile was tested. The result was intended to provide an ‘average’ of the soil profile, as would exist post mining.

To provide more detailed information related to the potential of a currently immobile nutrient bank within the Bassendean sand profile that could be mobilised during the mining and processing operation, additional soil sampling was undertaken. The sampling methodology obtained separate samples at 0.5 metre intervals down the hole and a composite sample for the entire hole. One sample to 3.5 metres below ground level

was collected on a dunal rise, sampling the dry profile above the water table. Two other samples were collected in low lying sand profiles within the water table.

Parameters tested were Total Phosphorous, Phosphorous Retention Index (PRI) and water soluble phosphorous, by two methods, P (H<sub>2</sub>O) and P (CaCl<sub>2</sub>). The results are provided in Table 5.

**Table 5: Nutrient Analyses of Soils in the Mine Area**

|         | <b>P<br/>(total)</b> | <b>(PRI)</b> | <b>P<br/>(H<sub>2</sub>O)</b> | <b>P<br/>(CaCl<sub>2</sub>)</b> |
|---------|----------------------|--------------|-------------------------------|---------------------------------|
|         | <b>mg/kg</b>         | <b>mL/g</b>  | <b>mg/kg</b>                  | <b>mg/kg</b>                    |
| H1 0.5  | 39                   | 2            | 1.5                           | 0.3                             |
| H1 1.0  | 14                   | 3.6          | <0.1                          | 0.2                             |
| H1 1.5  | 16                   | 4.6          | <0.1                          | 0.2                             |
| H1 2.5  | 18                   | 9.2          | 0.3                           | 0.2                             |
| H1 3.5  | 19                   | 11           | 0.1                           | 0.2                             |
| H1 Bulk | 24                   | 5.3          | <0.1                          | 0.2                             |
|         |                      |              |                               |                                 |
| H2 0.5  | 22                   | 13           | <0.1                          | 0.2                             |
| H2 1.0  | 13                   | 16           | <0.1                          | 0.2                             |
| H2 Bulk | 20                   | 17           | <0.1                          | <0.1                            |
|         |                      |              |                               |                                 |
| H3 0.5  | 22                   | 5.7          | <0.1                          | 0.2                             |
| H3 1.0  | 17                   | 38           | <0.1                          | 0.2                             |
| H3 1.5  | 17                   | 34           | <0.1                          | 0.2                             |
| H3 Bulk | 18                   | 18           | <0.1                          | 0.2                             |

The results indicate the following:

- The total phosphorous values are consistent with those reported in the PER Table 38.
- The surface layer of Hole 1 has an elevated total phosphorous value which suggests it has received an application of fertiliser at some time.
- The surface layer of Hole 1 has a very low PRI, consistent with the soil characteristics of the B1 unit shown in the PER Table 39.
- Consistent with the elevated phosphorous value and its very low PRI, the surface layer of Hole 1 also has the highest water soluble (leachable) value tested.
- There are no other elevated banks of total phosphorous in any profile down the holes tested.
- The composite sample showed similar results to the individual samples.
- The water soluble values are extremely low, indicating there is no significant leachable fraction as proposed in the submissions.

- The total phosphorous values therefore dominantly comprise phosphorous in a form that is not water soluble. It is most likely in forms such as organic material (fine roots) and bound onto clay, iron and aluminium complexes. This phosphorous can only be exported from the site as physical particles (i.e. in sediment) rather than as soluble phosphorous dissolved in water.

The proponent considers this data is consistent with findings from many studies on the nutrient leaching problems of the sandy coastal plain soils. In summary, these findings are:

- The dominant source of nutrients is from applied agricultural fertilisers.
- The high porosity and poor nutrient retention capability of the sandy soils result in rapid leaching and export of the predominantly water soluble forms of nutrients in the fertiliser.
- The majority of this nutrient leaching and transport process occurs in surface water flow and in the surface soil layers.

Another factor in apparent contradiction to the submitter's assertion that there is a potential nutrient bank at depth in the Bassendean sand profile or at the Bassendean sand/Guildford clay interface, is that this zone is within the winter water table. Any water soluble forms of phosphorous would be dissolved and mobilised on an annual basis. This further supports the data in the table above that the vast majority of total phosphorous measured in the soil samples is in an insoluble form and can only be exported from site in sediment.

The proponent is not aware that arsenic concentration in groundwater through the project area is presently a cause of concern. Domestic water supplies and stock water currently source local groundwater. No information has been identified in the investigations to date that suggest arsenic concentration exceed either human or stock drinking guidelines or primary industry (crop irrigation) guidelines. No specific site investigations have been conducted to date. Should arsenic prove to be an element of concern, the proponent will include this parameter in the water monitoring programme.

## **6.6.2 Increased Mobilisation of Salt**

In a similar vein to the nutrient submissions in item 6.6.1, there were also many submissions dealing with possible increases in salt levels.

Submissions by PHCC, Community 1, Community 2, Community 53, Community 60, PHCC and KNAG raise concerns over the mining process increasing salinity through the mobilisation of stored salt. The submission by KNAG states "there has been no effort to address the death of Marri trees on the western side of the mine area that have been linked to salinity. This salinity has been mapped by surface conductivity surveys. There is also visual evidence of dominant salt tolerant grasses in the area. Salt pans have been observed on Lot 62".



**Response**

The locations described in the submission are outside the mine area and will not be disturbed by the proposal. The locations are in pasture areas and are generally quite localised. The sites have been inspected by the proponent and discussions held with the owner of Lot 62. The following points are made in explanation of these sites:

1. The landform conditions applicable to these areas are as described in the PER Table 12, notably “imperfectly, poorly drained flats and ill defined stream channels”.
2. The location of the sites correspond to the Southern River Unit in Figure 8 of the PER, rather than the Bassendean Unit.
3. In discussion with the landowner, it appears the elevated salt levels occur as a result of accumulation of salts over time caused through the limited flushing of these poorly draining areas. In winter periods of below average rainfall or few heavy storm events, the salts that accumulated in the area are not dissolved and flushed off the site in overland flow. If these conditions extend over a period of years, the site becomes more and more brackish. A succession of pasture species has been noted to occur, as more salt sensitive species are replaced with more salt tolerant ones. In wet winters and heavy rainfall events, the reverse process occurs. There is sufficient surface flooding to flush these areas and lower the surface salt storages. The salt sensitive species then recolonise.

The explanation thus describes a dynamic situation with fluctuating surface salt levels relative to wet or dry climatic conditions. It is consistent with the comments made in the submission of “dominant salt tolerant grasses in the area” and “salt pans have been observed on Lot 62”, however these are not permanent and they are not evident at present.

These specific landform types are a natural part of the local landscape. They are not located within the Bassendean profile of the mine area. The proponent is not considering any action on these areas. The Bassendean profile of the mine area is generally more elevated and slightly better drained, resulting in less likelihood of salt accumulation.

The production bores were tested at 200 to 350 milligrams per litre Total Dissolved Solids (TDS), well within fresh water drinking values. The use of this water will therefore not create a detrimental salt load to the area.

**6.6.3 Water Storage Dam**

KNAG asks will the water storage dam be lined with polythene? Where does this polluted water end up?

**Response**

The water storage/settling dam will be lined with a heavy-duty plastic liner. The dam stores water that is recycled through the mining and process systems. As described in Section 5.8 of the PER, under normal operating circumstances, there will be no discharge of water from the dam.

#### 6.6.4 Nutrient Sampling

KNAG comments that nutrient measurements have been restricted to the upper two metres (the leached zone) yet mining depths are planned to five metres. Given the flushing effect of returning the tailings by water slurry, any nutrients at the clay sand interface at the base of the mine will be remobilised to the Nambeelup drainage.

##### Response

The maximum mining depth of five metres occurs during mining of the elevated sand dunes. The sampling conducted for soil analysis did not occur in the “upper two metres” of the elevated dunes. The samples were taken from low lying locations to reflect the average two metre mine profile depth. These locations are within the winter water table fluctuation. The base of the sample profile was at the interface of the Bassendean sand and Guildford Formation.

#### 6.6.5 Heavy Mineral Concentrate Stockpile

Community 112 notes that the PER states the HMC will be pumped onto stockpiles to drain water off prior to transport. No information is provided as to the quality of the water draining from the HMC stockpile. Leaching of minerals and other inorganic contaminants is likely to occur as the water will be slightly saline and this could contaminate soil and groundwater under the stockpile.

##### Response

The plant site area will require a layer of hardstand, to allow access by road trucks, fuel delivery vehicles and other service delivery suppliers.

The HMC minerals are insoluble, hence their retention in the existing soil profile. They do not contribute soluble nutrient or saline elements to water.

No chemicals are used in the process that add soluble nutrients or possible toxins to the water

As the water draining from the HMC stockpile is the same as that used throughout the process, the quality of water draining from the HMC stockpile is expected to be the same as from other sources.

As a greenfields proposal, no actual HMC stockpile exists for a sample of drainage water to be taken and analysed.

The water draining from the HMC stockpile compound will be directed to collection sumps and recycled back into the process circuit. It will not be discharged to the environment.

#### 6.6.6 Revegetation Success

The Serpentine-Jarrahdale Landcare Council (SJLC) stated it is also unclear whether revegetation success will be hindered by any losses in nutrient requirements due to

removal of minerals. Determine impact of removing mineral on water and nutrient uptake of native plants.

**Response**

The heavy mineral concentrate does not contain elements that are major plant nutrients. It is not expected that removal of the mineral will effect plant growth. Experience at other mineral sand mines has not shown any detrimental effect on rehabilitation as a result of removing the heavy mineral component.

## **6.7 ACID SULFATE SOILS (ASS)**

### **6.7.1 ASS Risk Assessment**

The submission from the DEC:LWQB raised the seven points outlined below.

Submissions by KNAG also raise questions on the risk of ASS generation from the site that are addressed in the responses to the following DEC:LWQB questions.

**Comment**

1. The proposed mining area involves 1,234 hectares consisting mainly of shallow sandy dunes averaging depth at 2.0 metres below ground level (metres below ground level) to a maximum depth of 5.0 metres below ground level. Generally much of the landscape in the area is classified as “medium to low risk” where ASS layers are predicted at depths greater than 3.0 metres below ground level. The proposed mineral sand mining is targeted at 2.0 metres below ground level and previous investigation was targeted at six locations to a depth of 3.0 metres below ground level. The laboratory results indicate that the sandy soils are low sulfide bearing.

**Response**

Acknowledged. The consultation between the proponent and the DEC:LWQB on the testing undertaken all confirmed the “medium to low risk” nature of the site. Also, the maximum mine profile depth above the predicted depth of ASS layers, again, supported the “low risk” status of the proposal.

**Comment**

2. In a meeting with Paul Rokich on 12 June 2006, LWQB was informed that the mining is restricted to within the seasonal water table variation, expected to be at 1.5 – 2.0 metres below ground level. This advice was not supported by any hydrological information or modelling to substantiate this assumption.

**Response**

This is incorrect. The information in support of the statement on the seasonal water table variation is provided in Charts 4 and 5 of the PER. At the time of the meeting, the officer had not sighted the PER document, although copies had been supplied to the Department. The officer was informed the information was in the PER.

**Comment**

3. The second sampling programme in two identified high risk areas followed a similar sampling approach by bulking the soil samples in pairs for analysis. The lab results from Chemistry Centre WA reported low Titratable Peroxide Acidity (TPA) which essentially is a measure of net acidity as the result of peroxide digest reacting with residual acid buffering components in the sample. Bulking samples may at times overestimate soil buffering capacity.

**Response**

This is incorrect. The second sampling was undertaken using a hand auger. No field sampling at 0.25 metres occurred for this second round of testing. Samples were collected from the auger shoe at 0.5 metre intervals.

**Comment**

4. Generally the approach undertaken to assess ASS risk for this proposal is limited when compared to the recommended ASS investigation protocols for an urban development which would require an experienced environmental scientist to assess the risk. LWQB also notes that the previous and current investigations had not followed the DEC's ASS Guidelines Series and only eight bulked soil samples were selected for chemical analysis.

**Comment**

5. Based on the current investigation it is difficult to predict where the discrete layers of sulphide minerals are deposited in a large landscape. In the absence of any field testing which is a useful indicator to locate potential or actual ASS deposits, a conservative approach is required of assuming that the soils are potential ASS. This will require the proponent to conduct field testing and laboratory testing as an ongoing basis to detect ASS.

Similar comments were made in submissions by the CC, Community 1, SJS and Murray Shire; that the level of initial sampling was inadequate and a second round of sampling was required to provide more detailed results.

**Response**

At meetings held with the DEC, it was acknowledged that the current ASS Guidelines were designed more for urban and 'intensive' forms of development, not for rural situations. The 2006 guidelines acknowledge that for extensive forms of development, reduced sampling densities may be appropriate (Table 6). The Draft Identification and Investigation of Acid Sulfate Soils: Acid Sulfate Soils Guideline Series, prepared by the Land and Water Quality Branch of the Department of Environment (May 2006) contains the following:

The proposed project is larger than 50 hectares.

The PER Section 5.4.1 outlines the consultation process undertaken with the DEC:LWQB to characterise the various geological/geomorphological units at the site and conduct a sampling programme reflective of these units.

**Table 6: DEC (2006) Guidelines for ASS Sampling**

| Type of disturbance | Extent of site project                                | Number of sampling locations |
|---------------------|-------------------------------------------------------|------------------------------|
| Non-linear          | Project Area                                          |                              |
|                     | < 1 ha                                                | 4                            |
|                     | 1 – 2 ha                                              | 6                            |
|                     | 2 – 3 ha                                              | 8                            |
|                     | 3 – 4 ha                                              | 10                           |
|                     | > 4 ha                                                | 2 per hectare                |
| Linear              | Minor <sup>3</sup> width and volume and low S (%)     | @ 100 m intervals            |
|                     | Major <sup>4</sup> width and volume and/or high S (%) | @ 50 m intervals             |

The sampling location density outlined in Table 2 relates to the pre-design phase, as opposed to sampling requirements after the project design has been established and a management plan needs to be developed (See Section 8 for guidance on requirements for further investigations to support management plans).

For projects disturbing small volumes (<1,000m<sup>3</sup>) or existing stockpiles of ASS, see Section 6.8.

*For large projects (>50 ha) the DoE may accept reduced sampling densities, providing the investigation program is designed to satisfactorily characterise the various geological/geomorphological units at a site.*

The sampling procedure conducted during the first round of samples involved collecting field samples every 0.25 metres down the hole. For laboratory analysis, sub samples of two 0.25 metre samples were combined for the 0.5 metre sample required in the DoE Guidelines. The bulking of the two samples was intended to test the ASS potential within each 0.5 metre layer.

In consultation with DEC, further transect sampling has been undertaken. An Acid Sulfate Soil Management Plan (ASSMP) has been prepared, which includes results of all sampling conducted. The ASSMP contains details on the monitoring programme to manage any ASS that may be generated as a result of the operation.

### Comment

6. If mining is restricted to dry excavation within 2.0 metres below ground level and above seasonal water table, the risk is considered low. However LWQB understands that dewatering may be required in some areas and this issue has not been adequately addressed as the cones of groundwater depression is likely to extend to greater depths that may disturb the ASS layers.

### Response

The proponent supports the DEC:LWQB comment that mining of the elevated dunes, above the maximum seasonal water table is considered low ASS risk.

The mineralised profile is confined to the Bassendean sand horizon. The underlying clay layers in the Guildford Formation will not be disturbed. The mine pit dewatering does not occur via a bore system that would create a dewatered cone of depression below the pit floor, and thus alter the oxygen and water regimes in the underlying Guildford Clay formation. Dewatering of the pit is achieved via drains on the pit floor directing water to collection sumps. This would have minimal effect on dewatering the profile below the pit floor. The DEC:LWQB notes in item 1 “the ASS layers are predicted at depths

greater than 3.0 metres below ground level.” This zone will not be impacted by the open pit.

**Comment**

7. Without conducting a comprehensive site investigation and their reliance on only eight soil samples, commencement of any site excavation in particular dewatering may represent a risk to groundwater quality and the receiving environment. Although the proponent is committed to prepare ASS management plan, LWQB is unclear how this will effectively deal with the issue when the associated risk is largely unknown.

**Response**

The proponent acknowledges that the large area of the proposal warranted a site specific assessment methodology as indicated in the DoE (May 2006) Guidelines: Table 2.

The proponent does not agree the associated risk is largely unknown. The proponent considers the potential risk of acid sulfate soil is low and can be effectively managed under the provisions stated in the PER. Elements of the low risk assessment include:

- WAPC mapping showing almost all the mine area as low to moderate risk.
- DEC:LWQB acknowledgement that the dunal rises are low risk.
- Target sampling of the only two small high risk sites within the mine area and the low lying geomorphological units on the site providing results well within the low to moderate action criteria for sand.
- The mine profile and dewatering methods will have minimal disturbance to the clay layers underlying the mineralised sand profile, the profile recognised by the DEC:LWQB as being the profile where potential ASS issues are likely to occur.
- The proponent’s commitment to undertake monitoring against trigger levels designed to detect any trend of acid generation.

The proponent considers the issue of risk of ASS generation needs to be clarified. The proponent has not made the assertion in the PER that there is no risk of ASS generation. Instead the points above confirm the proponent’s belief, based on a number of factors (not just laboratory analysis of samples) that the overall project site is low risk. Indeed, the WAPC Bulletin 64 (2003) maps show no areas of the swan coastal plain between the Spearwood dunes and the Darling escarpment as no risk.

The issue of a requirement to prepare an Acid Sulfate Soil Management Plan (ASSMP) therefore needs clarification. The DEC guidelines are specific that an ASSMP needs to be prepared for high risk sites. These are defined as soils having TPA values above the Action Criteria. It follows that it is not necessarily a requirement that an ASSMP must be prepared for sites with soils not exceeding the Action Criteria.

Olympia has prepared an ASSMP to provide proactive management actions for any acid soils that may be generated as a result of the operation.

### 6.7.2 Additional Sampling Programme

The Department of Water: Kwinana Peel Region's submission raised the following two points.

1. A commitment is made to undertake an additional sampling programme to provide more detailed results on sites four and five and it is understood that this was to be incorporated into the final PER. This information should be provided to the DoW for comment.

#### Response

The results of the additional sampling programme were supplied to DEC: LWQB on 4 August 2006. The results were consistent with the first round on sampling in these two locations and confirmed they are not high risk ASS sites.

2. The proposal indicates that 'monitoring is required to ensure a trend towards acidification does not continue to occur as a result of mining operation' and 'monitoring of discharge water will be undertaken'. At a minimum, baseline groundwater levels, pH and total acidity should be undertaken prior to mining and a monitoring programme implemented which includes contingencies to ensure acidification of the groundwater does not occur.

#### Response

This is addressed in the ASSMP.

As stated in Section 4.3 and Table 9 of the PER, under normal operating conditions, there is no planned discharge of water. Should unplanned events require the discharge of water from the process dam, the discharge will be monitored.

### 6.7.3 Acid Sulfate Soil Management Plan

Submissions from the CC, Community 1, Community 53, KNAG, Water Corporation and Department of Environment and Conservation Kwinana Peel Region, state that an Acid Sulfate Soil Management Plan should be prepared prior to operations to prevent potentially unacceptable impacts occurring, that no contingency plan exists in the event of an acid plume being released, and that no mining should be allowed in or adjacent to high risk acid sulfate areas.

#### Response

An ASSMP has been prepared.

As stated in item 6.7.1, the proponent considers there is a low risk of ASS generation as a result of mining at the Keysbrook site. As a pro-active measure, Olympia has prepared an ASSMP prior to commencement of mining. No mining will take place in any high-risk ASS areas identified.

## 6.7.4 Sampling Methodology

The Conservation Council stated “the testing programme conducted also deliberately occludes the scenario that will exist on this mine, whereby sand from different soil depths and from over a large area will be mixed together and then redistributed as tails. In this scenario any acid sulfate potential will be realized - due to the intensive mixing of soils, air and water – allowing the ideal conditions for oxygenation and acidification of moderate and low risk acid sulfate soils. Following this, the acidified soils will be spread over a large area. It can also be alleged that disturbance of the lower clay layers of the soil profile will reduce the acid buffering capacity of the soil, and in so doing not only create the conditions for the creation of acidic groundwater, but also facilitate the rapid infiltration and transport of the plume to receiving environments. Hence, it can be said that the mining methodology significantly increases the acid sulfate soils potential for acidification and subsequent acid groundwater plumes.”

### Response

The proponent disagrees that the testing programme conducted also deliberately occludes the scenario that will exist on this mine.

Testing for the scenario described by the Conservation Council, to mimic the homogenisation of the mined Bassendean sand profile would require bulking of the entire sampled profile. Other submissions were concerned that a bulking process over a 0.5 metre profile may at times overestimate soil buffering capacity. The homogenised soil profile scenario would bulk two metres of soil profile. This option was not examined during the sampling process. The discussions with the DEC:LWQB focussed on the separate 0.5 metre profiles, in an effort to identify if there were any specific landform types and soil horizons that were of high ASS risk.

It must be recognised that the mine profile is in a sand dune system. The portion permanently above the water table is already subject to water percolation and oxygenation. The submission to the PER by DEC:LWQB stated “if mining is restricted to dry excavation within two metres below ground level and above seasonal water table, the risk is considered low”. In consultation with DEC:LWQB, the focus of the sampling programme was therefore directed to the lower level of the mine profile, that is within the annual water table fluctuation zone, above the summer water table but below the winter water table depth. This zone also experiences changing oxygenation and water saturation levels relative to the seasons.

The Conservation Council submission suggests that the mining process provides the ideal potential for acidification to occur. The proponent acknowledges that the mining and processing operation does combine the elements of soil, water and air, however, the potential rate at which any oxidation of sulphides may occur has not been determined.

It should be noted the period of time between sand excavation, processing and return to the pit void as backfill would be less than one hour.

It is considered that for such a very rapid oxygenation of acid potential to occur over this short period, the form of sulphides must exist in a state that would also be rapidly



oxidised in the fluctuating oxygen and water regimes that exist in situ in this superficial profile on an annual basis.

Further, any significant short term acidification will be evident in the tailings return water which is collected from the backfilling pit and returned to the water dam. In consultation with DEC:LWQB the setting of monitoring trigger levels, as specified in Section 9.4.4 of the PER, was considered sufficient to act as an early detection system.

Sand material redeposited back into the mine void that has not already exhibited such rapid rate of acid formation is returned back to the hydrological and oxygenation cycles as existed before mining.

The mineralised profile is confined to the Bassendean sand horizon. The underlying clay layers in the Guildford Formation will not be disturbed. The mine pit dewatering does not occur via a bore system that would create a dewatered cone of depression below the pit floor and thus alter the oxygen and water regimes in the underlying Guildford Clay formation. Dewatering of the pit is achieved via drains on the pit floor directing inflow water to collection sumps. This would have minimal effect on dewatering the profile below the pit floor and it is the clay profile three metres below ground surface the DEC:LWQB predict is the most likely source of ASS.

### **6.7.5 Wider Implications**

Community 2 states the implications regarding the generation of ASS for this proposal need to be seriously considered. The proposal plans to cut below the water table, and also cut into the Leederville Formation, which is an important aquifer in the Peel area, including the North Dandalup/Keysbrook area. Community 60 raised similar concern on the generation of an ASS plume.

#### **Response**

The responses to the ASS generation are provided in item 6.7.1.

The description of the mine profile is given in Section 4.3.2 of the PER. In summer, the pit floor will be above the water table. Dewatering of the Bassendean sand will be required during winter.

The Leederville Formation extends from approx 15 metres below ground surface to over 100 metres. It will be used as a water source for the mining operation. There will be no mine excavation into the Leederville Formation. The average depth of the mine is two metres, meaning that the mine will not cut into the Leederville formation.

### **6.7.6 WAPC Risk Classification**

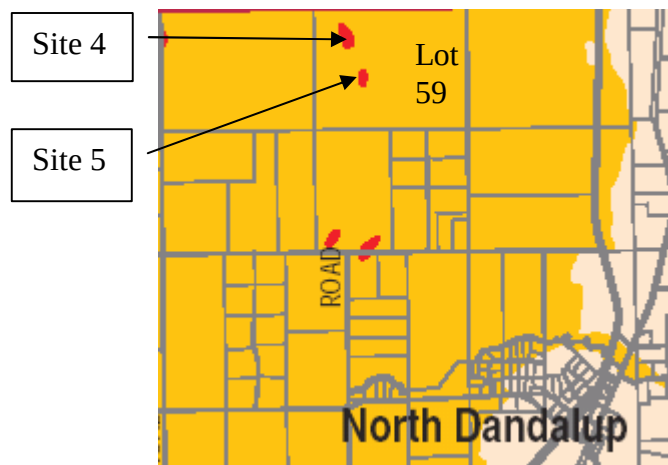
The Community 53 submission raised the point that there are no high risk areas marked in red, in Figure 18 of the PER, within the proposed mining area. It is assumed that the red marking comes from WAPC's Planning Bulletin 64. The drill sampling log in Table 12 of the PER identified sites 4 and 5 as high risk acid sulfate category, yet according to Planning Bulletin 64, the nearest high risk area was two kilometres

and three kilometres away respectively. Community 2 commented on the remobilisation of nutrients, salts and ASS.

### Response

This is not correct. The extract from the WAPC Planning Bulletin 64 (Figure 12) below shows the two sites. Field testing of the two sites confirmed they were not high risk. The two sites were retested in a second round of sampling that confirmed the findings of the first results.

**Figure 12: Extract from WAPC Planning Bulletin 64**



### 6.7.7 Sampling Depth and Scale

KNAG and Community 2 commented that the maximum mining depth is five metres and recommended sampling guidelines suggest sampling one metre below this depth. The six holes have only been sampled to a depth of three metres.

### Response

The maximum mining depth of five metres is only attained when elevated sand dunes are excavated, i.e. the top of the dune is five metres above the base of the Bassendean Formation. The dry profile that is permanently above the maximum winter water table is stated by the DEC:LWQB as being low ASS risk, therefore sampling was conducted in lower areas more likely to show evidence of ASS. In these areas the depth of the sand varies, but is on average two metres. The three metre bore samples therefore tested the average two metre ore profile within the annual water table fluctuation zone plus the one metre below. This is consistent with DEC Guidelines.

Additional sampling has been undertaken and is reported in the ASSMP.

### 6.7.8 Related Impacts from ASS

PHCC expressed concern about a possible acid plume being released from acid sulfate soils and the potential impact of this on water quality, aquatic communities and EPP, Conservation Category and Ramsar-listed wetland systems.

**Response**

The proponent considers there is a low risk of an acid plume being generated from the Keysbrook site to impact on waterways. As a pro-active measure, Olympia has prepared an ASSMP.

**6.7.9 ASS Sampling**

Community 1 and Community 53 commented that the methodology employed in the ASS sampling was inadequate and had not followed the DEC's ASS Guidelines Series.

**Response**

This is addressed in item 6.7.1.

**6.7.10 Mining Profile**

Community 1 commented: Olympia state on their web site that the Keysbrook site is "low in clay content and contains practically no rock." The ground is heavy in clay and has an abundance of coffee rock under the surface. Community 2 raised a similar point. "Breaking the coffee rock layer could impact on the surface water table and mix the surface aquifer layers. This is why the artesian bores must be encased in cement".

**Response**

The statement referred to on the proponent's website is in relation to the Bassendean sands containing the mineralised zone. Extensive drill sampling cross the Keysbrook site to the depth of the proposed mine confirmed this layer to be low in clay and containing practically no rock. Deeper zones have higher levels of clay and coffee rock. The mine profile will not extend below the Bassendean sand.

**6.7.11 Monitoring Bores**

The CC provides comments on the details of the ASS Management Plan to include an extensive, site-specific groundwater and surface water quality and quantity monitoring bores at regular and varied depths through the soil profile across the entire site and beyond. These should be gridded throughout the mine site, and downstream and at regular frequent intervals across the Swan Coastal Plain in the interstices of Department of Water monitoring bores.

**Response**

The Water Management Plan details the location of monitoring bores. Initially, it is not anticipated that monitoring for ASS beyond the boundaries of the mine area will occur. The data collected will be incorporated into revisions of the management plan and additional monitoring bores constructed if the need is identified.

**6.7.12 Trigger Levels**

The DEC: Kwinana Peel Region and PHCC submissions states the PER frequently refers to monitoring different activities, however, they have made little or no

commitments about management options they have established in response to monitoring showing “trigger” levels. For example, p.16 “Soil – Predicted Outcome” para.3, “Management measures will be implemented if monitoring discharge water confirms acid generation is occurring” and p25, 9.4.4c, “Trigger levels of key parameters will be defined”.

**Response**

The PER, Section 9.4 states:

Olympia will prepare and implement an ASSMP if these are exceeded. Initial trigger levels are TAA > 60 milligrams per litre (as CaCO<sub>3</sub>) and a pH variance >10% acid trend (reducing pH level) of background levels. These trigger levels will be reviewed annually against monitoring data to ensure their relevance and accuracy during the life of mine. (Management Action 9.4.4c).

Olympia has prepared an Acid Sulfate Soil Management Plan which includes trigger values.

## **6.8 DIEBACK**

### **6.8.1 Fungi Assessment**

The CC and SJLC stated that no assessment of fungi species has been undertaken. The DEC, Kwinana-Peel Region state that a dieback management plan should be prepared. The Community 1 submission state specific action on dieback management issues is required.

**Response**

The proponent has undertaken a fungal assessment of selected areas to confirm the presence of dieback disease in some upland remnant vegetation areas of the site. The survey did not target any other pathogenic fungi species.

No specific surveys of either endomycorrhizal or ectomycorrhizal fungi were conducted. The topsoil removal, storage and replacement processes proposed follow standard industry practices. The rapid advancement of the mine pit through the landscape will result in short storage times for topsoil which will minimise loss of these species.

Sections 5.4.2 and 9.5.1 of the PER describe the dieback survey undertaken and the proposed management measures. The range of normal farming activities associated with the existing land use, inflow of water from infected catchments upstream and natural spread from existing infected areas within the site are all uncontrollable factors that result in the slow spread of the disease. The proponent considers the management measures proposed in Table 40 comply with CALM Policy Statement No 3 (1998) as stated on page 151 of the PER and provide proactive measures to avoid introduction of the fungus into undisturbed sites and limit the introduction of the fungus into upland sites during rehabilitation. In this context, a separate Dieback Management Plan is not considered necessary.

### 6.8.2 Further Dieback Management

SJS comments that further dieback management work may be required, particularly in terms of additional onsite investigations and mapping as well as appropriate management.

#### Response

The management measures proposed (PER Table 40) include the assessment of upland vegetation areas to determine their dieback status so that topsoil from dieback free areas can be either separately stockpiled or directly returned to upland sites ready for rehabilitation.

### 6.8.3 Infected Root Material

KNAG states that in low-lying areas the resource thickness will be as thin as 0.5 metres yet there is a plan to place “any infected root material ... in low-lying landscapes” Table 40 point 3. This area is subject to sheetwash and there is no plan to buffer minor watercourses. This will result in the dieback fungi entering the wetland chain all the way to the Mandurah Estuary.

#### Response

The management action to place potentially infected root material on the pit floor is in order to locate all potential infected material in landform profiles that are already subject to natural infection by the fungus and more importantly, not locate it in upland sites where it may produce new sources of infection. Paddock areas under pasture, creeklines and wetlands will already be infected by the fungus, but show little, if any observable symptoms due to the existing vegetation in these areas being resistant to the disease.

### 6.8.4 Dieback Spread

KNAG and Community 65 state that the spread of *Phytophthora cinnamomi* (dieback) is partly by infected water and soil transportation. The increased mobility of the ground water after mining has increased permeability and the thousands of vehicle movements across the area will increase the spread of dieback. Controls must be taken (i.e. ponding) to control the spread of water borne fungal spores through the wetlands system.

#### Response

The proponent disagrees that mining will increase soil permeability and therefore increase mobility of ground water.

As also stated in the response to item 6.8.3, paddock areas under pasture, creeklines and wetlands will already be infected by the fungus but show little, if any observable symptoms due to remaining vegetation being resistant to the disease.

The management measure to replace topsoil on upland locations to be planted with native vegetation from dieback free locations will minimise the risk of infection spreading to these sites.

### 6.8.5 Revegetation Plan

KNAG comments that the Revegetation Plan needs to assess how dieback will be managed; how revegetation of local species will be achieved if dieback is spread through the mining process.

#### Response

Not all species used in the rehabilitation programme are susceptible to dieback disease. The Vegetation and Rehabilitation Management Plan contains target levels for vegetation loss, that includes losses due to dieback.

The management measures proposed in PER Table 40 outline the actions proposed to minimise the risk of spread of a disease that is already present on site and is being spread by natural means and the actions of stock and normal farm practices.

### 6.8.6 Dieback Hygiene

KNAG comments that the dieback management measures are presented in Table 40 of the Vegetation Management Plan. First impressions are that this plan should work. However the reality is, as late as May 2006, after this plan had been drawn up, a backhoe was observed leaving the resource area south of Redheads Road, after digging a large pit, in a dirty dusty condition. The backhoe, then drove along Atkins Road and re-entered the mining lease. There was no wash down facility on-site or in sight.

#### Response

The testing conducted on Lot 6 south of Readheads Rd was conducted in a cleared area of pasture with no native vegetation within the area, or in the proximity. The vehicle did not enter upland sites with remnant native vegetation.

### 6.8.7 Dieback Management

Community 60 commented that there seems to be minimal effort in stopping the spread of *Phytophthora* dieback, instead assuming in most areas it was already there and will spread eventually anyway. Olympia's response is reactive rather than proactive.

#### Response

Dieback is present on site and will spread by natural means. There is also the risk that movement of infected soil on the hooves of stock or on farm machinery will also transport the fungus to new locations. These actions are beyond the control of the proponent.

The planned dieback management measures are presented in the PER. These will minimise the risk of introducing the fungus to upland sites where the fungus does not currently exist.

### 6.8.8 Vehicle Wash Down

Community 65 and KNAG raise the point that all mobile equipment and vehicles, including private cars must be thoroughly washed down before entering and exiting the mine site to eliminate any possibility of spreading dieback to healthy vegetation in outlying areas. All the minerals are to be transported to Picton (Geraldton is stated in sections of the PER). If the vehicles are not properly washed, dieback could be spread for many kilometres.

#### Response

Trucks transporting HMC product to Bunbury and private cars will only have access to the plant site via the designated access road which will have a limestone road base to provide trafficability. There is no requirement to wash down these vehicles.

Earthmoving machinery undertaking topsoil stripping and return will be washed down prior to commencing operations in upland areas.

### 6.8.9 Jarrah Woodlands

Community 1 states “the Jarrah woodlands are endangered on the Swan Coastal Plain with less than 3% remaining”. On the Coastal Plain the sandy rises are the only places these trees have managed to survive. Jarrah die-back and lowered water tables are already killing many of them. There seems to be minimal effort in stopping the spread of *Phytophthora* dieback, instead assuming in most areas it was already there and will spread eventually anyway. Olympia’s response is reactive rather than proactive.

#### Response

This is addressed in item 6.8.7.

## 6.9 EMISSIONS AND DUST

### 6.9.1 Multiple Chemical Sensitivity

Community 2 queries possible impacts of vehicle emissions on a community member who has Multiple Chemical Sensitivity. To minimise impacts, Olympia should have strict emission control on all of their vehicles. The resident has been assured by Olympia that mining will occur when the wind is blowing away from her residence, and that mining near her premise would be done during her evening shifts. The resident has requested that in the event that she is significantly adversely impacted by the mining operation, Olympia should relocate her.

#### Response

Acknowledged. Discussions with this resident are ongoing. A 400 metre buffer has been placed around the residence and discussions held about flexibility of the timing of mining in the vicinity of the property.

## 6.9.2 Greenhouse Gas Emissions

Community 112 comment that no assessment was made of greenhouse gas emissions over the life of the project and no information provided as to how the proponent will offset greenhouse emissions from land clearing. Using CO<sub>2</sub> emissions rates of 10 tonnes per hectare for pasture; 100 tonnes per hectare for parkland cleared vegetation and 600 tonnes for remnant vegetation the greenhouse gas emissions when combined with indirect (electricity) and other direct (diesel emissions) emissions in total will easily exceed 100,000 tonnes.

The Conservation Council and the PHCC made a similar submission, that greenhouse emissions should be quantified.

### Response

A key factor of the Keysbrook project is that the fixed plant and pumps on the Keysbrook site are electrically powered. The burning of diesel fuel is limited to the mine equipment and light vehicles on site. The quantity of fuel consumed is similar to any other construction or quarrying operation using similar equipment. This equipment is mobile, so exhaust emissions will be spread over a large area in any given time period. The low residential density and relatively large individual rural landholdings within the project area also mean that there are a low number of sensitive premises in close proximity to operational areas.

Table 7 shows the results of calculations using the emission estimation techniques for NPI reporting for individual emission parameters over a twelve month period of mining. The table also shows comparison data sourced from the NPI website for the localities of Keysbrook (postcode 6128) and North Dandalup (postcode 6207) for the reporting year 2004-2005.

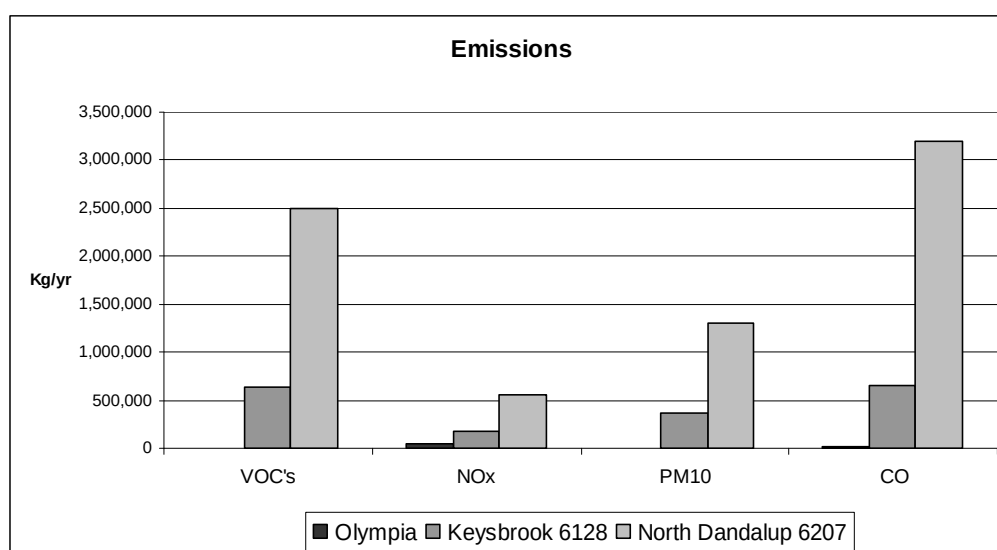
The data shows that primary products of diesel combustion for the project, (CO, NO<sub>x</sub>, VOC's and PM<sub>10</sub>) are insignificant relative to the diffuse emissions from sources throughout the locality. The other products of diesel combustion, formaldehyde and SO<sub>2</sub> is similar to the emissions from North Dandalup but larger than Keysbrook. The differences are considered not to warrant specific measures to be implemented to manage these emissions.

Figure 13 and Figure 14 show the data presented in the table in graphical format. Two graphs have been produced as the scale of emissions differs by too many orders of magnitude for all parameters to be visible on one graph.

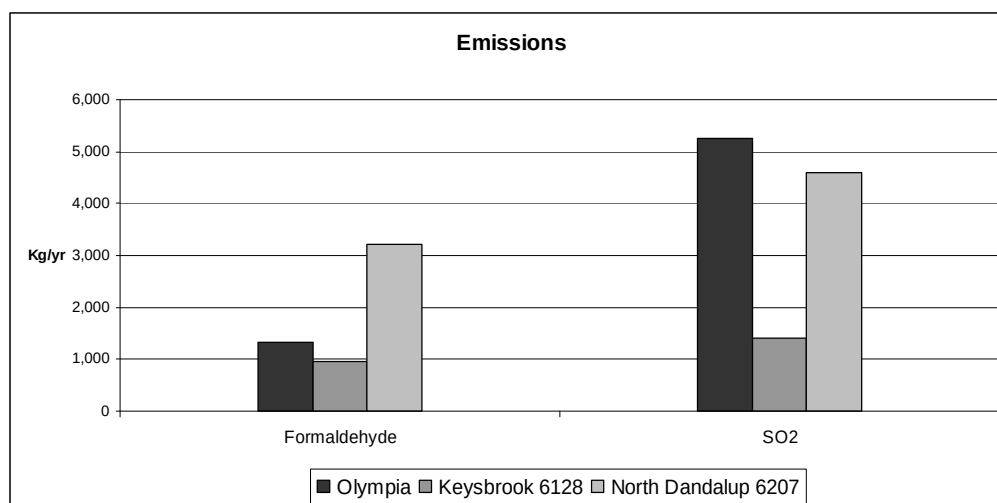


**Table 7: Emissions Data**

|                                  | Kg/yr     |         |           |           |              |                 |
|----------------------------------|-----------|---------|-----------|-----------|--------------|-----------------|
|                                  | VOC's     | NOx     | PM10      | CO        | Formaldehyde | SO <sub>2</sub> |
| Olympia                          | 4,608     | 51,199  | 4,738     | 17,168    | 1,330        | 5,247           |
| Keysbrook,<br>postcode 6128      | 630,000   | 180,000 | 360,000   | 660,000   | 950          | 1,400           |
| North Dandalup,<br>Postcode 6207 | 2,500,000 | 560,000 | 1,300,000 | 3,200,000 | 3,200        | 4,600           |

**Figure 13: Greenhouse Emission Data I**

It is not proposed to offset greenhouse emissions from land clearing. The rapid rate of mine advancement, with progressive rehabilitation in completed areas will see a return of pasture areas cleared within one growing season. The early planting programme of native species and stock shelter planting will offset progressive clearing of native vegetation.

**Figure 14: Greenhouse Emission Data II**

The indirect greenhouse emissions for the generation of electricity used has been calculated using the Department of Environment and Heritage (December 2006) *Australian Greenhouse Office Factors and Methods Workbook*. The workbook describes emission factors for **scope 2** and **scope 3** emissions.

The emission factor for **scope 2** covers emissions from fuel combustion at power stations associated with the consumption of purchased electricity from the grid. The emission factor for **scope 3** covers both the emissions from the extraction, production and transport of fuels used in the production of the purchased electricity (i.e. fugitive emissions and stationary and mobile fuel combustion emissions) and also the emissions associated with the electricity lost in transmission and distribution on the way to the consumer (from both fuel combustion and fuel extraction).

The total estimated electricity usage is approximately 30,000,000 kilowatts per annum. Using the emission factors in the workbook, total indirect emissions are 25,200 tonnes per annum CO<sub>2</sub> equivalent and 28,080 tonnes per annum CO<sub>2</sub> equivalent for scope 2 and scope 3 respectively.

### 6.9.3 Dust Management Plan

There were many submissions dealing with aspects of dust generation from disturbed areas.

Community 1 comment that:

- “Olympia has indicated that stockpiling of ore will be considered and this is not included within the PER nor methods to prevent wind erosion”.

Community 112 and Community 2 comment that:

- The dust management states that if dust exceeds threshold values the proponent will take remedial action.

- The threshold values are not documented.
- The monitoring techniques are not described so no assessment can be made as to their adequacy and the proposed remedial actions are not described in detail.
- Water sprays will not adequately control dust under high easterly winds during summer.
- Concern that many days when mining will/should cease will prolong the presence of this mine beyond eight years.

The Murray Shire, Community 71, and Community 53 are concerned that:

- The proposal will create a large amount of dust that will impact the local residences and cause sterile silica sand to deposit on their land.
- Dust will be difficult to control although Olympia stresses that topsoil will only be moved in calm conditions.
- There will be a residual dust problem associated with a sand mine 300 metres from residences, and this dust residue will contain portions of the minerals that are being mined.

The SJS and the CC expressed similar concern on the possible effects of dust on remnant vegetation, offsite impacts on neighbouring pastoral and farming operations and the nearby townsites of Serpentine, Keysbrook and North Dandalup should be considered in the Dust Management Plan.

### **Response**

It must be recognised that the handling of ore and waste during the mining and processing phase occurs in a wet process, as a slurry that is piped to its destination. Therefore, there is no fugitive dust generated from this activity.

Consistent with other bulk earthwork projects, fugitive dust can be generated from site traffic and dry disturbed areas that are not managed to minimise dust. The PER and the Dust Management Plan provides details of the measures to be put in place to address fugitive dust from these sources.

Responses to the above specific comments are provided below:

### **Community 1**

To initially start the 'normal' mining process as described in the PER, consisting of a continuous mining operation with waste sand being pumped back into the advancing excavation, there must be an initial hole excavated, for the process plant to pump the waste sand into.

Initially, an area must be excavated, prior to start-up of the primary processing plant, so continuous operations can commence. The ore removed from this initial excavation would be taken, by truck or scraper, and stockpiled near the primary processing plant. Once the plant is in operation, it would be fed into the plant. The process described in the PER is not for permanent, dry, stockpiles of ore to be located around the plant.

Management of dust from any short term stockpiles would be addressed by processes outlined in the Dust Management Plan for any dry active area with the risk of generating dust.

### **Community 112 and Community 2**

The Dust Management Plan submitted with the PER, Section 6 provides a wind threshold value of 45 kilometres per hour. Modelling of dust emissions used the NEPM threshold of 50 micrograms per cubic metre. The revised Dust Management Plan, Section 7, provides additional detail on the type of monitoring equipment to be used and the Australian Standards applicable to various monitoring methods. The modelling indicates when specific residences will be at the highest risk of dust impacts. The plan details proactive measures to ensure dust thresholds are not exceeded.

### **The Murray Shire, Community 71, Community 53 the SJS and CC**

The Dust Management Plan provides details on the monitoring and management methods used to control dust generation from the operation. Rehabilitation, with pasture species will provide rapid stabilisation of mined areas to mirror current pastured areas. It is not anticipated there will be an ongoing residual dust problem from mined areas.

## **6.9.4 Wind Monitoring**

There were many submissions dealing with aspects of local wind monitoring and local strong easterly winds during summer.

KNAG and the CC states that the lack of an accurate digital terrain model and the lack of representative wind monitoring has led to the failure in identification of a major wind tunnelling effect where the North Dandalup River Valley cuts the Darling Scarp.

Community 1, Community 53, Community 60, Community 70, Community 71 and Community 2 raised concerns on the use of Perth Airport data, as it is not relevant to the project site. Community 1 questions why Olympia have not used Karnet, Medina or Wokalup stations despite identifying these stations that are closer to the Keysbrook site. SJLC suggests that further study of the local katabatic winds and assessment of impact on soil erosion, vegetation removal (and establishment) be undertaken.

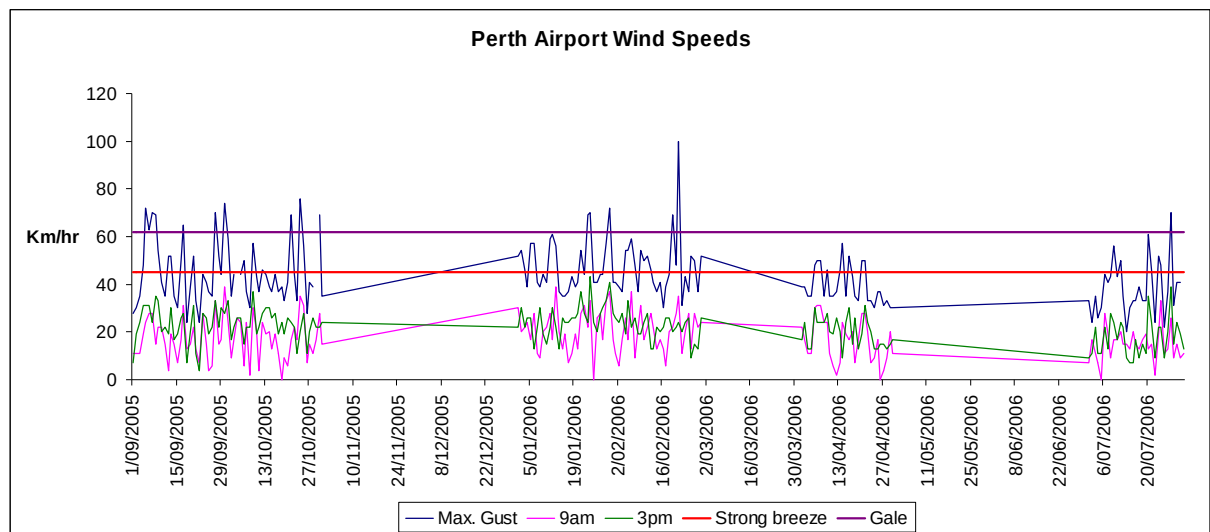
### **Response**

The proponent is aware of the North Dandalup River Valley and its potential impact on the wind patterns. The effect is similar to wind effects of valleys along the Darling Scarp and Whicher Escarpment, including the Swan, Serpentine, Murray, Brunswick, Collie, Preston and Capel rivers. Olympia employees have many years experience in mineral sands mines located on the Swan Coastal Plain and are confident that the dust management plan will minimise negative impacts.

Wind data is being collected on site, to establish local baseline information. The PER used data from the Perth airport, as being representative of the site, as the location of the airport (at the base of the Darling escarpment) is also subject to strong easterly winds.

The KNAG submission, page 45, provided graphs of wind data sourced from Waroona to demonstrate the wind gust speeds experienced at that location. Figure 15 below of a spring, summer, autumn and winter period, using Perth airport data, shows similar maximum wind gust speeds above the 45 kilometre per hour trigger level stated in the Dust Management Plan. The Gale wind speed, 62 kilometres per hour (see PER Table 10), is included to show that like the graphs provided by the submitter, these wind speeds are also recorded at Perth airport, especially in the spring and summer period as stated in the submission. Additional comparison of wind data from Perth Airport and Mundijong is presented in the revised Dust Management Plan. The result of this analysis confirmed the wind speed information from Perth Airport was not statistically different to Mundijong and so was appropriate to use as comparison data for the project. However wind direction was influenced by local topographic features and was different.

**Figure 15: Perth Airport Wind Speeds**



The distance from the escarpment also effects wind speed. The strong easterly winds off the escarpment are very localised (up to eight kilometres from the face of the escarpment). The review found that individual variations between Perth Airport and Mundijong could be explained by the fact that Mundijong is approximately two kilometres closer to the escarpment than Perth Airport. Waroona, used by KNAG in their submission, is also closer to the escarpment than the project site.

The proponent submits that analysis of all the available data shows that **no two locations can be defined as being exactly the same, all the time**. Perth airport data was selected as being representative of the winds experienced at the project site, not exactly the same.

Local wind monitoring is being undertaken at two location on the site and will contribute to the local database of information. During operations it will allow more specific and timely site management to minimise dust impacts.

Additional analysis of wind data from Mundijong and modelling of dust emissions has been undertaken and are reported in the Dust Management Plan.

### 6.9.5 Drinking Water Contamination

Anonymous 1 and Community 60 are concerned that dust contaminant will end up in the only source of drinking water, our rain tank.

#### Response

The proponent is confident that the dust management plan will minimise dust related issues. Discussions with community members have resulted in Olympia offering to wash-down roofs of residences which rely on rainwater collection at the end of summer, ensuring that winter rain collected will be clean.

### 6.9.6 Nearby Resident Health

Anonymous 1 is concerned about possible impacts on the health of residents (particular asthma) living close to the mine. “We have been advised by Olympia of their methods to keep dust and sand distribution to a minimum, but remain extremely dissatisfied with their “studies” of the extreme easterly winds which occur in this area”.

#### Response

Ongoing communication with community members with concerns such as this will enable Olympia to work to resolve the issue. All community members with any concerns are encouraged to contact Olympia to discuss resolution of their specific concerns. Olympia will continue ongoing communication with community members.

Specific measures to minimise and manage any impacts from air emissions on residents will be included in the revised dust management plan, which will also incorporate on-site monitoring and additional modelling work carried out in February and March 2007.

Consultation with neighbouring residents has been undertaken to determine whether any specific problems exist, and to identify specific solutions.

Specific examples of this consultation include:

1. One neighbour has multiple chemical sensitivity. In this instance, the sensitivity relating to the Keysbrook project is to diesel emissions. The following specific actions have been agreed between the proponent and the resident.
  - The buffer zone between this resident’s home and the mine area has been increased to 400 metres.
  - The resident works on a specific shift roster, and it has been agreed to mine closest to the resident’s home while the resident is at work. Ongoing contact will be maintained with this resident before and during mining to coordinate timing.
  - If the resident detects any diesel fumes from the mine site, contact will be made with the mine manager and mining activity will be moved.

2. One neighbour suffers from migraine headaches which can be caused and made worse by noise. Discussions have been held with this person regarding relocating the family while mining is close to their property. The resident stated that this solution would be satisfactory.
3. A submission from an unidentified community member commented that “As parents of a small boy who suffers from severe asthma attacks we are extremely concerned at the fact we may be so close to the proposed final stage of the mine. We have been advised by Olympia of their methods to keep dust and sand distribution to a minimum, but remain extremely dissatisfied with their “studies” of the extreme easterly winds which occur in this area.” In this instance, the following actions will be taken:
  - The exact timing of mining near the property will be determined. (Mining is not planned in this area until year 7).
  - Prior to the start of mining near the property, Olympia will consult with the residents to determine specific details of any concerns.
  - If the condition is still a concern, a solution will be worked out and agreed.

Contact and consultation with neighbouring residents will be continued throughout the life of the mine to monitor any health impacts caused by air emissions attributable to the project, and to develop specific solutions to these.

### **6.9.7 Typographical Error**

The KNAG and Community 1 submission identified typographical errors in the Dust Management Plan, Table 7 Summary of Management Action and infers this is proof that the report was simply copy and pasted from Eneabba.

#### **Response**

The typographical error is acknowledged. There has been no work undertaken for any operations located at Eneabba. The inferred connection to this site is incorrect. The table will be amended in the Dust Management Plan.

### **6.9.8 Light Overspill**

The Community 1 submission states Olympia states that as this is a rural area, and there are no existing issues of light overspill from another major contributor, that this will not be an issue.

#### **Response**

The PER, Table 1 addresses possible light overspill. The large lot sizes of the properties in the precinct, the location of houses relative to property boundaries, large distances from fixed plant sites and absence of other industries contributing to light overspill indicates there should be negligible light overspill from the project. The primary processing plant, where elevated light sources are most likely, will be a minimum of 1,000 metres from houses. No significant adverse impacts are anticipated.

### 6.9.9 Dust Generation Minimisation

Community 1 suggests the proponent's claim to only mine on the down wind side of any residence is not possible with houses surrounding the mine and summer winds changing 180 degrees in a day.

The PHCC and Community 2 submissions expressed concern that land clearing and mining simply cannot and should not be done during the spring and summer months because of the risk of east wind erosion. Landholders who have lived in the area for decades know that land cannot be cleared or ploughed once the ground dries and cover grasses stop growing, without risking massive erosion. Clearing when soil is dry risks causing erosion. The lack of an accurate topographic model and "on ground" mapping of wetlands prevents a valid rehabilitation programme. A satisfactory and agreed percentage of clay should be mixed with the original topsoil when replacing the soil in mined areas.

#### Response

The Dust Management Plan contains details of modelled dust emissions on residences adjacent to each mine cell. The information will be used to schedule monitoring and management actions to ensure dust emissions are within target levels.

The PER, Section 9.3 and Table 35 provides details on the scheduling of stabilisation and rehabilitation programmes to minimise exposed areas that may generate dust during the dryer months of the year. The use of clay for soil stabilisation is also addressed in responses 6.2.2 and 6.2.14.

The 'accurate topographic model' is addressed in response 6.2.18.

### 6.9.10 Power Requirements

Community 1 raised the issue of power usage and asks has Olympia made arrangements with Western Power to upgrade the local power grids, as they will be using a massive amount of energy. Jarrahdale, Keysbrook, North Dandalup and Ravenswood suffer more power outages than any other area in Perth because of overloaded transformers at the sub-station. The extra draw will ensure even more lengthy power disruptions for this area. Community 2 asked a similar question and also if generators were to be used, they will increase the noise.

#### Response

Olympia has not yet made arrangements with Western Power for the supply of power to the project site. Olympia will fund any upgrade of the supply system such as a suitable transformer to provide the power required for the project.

Portable generators may be used to power some pumps and equipment. Noise from these will comply with Noise Regulation requirements.



## 6.10 NOISE

### 6.10.1 Noise Complaints

Community 1 comment that sound travels further in this area, as it is flat land, that there appears to be no allowance for noise reduction during the day and that the Company should have a noise complaints register. Community 60 comment that noise containment is not adequately addressed. Community 53 also raised concerns over noise issues from a 24 hour operation.

#### Response

The noise model incorporates terrain in the model output.

The noise assessment provided separation distances for major plant and equipment to achieve compliance with statutory requirements. It is considered this adequately addresses noise containment.

Noise generated both day and night must meet relevant standards and legislation as outlined in section 9.10 of the PER. Operations will be kept to the level required to operate safely and efficiently. A complaints register and resolution system will be put in place which will include complaints regarding noise.

### 6.10.2 Noise Modelling

There were many submissions dealing with aspects of noise modelling and noise management.

Community 1, Community 112, and KNAG comment that the proponent has not used up to date maps for the area, including a dwelling on Lot 105 and several houses on the eastern side of McMahon Rd which are not shown and therefore no assessment has been made of the noise impacts on these residences or on North Dandalup. Community 1 comments that the sound impact diagram has not included the residence on Lot 105. Community 112 further states that using the sound power levels typical for the types of operations proposed and the noise model shows that it is possible that residences in North Dandalup will experience unacceptable noise under certain meteorological conditions, particularly at night with slight northerly winds and temperature inversions. Further, Community 112 feels that no assessment has been made as to the adaptive management required and proposed measures if the land uses changes during the lifetime of the mining operations. Community 2, Community 60, Community 70 and KNAG also express concerns on the noise impact to North Dandalup.

#### Response

The revised Noise Management Plan has included additional residences and transport noise within the mine area. The Noise Management Plan is adaptive, in establishing minimum distances of plant and equipment to any residence, under specific meteorological conditions, to achieve statutory compliance. The closest residence has therefore been used in the model to determine compliance with statutory limits rather than examining all neighbouring residences.

Operations in the area south of Readheads Road are restricted to day-time only, based on measurements from the nearest residences which preclude 24 hour operation. On this basis, measurements from residences the same distance or further away, such as North Dandalup, will not result in any change to the model output that effects the mine plan.

### **6.10.3 Cumulative Noise**

Community 112 comments that the generators, pumps, pipelines, and ancillary equipment that will be required for mining operations will produce unacceptable noise (>30 dB(A)) and that it appears that the noise assessments have been carried out for individual equipment items and operational activities. That is, the cumulative noise impacts from all equipment operating at one time have not been determined. Noise Regulations require that cumulative noise impacts (excluding transport noise) be considered in determining compliance. Community 2 and KNAG commented on similar issues and reversing beepers on equipment.

#### **Response**

Measurements for the model were conducted on individual items of equipment to determine the minimum distance each item is to be located to achieve compliance. Depending on the proximity of items of equipment, combining sound power levels is appropriate. In general, the most dominant noise source will mask minor noise sources. The scraper was identified as the most dominant noise source, the most mobile and the item that will be the closest to adjacent residences. Reversing beepers are a safety warning device, required by law to be fitted. Newer types of devices are less intrusive.

### **6.10.4 Caretaker Residences**

Community 112 comments the PER is dismissive of the noise impacts of caretaker residences, the Noise Regulations apply to caretaker residences in industrial areas and no assessment of the noise impacts on these was presented in the PER therefore it is not possible to determine if compliance with the Noise Regulations is possible with the proposed operations.

#### **Response**

The proponent disagrees it has dismissed noise impacts to houses within the mine area. The area is zoned rural, not industrial. Agreement with landowners has been reached regarding operations around residences on the property.

### **6.10.5 Noise Emissions**

KNAG comments that mobile mine vehicles not included in the noise model are a minimum of two scrapers to achieve 600tonnes per hour; a minimum of four scrapers if restricted to day light hours, a water truck, a front-end loader (will this be restricted to daylight hours?), HMC haulage trucks, no mention of the incessant beeping noises from a myriad of mine vehicles has been included in the study.

The Community 1 and Community 2 submissions raised similar issues on the cumulative noise from the range of plant and equipment on site 24 hours per day. Community 71 raised the problem of reversing beepers on equipment.

**Response**

Other plant items such as water cart, front end loader, bulldozer, grader are not used continuously on site and will be used in a range of locations, so distance to nearest noise sensitive premises can differ significantly. In contrast, the scraper is used continuously and in a defined location. The scraper also has the highest sound power level (is the dominant noise source).

Some activities, such as clearing and rehabilitation work using a bulldozer would be restricted to daylight hours, when threshold noise limits are higher. Other plant such as the water cart is anticipated to be operated at night, particularly during times of strong winds.

The Noise Management Plan provides for on site assessment of noise emissions, to verify the model results. Should it be required, modifications to plant and equipment will be made to ensure compliance with the Noise Regulations.

Safety warning devices (reversing beepers) are excluded from the Noise Regulations. However, Olympia acknowledges the negative amenity issues from the traditional reversing beepers. New alternatives to these devices will be used to minimise noise from this source.

**6.10.6 Night Operations**

KNAG and Community 2 comments that the noise modelling suggests that scrapers cannot operate at night for much of the area. This will necessitate at least two pits to be open at any given time (a night time pit and a day time pit) i.e. at least 60 hectares will be exposed at any time. This will be further complicated if additional pits are required during times of high winds to avoid impact on neighbours.

**Response**

The noise model shows that unconditional night operation (in terms of noise) is not possible in all parts of the site. The pit area to be open at any one time will be approximately 30 hectares, as stated in the PER. This provides a sufficient radius from the centrally located hopper to work on the 'near side' (between the hopper and the closest resident) during the day and the 'far side' (with the hopper between the scraper and working pit face) at night. Two separate open pits will not be required.

**6.10.7 Primary Processing Plant Location**

KNAG comments that the image from Figure 4 of the mining schedule clearly shows where noise-modelling studies have positioned the wet plant in year eight and further produces a photograph plan showing "the location of the wet plant in a wooded creek that drains to the Mandurah Estuary".

**Response**

The noise model identified locations with a distance of approximately 1000 metres to nearest residences, where the primary processing plant would achieve the required 30 dB L<sub>A10</sub>. The plant will not be located in a creek. The most likely location of the plant will be on the north side of Readheads Road, on Lot 49, just outside the mine boundary. The exact location will be defined through the life of the mine, taking into account issues in addition to noise. The open paddock to the east of the location in the submission is an obvious choice for detailed site examination.

**6.10.8 Plant Location and Noise Bunding**

The KNAG submission stated the PER Figure B01 has placed a wet plant on a property holding that has not yet signed an agreement for mining. Figure B03 places the wet plant as close as possible to houses 8 and 10. The CC comment that the proponents plan to stockpile topsoil as a noise barrier is concerning considering that the maximum depth for topsoil storage should be less than 2m. It is also not possible if they are to be undertaking progressive rehabilitation of areas behind the mine path, as is claimed elsewhere in the PER (Section 4.2). This inconsistency shows a concerning lack of planning, where one very important resource has two important functions that it cannot fulfil simultaneously.

**Response**

The figures identified show the modelled location of the primary processing plant that achieves the 1,000 metres from the nearest residence required to achieve compliance with the Noise Regulations. Further assessments may occur prior to actual location of infrastructure (as stated in response 6.10.7) to ensure infrastructure is located in the best possible position, which includes compliance with Statutory requirements.

Negotiations between the proponent and landowners are confidential. The PER Section 3.2 on Alternative Options Considered states “...*the area potentially available for mining will be governed by the amount of land access and compensation agreements that can be entered into with the private landowners. In reality, it is considered highly likely that agreements will not be entered into with all landowners that have heavy minerals on their property. Where agreements cannot be made, these areas will be excluded from mining operations.*”

It is self evident that should an access agreement not be reached with a landowner, no activity including mining or location of plant would occur on the property. The stated mine life of up to eight years is reflective of the maximum mine life, should all landowners enter access agreements with Olympia.

The stockpiling of topsoil for extended period will only occur on locations around the primary processing plant, where the facility is fixed for a number of years. Topsoil stripped from the active open pit will be returned as soon as the rehabilitation sequence allows.

### 6.10.9 Noise Management Plan

The DEC:LWQB submission raised the issue of a Noise Management Plan. Although information the PER and further information provided by the consultant has addressed noise issues as a result of the project, it is considered there should remain a commitment from the proponent to prepare a Noise Management Plan (NMP). The Shire of Murray requested the NMP be submitted to them during the approval process.

The NMP should incorporate some basic details in relation to construction noise management, should “out of hours” construction be proposed at a later date.

The acoustic model recognises the influence of ground absorption on the predicted noise levels. The consultant has provided further information, including a sensitivity analysis, to justify the value used in the model. Notwithstanding, it is perhaps more appropriate to re-examine the issue as an element of the proponents NMP i.e. verifying the model.

#### Response

The proponent has prepared a NMP, which includes the following:

- Background (including legislative requirements and details of modelling undertaken).
- Management of noise during construction.
- Identification of all noise sources and associated noise control measures.
- Complaint response procedures.
- Management of noise during operations.
- Identification of all noise sources and associated noise control measures (including operating conditions and buffers for mobile plant).
- Monitoring regime for noise emissions.
- Details relating to how a detected breach would be managed and rectified.
- Management of transport noise.
- Reporting of noise emissions.
- Model refining/verification.
- Review and continuous improvement programme.
- Commitment to “buy quiet”.
- Complaint management procedure.

## 6.11 RADIATION

### 6.11.1 Radiation Management Plan

Community 1 asks if the minerals at the proposed site will increase radiation in the surrounding area and what is the possibility of radioactive elements being found in the mineral sands, and possibly the airborne dust in the area? Community 1 further

comments that if the mining proceeds, cattle in the area could become contaminated with the radioactive dust, which would settle on the pasture and in the surface and ground water. During the summer months, when the east wind blows, Olympia will not be able to control the radioactive dust. KNAG asks how Olympia proposes to protect the public and their workers from radiation exposure and ensure that international standards of radiation protection are met.

The KNAG submission asks has Olympia Resources Limited identified the "Critical Group" in relation to the proposed mining activities? Critical Group = Members of the population who because of their habits or sources of foodstuff are likely to have the highest exposure to radiation from a particular source. Has Olympia Resources Limited estimated how much additional radiation above background the Critical Group might be exposed to? Is this exposure well within accepted international guidelines? How would Olympia Resources Limited ensure this exposure, and exposure of the local population generally was as low as reasonably practicable? How would they monitor the Critical Group? How does Olympia Resources Limited propose to protect their workers from radiation exposure and ensure that international standards of radiation protection are met?

The Radiological Council submission stated the proposal is required to obtain a licence and be registered under the *Radiation Safety Act*. Monitoring is required to confirm radiation (and monazite) levels.

### **Response**

Naturally occurring soils, rocks and minerals contain small amounts of the radioactive materials thorium and uranium. These elements cause a level of background radiation.

Mineral sands may contain minor levels of the mineral monazite. Monazite contains more uranium and thorium than other mineral sands and typically contains approximately 60,000 parts per million thorium and 2,500 parts per million uranium.

Olympia has not identified monazite in the Keysbrook ore-body (Table 8). However, in the project's Radiation Management Plan, it will be assumed that monazite could be present in very low quantities and appropriate procedures will be put in place.

Olympia will apply to register and gain a licence under the *Radiation Safety Act 1975* to mine at Keysbrook and process mineral sands at Bunbury. As a registered site Olympia is required to produce a Radiation Management Plan which includes radiation waste, which is required to be approved by the State Mining Engineer. The mine and processing site will remain registered until the Radiological Council approves the release of the site and terminates the registration.

A baseline radiation survey has been conducted over the area comprising the first three years of mining. Subsequent surveys will be conducted in other areas in advance of mining. The baseline survey measures the existing natural level of background radiation. The Radiation Management Plan will ensure that the completed mine areas have radiation levels no higher than those that existed before mining.

**Table 8: Analysis of Keysbrook Ore**

| Sample | Date       | Description                              | Ilmenite | Altered Ilmenite | Limonite | Leucoxene | Rutile | Zircon | Staurolite | Schorl | Trash | Comments                                                                                                        |
|--------|------------|------------------------------------------|----------|------------------|----------|-----------|--------|--------|------------|--------|-------|-----------------------------------------------------------------------------------------------------------------|
| KR2    | 26/03/2004 | Heavy mineral in ore                     | 23.4%    | 22.6%            |          | 43.2%     | 1.0%   | 5.3%   |            |        | 4.5%  | Trash in approximate order of decreasing abundance is kyanite, staurolite, tourmaline, garnet, goethite, other. |
| KR3    | 26/03/2004 | Heavy mineral in ore                     | 10.1%    | 13.4%            |          | 62.5%     | 1.6%   | 6.7%   |            |        | 5.7%  |                                                                                                                 |
| Con A1 | 3/05/2004  | Heavy mineral in spiral test concentrate | 6.3%     | 55.0%            | 0.2%     | 12.8%     | 3.8%   | 10.9%  | 4.4%       | 1.2%   | 5.4%  |                                                                                                                 |
| Con A2 | 3/05/2004  | Heavy mineral in spiral test concentrate | 8.6%     | 56.7%            | 0.1%     | 12.3%     | 1.5%   | 10.0%  | 0.9%       | 0.5%   | 9.4%  |                                                                                                                 |
| Con B1 | 3/05/2004  | Heavy mineral in spiral test concentrate | 15.7%    | 41.8%            | 0.4%     | 14.1%     | 2.2%   | 15.7%  | 2.7%       | 0.0%   | 7.4%  |                                                                                                                 |
| Con B2 | 3/05/2004  | Heavy mineral in spiral test concentrate | 4.3%     | 57.2%            | 0.7%     | 21.3%     | 3.4%   | 3.2%   | 0.2%       | 0.8%   | 8.9%  |                                                                                                                 |
| Mid 1  | 3/05/2004  | Heavy mineral in spiral test middling    | 5.5%     | 44.7%            | 1.1%     | 27.0%     | 1.5%   | 1.0%   | 0.7%       | 2.2%   | 16.3% |                                                                                                                 |
| A9188  | 4/05/2004  | Heavy mineral in spiral Concentrate      | 20.4%    | 31.6%            | 0.9%     | 29.1%     | 3.4%   | 8.6%   | 1.2%       | 0.5%   | 4.3%  |                                                                                                                 |

The Radiation Management Plan details procedures to ensure radiation exposure to employees and the public is controlled and as low as reasonably practicable. These procedures are similar to those undertaken by other mineral sands companies operating in Western Australia.

The project's Dust Management Plan outlines methods used to control airborne dust blowing from the site.

### 6.11.2 Monazite

Community 1 states "the balance is made up of minor amounts of other heavy minerals (trash) which are not of general economic interest. "(Olympia's Share Prospectus) 'Trash' or 'other minerals' is what mining companies now call Monazite as it is no longer commercially mined because of the radiation stigma and issues with radioactive waste disposal. Community 1 adds that there have been no assays done in relation to the Monazite.

#### Response

Monazite was looked for separately in the mineral assays and from test samples of concentrate. The HMC produced by the Keysbrook mine site comprises of a suite of valuable minerals and trash all of which contain the elements uranium and thorium in varying concentrations. Table 8 shows the analysis of the Keysbrook ore in test samples. The analysis did not identify any monazite, however, for the purposes of site management it will be assumed that monazite may be present in very low concentrations.

### 6.11.3 Waste Disposal

Community 1 states returning the concentrated Monazite back to the pit would be totally unacceptable as this waste material is classified as 'hazardous' waste under the EPA guidelines and has to be disposed of in a regulated waste management site.

#### Response

Mineral sands mines and processing plants are regulated under the *Radiation Safety Act 1975*. Olympia will apply to register and gain a licence under the *Radiation Safety Act 1975* to mine at Keysbrook and process mineral sands at Bunbury. The mine and processing site will remain registered until the Radiological Council approves the release of the site and terminates the registration. As a registered site, Olympia has produced a Radiation Management Plan, which includes Radiation Waste Management.

### 6.11.4 Registration and Licensing

Radiological Council comments that the PER should include requirement for registration and licensing under *Radiation Safety Act 1975*. The Radiological Council also requires compliance with the Radiation and Radiation Waste Management Plan.

#### Response

Acknowledged. Olympia will apply to register and gain a licence under the *Radiation Safety Act 1975* to mine at Keysbrook and transport HMC. As a registered site, Olympia has produced a Radiation Management Plan to be approved by the State Mining Engineer. The



mine and processing site will remain registered until the Radiological Council approves the release of the site and terminates the registration.

### **6.11.5 Radiation Monitoring**

Community 1 comments that there have not been any surface studies presented to establish the background radiation levels in the area. There have been no down hole radiation logs presented in the PER to establish possible increases in radiation when mining commences.

KNAG also comment that no radiation monitoring results were provided to support the statement that no monazite was detected in the testing conducted.

#### **Response**

Section 6.11.1 provides details on the Radiation Management Plan and baseline survey. Section 0 provides analysis of Keysbrook ore that shows no monazite has been identified, however, for the purpose of the management plan, it will be assumed that monazite could be present in very low quantities and appropriate procedures will be put in place.

### **6.11.6 Radiation Surveying**

KNAG commented that Olympia Resources Limited has not presented any surface or down hole measurements of radiation. It is therefore not possible to guarantee that radioactive elements do not exist.

#### **Response**

As part of the radiation management plan Olympia has conducted a gamma survey over the area to be mined in the first three years at the proposed Keysbrook mine site.

## **6.12 HERITAGE**

### **6.12.1 Archaeological and Ethnographic Surveys**

The Department of Indigenous Affairs, CC and Community 1 raised comments on the lack of a heritage survey over the area. Due to the existence of a number of previously recorded archaeological and ethnographic sites in the vicinity of the proposed works it is highly recommended that archaeological field inspections and consultations are conducted with relevant Aboriginal people prior to any developments commencing at the project area.

#### **Response**

Olympia has completed an Aboriginal heritage survey at Keysbrook. Representatives of the Gnarla Kaaja Boojah Native Title claimant group attended the survey.

No new ethnographic sites were located as a result of the survey. Apart from avoiding the previously recorded sites located within the area, which Olympia has already agreed to, there are no ethnographic impediments preventing the project from proceeding.

As a result of the archaeological survey, five artefact scatters were located in the south of the project area. Three are outside the mine area and will not be disturbed. Two sites border the mine boundary, with portions inside the mine area. Olympia will need to avoid disturbance to the sites, unless it obtains permission from the Minister under Section 18 of the *Aboriginal Heritage Act 1972*. No decision has yet been made of whether to avoid the sites by placing a mine exclusion area around the sites, or seeking permission to disturb.

Apart from avoidance of the sites, and the use of an archaeologist to monitor top soil removal around the sites in the southern section of the survey area, there are no other archaeological impediments preventing the proposed project from proceeding.

## 6.13 SOCIAL IMPACT

### 6.13.1 Restrictions to Future Urban Development

Community 1 is concerned that Olympia's tenement E70/2407 covers an area of 188 square kilometres and that this large area, practically an outer suburb to Mandurah, will have development restricted for at least the next 10 years, because of mineral sand mining.

#### Response

Any company or individual proposing to develop land in the area covered by tenement E70/2407 or elsewhere in the region will have to apply for approval to do so from the relevant government authorities, by following the required procedures. Holding an exploration tenement does not guarantee that mining will occur.

### 6.13.2 Depiction of North Dandalup

Community 1 comment "in the Olympia propaganda, they state; "the Keysbrook deposit is situated in the southwest of W.A. Southwest WA is one of the world's great mineral sands provinces where mineral sands mining has been carried out for 50 years by companies such as Cable Sands, Iluka Resources and more recently, Doral."

Part of that statement may be true, but the locations are a world apart. Southwest WA is a huge area, and the linking of those mines to an area like Keysbrook, makes it sound as if we were down south near Capel, instead of only a stones throw from Perth and Mandurah.

Community 1 and KNAG raise similar points, "in the PER section 3, the description of the project area and the affected area states: "Hopelands and Readheads Roads are two gazetted unsealed roads running to the west and south of the project area respectively." Hopelands Road is a long, good quality wide bitumen road and has been bitumen for over 20 years. Readheads Road on the other hand is narrow and only six kilometres long, the four kilometres from the South West Highway end is bitumen, and it also has been bitumen for over 20 years. The remaining two kilometres is gravel, mainly because the residents preferred it left as gravel to discourage traffic using the road as a short-cut to Mandurah.

This was an obvious attempt to portray North Dandalup as a rural backwater.

**Response**

The stated text could not be found in the PER. The proponent does not in any way intend to portray the area in a misleading way.

**6.13.3 Public Opposition**

Community 1 and KNAG question why would Olympia persist in attempting to mine in this area when they are fully aware that the local community is completely against the idea? KNAG adds that on 26 July 2006, between 80 and 90 people attended a meeting organised by KNAG and the vast majority were unconvinced by Olympia's answers and remained firmly opposed to the mining proposal. KNAG adds that at a public information session presented by Olympia on 25 October 2005 attended by at least 90 residents, there was loud applause for the argument outlining the negative aspects of the project. The vast majority of the audience went away annoyed that mining on such a massive scale was proposed in their community. Community 71 states that Olympia should go back to the drawing board and get it right. The whole community involved should be included in the community consultation, accurate studies of the area they are affecting should be undertaken, with the use of real data rather than other PER's.

**Response**

Through regular visits to consult with community members, the PER process, the appointment of a specific community relations person within the company, public information programs, including open days, newsletters, web-site, meetings, and local media, Olympia hopes to speak with all community members involved to resolve concerns the community may have with the proposed mine.

We acknowledge that it is not always possible to resolve every concern.

**6.13.4 Lifestyle and Community Disruption**

Community 1, KNAG, Community 2, and Community 60 raise similar points. The area is an attractive rural setting with numerous lifestyle blocks and is incompatible with mining. I like to travel to this area to visit and appreciate for its natural beauty, not mining, and that young families planning their dream home have been forced to postpone plans. The mine and processing plant will inevitably lead to pollution. Dust and fumes will be generated. It will also cause visual pollution, as main roads and the railway are very near to the mine excavation. KNAG comments that the steadily increasing sustainable industries based on lifestyle and tourism will be severely impacted by these changes. The narrow strip of vegetation left in a few areas will not hide the environmental damage. The destruction of native Jarrah bushland is damaging to the feature that gives the area a special appeal to visitors and residents.

Community 2 adds that early colonists carried out massive clearing, land is now unproductive and unsuitable for housing because of salinity, some families have lived here since colonisation in 1830. We came, like they did, to live in this quiet countryside, where you can hear the birds singing, and frogs croaking, with clean air and clean water. This could all be destroyed by the opening of this sand mine. After eight years, will Olympia move further

down to Pinjarra, or eastwards, it would be never ending. The very short term economic benefits of the Project will inevitably be outweighed by the irreversible long-term damage to the environment.

### **Response**

The proponent is confident that disturbance to residents 'lifestyle and amenity' can be kept to a minimum by the implementation of the project's management plans. The Dust Management Plan will see the area of land open for mining at any one time kept to a minimum. Rehabilitation will follow as soon as possible after mining, with full rehabilitation occurring as soon as possible after mining.

### **6.13.5 Community Benefits**

Community 1, Community 2 and Community 60 comment that most mining developments offer substantial benefits to a community. This proposal will have an overwhelmingly negative effect. Olympia seems to offer no benefits to the community other than employment, and support to the Murray Shire in the Pinjarra bypass. Olympia should offer more benefits to the local communities that they choose to be part of. KNAG states that the proponent will receive tax-free diesel for a mining operation that pays no state or federal royalties. KNAG and Community 1 state further that workforce requirements if sourced locally would intensify labour shortages already experienced in sustainable and value adding industries, and that there would be massive damage for little return.

### **Response**

The statement suggesting that the proponent will receive tax-free diesel is incorrect.

The value of the minerals to be exported is \$317million. The minerals to be recovered from the Keysbrook project are valued at \$317million. Rehabilitation as soon as is possible after mining will ensure that the land will be returned to its pre-mining agricultural use. Olympia is confident that benefits will flow to the local community and region from the project. Benefits will include:

- 30 people employed, locally if available, approximately \$2.0 million per year.
- 25 people employed during construction phase.
- Local road upgrades and maintenance, with an estimated value of \$650,000 for initial works, then \$25,000 per year for maintenance.
- Construction value \$18million; south west contractors and suppliers used.
- Export value through Bunbury: \$317million.
- South West 'Buy Local' policy: mining, engineering and maintenance contractors, fuel, accommodation, supplies.
- Olympia sponsorship of local groups: \$25,000 per year.

### 6.13.6 Extended Mine Life

Community 1 comments that landholders have also been told repeatedly that the mining will be for eight years. But Olympia is advising shareholders that it intends to extend the Keysbrook mining life by further drilling in the area.

#### Response

A mineral resource discovered at Keysbrook South, four kilometres south of the existing deposit and at Coolup, 34 kilometres south have the potential for three to four years mining under the same project name as the existing resource, “Keysbrook Mineral Sands Project”. Any development of these locations would require environmental and development approval from government. It is not intended at this stage to pursue development.

### 6.13.7 Greenacres Turf Farm

Greenacres Turf Farm comments that the impact on the surrounding land holdings in terms of economic consequences is an unknown.

#### Response

The proponent does not consider that the project will have any unidentified economic consequences on surrounding landholders such as Greenacres Turf Farm. Landowners whose properties will be mined will lose production for a period of time; however agreements have been developed to compensate for their loss.

### 6.13.8 Consultation with Landowners and Aboriginal Elders

Community 1 and KNAG comment that in the Review, (PER) Olympia admits that they have not yet consulted with the Aboriginal elders of this district. DIA comment that due to the existence of a number of previously recorded archaeological and ethnographic sites in the vicinity of the proposed works it is highly recommended that archaeological field inspections and consultations are conducted with relevant Aboriginal people prior to any developments commencing at the project area.

Community 1 states that there has been no mention that caveats are placed on the properties being mined, ensuring the owner of the land cannot sell without the purchaser accepting and signing the mining agreement prior to settlement. In addition, Community 1 comments that so far, only a couple of the landholders have actually signed the agreement, while others have changed their minds. KNAG comments that negotiations with land holders are described as advanced, however, due to the rapid increase in the real estate value it would appear that many of the negotiations have not only stalled, but have broken down. Community 1 comments that offering compensation to some landowners to mine their land to the detriment of neighbours has caused bad feeling among neighbours.

#### Response

In the PER, Olympia stated that the preliminary survey of anthropological and ethnographic sites had been undertaken and it was planned to complete the on-ground survey prior to the release of the final PER. The on-ground survey was carried out between October 18 and 20

2006. Representatives of the Gnarla Kaaja Boojah Native Title claimant group attended the survey.

No new ethnographic sites were located as a result of the survey. Apart from avoiding the previously recorded sites located within the area, which Olympia Resources has already agreed to, there are no ethnographic impediments preventing Olympia Resources project from proceeding.

As a result of the archaeological survey five artefact scatters were located in the south of the project area. The survey report recommended:

1. Olympia Resources avoid disturbance to the archaeological and previously recorded ethnographic sites.
2. If disturbance is unavoidable Olympia Resources obtains permission from the Minister under Section 18 of the Aboriginal Heritage Act 1972 to disturb the sites.
3. Olympia Resources contract an archaeologist to monitor the removal of the topsoil around the sites in the southern section of the survey area.
4. Olympia Resources inform its contractors and employees working on the project of the location of the archaeological sites and the previously recorded ethnographic sites.

Olympia will implement the recommendation of the survey report.

Agreements made and negotiations underway with landowners whose property will be mined are confidential and details are not available. Comments regarding the alleged breakdown of negotiations with landholders are incorrect. The proponent considers that compensation for the temporary disruption of farming activity is fair and reasonable, and regrets that those not receiving compensation because there is no extractable resource on their land feel aggrieved.

### **6.13.9 Community Division**

Community 1 and Community 2 comment that this threat of mining is destroying lifestyles, creating hardship and stress, concern for our safety and devaluing our properties. If the mining goes ahead, I envisage the next community action group will be formed to seek compensation because of health fears and property value losses. Community 2 further add that the way Olympia has gone about its business is destroying the social fabric of a once very strong rural community. To offer royalties to some landowners to mine on their land, to the detriment of their neighbours and other members of the community has caused bad feelings amongst neighbours. This threat of mining has caused great stress and hostility in the community

#### **Response**

The proponent is confident that the mine will cause minimal disruption to the lifestyle of neighbours and residents of North Dandalup. Due to the shallow nature of the deposit, mining will move rapidly through the deposit, with rehabilitation occurring as soon as possible after mining. Mining will be adjacent to the closest neighbours for a period of two to three months, with rehabilitation complete in two years, then monitored by Olympia until the rehabilitated area is sustainable. Through community consultation, the PER process and public information

programs, Olympia hopes to resolve any concerns the community may have with the proposed mine. We acknowledge that it is not always possible to resolve every concern.

### 6.13.10 Adjacent Property Values

Community 1, Community 2, Anonymous 1 and Community 71 express concern that adjacent property sales will be difficult to negotiate with the threat of mining for the next 10 years. Community 1 and Community 71 comment that in public meetings, this life of mine has ranged from seven to 18 years. Community 2 expressed concern on the adjustments in property values with the threat of mining.

#### Response

The properties most directly affected by mining are participating in the mining project. There are approximately one dozen small land holdings of 100 acres or less adjoining the mining area, but these would be impacted by mining and rehabilitation activities for two years at most. There has been no evidence that property values in the mineral sands regions of the South West have reduced after mining. A number of farming areas have been enhanced in value by rehabilitation after mineral sands mining projects have recombined clay fines into the sand tailings which boost moisture and nutrient retention levels in the soil.

The proponent disagrees with the statement that in public meetings, the life of the mine has ranged from seven to 18 years. The information consistently provided is that the Keysbrook mine has an expected operational life of up to eight years.

### 6.13.11 North Dandalup Primary School

Community 1, Anonymous 1, KNAG, Community 2, Community 71 and the North Dandalup Primary P & C raise similar points, commenting that the project contradicts the strong environmental focus and teaching of the North Dandalup Primary School. Comments include:

- The North Dandalup School is renown for being environmentally conscious and active and has received numerous state and federal awards for active involvement in Landcare activities.
- A sand mine has no place in that community and it will provide a bad example for students.
- It is extremely distressing to us that Olympia plan to mine and destroy such a vast amount of bush land and old trees which are well known nesting areas for the Redtail Black Cockatoo.
- The destruction of remnant bushland on this proposed site is against all the teachings at the school.
- If mining were to go ahead the school focus would be lost and children would be influenced to leave school at fifteen to get a job bulldozing remnant vegetation.

#### Response

The proponent is confident that responsible environmental management of the project will provide opportunities to enhance and add to the diversity and sustainability of the region into

the future. It is hoped that local community groups will become partners in the rehabilitation programme and in the flora and fauna management.

The experience gained by becoming involved in a rehabilitation project such as this would result in a great deal of learning for the school children, whose future employment (of some of the children) may be with the mining industry locally and elsewhere; for example Alcoa and Iluka.

### **6.13.12 Future Urban Development**

Community 1 and KNAG comment that the land may be unstable, and unsuitable for housing and infrastructure development after mining and rehabilitation. The proximity to the metropolitan area means development is rapidly approaching. KNAG comments that mining will make the area prone to liquefaction and significant damage in the event of an earthquake.

#### **Response**

The land is zoned Rural in the Peel Region Scheme.

The very low clay fraction and the absence of overburden at the Keysbrook site will enable the recombining of clay with the sand at the same time tailings are returned to mined areas. The resulting soil will have the approximate consistency of building sand and will readily settle to be suitable for future housing and infrastructure construction.

### **6.13.13 Disregard for Nearby Communities**

KNAG comments that the Coral Park subdivision on the western side of North Dandalup town site is located 500 metres from the proposed pit. There are numerous lifestyle blocks immediately adjacent to the mine-site across the entire lease and the failure to even mention the township of North Dandalup in the Executive Summary of the PER highlights the lack of concern shown by the company, towards the community.

#### **Response**

Management plans including noise, dust, emissions and water do incorporate residences in North Dandalup, including the Coral Park subdivision. This is also addressed in Section 5.10.2. The proponent disagrees that the lack of mention of the town of North Dandalup in the PER Executive Summary shows a lack of concern for the community and regrets that the submitter feels that this is the case. Where maps do not show North Dandalup or Coral Park, this is because sensitive receptors (residences) closer to the site are providing the limit of activity.

### **6.13.14 Clearing Approval**

Community 2 comment that clearing bans have protected vegetation from destruction to date, but they are now under threat because of a low grade mineral ore deposit. If farmers are being refused permission to clear land, how can we justify wholesale clearing for mining, especially when it is so close to the metropolitan area? There would appear to be different rules for the



clearing of land for developers to that of farmers. Developers can bulldoze all the vegetation, whereas farmers are very restricted.

**Response**

The proponent disagrees with the statements above. The land has been progressively cleared for agricultural and forestry purposes since 1830. From the 1920's, land subdivisions saw an increased rate of clearing. Currently, the land is used for agricultural purposes, predominately cattle grazing. The mine area covers 1,406 hectares. Of this, 1,184 hectares (84.2%) is open pasture, 182 hectares (13%) is parkland cleared remnant vegetation and 40 hectares (2.8%) is remnant vegetation scoring a Bush Forever condition rating between 3 and 5. The proponent, as with any other person or business now wishing to clear vegetation must apply for a clearing permit or environmental approval from the DEC.

**6.13.15 Typographical Error**

Community 71 comments that a typographical error in the Dust Management Plan Table 7 Summary of Management Action is proof that this report was simply cut and pasted from Eneabba "spillage from loads bound for Geraldton".

**Response**

This comment is addressed in response 6.9.7.

**6.13.16 Future Urban Development of Community 1**

Community 1 major development and housing proposals would be restricted if mineral sand mining was allowed to extract two gigalitres from a diminishing water resource.

**Response**

This query is addressed in Section 6.4.

**6.13.17 Olympia's Experience and Professionalism**

Community 60 questions the proponent's ability to undertake the project, stating that Olympia has no proven background in mineral sand mining yet they are embarking on a major project that drains into waterways of the fastest growing tourist resort areas of Western Australia.

**Response**

The proponent strongly disagrees with the above statements. The company's senior staff have many years experience in the mineral sands industry in Western Australia, and are competent, ethical operators.

**6.13.18 Olympia's Financial Situation**

Community 2, Community 60, and KNAG query whether Olympia have the financial resources to fulfil all the commitments. KNAG comments that the last capital raising from "sophisticated" investors was at a share value of 20 cents. Current trading of shares on the ASX is as low as 15 cents/share. Community 60 states that they have no contingency plan and

are financially inept to deal with unforeseen problems. Community 1 also comments that the absence of any financial test that would confirm Olympia's capacity to mine responsibly, and to rehabilitate in a timely way during the mining operation and post mining. Community 60 also asserts that inaccurate and flexible figures have been provided to the EPA, community and financial sector.

**Response**

The proponent, the ASX, shareholders and the Company's bankers are confident that the proponent has the financial resources to successfully carry out the project and fulfil the commitments made. The proponent strongly disagrees with the final comment.

**6.13.19 Different Information**

KNAG, Community 71 and Community 2 question the proponents credibility, commenting that the proponent has provided different and evasive information at different times, e.g. the working area of the mine shown in the maps in the PER have been altered, the mine plan presented by Olympia at community meetings is different to that in the PER. At the community meetings, Olympia gave evasive answers to the local residents. It is no wonder the residents are distrustful. KNAG adds with a history of misleading the audience most of the community is completely distrustful of anything that the company says and have shown little interest in the misleading public displays in which the figures presented differ from what was shown in the PER documents.

Community 1 questioned the absence of any financial testing that would confirm Olympia's capacity to mine responsibly, and to rehabilitate in a timely way during the mining operation and post mining.

**Response**

In response to feedback from the community expressing concern with the transport route outlined in the PER, the company put forward an alternative transport route at one public meeting and four open days to assess community preference.

The rehabilitation plan displayed at the same venues was the penultimate version of the plan in the PER, which had been enlarged to provide easier viewing.

The mine plan shown at the open days display is the same as that in the PER. An updated illustration of the proposed mine had been completed subsequent to the PER release to provide the public with a better understanding of the Keysbrook site.

The proponent disagrees that evasive or misleading information was provided. Samples of information provided to the community at public meetings is included as Appendix 2 to this document.

The proponent disagrees with the statement that most of the community is completely distrustful of anything that the company says. It is acknowledged that the community group KNAG is distrustful of anything that the company says.

### 6.13.20 Duty of Care

KNAG queries the credibility of the proponent, as follows: the company has no mining record in Australia. Therefore, it has no systems and procedures in place to ensure that the management plans in the PER are actually carried out. KNAG further states that in a release to the ASX 16 March 2006 Olympia details how it plans to buy Zircon from artisanal miners in Kalimantan. The zircon is to be extracted from gold tailings. What is not stated are the likely contaminants of mercury, cyanide and arsenic that would be associated with these tailings. This part of the world has been devastated by illegal logging and mining. For a company to promote the reworking of these contaminated gold tailings by indigenous people using unsafe methods would suggest a lack of “Duty of Care” that would not be welcome in the Australian Mining Industry

#### Response

The proponent strongly disagrees with the above statements. The company’s senior staff have many years experience in the mineral sands industry in Western Australia, and are competent, ethical operators.

The artisan miners in Kalimantan do use mercury to extract the gold. This process has been used by the artisan miners since they have been mining for gold. The mercury is used to concentrate the gold from the sand. The mercury is then separated from the gold by heating the mercury/gold mixture at a temperature which evaporates the mercury from the gold.

Since its recent involvement in the region, the proponent has stated its intention to introduce to the miners a simple, but effective means by which the mercury can be re-collected and re-used, which will reduce or eliminate any current mercury contamination. This simple contribution plus the introduction of training for the artisans will vastly improve the health and environmental conditions in the region of Kalimantan in which Olympia operates.

### 6.13.21 Landholder Agreements

KNAG comments that the PER has been submitted by a mining company that does not own the minerals within the mining lease and has not completed compensation agreements with the landholders that do. It is impossible to seek EPA approval for this project when it relies on modelling surveys to position mine infrastructure; water bores and haul roads if they may never have access to the land. It is further impossible to talk about redirecting watercourses and linking vegetation corridors if they do not have contiguous access to the land. The negotiations with the land holders are described as advanced, however, due to the rapid increase in the real estate value of the land it would appear that many of the negotiations have not only stalled, but have broken down.

#### Response

The proponent disagrees with the assumptions made in this statement.

The Keysbrook site falls within an area of old land titles, traceable back to the original ‘Peel Estate’ pre-1899 land titles. As such, mineral rights, other than for the ‘Royal minerals’ (platinum, gold and silver), belong to the owner of the land rather than to the State. All landowners whose properties appear in the PER have given permission for the proponent to

include their property in the PER. Negotiations with the landowners involved is ongoing, and is confidential.

### 6.13.22 Public Notices

KNAG comments that examples of Olympia Resources Limited Media Statement and announcements: All public notices advertising the PER were placed without the Olympia Resources Limited logo. What have they got to hide???

#### Response

The public notices advertising the PER followed the template provided by DEC.

### 6.13.23 Mature Tree Removal

KNAG comments that in a Serpentine-Jarrahdale Examiner Newspaper Article (3rd August 2006) "Vegetation to be cleared for mineral sands plan". Olympia Resources Limited spokesperson claimed that only 100 trees that would date back more than a century would be bulldozed. A conservative estimate is 4,500 trees greater than 100 years old.

#### Response

The proponent has used area of trees, rather than a count of individual trees, to calculate the area to be mined and the area to be rehabilitated.

### 6.13.24 Company Personnel

KNAG asserts that the company claims to have personnel with a long history of experience. Is it possible that these people are at the end of their working life, have migrated to the fringe of the mining industry and are hoping to cash in on the current commodity boom before retirement? Would this leave the company devoid of experienced people before the project is completed?

#### Response

The proponent strongly objects to the above statement.

### 6.13.25 Rehabilitation

KNAG comments that at the public display at Keysbrook and North Dandalup, examples of rehabilitation at South Dandalup Dam showed complete reforestation of the area whereas Olympia Resources Limited plans no such thing.

#### Response

The example of rehabilitation at South Dandalup Dam displayed at the four open days in Keysbrook and North Dandalup was clearly captioned, on an A4 sheet, as follows: *"TEN YEARS ON... Examples of successful mine site rehabilitation can be seen in many locations, and in many soil and climate types. These photographs, taken ten years apart, show rehabilitation of a mine site to Jarrah forest at the South Dandalup Dam. Examples of successful rehabilitation of mine sites to farmland can be seen throughout the south-west."*

### 6.13.26 Community Relations Officer

KNAG comments that at a public meeting held 14th February 2006 arranged by the Dandalup and Districts Community Association a presentation by Olympia's community relation's officer, Sandra Jamieson was given. There were a total of 14 questions put to her about the project KNAG further states 'the only answer she gave was later found to conflict with what the company was telling the ASX.'

#### Response

It is incorrect to state that only one answer was given. Answers were provided to the majority of questions asked, although the stated purpose of the meeting was to gather community input.

An unintentional error was made by Sandra Jamieson who answered a question regarding the Company's activities in Pinjarra. This was acknowledged by the company in March 2006 when the error was brought to its attention, and an explanation was tendered in writing by the company's Managing Director. This letter was mailed both to the person who had asked the question, Ms Annette Bain, and to the Chair of the Dandalup and Districts Community Association with a request to table the document at their next meeting for the information of those attending. Additional information relating to this submission is contained in Appendix 2.

### 6.13.27 Olympia Handout October 2005

KNAG commented that on the back page of an Olympia handout Oct 2005, a picture of a "rehabilitated lake" is shown. In words of State Opposition Environment Minister Steve Thomas (who lives in the area) "that's a dead lake" i.e. the water quality is unsuitable for any biodiversity.

#### Response

This comment is noted.

### 6.13.28 Depiction of North Dandalup

KNAG states that in the Environmental Scoping document Dec 2005 (draft 2, fig 3); landowner boundaries are incorrectly located by almost one kilometre. This is an attempt to compress the apparent size of the project and move it away from North Dandalup town site. KNAG further states that "Hopelands and Redheads Roads are two unsealed roads, west and south of the project'. Hopelands Rd has been sealed for at least 25 years. This was an obvious attempt to display North Dandalup as some rural backwater.

#### Response

The information was corrected in the subsequent draft of the Scoping document.

The proponent disagrees with the statement that "this was an obvious attempt to display North Dandalup as some rural backwater'. It is not an intention of the proponent to provide misleading information.

### 6.13.29 PER Numbering System

KNAG critiques the Executive Summary in the PER stating that the numbering system of PER CD Version is different to that of the hard copy version.

#### Response

The proponent was unable to identify the numbering differences referred to.

### 6.13.30 Incomplete Community Consultation

KNAG comments that of the 16 other mineral sand deposits seeking development in Australia, this has the lowest grade, smallest capital expenditure and is the only one located in the growth corridor of a metropolitan area, and that the bauxite mining is hidden behind the Darling Scarp 10's of kilometres to the east. Community 2 states that the Shire of Serpentine-Jarrahdale has a "No Mineral Sand Mining" policy, which it has had for a number of years to prevent the degradation caused by this type of mining. Community 1 states that the Dandalup & Districts Community Association Inc has been omitted from Section 6.3 Consultation Programme, Table 27. Concerns and questions raised at a community meeting on the 14 February 2006 (submitted to Olympia 20/02/06 and not answered to date) are not included in Section 6.4, Table 29.

#### Response

These comments are noted.

The complete response to community questions is attached as Appendix 2 of this document.

### 6.13.31 Appeals Process

KNAG points out that normally a mining proposal of this magnitude would be subject to the appeals process of the Mine Warden's Court. However, because of a technicality with the land titles, this process has been bypassed.

#### Response

The appeals body in the case of the Keysbrook project, when approval is sought via local Government is the State Administrative Tribunal.

### 6.13.32 Project Viability

KNAG, Community 2 and Community 1 comments that the comparison with other sand mining operations fails to highlight the massive aerial extent for such a low-grade deposit. Further, most mineral sand deposits are narrow high-grade strand deposits, not massively broad acre, low grade, strip mining operations like this proposal. The Conservation Council, also notes that the quality of the ore deposit is very low for the extremely high environmental impacts 115,000 tonnes of heavy mineral concentrate of variable quality is recovered from approximately 4,250,000 tonnes of ore each year, at an average concentration of 2.7%.

**Response**

The proponent has made no comparisons with other sand mining operations in the PER. Mineral concentrations vary widely between ore deposits. It is not relevant to compare the Keysbrook deposit with other deposits.

Mineral Sands deposits occur in different forms. The narrow deposits referred to in the submission above are strand lines. Strand lines are fossil beaches, which record the position of the shore-line of that part of Australia at various times in the geological past. The heavy minerals occur in high-grade deposits at the base of the strand lines. Strand lines may be 100 to 400 metres across, but individual deposits can be up to five kilometres long. They are buried to depths up to 30 metres. The Keysbrook deposit is a dunal deposit, which consists of sands washed or blown then deposited in dunes from the heavy minerals strand deposits over many years.

**6.13.33 Kangaroo Population Size**

KNAG stated that at a KNAG Public Meeting on 26 July 2006 Paul Rokich of MBS Environmental stated that there were only about 30 or 40 kangaroos in the mining lease. A licensed shooter routinely shoots this amount on a single night on one property. Most landholders will testify to counting 70 kangaroos in a single mob.

**Response**

See response 6.3.22.

**6.13.34 Population Pressure**

KNAG states that population pressures forced mines from Australia's eastern coast.

**Response**

Mineral sands mining has been operating in Western Australia for 50 years. Mining began in WA in 1956 at Koombana Bay (Bunbury) followed by five other deposits in the Capel area in the next ten years (Ref. CMEWA). The proponent disagrees with the statement.

**6.13.35 Bond**

KNAG states that there is no mention of any bond money to be kept in reserve. Even a slight blow out in costings could bankrupt this junior company and it would be unable to meet its rehabilitation commitments. Who pays for the clean up?

**Response**

Rehabilitation bonds can be set in conjunction with other approval processes. The question is also addressed in response 6.2.29.

**6.13.36 Appendix 3 of the Groundwater Report**

KNAG and Community 60 state that in the PER Appendix 4 of the Ground Water study the image clearly shows an illegal drill traverse by Olympia across private land.

**Response**

This is incorrect. No illegal drilling has been conducted by the proponent. Figure 3 Appendix 2 of the Ground Water Report is included for the purpose of illustrating the relative positions of monitoring bores, licensed draw-points and exploration drilling locations. It is a composite of maps with different reference points, resulting in the drill holes appearing slightly south of their actual position. In addition, to make the exploration drill-points visible on a map scaled 1:25,000, the points are significantly enlarged. The map is for illustrative purpose and is within the +/- 10 metre accuracy level for maps of 1:25,000 scale.

**6.13.37 Restriction to Future Urban Development**

Community 2 comment that the land to be mined is too close to the metropolitan area, and on an urban development corridor, due to proximity to the railway and the South Coast Highway. After the eight year life of the project, we could find that we have a sand mine in suburbia. If it goes ahead it may open the floodgates for further sand mining along the coastal strip within the metro area as well as to the north and south. The PER appears to ignore the potential impact of the proposal on possible future development in the area over the next decades. Nearby Mandurah has grown beyond expectation in the recent past and it seems certain that this will be followed by the development of Pinjarra, North Dandalup, Keysbrook and surrounding areas. Community 1 stated a similar point, that Mandurah is the fastest growing area in Australia and there are massive developments planned in the immediate future.

**Response**

The proponent is aware of the rapid increase of housing development and real estate subdivision in the region. This is addressed in Section 5.11 of the PER.

**6.13.38 Nearby Landholder Health**

KNAG comments that land holders with health problems or wanting to retire are unable to sell their properties at expected returns, and land holders with specific health problems or who are shift workers would be directly affected by mining. Community 2, comments that to minimize impact on a local resident who suffers from sleeping conditions, operations near her residence should cease from 11:00pm to 6:00am. The link to Atkins Road should be located as far away as possible from her residence.

**Response**

The proponent has held conversations with neighbouring landholders with specific health issues and with those who are shift workers. Communications will be ongoing. Solutions best meeting the needs of each individual will be negotiated. Item **Error! Reference source not found.** also addressed this issue.

**6.13.39 Ore Grade**

Community 2 submission stated the proposed deposit is an old dune system. The mineral content is about a quarter of the other style of deposit and spread over a much wider area. In



this case it will be mined across an area of 9,000 metres long and 5,000 metres wide to a depth of five metres.

**Response**

The PER, Table 7 shows the average ore grade for the deposit as 2.7%. The total mine area covers 1,218 hectares, with an average mine depth of two metres, but ranging from a minimum mine depth of one metre to a maximum mine depth in the dunal rises of five to six metres.

**6.13.40 Fire Risk**

Community 2 states the area is fire prone.

**Response**

The comment is noted. Firebreaks will be maintained around paddocks and work areas to statutory requirements.

**6.13.41 Predominant Land Use**

The PHCC submission requested to please note that the land within the mine area is NOT predominately used for dairy cattle grazing as is repeatedly stated throughout the PER. There has been a substantial decline in our catchment of dairy cattle grazing since deregulation of the Dairy Industry in July 2000. We suggest the predominant land use is best described as beef cattle grazing.

**Response**

A number of the properties in the immediate vicinity of the mine area graze dairy cattle. References in the PER include dairy cattle grazing, beef cattle grazing, and a small area of intensive horticulture as agricultural land uses in the local area.

**6.13.42 Nearby Ore Deposits**

The Community 1 submission stated that Olympia stated in an earlier EPBC Referral to the Department of Environment and Heritage on 3rd June 2005, under section 2.6 asking if this action relates to other actions in this area, they stated that: 'There are several undeveloped mineral sand deposits located within eight to 15 kilometres of the proposed project area.' Considering Olympia holds the majority of these pending mining leases all the way to Baldivis, this is hardly a reason to assume that this is a potential mining area.

**Response**

Section 2.6 of the EPBC referral states:

(Question): Indicate whether, and in what way, the action is related to other actions or proposals in the region.

(Response): There are several undeveloped mineral sand deposits located within eight to 15 kilometres of the proposed project area. The nearest operational mineral sand mine is located near Dardanup which is some 105 kilometres south of the Keysbrook area.

The Keysbrook project has a current proven resource of 1,234,000 tonnes of heavy mineral sands. The proponent's base plans are to build and operate a wet heavy mineral concentration plant within the project area and transport concentrate to a dry mineral separation plant located nearby. However as an alternative to reduce the initial capital outlays and maximise shareholder returns, Olympia Resources is investigating the following options:

- Selling heavy mineral concentrate to existing producers for dry separation into mineral components.
- Toll treating heavy mineral concentrate through existing mineral separation plants.
- Building a relatively simple separation plant to produce titanium minerals (ilmenite, leucoxene and rutile) and selling zircon concentrate or toll treating zircon concentrate through an existing producer's separation plant.

#### **6.13.43 Public Opposition 2**

KNAG comment that on 26 July 2006, KNAG meeting between 80 and 90 people attended and the vast majority were unconvinced by Olympia's answers and remained firmly opposed to the mining proposal.

##### **Response**

As acknowledged above, the meeting on 26 July 2006 was a meeting organised and promoted by KNAG. As such, the proponent considers it represented members of the local community and people from neighbouring towns such as Mandurah and Jarrahdale who are opposed to the project, and did not include a representative cross-section of the local community. Through community consultation, the PER process and public information programs, Olympia hopes to resolve any concerns the community may have with the proposed mine. We acknowledge that it is not always possible to resolve every concern.

#### **6.13.44 Lack of Community Concern**

KNAG comments that the failure to even mention the township of North Dandalup in the Executive Summary of the PER highlights the lack of concern shown by the company, towards the community.

##### **Response**

The proponent disagrees with the above assertion. The statement is addressed in responses 6.10.2 and 6.13.13.

#### **6.13.45 Degraded Bushland**

KNAG comments there is less than 3% remnant coastal Jarrah bushland on the Swan Coastal Plain and asserts that if a farmer with remnant vegetation over a sand dune (that's where the best Jarrah bushland is) wishes to sign up for sand mining, all he has to do is graze out the

understorey. This remnant vegetation is then mapped as “Degraded Bushland” and can then be mined.

**Response**

The proponent does not agree with the statement.

**6.13.46 Proposed Mine Plan**

Community 60 states that the working area of the mine shown in the maps in the PER have been altered and that the time frames for the working life of mine change, and do not add up.

**Response**

No details are provided in the submission. The proponent is unsure what the submission is referring to.

**6.14 TRANSPORT****6.14.1 Alternative Haulage Routes**

There were a number of submissions dealing with aspects of product haulage and the haulage route.

Transport submissions from Community 1, Community 2 and KNAG raised a number of issues including road haulage of concentrate fails the “preference for rail transport policy”, interaction with school bus routes, alternative haulage routes, but these have not been included in the PER and the shire requirement for sealing Atkins Road to reduce dust when transporting. The EPASU comment that the haulage route must be confirmed.

**Response**

Section 3.2 of the PER (Transport) addresses the rail verses road alternative. The product stockpiling facilities do not currently exist at a local siding. Even if such facilities were constructed, this does not remove the need for truck transport of product on local roads, travelling from the mine to the siding, rather than from the mine to the South Western Highway. The rail option would result in dramatically increasing the number of trucks on local roads. To transport the 315 tonnes per day (2,200 tonnes per week) of HMC requires six to seven 50 tonne (double road train) trips. To transport the same quantity to a local rail siding, single semi trailers would be used, carrying approximately 25 tonnes per load. This effectively doubles the number of truck movements on the local roads.

The three roads linking the mine area to the South West Highway are Elliott Road, Page Road and Readheads Road. All are on school bus routes, although Readheads and Elliott roads have more than one bus. The school buses also travel on the South Western Highway which contains significantly higher vehicle traffic count than the local roads. The short period in the morning and afternoon that school buses traverse the 700 metre section of Readheads Road between Atkins Road and the South Western Highway will be noted. Trucks will be scheduled not to exit the site during this period.

Olympia raised the issue of alternative transport routes at public meetings to gauge if the community had a particular preference for a transport route. No clear preference of one route over another was expressed. The route shown in the PER is Atkins road to Readheads Road and then to the South Western Highway. This remains the preferred route. Upgrading the roads to the standard required by the Shire of Murray will be undertaken.

#### **6.14.2 Dangerous Haulage Route**

KNAG, Community 60, Community 1, Community 2 and Community 71 submissions expressed concern that the transport route for the trucks is along Atkins Road which is one of the few low traffic gravel roads left that can safely be used by walkers, joggers, cyclists and horse riders. It is also used for the transport of slow moving farm machinery between properties. Atkins Road itself is clay and gravel and would not take the pressure of constant heavy truck movements. Readheads Road is narrow with clay and gravel edges which would also disintegrate with heavy truck usage. It is also the route for the school bus.

##### **Response**

The 12 to 14 vehicle movements per day are not anticipated to result in a significant safety impact to other road users. Roads will be upgraded to provide a safe trafficable surface.

Other issues are addressed in response 6.14.1.

#### **6.14.3 Road Upgrades**

The Community 1 submission stated that Olympia intends to request the Murray Shire to upgrade Atkins and Readheads Roads and Main Roads to upgrade the South West Highway turnoff. Readheads Road is heavily tree lined with some very large old trees which overhang the road giving it an 'avenue' effect. If the road were widened, many of these trees would have to be removed. It also has several large culverts under the road and deep drains running parallel with the road and as it is undulating, would require building up in the hollows. This expense would increase the rates for the local residents, or mean the deferment of other more urgent works in the shire. Community 2 expressed similar concerns for the use of access roads to South West Highway as heavy haulage routes, especially Westcott Road.

##### **Response**

The upgrade of local roads is addressed in response 6.2.24. Olympia will fund the cost of the road upgrade to the Shire's standard. The road entry and exit point onto the South Western Highway will be upgraded to Main Roads requirements.

#### **6.14.4 Ore Concentrate Transport**

The KNAG and Community 1 submissions raised the issue that some sections of the PER were not very clear and even copied from other companies. Sections of the PER state that the concentrate was going to be transported to the yet to be built plant at Picton. However Management Plan 2.4, Item 12.12, p20, states "Spillage from loads bound for Geraldton is negligible".

**Response**

The PER Section 3.2, Processing addresses the proposed secondary (dry separation) plant at Picton. Olympia Resources has since entered into a life of mine toll treatment agreement for the Keysbrook mine with Cable Sands. Under the agreement, heavy mineral concentrate produced at Keysbrook will be trucked to Bunbury for processing at Cable Sands' existing plant and then shipped directly from the Port of Bunbury.

This removes the need for Olympia to construct another secondary processing plant in the Bunbury area. The haulage of HMC from the mine will follow the same route, (i.e. down the South Western Highway), but now going the Cable Sands plant in Bunbury, rather than a location in Picton.

The typographical error of Geraldton is noted. This is also addressed in response 6.9.7.

**6.14.5 Truck Movements**

The North Dandalup P & C, Community 1 and Anonymous 1 submissions comment "we were advised that Olympia will have a haulage route through North Dandalup to Pinjarra. This obviously raises concerns for numerous reasons, the main being the safety of our children on the roads, especially the children venturing to the BMX track and park on Railway Ave, North Dandalup. The proposal by Olympia is not just one or two truck movements but sixteen per day. As we have been advised by Olympia at the town meeting Tuesday 25th July, not only truck but they will be towing trailers as well. The noise of these vehicles we feel will also pose a problem to the residents on the proposed routes".

KNAG comments on the impact of increased traffic movements through towns from Waroona south that already have increased truck movements from Iluka's mines north of Waroona and at Wagerup.

**Response**

PER Table 44 provides traffic counts of heavy vehicles currently using South Western Highway. It is not considered the 12 - 14 extra vehicle movements will create any additional significant impact.

Olympia Resources have sought advice from Main Roads. A written response has been received that confirms the South Western Highway is currently available for 27.5 meter combinations at VSR weights. Main Roads acknowledge there is community concern on the volume of heavy vehicles using the highway. At this point in time, further action from Main Roads is not required until agreement is also obtained from the local government on haulage on local roads. Olympia will continue to liaise with both Main Roads and the local governments to obtain the required permits.

**6.14.6 Processing Plant Locations**

PHCC expressed concern the specific locations for the processing plant in each of the three proposed locations within the mine area should be clearly identified so potential impacts may

be assessed. The fact that there are likely to be three processing locations is not clearly detailed under c) or d) (pages 2 and 3.)

### **Response**

The locations are shown in Figures 4 and 22 of the PER. The plant locations are in cleared paddock areas.

## **6.15 WETLANDS**

### **6.15.1 Impact upon Ramsar Listed Wetlands**

The submission from CC expressed concern that comments on wetlands do not recognise the potential to impact on the Ramsar listed Peel-Yalgorup System, Becher Point Wetlands and Thompsons Lake; or the Peel-Harvey system, despite this being a controlled action under the EPBC act for this very reason.

### **Response**

The proponent considers the PER, additional site assessment and modelling work and the Water Management Plan sufficiently demonstrates that impacts as a result of the project are temporary, localised and not anticipated to extend beyond the boundaries of the mine area. There are no planned discharges that are considered able to transport materials to the Ramsar listed wetlands, shown in the PER Table 18 as being between 20 to 37 kilometres from the project site.

This is further addressed in the responses to submission on Groundwater; 6.4.3, 6.4.12, 6.4.15, Nutrients and Salinity; 6.6.1, 6.6.2 and Acid Sulfate Soils; 6.7.1.

### **6.15.2 Wetland Buffer Requirements**

The DEC Kwinana Peel Region, KNAG and SJLC submissions state the PER does not appear to have referred to the WAPC's *Guideline for the Determination of Wetland Buffer Requirements (Draft)*, in determining proposed buffers. KNAG, CC, SJS and also PHCC express concerns that the PER does not consider the presence of other "Conservation Category", "Resource Enhancement" or "Multiple Use" wetlands through the mine area. KNAG is concerned that areas of heavily grazed bulrushes are actually wetlands that are not mapped.

The PHCC adds that the PER fails to note that the Peel-Harvey estuary is Ramsar-listed as part of the Peel-Yalgorup system and that Nambelyp Brook is one of the most nutrient enriched catchments in the Peel-Harvey.

### **Response**

Wetland buffers are addressed in Section 5.8 of the PER. The reference cited; Balla, S (1994). *Wetlands of the Swan Coastal Plain: Their Nature and Management*. Vol 1. Water Authority of Western Australia and the Department of Environmental Protection, is also cited in the WAPC (2005) guideline. The following extract from the PER is relevant:

Balla (1994); page 69 describes a surface catchment buffer zone as “a zone of vegetation which begins at the transition from wetland vegetation to upland vegetation and extends radially outwards from a wetland and ends at the interface with another land use.” Thus, most of the examples described by Balla (1994) are for wetlands containing intact vegetation and surrounded by contiguous native vegetation. As shown in PER Figures 11, 12 and 13, the wetlands around the mine area are all within an agricultural landscape, with cleared pasture providing “another land use” both surrounding and within the wetland boundary.

The current grazing land use has no existing functional buffer for any of the former EPP wetlands (now Conservation Category wetlands). In response to submissions the proponent has increased buffers to the listed Conservation Category wetlands abutting the mine boundary to a minimum of 50 metres.

The proposed mine area contains and is adjacent to several wetlands classified as Conservation (C) wetlands in the Geomorphic Wetlands Swan Coastal Plain dataset. EPA (1993) describes wetlands in this category as “*possessing a high degree of naturalness*”.

However, site inspection of nominated wetlands indicates the current Conservation classification to be incorrect. Of the nine wetlands inspected, four were actually located on elevated sand dunes, and therefore been incorrectly mapped as wetlands, and five are heavily degraded by stock and do not exhibit a “high degree of naturalness”.

All these wetlands are located on private property, rural farmland, actively used for cattle grazing. There is no differential management being applied to the Conservation classification wetland areas by the property owner. The surrounding landform comprises parkland cleared pasture, mostly classified as Multiple Use wetlands, with some portions as Resource Enhancement

The DEC has published a protocol for requesting a modification to the dataset of geomorphic classification to wetlands. The DEC (2007) protocol states “*DEC is cognisant that wetland values or area can change, either through natural or anthropogenic processes, and that a dataset modification may be required. A modification to the dataset can be requested if it is considered that the management category or boundary of a wetland is incorrect, or has been altered. This protocol outlines the information that should be provided to DEC when requesting a modification to the dataset*”.

EPA Bulletin 686, also referenced as EPA (1993), contains specific information related to the limitations of the document in applying to wetlands on private land in rural settings. Empirically, it is difficult to see how different portions of the same farm paddock can be mapped as different categories, when no differential management is being applied by the landowner. In the current case, all the Conservation classification wetlands are being actively grazed by cattle, no areas have been fenced to exclude stock and the landowner applies the same rate of agricultural fertiliser over these locations as the rest of the paddock. It is considered none of these management factors are appropriate for the management objectives in Section 3.2 of Bulletin 686 for Conservation (C) wetlands which state “*to maintain and enhance natural attributes and functions*.”

EPA Bulletin 686 provides a classification system that converts the wetlands' natural and human-use values to a numerical score. This is then plotted on a graph, with different areas assigned to different management categories.

A review of the axes in both Graph 1 and Graph 2 in Bulletin 686 shows that the Human Use axis is totally irrelevant in defining a Conservation category wetland. Conservation category wetlands are defined solely on their Natural Attributes score. This is appropriate given their description which states *“these wetlands possess a high degree of naturalness”* (Bulletin 686, pg 5).

Wetlands in a rural setting are subject to factors that can dramatically reduce the Natural Attributes score. This includes degradation by stock grazing, past clearing and fertiliser application. It is difficult to see how wetlands in this situation can sustain a Conservation category status if they progressively lose their “high degree of naturalness”.

All the wetlands assessed have been degraded by agricultural practices and no longer possess the high degree of naturalness that define them as Conservation category wetlands. Depending on the severity of degradation, it is considered they should more correctly be classed as Multiple Use or Resource Enhancement, consistent with the mapping over the majority of the mine area and property areas beyond. It is considered none of the wetlands assessed can be justified as Conservation category wetlands. The proponent considers no buffer to paddock areas grazed by stock is necessary.

## **6.16 PROJECT DESCRIPTION**

### **6.16.1 Environmental Review and Management Programme**

The Community 1 submission states that due to the inadequacies of the PER document to date, the studies should be completed, resubmitted and be subjected to the higher level of assessment, namely an “Environmental Review and Management Programme”.

Community 2 and Community 71 expressed a similar view, that the proposal for this sandmining be subjected to the higher level of assessment, namely an “Environmental Review and Management Programme”.

#### **Response**

The proponent considers the PER and additional surveys adequately address the environmental issues raised by the project. The proponent considers the Public Environmental Review level of assessment is appropriate.

### **6.16.2 Phase Details**

The EPASU raised the issue that Olympia needs to clearly define the activities that represent the design, construction, operation and closure phases of the proposal



**Response**

Further clarification has been requested from DEC on the description of different project stages. These are detailed as follows:

*Site Construction*

Aspects included in site construction include the initial (one-off) activities associated with mobilising and assembling all the components of the wet processing plant, locating the portable site offices, lunch room, ablution facility screening plant, pumps, construction of any storage sheds, workshops and works associated with connection to mains power supply. This range of activities would normally be the subject of a Works Approval application.

*Site Operations*

Activities in this category are more related to the ongoing activities associated with the mining operations. This includes works associated with moving and relocating pipe lines and power services through the mine, progressive clearing and earthworks in advance of the mine pit and rehabilitation earthworks in completed areas,

**6.16.3 Legislation and Policy References**

The PHCC lists items of primary Legislation and policy that we believe the Olympia Resources Ltd PER document does not addresses with sufficient detail:

- a) Environmental Protection (Peel Inlet Harvey Estuary) Protection Policy (and reviews): not addressed as a reference in PER, p. 36-40, Table 6: "Legislation, Policies and Guidelines Applicable to the Proposal".
- b) *Aboriginal Heritage Act 1972*: especially with respect to the disturbance of waterways and wetlands to which the PER does not refer to at Section 1.3 q) on p.8.
- c) *Environment Protection and Biodiversity Conservation Act (1999)* (Cth) with respect to matters of National Environmental Significance including the Ramsar-listed Peel-Yalgorup System, Threatened Ecological Communities, threatened species including Carnaby's and Baudin's White-tailed Black Cockatoo and migratory species.
- d) Japan-Australia Migratory Bird Agreement and China-Australia Migratory Bird Agreement.
- e) *Western Australia Wildlife Conservation Act (1950)*: listed Threatened Ecological Communities, threatened and priority species.
- f) Environmental Protection Authority, 1992, Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 and the Environmental Protection Authority, 2004, Revised Draft Environmental Protection (Swan Coastal Plain Wetlands) Policy and Regulations 2004, Environmental Protection Authority, Perth, Western Australia.
- g) WAPC, 2005, Guideline for the Determination of Wetland Buffer Requirements: not used as a reference.
- h) Outcomes of Peel-Harvey Coastal Catchment Initiative Project and draft Water Quality Improvement Plan.

**Response**

The response to each point is as follows:

- a) This is incorrect. The reference Western Australian Planning Commission. Statement of Planning Policy (5AA Policy) 2.1. The Peel-Harvey Coastal Plain Catchment Policy (February 1992) is listed in the PER on Page 39.
- b) This is incorrect. *The Aboriginal Heritage Act 1972* is listed in the PER on page 37 and addressed in Section 10.1. A heritage survey of the site has been undertaken.
- c) This is incorrect. *The Environment Protection and Biodiversity Conservation Act 1999* is listed in the PER on page 36. Issues are addressed in Sections 5.8 (wetlands), 5.9 (flora) and 5.10 (fauna).
- d) This is incorrect. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) November 1983, Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA) February 1974 and Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA) October 1986 are listed in the PER on page 36 and addressed in Table 24.
- e) This is incorrect. The *Western Australian Wildlife Conservation Act (1950)* is listed in the PER on page 37 and addressed in Sections 5.9, 9.1 (flora) and 5.10, 9.2 (fauna).
- f) This is incorrect. The Revised Draft Environmental Protection (Swan Coastal Plain Wetlands) Policy and Regulations 2004 is addressed in the PER Section 5.8. On 23 August 2006 the Minister for the Environment announced he would not approve the revised draft Policy.
- g) The reference Balla, S (1994). Wetlands of the Swan Coastal Plain: Their Nature and Management. Vol 1. Water Authority of Western Australia and the Department of Environmental Protection was used. This reference is also used in the WAPC (2005) guideline.
- h) The reference cited was not specifically used in the preparation of the PER.

**6.16.4 Adjacent Vegetation Death**

The Community 2 submission stated that a claim by Olympia that mining can be done to within four metres of neighbouring shelterbelts is proven to be false, as the existing trees will eventually die.

**Response**

The statement made by the submitter is not made in the PER. It is unclear as to where and in what context the claim was made. Various earthworks, such as for road construction, are regularly undertaken in close proximity to trees without the death of the trees.

### 6.16.5 Recycling

The submission by CC states that the proponent should be recycling office and food waste wherever possible. It is also possible to recycle the poly pipe used for water supply. The proponent should commit to recycling all materials that can be recycled locally.

#### Response

Only minor quantities of office and food waste will be generated on site. The proponent will consult with the relevant local government within which it operates for the provision of a recycling service for office waste. Food waste and other non recyclable waste will be disposed through a commercial waste service provider. The poly pipe used for water supply will be reused throughout the mine life. At the conclusion of the project, all endeavours will be made to reuse, sell or recycle as much material as possible. This issue will be further addressed in subsequent revisions of the Decommissioning and Closure Plan.

### 6.16.6 General Concerns

Community 1 comment that before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba.

#### Response

The submission is very broad in description and contains very little specific details. The proponent considers each of the individual elements mentioned are addressed in the respective sections in this document.

## APPENDICES

## **APPENDIX 1: SUBMISSIONS RECEIVED**

| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reference |
|----------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| ASS            | CC          | A brief examination of the Department of Environment's own document 'Development of Sampling and Analysis Programs' (2001, p.8) indicates that initial DoE advice to the proponent was insufficient. The PER states, an additional sampling program complying with the DOE (2003) guidelines will be undertaken to provide more detailed results on these two areas. The results will be incorporated in to the final PER. The document is clearly the final PER and these results are not included.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 7 1     |
| ASS            | CC          | Any Management Plan must include an extensive network of site-specific groundwater and surface water quality and quantity monitoring bores at regular and varied depths through the soil profile across the entire site and beyond. These should be gridded throughout the mine site, and downstream and at regular frequent intervals across the Swan Coastal Plain in the interstices of Department of Water monitoring bores. These monitors will provide early warnings for an acid plume heading towards the precious Ramsar-listed Peel-Yalgorup Wetland System.                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 7 11    |
| ASS            | CC          | However, the testing regime for the presence of acid sulphate soils is grossly inadequate. The methodology of spot testing in areas that the proponent following Department of Environment advice, thinks are most likely to have potential acid sulphate soils has no scientific rigor whatsoever. Modern best practice standards for sand mines involve a grid drilling pattern over the entire mining area and the development of a management plan based on the solid knowledge obtained from this survey. The proponent has not even come close to meeting this standard, despite an acknowledged desktop assessed potential for acid sulphate soils.                                                                                                                                                                                                                                                                                                                                                                                      | 6 7 3     |
| ASS            | CC          | The actions recommended by MBS Environmental ie: "the preparation of an ASS management plan and the implementation of management actions to mitigate acidic impacts will be undertaken if monitoring shows threshold (trigger values) is recorded" are wholly inadequate. A precautionary approach must be taken in this instance. Acid Sulfate Soil Management Plans should be provided before any EPA Approval is granted. These should include 12 months data to verify background levels of pH, nutrients and salinity, as well as other relevant water quality and water quantity data. What environmental impacts will trigger management action? If a transient acid plume enters the surface water system, what can the proponent offer to ensure no environmental harm to biodiversity and ecosystems downstream of the mine-site? Appropriate management trigger points should be chosen using the precautionary principle. Rigorous and enforceable management actions should be identified.                                         | 6 7 3     |
| ASS            | CC          | The proponent's proposed management of a potential acid sulphate soils problem during operations is also unacceptable. It is also unacceptable to defer the production of an acid sulphate management plan until after the Public Environmental Review when this is one of the key damaging impacts of the proposal to Ramsar listed wetlands. It is unfair to ask the community to look at a proposal, or to give meaningful comment, when the management of the key impacts is ignored.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 7 3     |
| ASS            | CC          | The testing program conducted also deliberately occludes the scenario that will exist on this mine, whereby sand from different soil depths and from over a large area will be mixed together and then redistributed as tails. In this scenario any acid sulphate potential will be realized - due to the intensive mixing of soils, air and water – allowing the ideal conditions for oxygenation and acidification of moderate and low risk acid sulfate soils. Following this, the acidified soils will be spread over a large area. It can also be alleged that disturbance of the lower clay layers of the soil profile will reduce the acid buffering capacity of the soil, and in so doing not only create the conditions for the creation of acidic groundwater, but also facilitate the rapid infiltration and transport of the plume to receiving environments. Hence, it can be said that the mining methodology significantly increases the acid sulphate soils potential for acidification and subsequent acid groundwater plumes. | 6 7 4     |
| ASS            | Community 1 | There have been a very limited number of PASS samples in a small section of the proposed area, yet the PER admits to the variability of PASS in the soil profile and between samples (p68). There should have been more samples over a wider area to obtain a better understanding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 7 1     |
| ASS            | Community 1 | ASS sampling inadequate. The PER states, an additional sampling program complying with the DOE (2003) guidelines will be undertaken to provide more detailed results on these two areas. The results will be incorporated in to the final PER. The document is clearly the final PER and these results are not included. The measurement guidelines for an ASS sampling are a minimum of 2 samples per hectare. The proposed mining area is 1234 hectares but only a mere 6 hole samples were tested for ASS, which is totally inadequate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 7 1     |
| ASS            | Community 1 | When mining operations are restricted due to prevailing conditions the company has not addressed the issue of stockpiling material. Olympia states in the PER and advertising to landholders that - there is very little rock and only minimum clay in this ground, which is totally incorrect. In their 2005 shareholders update, they state that the Keysbrook mine is - low clay and has no rock. Olympia should have questioned the local farmers about the ground and other conditions. People who have lived and worked the land in the area for years have an excellent knowledge.                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 7 10    |
| ASS            | Community 1 | There have been a very limited number of PASS samples in a small section of the proposed area, yet the PER admits to the variability of PASS in the soil profile and between samples (p68). There should have been more samples over a wider area to obtain a better understanding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 7 3     |
| ASS            | Community 1 | ASS sampling inadequate. The PER states, an additional sampling program complying with the DOE (2003) guidelines will be undertaken to provide more detailed results on these two areas. The results will be incorporated in to the final PER. The document is clearly the final PER and these results are not included. The measurement guidelines for an ASS sampling are a minimum of 2 samples per hectare. The proposed mining area is 1234 hectares but only a mere 6 hole samples were tested for ASS, which is totally inadequate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 7 9     |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Reference |
|----------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| ASS            | Community 1  | The depth, number and coverage of measurements of nutrient concentrations and Acid Sulphate Soils (ASS) risks fail recommended guidelines. There is no contingency plan to clean up any nutrient or ASS contamination.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 7 9     |
| ASS            | Community 2  | Olympia has done very little work to determine whether Acid Sulphate Soils (ASS) will be exposed. The implications regarding the generation of ASS for this proposal need to be seriously considered. The proposal plans to cut below the water table, and also cut into the Leederville Formation, which is an important aquifer in the Peel area, including the North Dandalup/Keysbrook area.                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 7 5     |
| ASS            | Community 53 | No mining should be allowed in or adjacent to high risk acid sulphate areas, as you are left with an intractable problem once the ASS are exposed to the environment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 7 3     |
| ASS            | Community 53 | There are no high risk areas marked in red, in Figure 18 of the PER, within the proposed mining area. It is assumed that the red marking comes from WAPC's Planning Bulletin 64.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 7 6     |
| ASS            | Community 53 | The drill sampling log in Table 12 of the PER identified sites 4 and 5 as high risk acid sulphate category, yet according to according to Planning Bulletin 64, the nearest high risk area was 2 kilometres and three kilometres away respectively.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 7 6     |
| ASS            | Community 53 | The extent of scientific investigation of possible ASS within the mine site is inadequate. A comprehensive grid pattern drilling program should be undertaken in each proposed mine pit area to ensure that they are not high risk acid sulphate areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 7 9     |
| ASS            | Community 60 | Possible acid plume release from acid sulphate soils                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 7 5     |
| ASS            | DEC - LWQB   | The proposed mining area involves 1,234 ha consisting mainly of shallow sandy dunes averaging depth at 2.0 metres below ground level (mbgl) to a maximum depth of 5.0mbgl. Generally much of the landscape in the area is classified as "medium to low risk" where ASS layers are predicted at depths greater than 3.0mbgl. The proposed mineral sand mining is targeted at 2.0mbgl and previous investigation was targeted at 6 locations to a depth of 3.0mbgl. The laboratory results indicate that the sandy soils are low sulphide bearing.                                                                                                                                                                                                                                                                                                             | 6 7 1 1   |
| ASS            | DEC - LWQB   | ASS - bulking of samples may overestimate soil buffering capacity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 7 1 3   |
| ASS            | DEC - LWQB   | If mining is restricted to dry excavation within 2mbgl and above seasonal watertable, the risk is considered low. However LWQB understands that dewatering may be required in some areas and this issue has not been adequately addressed as the cones of groundwater depression is likely to extend to greater depths that may disturb the ASS layers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 7 1 6   |
| ASS            | DEC - LWQB   | Based on the current investigation it is difficult to predict where the discrete layers of sulphide minerals are deposited in a large landscape. In the absence of any field testing which is a useful indicator to locate potential or actual ASS deposits, a conservative approach is required of assuming that the soils are potential ASS. This will require the proponent to conduct field testing and laboratory testing as an ongoing basis to detect ASS.                                                                                                                                                                                                                                                                                                                                                                                            | 6 7 1     |
| ASS            | DEC - LWQB   | Without conducting a comprehensive site investigation and their reliance on only 8 soil samples, commencement of any site excavation in particular dewatering may represent a risk to groundwater quality and the receiving environment. Although the proponent is committed to prepare ASS management plan, LWQB is unclear how this will effectively deal with the issue when the associated risk is largely unknown.                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 7 1 3   |
| ASS            | DEC - LWQB   | Generally the approach taken to assess ASS risk is limited. Previous and current investigations had not followed the DEC's ASS Guidelines Series and only 8 bulked soil samples were selected for chemical analysis. Bulking samples may at times overestimate soil buffering capacity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 7 1 4   |
| ASS            | DEC KwP      | The proposal plans to monitor water quality and if found to exceed trigger levels, an ASS management plan will be developed. The DEC recommends that the MP be prepared prior to works because if trigger levels are exceeded how will appropriate measures be implemented if the MP has not been prepared.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 7 12    |
| ASS            | DEC KwP      | The PER stated that additional sampling will be undertaken to provide more detailed results. The DEC is concerned that this additional sampling has not been conducted. Furthermore, once conducted substantial amendment to the proposal may be required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 7 3     |
| ASS            | DOW          | Additional ASS tests committed to should be provided to DOW for comment. Baseline groundwater levels, pH and Total acidity should be undertaken prior to mining and a monitoring program implemented which includes contingencies to ensure acidification of the groundwater does not occur.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 7 2     |
| ASS            | KNAG         | KNAG (Appendix 2 by Ron Watkins). Features of the planned mining, such as the comprehensive recycling of process water, at least during summer, and the wholesale extraction and processing of the shallow sediments to the limit of mining, will facilitate management of any acidification generated in the disturbed sediment or the water circuit. The greater environmental risk arises from any potential acid sulphate soils (PASS) that may presently lie beneath the water table but will be exposed to atmosphere while occupying the unsaturated zone, at least temporarily, as a result of dewatering of the mining excavation. It is reasonable to consider that any substantial lenses of PASS present in the zone of groundwater depression generated during the mining process could pose a significant threat of groundwater acidification. | 6 7 1     |
| ASS            | KNAG         | The depth, number and coverage of measurements of nutrient concentrations and ASS risks are totally in adequate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 7 3     |
| ASS            | KNAG         | The ASS sampling is totally inadequate. The measurement Guidelines for an ASS sampling are a minimum of 2 samples/hectare. The proposed area to be mined is 1,234 hectares yet only results from 6 boreholes have been supplied; The strike length of the ore body is 9 kilometres long, yet the six holes only span 1½ kilometres of the strike length; The maximum mining depth is 5 metres and recommended sampling guidelines suggest sampling 1 metre below this depth. The 6 holes have only been sampled to a depth of 3 metres;                                                                                                                                                                                                                                                                                                                      | 6 7 7     |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reference |
|----------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| ASS            | Murray Shire | The applicant be required to submit an ASS assessment in accordance with the DEC's requirements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 7 1     |
| ASS            | PHCC         | The PER frequently refers to monitoring different activities, however, they have made little or no commitments about management options they have established in response to monitoring showing "trigger" levels. For example, p.16 "Soil – Predicted Outcome" para.3, "Management measures will be implemented if monitoring discharge water confirms acid generation is occurring" and p25, 9.4.4c, "Trigger levels of key parameters will be defined".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 7 12    |
| ASS            | PHCC         | Disturbance of Potential or Actual Acid Sulphate Soils (PASS; ASS) and the related impacts on water quality, aquatic communities and EPP, Conservation Category and Ramsar-listed wetland systems and also the impacts related to ASS management (e.g. offsite impacts to obtain limestone).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 7 8     |
| ASS            | SJS          | The Acid Sulphate Soils (ASS) investigation undertaken was extremely limited. Whilst it targeted the specific soil types likely to be encountered during the mining operations, it does not appear to conform to Department of Environment and Conservation requirements in terms of its intensity. Further intrusive work may be warranted in this regard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 7 1     |
| ASS            | WC           | ASS Management Plan should be prepared prior to prevent potentially unacceptable impacts associated with ASS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 7 3     |
| Clay           | CC           | Many sand mines require large areas of solar drying cells in order to manage the fine clays produced in the separation process. It is not clear why the Keysbrook clays will readily mix with the sand tails when this does not occur in other areas. What modelling and testing has been done to demonstrate that this will work on Bassendean soils? What impacts will this have on infiltration rates to the superficial and confined groundwater aquifers?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 2 14    |
| Clay           | CC           | Many sand mines require large areas of solar drying cells in order to manage the fine clays produced in the separation process. It is not clear why the Keysbrook clays will readily mix with the sand tails when this does not occur in other areas. What modelling and testing has been done to demonstrate that this will work on Bassendean soils? What impacts will this have on infiltration rates to the superficial and confined groundwater aquifers?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 2 25    |
| dandle         | Community 1  | Kangaroos do not need 'corridors' to move around a property. They only use the vegetation during the day for sleeping. Late afternoon they emerge into the open paddocks to eat grass, and return to the protection of the scrub the following morning. The destruction of remnant bushland will force the large kangaroo population onto neighbouring farms, causing damage to fences and crops. Associated kangaroo culling operations will result in hundreds of deaths. Olympia's plan is to 'rehabilitate' the trees and scrub into straight lines to 'function as corridor linkages' instead of parkland cleared. This corridor is to increase the mobility of fauna e.g. kangaroo traffic. Do they really think the kangaroos will stay on the site with people, noise, heavy machinery and vehicles everywhere? They will have moved into adjoining properties at the arrival of the first machine. Olympia states that they may 're-locate' them. This does not seem practical. Who is going to tackle a 6-foot boomer and put him in a truck? And where will they re-locate them to? | 6 3 22    |
| Dieback        | CC           | It is mentioned that dieback is present on the proposed mine site, and yet no quantitative information or mapping of dieback affected areas are shown, this will be a necessary component of the dieback management plan. The proponent's mining methodology will see the rapid spread of Phytophthora cinnamomi through the extent of the mine-site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 8 1     |
| Dieback        | CC           | There has been no assessment of fungi species present on site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 8 1     |
| Dieback        | Community 1  | There seems to be minimal effort in stopping the spread of Phytophthora dieback, instead assuming in most areas it was already there and will spread eventually anyway. Olympia's response is reactive rather than proactive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 8 1     |
| Dieback        | Community 1  | There seems to be minimal effort in stopping the spread of Phytophthora dieback, instead assuming in most areas it was already there and will spread eventually anyway. Olympia's response is reactive rather than proactive.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 8 9     |
| Dieback        | Community 60 | Spreading of Phytophthora cinnamomi dieback is not addressed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 8 7     |
| Dieback        | Community 65 | Quote: "Where surface water drainage requires diversion away from operational areas roads and other areas, the diversion shall be managed such that the surrounding vegetation is protected from long term inundation." Since dieback is spread by the movement of water, controls must be taken (i.e. ponding) to control the spread of water borne fungal spores through the wetlands system                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 8 4     |
| Dieback        | Community 65 | "Quote: "All mobile equipment shall be washed down and clean of earth and seeds prior to entry to the site". All mobile equipment and vehicles including private cars must be thoroughly washed down before entering and exiting the mine site to eliminate any possibility of spreading dieback to healthy vegetation in outlying areas. All the minerals are to be transported to Picton (Geraldton is stated in sections of the PER). If the vehicles are not properly washed, dieback could be spread for many kilometres.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 8 8     |
| Dieback        | DEC KwP      | Recommends vegetation offsets package to compensate for loss of Bassendean Complex central & south which is currently under the 30% biodiversity threshold. The DEC recommends that all vegetation identified as being in Good or better condition be retained                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 5     |
| Dieback        | DEC KwP      | PER; results confirm dieback disease is present in some upland sites of the mine area. Therefore a dieback management plan must be prepared and implemented which includes detailed dieback mapping of the site and management measures.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 8 1     |



| Specific Topic | Submitter     | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Reference |
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| Dieback        | KNAG          | In low-lying areas the resource thickness will be as thin as 0.5 metres yet there is a plan to place "any infected root material ... in low-lying landscapes" Table 4 point 3. This area is subject to sheetwash and there is no plan to buffer minor watercourses. This will result in the dieback fungi entering the wetland chain all the way to the Mandurah Estuary.                                                                                                                                                                                                                                                                                                                                            | 6 8 3     |
| Dieback        | KNAG          | Since dieback is spread by the movement of water controls must be taken (i.e. ponding) to control the spread of water borne fungal spores through the wetlands system. One tablespoon of fungus sets the dieback in motion.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 8 4     |
| Dieback        | KNAG          | The spread of Phytophthora cinnamomi (dieback) is partly by infected water and soil transportation. The increased mobility of the ground water after mining has increased permeability and the thousands of vehicle movements across the area will increase the spread of dieback.                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 8 4     |
| Dieback        | KNAG          | The Revegetation Plan needs to assess how dieback will be managed; how revegetation of local species will be achieved if dieback is spread through the mining process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 8 5     |
| Dieback        | KNAG          | The dieback management measures are presented in Table 4 of the Vegetation Management Plan. First impressions are that this plan should work. However the reality is, as late as May 2006, after this plan had been drawn up, a backhoe was observed leaving the resource area south of Redheads Road, after digging a large pit, in a dirty dusty condition. The backhoe, then drove along Atkins Road and re-entered the mining lease. There was no wash down facility on-site or in sight.                                                                                                                                                                                                                        | 6 8 6     |
| Dieback        | KNAG          | The PPG is adamant that all mobile equipment and vehicles including private cars must be thoroughly washed down before entering and exiting the mine site to eliminate any possibility of spreading dieback to healthy vegetation in outlying areas. All the minerals are to be transported to Geraldton. If the vehicles are not properly washed, dieback could be spread for hundreds of kilometres                                                                                                                                                                                                                                                                                                                | 6 8 8     |
| Dieback        | SJS           | <ul style="list-style-type: none"> <li>Given the possibility that dieback may be an issue for the site (and particularly in terms of rehabilitation) it will be important to use species for rehabilitation work that are dieback resistant and not just species that don't get the disease.</li> <li>Further dieback management work may be required, particularly in terms of additional onsite investigations and mapping as well as appropriate management</li> <li>Dieback may be present in the area and with the increased vehicle mobility this may cause a greater impact on the remnant vegetation. An appropriate management plan should be put in place before further onsite works commence.</li> </ul> | 6 8 2     |
| Dust           | Anonymous 1   | As parents of a small boy who suffers from severe asthma attacks we are extremely concerned at the fact we may be so close to the proposed final stage of the mine. We have been advised by Olympia of their methods to keep dust and sand distribution to a minimum, but remain extremely dissatisfied with their "studies" of the extreme easterly winds which occur in this area.                                                                                                                                                                                                                                                                                                                                 | 6 9 6     |
| Dust           | CC            | The possible effects of dust on remnant vegetation, on neighbouring pastoral and farming operations and the nearby townsites of Serpentine, Keysbrook and North Dandalup should be considered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 9 3     |
| Dust           | Community 1   | There is no on-site wind data presented in the report; instead they have used Perth Airport as the measure. They might as well have used Sydney. This shows how little Olympia knows about this area and the intensity of the gale force east winds that roll down the Darling Escarpment all summer.                                                                                                                                                                                                                                                                                                                                                                                                                | 6 9 4     |
| Dust           | Community 1   | Land clearing and mining simply cannot and should not be done during the spring and summer months because of the risk of east wind erosion. Landholders who have lived in the area for decades know that land cannot be cleared or ploughed once the ground dries and cover grasses stop growing, without risking massive erosion. Clearing when soil is dry risks causing erosion. The lack of an accurate topographic model and "on ground" mapping of wetlands prevents a valid rehabilitation programme. A satisfactory and agreed percentage of clay should be mixed with the original topsoil when replacing the soil in mined areas.                                                                          | 6 9 9     |
| Dust           | Community 112 | The PER is very light on detail and it is not possible to determine if the mitigation measures proposed to avoid environmental impacts will be successful if the measures are not adequately documented in the PER. For example, under the dust management plan it is stated that if dust levels exceed threshold values the proponent will take remedial action. The threshold values for nuisance dust levels are not documented and the monitoring techniques are not described so no assessment can be made as to their adequacy and the proposed remedial actions are not described in detail. Water sprays will not adequately control dust generation under high easterly winds during the summer months      | 6 9 3     |
| Dust           | Community 2   | The mine and processing plant will inevitably lead to pollution. Dust and fumes will be generated. It will also cause visual pollution, as main roads and the railway are very near to the mine excavation. The narrow strip of vegetation left in a few areas will not hide the environmental damage.                                                                                                                                                                                                                                                                                                                                                                                                               | 6 2 12    |
| Dust           | Community 2   | The mine and processing plant will inevitably lead to pollution. Dust and fumes will be generated. It will also cause visual pollution, as main roads and the railway are very near to the mine excavation. The narrow strip of vegetation left in a few areas will not hide the environmental damage.                                                                                                                                                                                                                                                                                                                                                                                                               | 6 9 3     |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reference |
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| Dust           | Community 2  | There must be a residual dust problem associated with a sand mine 300 metres from residences, and this dust residue will contain portions of the minerals that are being mined.<br><ul style="list-style-type: none"> <li>• The winds in summer are extremely strong and blow first from the East until about 10 am and then from the West from about 4 pm. The mine will be unable to control its dust emissions and will impact upon the nearby residents (from a reduction in air quality and rain water quality).</li> <li>• There are several references in the PER to locations remote from North Dandalup which would appear to indicate that sections of the document to do with dust and run-off management were taken from a previous document, i.e. there was no specific study undertaken for this project.</li> </ul>                              | 6 9 3     |
| Dust           | Community 2  | If the impact of the local wind conditions has not been fully investigated, then the planned water use may far exceed what has been predicted (in an effort to keep the dust down).<br><ul style="list-style-type: none"> <li>• In the warmer months of the year, a south west wind blows in the afternoon and evenings. This would mean that large quantities of soil, dust and pollutants would be blown into nearby properties.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 9 3     |
| Dust           | Community 2  | The data within the PER has been taken from Perth airport statistics. There is no evidence that the proposed mining area has similar wind conditions - no measurements have been quoted from the proposed mining area.<br><ul style="list-style-type: none"> <li>• The winds on the Coastal Plain in the proposed mining area are katabatic, and are notoriously strong and persistent.</li> <li>• The PER states that operations will cease if watering and other dust control measures are not sufficient (Dust management plan 12.6). There will be many days when the local wind monitoring feedback (high wind warning system - PER p26 9.9.4) indicates that mining operations should cease, and my concern is that this factor (many days when mining will/should cease) will prolong the presence of this mine beyond the predicted 8 years.</li> </ul> | 6 9 3     |
| Dust           | Community 2  | There must be a residual dust problem associated with a sand mine 300 metres from residences, and this dust residue will contain portions of the minerals that are being mined.<br><ul style="list-style-type: none"> <li>• The winds in summer are extremely strong and blow first from the East until about 10 am and then from the West from about 4 pm. The mine will be unable to control its dust emissions and will impact upon the nearby residents (from a reduction in air quality and rain water quality).</li> <li>• There are several references in the PER to locations remote from North Dandalup which would appear to indicate that sections of the document to do with dust and run-off management were taken from a previous document, i.e. there was no specific study undertaken for this project.</li> </ul>                              | 6 9 4     |
| Dust           | Community 2  | If the impact of the local wind conditions has not been fully investigated, then the planned water use may far exceed what has been predicted (in an effort to keep the dust down).<br><ul style="list-style-type: none"> <li>• In the warmer months of the year, a south west wind blows in the afternoon and evenings. This would mean that large quantities of soil, dust and pollutants would be blown into nearby properties.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 9 4     |
| Dust           | Community 2  | The data within the PER has been taken from Perth airport statistics. There is no evidence that the proposed mining area has similar wind conditions - no measurements have been quoted from the proposed mining area.<br><ul style="list-style-type: none"> <li>• The winds on the Coastal Plain in the proposed mining area are katabatic, and are notoriously strong and persistent.</li> <li>• The PER states that operations will cease if watering and other dust control measures are not sufficient (Dust management plan 12.6). There will be many days when the local wind monitoring feedback (high wind warning system - PER p26 9.9.4) indicates that mining operations should cease, and my concern is that this factor (many days when mining will/should cease) will prolong the presence of this mine beyond the predicted 8 years.</li> </ul> | 6 9 4     |
| Dust           | Community 2  | <ul style="list-style-type: none"> <li>• The proposal will create a large amount of dust that will impact the local residences.</li> <li>• The PER fails to address the severe winds that are common in the summer months in some of the areas.</li> <li>• Dust will be difficult to control. Olympia stresses that the topsoil will only be moved in calm conditions. Obviously when the surveys were done it was not summer time when the east wind can blow, non stop for days, taking all the top soil with it. The wind comes over the Scarp and picks up speed as it reaches the flats where the mine will be located.</li> </ul>                                                                                                                                                                                                                         | 6 9 9     |
| Dust           | Community 71 | The proposed operation will create a dust impact on the local community, even though Olympia has advised that dust would not be an issue as water trucks would be used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 9 3     |
| Dust           | Community 71 | The proposed operation will create a dust impact on the local community, even though Olympia has advised that dust would not be an issue as water trucks would be used.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 9 4     |
| Dust           | KNAG         | This report was so hastily prepared that they forgot to disguise the fact that it was simply copied from another company's work <b>Refer 2.4 Dust Management Plan 12.12 "spillage from loads bound for Geraldton"</b> . Surely this should be read Picton. There is no on-site wind data presented in the report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 14 4    |
| Dust           | KNAG         | Appendix Dust Management Plan. Table 7 Summary of Management Action proof that this report was simply copy and pasted from Eneabba.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 9 7     |

| Specific Topic                           | Submitter     | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Reference |
|------------------------------------------|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Dust                                     | Murray Shire  | Amend the dust management plan, particularly relating to the active mining areas where dust may affect nearby residences                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 9 3     |
| Dust                                     | PHCC          | The timing of the operation in regard to Land clearing is important to minimise wind erosion during summer and water erosion in winter. Timing in regard to mine pit locations is also important to ensure that any dewatering drawdown reflects the natural timing of such effects i.e. the lowest natural drawdown levels usually occur towards the end of autumn before the rains start to break the season. Top soil stripping needs to specify what "seasonal weather conditions" will constrain the times topsoil can be directly returned to completed areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 9 9     |
| Dust                                     | SJS           | The topography of the site is also likely to lend itself to potential exposure to relatively high wind speeds, and appropriate controls for dust management both during mining and during the ongoing rehabilitation onsite are employed. This will have implications for impacts offsite, as well as the success of the proposed rehabilitation works.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 9 3     |
| Electricity                              | DOW           | Page 58, section 9.6.4, the statement "Within the mine cell, where the pit floor will be within the minimum separation zone, the screening plant and all transfer pumps are electrically powered" should be included in Table 2, p. 25 under 9.6.4 (f). This is an important management action and should not be overlooked.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 4 15    |
| Emissions                                | CC            | It is completely unacceptable for a proponent to state, it is not anticipated that the additional greenhouse gas emissions resulting from this project will have an adverse impact on local or regional air quality. Global climate change due to greenhouse gases is a now a well recognised phenomenon that has stood up to decades of scientific rigour. Proponents should not be allowed to continue with the discredited practice of Climate Change Denial in EPA assessment documents. Greenhouse emissions should be quantified, and some quantifiable offset offered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 9 2     |
| Emissions                                | CC            | There would be a net loss to WA through increased greenhouse emissions and the usage of precious water supplies due to this project as it is currently presented.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 9 2     |
| Emissions                                | Community 112 | No assessment was made of greenhouse gas emissions over the life of the project and no information provided as to how the proponent will offset greenhouse emissions from land clearing. Using CO2 emissions rates of 10 tonnes/ha for pasture; 100 tonnes/ha for parkland cleared vegetation and 600 tonnes for remnant vegetation the greenhouse gas emissions when combined with indirect (electricity) and other direct (diesel emissions) emissions in total will easily exceed 100,000 tonnes CO2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 9 2     |
| Emissions                                | PHCC          | ...the proposal, if approved, should operate as a "carbon-neutral" mine. The PER needs to determine the carbon outputs of the entire mining process, including primary and secondary mineral processing and transport, and indicate how they will operate as carbon-neutral.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 9 2     |
| Emissions, multiple chemical sensitivity | Community 2   | Impacts on a community member who has Multiple Chemical Sensitivity. To minimise impacts, Olympia should have strict emission control on all of their vehicles. The resident has been assured by Olympia that mining will occur when the wind is blowing away from her residence, and that mining near her premise would be done during her evening shifts. The resident has requested that in the event that she is significantly adversely impacted by the mining operation, Olympia should relocate her.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 9 1     |
| Environmental Management                 | CC            | The Conservation Council also notes that the quality of the ore deposit is very low for the extremely high environmental impacts 115,000 tonnes of heavy mineral concentrate of variable quality is recovered from approximately 4,250,000 tonnes of ore each year, at an average concentration of 2.7%.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 13 32   |
| Erosion                                  | Community 1   | Olympia has indicated that stockpiling of ore will be considered and this is not included within the PER nor methods to prevent wind erosion.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 9 3     |
| Fauna                                    | CC            | Most of the surveys that are required to understand the impact of the proposal on fauna haven't been conducted yet. The PER should be re-submitted and re-advertised for public comment once the potential impacts of the proposal are known.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 3 1     |
| Fauna                                    | CC            | Much of the fauna survey information that should have been in the PER document is proposed to take place following the PER process. The PER should be re-submitted for public review once the impact on fauna is understood to a degree such that the public can have some reasonable chance of understanding the impact of the proposed mine on fauna.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 3 1     |
| Fauna                                    | CC            | Need a cockatoo Management Plan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 3 1     |
| Fauna                                    | CC            | Conservation Council concurs with the assertion that, although only a few potential nesting hollows were identified in the survey, it is likely that this is an incomplete list, as hollows are sometimes not visible from the ground. Given this, it is striking that no evidence has been provided to indicate an exhaustive study of potential breeding hollows has been conducted which would be a minimum requirement for assessment under the Commonwealth EPBC Act. The evidence of Baudin's Cockatoos feeding in the area should be given more weight. The sightings of Carnaby's Black Cockatoos by local residents are likely to be correct, as a small flock of white tailed black cockatoos were spotted during the Conservation Council site visit. There is no discussion of the effect of the proposed clearing on the other 39 bird species (some listed on JAMBA and CAMBA lists) of conservation significance in the PER. The possible effects on these species should also be considered. Only an initial fauna survey has been conducted. 3 amphibian species, one reptile species, 41 bird species and two mammal species is an excellent result from a two day survey. The proponent's PER states "High numbers of cockatoo sightings and evidence of the Southern Brown Bandicoot or Quenda...were | 6 3 19    |

| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Reference |
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| Fauna          | CC          | Conservation Council concurs with the assertion that, although only a few potential nesting hollows were identified in the survey, it is likely that this is an incomplete list, as hollows are sometimes not visible from the ground. Given this, it is striking that no evidence has been provided to indicate an exhaustive study of potential breeding hollows has been conducted which would be a minimum requirement for assessment under the Commonwealth EPBC Act. The evidence of Baudin's Cockatoos feeding in the area should be given more weight. The sightings of Carnaby's Black Cockatoos by local residents are likely to be correct, as a small flock of white tailed black cockatoos were spotted during the Conservation Council site visit. There is no discussion of the effect of the proposed clearing on the other 39 bird species (some listed on JAMBA and CAMBA lists) of conservation significance in the PER. The possible effects on these species should also be considered. Only an initial fauna survey has been conducted. 3 amphibian species, one reptile species, 41 bird species and two mammal species is an excellent result from a two day survey. The proponent's PER states "High numbers of cockatoo sightings and evidence of the Southern Brown Bandicoot or Quenda...were | 6 3 20    |
| Fauna          | CC          | Much of the fauna survey information that should have been in the PER document is proposed to take place following the PER process. The PER should be re-submitted for public review once the impact on fauna is understood to a degree such that the public can have some reasonable chance of understanding the impact of the proposed mine on fauna.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 3 3     |
| Fauna          | CC          | Most of the surveys that are required to understand the impact of the proposal on fauna haven't been conducted yet. The PER should be re-submitted and re-advertised for public comment once the potential impacts of the proposal are known.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 3 3     |
| Fauna          | CC          | The potential for impact on bats should be assessed. It is likely that the old trees across much of the vegetated area are utilised by bats as well as birds. Scarcity of information is not an excuse; this should be obtained by the appropriate surveys.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 6     |
| Fauna          | CC          | Most of the surveys that are required to understand the impact of the proposal on fauna haven't been conducted yet. The PER should be re-submitted and re-advertised for public comment once the potential impacts of the proposal are known.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 3 6     |
| Fauna          | Community 1 | The PER understates the fauna statistics, and some cases does not include species. • The fauna study would appear to be missing a number of species. Previous studies in nearby locations include the following number of species: Previous study: 64 Bird species including 4 CS1 species, 18 CS3 species 24 Reptile species, 5 Amphibian species, 3 Mammal species including 1 CS2 species. Olympia Study (Appendix 5): 41 Bird species including 1 CS1 species, 15 CS3 species; 1 Reptile species, 3 Amphibian species, 1 Mammal species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 3 1     |
| Fauna          | Community 1 | The fauna studies have not been completed and are absent from the North Dandalup area. Olympia's survey showed surprisingly few nesting hollows in trees. Surrounding properties with identical tree cover have trees that are full of hollows for both birds and possums. Cockatoo sightings are also subject to various times of the year, even times of the day. Obviously the survey was done when the cockatoos were elsewhere at the time. The clearing of 1,234 hectares of Jarrah and Marri trees will destroy nesting hollows used by cockatoos. The cockatoos will have to move to another location permanently. If Lot 56 (Mostert) and Lot 3 (Hill) were cleared, 500 plus kangaroos that use this bush as their habitat would put extra pressure on farmland pastured creating extra environmental problems from over grazing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 1     |
| Fauna          | Community 1 | The PER understates the fauna statistics, and some cases does not include species. • The fauna study would appear to be missing a number of species. Previous studies in nearby locations include the following number of species: Previous study: 64 Bird species including 4 CS1 species, 18 CS3 species 24 Reptile species, 5 Amphibian species, 3 Mammal species including 1 CS2 species. Olympia Study (Appendix 5): 41 Bird species including 1 CS1 species, 15 CS3 species; 1 Reptile species, 3 Amphibian species, 1 Mammal species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 3 12    |
| Fauna          | Community 1 | Cockatoo are not the only birds to use the remnant vegetation for nesting, and the removal of so much vegetation will severely impact on all of these. Birds tend to be territorial and will use the same tree for years. The complete destruction of all mature Jarrah and Marri trees means that there will be no nesting hollows for several hundred years across a 1200 hectare area. Flocks of between 50 and over 100 White-tailed Cockatoos have been sighted in the area. Baudin's Cockatoos and Carnaby's Cockatoo's have been identified in the vicinity of project area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 3 19    |
| Fauna          | Community 1 | The fauna studies have not been completed and are absent from the North Dandalup area. Olympia's survey showed surprisingly few nesting hollows in trees. Surrounding properties with identical tree cover have trees that are full of hollows for both birds and possums. Cockatoo sightings are also subject to various times of the year, even times of the day. Obviously the survey was done when the cockatoos were elsewhere at the time. The clearing of 1,234 hectares of Jarrah and Marri trees will destroy nesting hollows used by cockatoos. The cockatoos will have to move to another location permanently. If Lot 56 (Mostert) and Lot 3 (Hill) were cleared, 500 plus kangaroos that use this bush as their habitat would put extra pressure on farmland pastured creating extra environmental problems from over grazing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 20    |
| Fauna          | Community 1 | Cockatoo are not the only birds to use the remnant vegetation for nesting, and the removal of so much vegetation will severely impact on all of these. Birds tend to be territorial and will use the same tree for years. The complete destruction of all mature Jarrah and Marri trees means that there will be no nesting hollows for several hundred years across a 1200 hectare area. Flocks of between 50 and over 100 White-tailed Cockatoos have been sighted in the area. Baudin's Cockatoos and Carnaby's Cockatoo's have been identified in the vicinity of project area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 3 20    |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Reference |
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| Fauna          | Community 1  | The fauna studies have not been completed and are absent from the North Dandalup area. Olympia's survey showed surprisingly few nesting hollows in trees. Surrounding properties with identical tree cover have trees that are full of hollows for both birds and possums. Cockatoo sightings are also subject to various times of the year, even times of the day. Obviously the survey was done when the cockatoos where elsewhere at the time. The clearing of 1,234 hectares of Jarrah and Marri trees will destroy nesting hollows used by cockatoos. The cockatoos will have to move to another location permanently. If Lot 56 (Mostert) and Lot 3 (Hill) were cleared, 500 plus kangaroos that use this bush as their habitat would put extra pressure on farmland pastured creating extra environmental problems from over grazing. | 6 3 22    |
| Fauna          | Community 1  | Cockatoo are not the only birds to use the remnant vegetation for nesting, and the removal of so much vegetation will severely impact on all of these. Birds tend to be territorial and will use the same tree for years. The complete destruction of all mature Jarrah and Marri trees means that there will be no nesting hollows for several hundred years across a 1200 hectare area. Flocks of between 50 and over 100 White-tailed Cockatoos have been sighted in the area. Baudin's Cockatoos and Carnaby's Cockatoo's have been identified in the vicinity of project area.                                                                                                                                                                                                                                                          | 6 3 22    |
| Fauna          | Community 1  | The fauna studies have not been completed and are absent from the North Dandalup area. Olympia's survey showed surprisingly few nesting hollows in trees. Surrounding properties with identical tree cover have trees that are full of hollows for both birds and possums. Cockatoo sightings are also subject to various times of the year, even times of the day. Obviously the survey was done when the cockatoos where elsewhere at the time. The clearing of 1,234 hectares of Jarrah and Marri trees will destroy nesting hollows used by cockatoos. The cockatoos will have to move to another location permanently. If Lot 56 (Mostert) and Lot 3 (Hill) were cleared, 500 plus kangaroos that use this bush as their habitat would put extra pressure on farmland pastured creating extra environmental problems from over grazing. | 6 3 3     |
| Fauna          | Community 2  | Clearing of bushland will destroy the homes of many endangered animals and birds. The proposal will destroy the Black Tailed Cockatoos' home and other native animals and plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 3 1     |
| Fauna          | Community 2  | Clearing of bushland will destroy the homes of many endangered animals and birds. The proposal will destroy the Black Tailed Cockatoos' home and other native animals and plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 3 20    |
| Fauna          | Community 2  | According to another survey done by Olympia only 32 Kangaroos were counted. When was the survey carried out, and at what time of day? On sunset every night (at a nearby property) there are at least 32 Kangaroos on the driveway.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 3 22    |
| Fauna          | Community 60 | Destruction of habitat for threatened red and white tailed black cockatoos. Flocks of over one hundred white tailed black cockatoos and over 30 red tail blacks have been sighted regularly in the area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 3 21    |
| Fauna          | Community 65 | " selectively remove large mature trees that contain potential cockatoo nesting sites. How will the proponent "save" these nesting sites? There are hundreds of very old trees (at least 100 years old or more) within the sites to be cleared, not the few mentioned in the mining proposal. The greater percentage of these trees display several nesting sites per tree. How does the proponent propose to selectively remove and save so many                                                                                                                                                                                                                                                                                                                                                                                            | 6 1 26    |
| Fauna          | Community 70 | Recent studies have shown that hollows suitable for black cockatoos did not begin to appear in eucalypts until they are at least 230 years old. A number of nest trees used by Forest Red-tailed Black Cockatoos and Baudin's and Carnaby's Cockatoos are estimated to be between 300-500 years of age. A more in-depth assessment of trees that are currently or will be suitable for hollows should be undertaken.                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 1 10    |
| Fauna          | DEC KwP      | The PER states that additional fauna surveys are proposed during June 2006 with the results submitted to the EPA prior to the EPA report and recommendation bulletin. The additional information has not been received by the DEC/EPA. The DEC is concerned that the proposal may require substantial amendment following the results of the additional surveys.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 3 6     |
| Fauna          | DEC-CALM     | The regional conservation significance of the areas of native veg in the project area have not been fully assessed in the PER.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 1     |
| Fauna          | DEC-CALM     | The regional conservation significance of the areas of native veg in the project area have not been fully assessed in the PER.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 12    |
| Fauna          | DEC-CALM     | No management measures for Quenda outlined. Recommends survey to detect presence of Quenda, and if detected, plan appropriate action in consultation with DEC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 2     |
| Fauna          | DEC-CALM     | The regional conservation significance of the areas of native veg in the project area have not been fully assessed in the PER.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 3     |
| Fauna          | EPASU        | Executive Summary pge 8. This section understates the regional significance of faunal habitat in the project area. Additionally there are technical errors. Some statements in regard to Priority fauna species are incorrect. The Forest Red-tailed Black Cockatoo is a Schedule 1 listed species not a Priority species, the Quenda is given an incorrect Priority status (it is given correct status in Table 24 but incorrect on page 94 and page 133). The Forest Red-tailed Black Cockatoo is described as "potential presence" and then as "directly observed".                                                                                                                                                                                                                                                                       | 6 3 10    |
| Fauna          | EPASU        | Page 96. There is confusion regarding potential presence and observed directly. The same species are given both categories. Page 97. Some statements on cockatoos are incorrect. Recent studies show that Forest Red-tailed Black Cockatoo breeds frequently on the southern part of the Swan Coastal Plain in the region of the project area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 10    |

| Specific Topic | Submitter | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Reference |
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| Fauna          | EPASU     | Page 91. The section on Regional Surveys and Information is extremely limited. The only comments made are in reference to mammals which typically for this region are largely absent. Reptiles, amphibians, birds, and invertebrates are not discussed at all. Table 24 page 92, and page 94. Incorrect status for Forest Red-tailed Black Cockatoo. Page 94. It is incorrect to state that Conservation Significant (CS3) species are only of local significance. Most of them are of regional significance on the Swan Coastal Plain. It is not true that most reptiles could be found anywhere in the project area. Most would be found in particular habitat remnants. Page 95. No list is provided of the 40 bird species of conservation significance; Table does not include that number. Yellow-throated Miner in Table 25 should be denoted as conservation significant. | 6 3 12    |
| Fauna          | EPASU     | Page 96. There is confusion regarding potential presence and observed directly. The same species are given both categories. Page 97. Some statements on cockatoos are incorrect. Recent studies show that Forest Red-tailed Black Cockatoo breeds frequently on the southern part of the Swan Coastal Plain in the region of the project area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 3 16    |
| Fauna          | EPASU     | Page 129. The statement that "clearing for the project is temporary" is a misstatement. Clearing habitat of mature trees that are hundreds of years old and planting young trees cannot be described as temporary. The statement that "The site was not included in the BushPlan-Bush Forever process as worthy of conservation" is misleading. Much privately owned land in the region was not accessible to the Bush Forever process and accordingly the conservation values were not known.                                                                                                                                                                                                                                                                                                                                                                                    | 6 3 17    |
| Fauna          | EPASU     | Additional errors in Appendix 5 not referred to in comments on the PER above. Page 27. lunulata is misspelt: Page 28. White-breasted Sea-Eagle is not expected to occur in the project area and should be deleted : Page 31. Grey Currawong is placed in the wrong Family: Page 33 Western Grey Kangaroo was recorded in several sites but on page 34 (Table 26) it is not included as recorded Page 35 (Table 27): The Mardo and Grey-bellied Dunnart are incorrectly listed as "extinct in the region". These species should be transferred to species "recorded or expected to occur in the region" in Table 26 on Page 34.                                                                                                                                                                                                                                                    | 6 3 18    |
| Fauna          | EPASU     | The PER has not adequately addressed fauna values in the project area and the level of survey is significantly below the level expected according to EPA Guidance 56. It does not provide adequate information to enable the interested public to reasonably evaluate the likely impacts of this proposal on faunal biodiversity values.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 3 3     |
| Fauna          | EPASU     | The current PER proposes to undertake additional surveys "during June 2006". The results of these surveys have not been provided and accordingly it is not possible to adequately assess the fauna values of the project area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 3 6     |
| Fauna          | EPASU     | Moreover it makes technically incorrect and invalid statements that significantly understate the biodiversity values of the project area. Many of the technical errors in the PER are based on similar errors in Appendix 5 Vegetation and Fauna Assessment (MBS Environmental 2004) which has not been updated as part of the current PER. Additionally a number of unsubstantiated statements have been made without supporting data or data sources: e.g. comments that recolonisation of fauna will occur when areas cleared for mining are rehabilitated. This ignores the inability of many poorly dispersing fauna species to recolonise areas once they are locally exterminated by clearing and habitat isolation                                                                                                                                                        | 6 3 7     |
| Fauna          | EPASU     | Collectively the remnant bushland in the northern areas on Lots 3 and 56 comprise close to 100 ha of mature vegetation that has been unburnt for many years and represents excellent habitat for at least 8 habitat sensitive bird species listed as significant on the Coastal Plain (Bush Forever Table 15). The remnants on Lots 62 and 59 together with the adjoining vegetation on Lots 505, 506, 507 etc that will not be mined comprise further habitat of similar size, although more fragmented, and appears to contain reasonable ecological linkage for habitat sensitive bird species.                                                                                                                                                                                                                                                                                | 6 3 8     |
| Fauna          | EPASU     | Moreover it makes technically incorrect and invalid statements that significantly understate the biodiversity values of the project area. Many of the technical errors in the PER are based on similar errors in Appendix 5 Vegetation and Fauna Assessment (MBS Environmental 2004) which has not been updated as part of the current PER. Additionally a number of unsubstantiated statements have been made without supporting data or data sources: e.g. comments that recolonisation of fauna will occur when areas cleared for mining are rehabilitated. This ignores the inability of many poorly dispersing fauna species to recolonise areas once they are locally exterminated by clearing and habitat isolation                                                                                                                                                        | 6 3 9     |
| Fauna          | EPASU     | The fauna assessment needs to provide an inventory of vertebrate fauna species based on actual survey of remnants in the project area, as well as assessment of appropriate literature records. The regional and local conservation value of the area needs to be determined. The fauna survey scope and intensity needs to be in accordance with the Environmental Protection Authority's (EPA) Guidance Statement No. 56. The regional conservation value for fauna of all natural areas affected by the proposal also requires reference to the Criteria in Guidance 10. Based on the location and the scale of the project, EPA Position Statement 3 and Guidance Statement No. 56 would require that a Level 2 Detailed survey be undertaken.                                                                                                                                | 6 3 4     |
| Fauna          | EPASU     | The fauna assessment needs to provide an inventory of vertebrate fauna species based on actual survey of remnants in the project area, as well as assessment of appropriate literature records. The regional and local conservation value of the area needs to be determined. The fauna survey scope and intensity needs to be in accordance with the Environmental Protection Authority's (EPA) Guidance Statement No. 56. The regional conservation value for fauna of all natural areas affected by the proposal also requires reference to the Criteria in Guidance 10. Based on the location and the scale of the project, EPA Position Statement 3 and Guidance Statement No. 56 would require that a Level 2 Detailed survey be undertaken.                                                                                                                                | 6 3 5     |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reference |
|----------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Fauna          | KNAG         | In The Appendix 6 Cockatoo Report Table 1 lists only 20 potential nesting sites over the entire mining lease. Below are two images showing potential nesting sites taken from the window of a vehicle on the "sealed" Redheads Road.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 1 10    |
| Fauna          | KNAG         | It is difficult to comment on a fauna management plan when the work that would guide the creation of this plan has not been done. When only 20 potential nesting hollows have been identified in an area over 1200 hectares, one questions the commitment of the organization presenting the results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 2 22    |
| Fauna          | KNAG         | There is a reference to a survey by Ninnox carried out at West Kingia – "Bush Forever Site" near Keysbrook in which only 4 mammal species were identified. What was not quoted was that in the same survey: 28 species of amphibians and reptile species were identified; 56 species of birds were identified. A copy of these lists can be purchased from Ninnox                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 3 12    |
| Fauna          | KNAG         | It is difficult to comment on a fauna management plan when the work that would guide the creation of this plan has not been done. When only 20 potential nesting hollows have been identified in an area over 1200 hectares, one questions the commitment of the organization presenting the results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 20    |
| Fauna          | KNAG         | The number of cockatoo sightings would appear to significantly underestimate the number of cockatoos in the area. Flocks of 50 or more are regularly seen in mature jarrah trees in the evenings within the mining lease. The number of potential nesting sites in tree hollows shown on the Figure 2 would suggest that a comprehensive survey has not been made                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 3 20    |
| Fauna          | KNAG         | Keysbrook North Dandalup Action Group (KNAG) Inc. Public Meeting on 26 July 2006 Paul Rokich (Senior Environmental Scientist) MBS Environmental stated that there were only about 30 or 40 kangaroos in the mining lease. A licensed shooter routinely shoots this amount on a single night on one property on a regular basis. Most landholders will testify to counting 70 kangaroos in a single mob                                                                                                                                                                                                                                                                                                                                                                              | 6 3 22    |
| Fauna          | Murray Shire | Excise the potential Cockatoo nesting tree located on the northern boundary of Lot 506 from the mining area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 3 1     |
| Fauna          | PHCC         | This section should record the State and Commonwealth listing for Carnaby's, Forest Red-tail and Baudin's Black Cockatoos. It should also detail exactly how many potential hollows and feeding trees occur across the site and how many will be lost due to clearing for the proposal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 1 10    |
| Fauna          | PHCC         | Loss of feeding habitat is identified as a key threatening process under the EPBC Act by DEH. The Forest Red-tailed Black Cockatoo may similarly utilise remnants in the area for feeding, but additionally this species may breed in suitable nest hollows in the region. The presence of a breeding population of this species should be established prior to any habitat clearing". We endorse the importance of this recommendation, that doesn't seem to have been reflected in the PER                                                                                                                                                                                                                                                                                        | 6 1 10    |
| Fauna          | PHCC         | Concerned re the impacts the mining proposal will have on local fauna given the "Vegetation and Fauna Assessment" states that with the exception of the Western Grey Kangaroo, all the native mammals can be considered to be at least of regional conservation significance. It is also a concern that we cannot identify where this statement has been clearly addressed and responded to in the PER; we understand there are outstanding surveys Also, para.7 p.135 implies fauna moves directly back into revegetation areas. However, revegetation areas can take many years to reach the level of maturity to provide food, usually through flowering process either directly or through the insects that flowering attracts, and even longer to provide hollows for habitat. | 6 1 25    |
| Fauna          | PHCC         | The "Vegetation and Fauna Assessment" recommends (p.37) that, "all practical measures be undertaken to ensure that regional connectivity of habitats is maintained". The PER is proposing to clear the majority of the remnants and then establish corridors through this cleared landscape to the small remaining remnant on Lot 56. This seems to be a paradox within the proposal/PER and with the proposed mitigation measures.                                                                                                                                                                                                                                                                                                                                                 | 6 2 12    |
| Fauna          | PHCC         | Concerned re the impacts the mining proposal will have on local fauna given the "Vegetation and Fauna Assessment" states that with the exception of the Western Grey Kangaroo, all the native mammals can be considered to be at least of regional conservation significance. It is also a concern that we cannot identify where this statement has been clearly addressed and responded to in the PER; we understand there are outstanding surveys Also, para.7 p.135 implies fauna moves directly back into revegetation areas. However, revegetation areas can take many years to reach the level of maturity to provide food, usually through flowering process either directly or through the insects that flowering attracts, and even longer to provide hollows for habitat. | 6 2 22    |
| Fauna          | PHCC         | The "Vegetation and Fauna Assessment" recommends (p.37) that, "all practical measures be undertaken to ensure that regional connectivity of habitats is maintained". The PER is proposing to clear the majority of the remnants and then establish corridors through this cleared landscape to the small remaining remnant on Lot 56. This seems to be a paradox within the proposal/PER and with the proposed mitigation measures.                                                                                                                                                                                                                                                                                                                                                 | 6 2 28    |



| Specific Topic | Submitter | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Reference |
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| Fauna          | PHCC      | Concerned re the impacts the mining proposal will have on local fauna given the "Vegetation and Fauna Assessment" states that with the exception of the Western Grey Kangaroo, all the native mammals can be considered to be at least of regional conservation significance. It is also a concern that we cannot identify where this statement has been clearly addressed and responded to in the PER; we understand there are outstanding surveys. Also, para.7 p.135 implies fauna moves directly back into revegetation areas. However, revegetation areas can take many years to reach the level of maturity to provide food, usually through flowering process either directly or through the insects that flowering attracts, and even longer to provide hollows for habitat. | 6 2 28    |
| Fauna          | PHCC      | The "Vegetation and Fauna Assessment" recommends (p.37) that, "all practical measures be undertaken to ensure that regional connectivity of habitats is maintained". The PER is proposing to clear the majority of the remnants and then establish corridors through this cleared landscape to the small remaining remnant on Lot 56. This seems to be a paradox within the proposal/PER and with the proposed mitigation measures.                                                                                                                                                                                                                                                                                                                                                  | 6 2 8     |
| Fauna          | PHCC      | Concerned re the impacts the mining proposal will have on local fauna given the "Vegetation and Fauna Assessment" states that with the exception of the Western Grey Kangaroo, all the native mammals can be considered to be at least of regional conservation significance. It is also a concern that we cannot identify where this statement has been clearly addressed and responded to in the PER; we understand there are outstanding surveys. Also, para.7 p.135 implies fauna moves directly back into revegetation areas. However, revegetation areas can take many years to reach the level of maturity to provide food, usually through flowering process either directly or through the insects that flowering attracts, and even longer to provide hollows for habitat. | 6 3 1     |
| Fauna          | PHCC      | Concerned re the impacts the mining proposal will have on local fauna given the "Vegetation and Fauna Assessment" states that with the exception of the Western Grey Kangaroo, all the native mammals can be considered to be at least of regional conservation significance. It is also a concern that we cannot identify where this statement has been clearly addressed and responded to in the PER; we understand there are outstanding surveys. Also, para.7 p.135 implies fauna moves directly back into revegetation areas. However, revegetation areas can take many years to reach the level of maturity to provide food, usually through flowering process either directly or through the insects that flowering attracts, and even longer to provide hollows for habitat. | 6 3 12    |
| Fauna          | PHCC      | Concern regarding loss of habitat for the endangered Short-billed (Carnaby's) Black-Cockatoo, the Priority 3 Forest Red-tail Black-Cockatoo, the endangered Long-billed (Baudin's) Black-Cockatoo and other listed species such as the Priority 3 Quenda, and the Priority 4 Western False Pipistrelle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 3 2     |
| Fauna          | PHCC      | Concerned re the impacts the mining proposal will have on local fauna given the "Vegetation and Fauna Assessment" states that with the exception of the Western Grey Kangaroo, all the native mammals can be considered to be at least of regional conservation significance. It is also a concern that we cannot identify where this statement has been clearly addressed and responded to in the PER; we understand there are outstanding surveys. Also, para.7 p.135 implies fauna moves directly back into revegetation areas. However, revegetation areas can take many years to reach the level of maturity to provide food, usually through flowering process either directly or through the insects that flowering attracts, and even longer to provide hollows for habitat. | 6 3 8     |
| Fauna          | PHCC      | Concern regarding loss of habitat for the endangered Short-billed (Carnaby's) Black-Cockatoo, the Priority 3 Forest Red-tail Black-Cockatoo, the endangered Long-billed (Baudin's) Black-Cockatoo and other listed species such as the Priority 3 Quenda, and the Priority 4 Western False Pipistrelle.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 3 9     |
| Fauna          | SJLC      | 'The Carnaby's Cockatoo is likely to utilise the remnants for feeding. Given the paucity of remnant vegetation in the area, these remnants are probably important for this species. Loss of feeding habitat for Carnaby's Cockatoo is identified as a key component of the threat under the Commonwealth EPBC Act 1999.'(p.96) Remnants containing Marri trees are also significant feeding and breeding areas for Forest Red-tailed Black-Cockatoos.                                                                                                                                                                                                                                                                                                                                | 6 1 10    |
| Fauna          | SJLC      | There are very few (approximately 20-30) mature 'stag' trees in the mining area with hollows suitable as cockatoo nest sites. An area in the south-west of Lot 56 has been identified as having a concentration of at least 11 such trees (approximately 50% of the total in the mine area) (p.106). A more in-depth assessment of trees be undertaken to take into account their current or potential suitability for nesting hollows.                                                                                                                                                                                                                                                                                                                                              | 6 1 33    |
| Fauna          | SJLC      | 'The primary issue for fauna in fragmented agricultural landscapes is connectivity of remnant vegetation. Any reduction in the number of remnants may lead to the reduction in value of the remaining remnants, as the movement of fauna will be impeded' (p.92).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 2 12    |
| Fauna          | SJLC      | There are very few (approximately 20-30) mature 'stag' trees in the mining area with hollows suitable as cockatoo nest sites. An area in the south-west of Lot 56 has been identified as having a concentration of at least 11 such trees (approximately 50% of the total in the mine area) (p.106). A more in-depth assessment of trees be undertaken to take into account their current or potential suitability for nesting hollows.                                                                                                                                                                                                                                                                                                                                              | 6 2 22    |
| Fauna          | SJLC      | There are very few (approximately 20-30) mature 'stag' trees in the mining area with hollows suitable as cockatoo nest sites. An area in the south-west of Lot 56 has been identified as having a concentration of at least 11 such trees (approximately 50% of the total in the mine area) (p.106). A more in-depth assessment of trees be undertaken to take into account their current or potential suitability for nesting hollows.                                                                                                                                                                                                                                                                                                                                              | 6 3 20    |



| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Reference |
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| Fauna          | SJLC        | As <i>Corymbia calophylla</i> , <i>Banksia attenuata</i> and <i>Banksia ilicifolia</i> have been surveyed in the proposed mining area (see Appendix 5) the value of the remnant vegetation as feeding and nesting habitat for Carnaby's Cockatoos and Forest Red-tailed Black-Cockatoos must be further researched.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 3 20    |
| Fauna          | SJLC        | The understanding of existing fauna species habiting proposed mining areas is very limited. Of the limited surveying performed 'With the exception of the Western Grey Kangaroo, all the native mammals can be considered to be at least of regional conservation significance'(p.97). Undertake further detailed studies to determine the presence of mammals and the suitability of existing remnants as habitats for native fauna.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 3 3     |
| Fauna          | SJS         | • The red-tailed black cockatoo (listed as an endangered species by the Department of Conservation and Land Management (CALM)) and Carnaby's Cockatoo (protected through the federal Environmental Protection and Biodiversity Conservation (EPBC) Act) have been shown to use the remnant Marri woodland in the northern section of Lot 56, a significant source of food for these species. These areas of vegetation should therefore be retained wherever possible, particularly as they provide some ecological linkage function onsite.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 7     |
| Fauna          | SJS         | • The red-tailed black cockatoo (listed as an endangered species by the Department of Conservation and Land Management (CALM)) and Carnaby's Cockatoo (protected through the federal Environmental Protection and Biodiversity Conservation (EPBC) Act) have been shown to use the remnant Marri woodland in the northern section of Lot 56, a significant source of food for these species. These areas of vegetation should therefore be retained wherever possible, particularly as they provide some ecological linkage function onsite.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 2 22    |
| Fauna          | SJS         | • A fauna survey was undertaken for the site, and noted that it had low values as it had been severely degraded over time by historical agricultural practices. It is not clear whether invertebrates were considered during the survey.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 3 23    |
| Fauna          | WS          | The PER wrongly gives the impression that fauna will not be significantly affected since clearing will be undertaken in stages of only 30ha and rehabilitation will be progressive thereby resulting in only temporary and restricted habitat loss. Any areas that have been rehabilitated will still be in their growth stages, which is insufficient for most fauna species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 1 13    |
| Fauna          | WS          | Species relying on old tree hollows, such as Red-tailed Black Cockatoos, etc, will be disadvantaged for decades to come. The process of clearing itself will surely involve many animal deaths. The proposed mine will therefore have a significant impact on the existing flora and fauna in the area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 1 7     |
| Fauna          | WS          | The PER wrongly gives the impression that fauna will not be significantly affected since clearing will be undertaken in stages of only 30ha and rehabilitation will be progressive thereby resulting in only temporary and restricted habitat loss. Any areas that have been rehabilitated will still be in their growth stages, which is insufficient for most fauna species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 2 12    |
| Fauna          | WS          | Species relying on old tree hollows, such as Red-tailed Black Cockatoos, etc, will be disadvantaged for decades to come. The process of clearing itself will surely involve many animal deaths. The proposed mine will therefore have a significant impact on the existing flora and fauna in the area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 2 22    |
| Fauna          | WS          | Species relying on old tree hollows, such as Red-tailed Black Cockatoos, etc, will be disadvantaged for decades to come. The process of clearing itself will surely involve many animal deaths. The proposed mine will therefore have a significant impact on the existing flora and fauna in the area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 3 1     |
| Fauna          | Community 2 | The surveys done by Olympia Resources Limited (Olympia) found no nesting trees for the Black Cockatoos. Landowners at meeting with the proponent on 26 July 2006 reported the area being inundated with large numbers of Black Cockatoos. These are protected birds, and they nest in the very old Marri trees. The gumnuts on the Marri trees being part of their foodchain. If these wonderful old trees are bulldozed their natural habitat will be destroyed forever. They will have no where to go. A study of wild-life was cursory and casual by Olympia, reporting a meagre amount of nesting sites and cockatoos where they in fact reside in their hundreds. The survey of the proposed mining area for cockatoos and other bird species was carried out on only 2 days. The report indicates that further advice should be sought from Ron Johnston, (Conclusion, p7) but there is no indication that this has been followed up. The destruction of ANY of the aged trees in the area should not be contemplated. | 6 1 10    |
| Fauna          | Community 2 | Cockatoos are only able to nest in aged trees with suitable hollows, and any proposed rehabilitation would not replace nesting areas for (probably) a hundred years. Olympia has done very little research to determine whether the 60ha of bush and all the mature trees are valuable habitat with hollows for Red and White-Tailed Cockatoos, and the many other animals and birds that require hollows for breeding. The cockatoos also require a network of mature, particularly Marri trees, for feeding and roosting. Olympia has not done any research on that aspect of their lifecycle.                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 1 10    |
| Fauna          | Community 2 | Cockatoos are only able to nest in aged trees with suitable hollows, and any proposed rehabilitation would not replace nesting areas for (probably) a hundred years. Olympia has done very little research to determine whether the 60ha of bush and all the mature trees are valuable habitat with hollows for Red and White-Tailed Cockatoos, and the many other animals and birds that require hollows for breeding. The cockatoos also require a network of mature, particularly Marri trees, for feeding and roosting. Olympia has not done any research on that aspect of their lifecycle.                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 1 25    |
| Fauna          | Community 2 | Cockatoos are only able to nest in aged trees with suitable hollows, and any proposed rehabilitation would not replace nesting areas for (probably) a hundred years. Olympia has done very little research to determine whether the 60ha of bush and all the mature trees are valuable habitat with hollows for Red and White-Tailed Cockatoos, and the many other animals and birds that require hollows for breeding. The cockatoos also require a network of mature, particularly Marri trees, for feeding and roosting. Olympia has not done any research on that aspect of their lifecycle.                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 1 7     |

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| Fauna          | Community 2 | The surveys done by Olympia Resources Limited (Olympia) found no nesting trees for the Black Cockatoos. Landowners at meeting with the proponent on 26 July 2006 reported the area being inundated with large numbers of Black Cockatoos. These are protected birds, and they nest in the very old Marri trees. The gumnuts on the Marri trees being part of their foodchain. If these wonderful old trees are bulldozed their natural habitat will be destroyed forever. They will have no where to go. A study of wild-life was cursory and casual by Olympia, reporting a meagre amount of nesting sites and cockatoos where they in fact reside in their hundreds. The survey of the proposed mining area for cockatoos and other bird species was carried out on only 2 days. The report indicates that further advice should be sought from Ron Johnston, (Conclusion, p7) but there is no indication that this has been followed up. The destruction of ANY of the aged trees in the area should not be contemplated. | 6 1 7     |
| Fauna          | Community 2 | Cockatoos are only able to nest in aged trees with suitable hollows, and any proposed rehabilitation would not replace nesting areas for (probably) a hundred years. Olympia has done very little research to determine whether the 60ha of bush and all the mature trees are valuable habitat with hollows for Red and White-Tailed Cockatoos, and the many other animals and birds that require hollows for breeding. The cockatoos also require a network of mature, particularly Marri trees, for feeding and roosting. Olympia has not done any research on that aspect of their lifecycle.                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 2 22    |
| Fauna          | Community 2 | The surveys done by Olympia Resources Limited (Olympia) found no nesting trees for the Black Cockatoos. Landowners at meeting with the proponent on 26 July 2006 reported the area being inundated with large numbers of Black Cockatoos. These are protected birds, and they nest in the very old Marri trees. The gumnuts on the Marri trees being part of their foodchain. If these wonderful old trees are bulldozed their natural habitat will be destroyed forever. They will have no where to go. A study of wild-life was cursory and casual by Olympia, reporting a meagre amount of nesting sites and cockatoos where they in fact reside in their hundreds. The survey of the proposed mining area for cockatoos and other bird species was carried out on only 2 days. The report indicates that further advice should be sought from Ron Johnston, (Conclusion, p7) but there is no indication that this has been followed up. The destruction of ANY of the aged trees in the area should not be contemplated. | 6 3 1     |
| Fauna          | Community 2 | The surveys done by Olympia Resources Limited (Olympia) found no nesting trees for the Black Cockatoos. Landowners at meeting with the proponent on 26 July 2006 reported the area being inundated with large numbers of Black Cockatoos. These are protected birds, and they nest in the very old Marri trees. The gumnuts on the Marri trees being part of their foodchain. If these wonderful old trees are bulldozed their natural habitat will be destroyed forever. They will have no where to go. A study of wild-life was cursory and casual by Olympia, reporting a meagre amount of nesting sites and cockatoos where they in fact reside in their hundreds. The survey of the proposed mining area for cockatoos and other bird species was carried out on only 2 days. The report indicates that further advice should be sought from Ron Johnston, (Conclusion, p7) but there is no indication that this has been followed up. The destruction of ANY of the aged trees in the area should not be contemplated. | 6 3 16    |
| Fauna          | Community 2 | There are Wedge-tailed Eagles in the area, who require very large and mature trees to nest                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 3 19    |
| Fauna          | Community 2 | The surveys done by Olympia Resources Limited (Olympia) found no nesting trees for the Black Cockatoos. Landowners at meeting with the proponent on 26 July 2006 reported the area being inundated with large numbers of Black Cockatoos. These are protected birds, and they nest in the very old Marri trees. The gumnuts on the Marri trees being part of their foodchain. If these wonderful old trees are bulldozed their natural habitat will be destroyed forever. They will have no where to go. A study of wild-life was cursory and casual by Olympia, reporting a meagre amount of nesting sites and cockatoos where they in fact reside in their hundreds. The survey of the proposed mining area for cockatoos and other bird species was carried out on only 2 days. The report indicates that further advice should be sought from Ron Johnston, (Conclusion, p7) but there is no indication that this has been followed up. The destruction of ANY of the aged trees in the area should not be contemplated. | 6 3 20    |
| Fauna          | Community 2 | The surveys done by Olympia Resources Limited (Olympia) found no nesting trees for the Black Cockatoos. Landowners at meeting with the proponent on 26 July 2006 reported the area being inundated with large numbers of Black Cockatoos. These are protected birds, and they nest in the very old Marri trees. The gumnuts on the Marri trees being part of their foodchain. If these wonderful old trees are bulldozed their natural habitat will be destroyed forever. They will have no where to go. A study of wild-life was cursory and casual by Olympia, reporting a meagre amount of nesting sites and cockatoos where they in fact reside in their hundreds. The survey of the proposed mining area for cockatoos and other bird species was carried out on only 2 days. The report indicates that further advice should be sought from Ron Johnston, (Conclusion, p7) but there is no indication that this has been followed up. The destruction of ANY of the aged trees in the area should not be contemplated. | 6 3 21    |
| Fauna          | KNAG        | The complete destruction of all mature Jarrah and Marri trees (save for a "billboard strip of bush" on Elliott Road) means that there will be no nesting hollows for several hundred years across a 1200 hectare area. Many hundreds, if not thousands of kangaroos will be forced from the area and the resultant damage to smaller neighbouring farms will cause major culling operations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 1 10    |
| Fauna          | KNAG        | The complete destruction of all mature Jarrah and Marri trees (save for a "billboard strip of bush" on Elliott Road) means that there will be no nesting hollows for several hundred years across a 1200 hectare area. Many hundreds, if not thousands of kangaroos will be forced from the area and the resultant damage to smaller neighbouring farms will cause major culling operations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 22    |

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| Fauna          | KNAG        | The complete destruction of all mature Jarrah and Marri trees (save for a "billboard strip of bush" on Elliott Road) means that there will be no nesting hollows for several hundred years across a 1200 hectare area. Many hundreds, if not thousands of kangaroos will be forced from the area and the resultant damage to smaller neighbouring farms will cause major culling operations                                                                                                                                                                                                                                                                                                                                                                                                                | 6 3 1     |
| Fire           | Community 2 | The area is fire prone.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 13 40   |
| Flora          | CC          | The proponent has simply written off the possibility of the project impacting on breeding or feeding habitat of endangered cockatoos, despite this being an issue recognized by the Department of Environment and Heritage for this project, and an issue of increasing media and public focus on other projects in recent times. Losses of feeding and breeding habitat are recognised as key threatening processes. Given the amount of potential cockatoo habitat in the project area, the proponent should be required to produce a scientifically based cockatoo management plan for the project.                                                                                                                                                                                                     | 6 1 10    |
| Flora          | CC          | During the assessment process the Conservation Council undertook a site visit with the proponent and consultant. On this visit it was noted that much of the grazed woodland was of a higher quality that is asserted by the proponent, and a number of potential hollows were easily spotted from the car that do not appear on the proponents maps. Hence, the Conservation Council recommends that the EPA undertake a site visit during the assessment of the project.                                                                                                                                                                                                                                                                                                                                 | 6 1 11    |
| Flora          | CC          | In particular, much of the areas of heavily grazed remnant vegetation that is rated at 6 were more likely 5. Although the under-story was largely removed, the areas were far from being almost completely without native species - with several tree and large shrub species present in a relatively dense canopy - and a program of fencing, minimal under-story replanting and potentially weed management would see these areas return to reasonable native vegetation. Some areas marked as 5 also appeared to retain some vegetation structure or an ability to regenerate from adjacent vegetation rated at 3.                                                                                                                                                                                      | 6 1 12    |
| Flora          | CC          | Net environmental benefit is not demonstrated in this proposal. The removal of large areas of diverse parkland grazed native vegetation and remnant vegetation communities cannot be replaced by a strip replanting with a limited number of species. Whilst some of the affected vegetation communities are degraded, many trees are in good health and a combination of stock fencing and some low level management would likely see a return to healthy bush within decades.                                                                                                                                                                                                                                                                                                                            | 6 1 12    |
| Flora          | CC          | The rehabilitation plan claims to adhere to a "no net loss" principle. This is inadequate for a number of reasons, including It is the current policy of the EPA and Government that a proponent should demonstrate net environmental benefit when significant environmental values are to be impacted; There would be a net loss of mature trees and species diversity through this project as it is currently presented;                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 13    |
| Flora          | CC          | The proponent is also soft on the transplanting of Xanthorrhoea and Kingia sp. There is no need to conduct trials for this species, relocation is now a standard practice, and the success rate is improving, however that is a poor replacement for the destruction of in-situ functioning ecosystems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 1 14    |
| Flora          | CC          | Whilst it is noted that the proponent has reserved some of the remnant vegetation to the North of the proposed project area, plans to clear remnant vegetation is also at odds with the Native Vegetation Clearing Principle (e), and possibly (b) for its importance to cockatoos, and possibly other fauna, birds and bats. Two hundred year old marris, habitat logs and parkland cleared vegetation will be replaced by a limited range of quick growing native vegetation, which will be quickly affected by the dieback made active in the soil by the proponent's soils management plan. The result will be the replacement of patches of currently unmanaged (but easy to do so) precious remnant vegetation with roadside shelter belts and very little prospect of survival in a meaningful way. | 6 1 17    |
| Flora          | CC          | During the assessment process the Conservation Council undertook a site visit with the proponent and consultant. On this visit it was noted that much of the grazed woodland was of a higher quality that is asserted by the proponent, and a number of potential hollows were easily spotted from the car that do not appear on the proponents maps. Hence, the Conservation Council recommends that the EPA undertake a site visit during the assessment of the project.                                                                                                                                                                                                                                                                                                                                 | 6 1 30    |
| Flora          | CC          | Net environmental benefit is not demonstrated in this proposal. The removal of large areas of diverse parkland grazed native vegetation and remnant vegetation communities cannot be replaced by a strip replanting with a limited number of species. Whilst some of the affected vegetation communities are degraded, many trees are in good health and a combination of stock fencing and some low level management would likely see a return to healthy bush within decades.                                                                                                                                                                                                                                                                                                                            | 6 1 5     |
| Flora          | CC          | No indication is given in the PER or flora assessment of the percentage remaining of each vegetation type that is proposed to be cleared, this is vital information to assessing its conservation status. Potential TEC's should be excluded from the mine area, rehabilitated and reconnected to areas of remnant vegetation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 1 9     |
| Flora          | Community 1 | • Olympia intends to 'rehabilitate' the mined area. Their environmental objective is 'avoidance or management of adverse impacts'. How adverse does the impact have to be, when they are going to bulldoze hectares of 100-200 year old trees? • Olympia refers to the 60ha of remnant vegetation and 244ha of parkland cleared vegetation that will be cleared in the PER. Olympia will be clearing an area which totals 1,234ha of remnant and parkland cleared vegetation, not 304ha. The fact that there is grass between some of the trees does not eliminate them from the equation. This is the meaning of 'parkland cleared'.                                                                                                                                                                      | 6 1 17    |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Reference |
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| Flora          | Community 1  | This area has less than 3% of the surviving Jarrah bushlands on the Swan Coastal Plain and to destroy these remaining trees for such marginal mining would be sacrilege. •The Jarrah woodlands are endangered on the Swan Coastal Plain with less than 3% remaining. On the Coastal Plain the sandy rises are the only places these trees have managed to survive. Jarrah die-back and lowered water tables are already killing many of them. •Clearing bans have protected them from destruction to date, but they are now under threat because of a low grade mineral ore deposit. • Olympia will be clearing a minimum of 1,234 hectares of bush and parkland cleared farmland to retrieve 1 to 2 metres of poor quality mineral sand from the site. | 6 1 19    |
| Flora          | Community 2  | There would appear to be different rules for the clearing of land for developers to that of farmers. Developers can bulldoze all the vegetation, whereas farmers are very restricted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 1 18    |
| Flora          | Community 2  | Concern regarding the clearing of 60 hectares of good condition bushland and hundreds of hectares of mature trees over the project area. This vegetation cannot be replaced.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 1 18    |
| Flora          | Community 2  | Concern regarding the destruction of the Jarrah forest, and loss of habitat for the wildlife, especially the bandicoot.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 18    |
| Flora          | Community 2  | Concern regarding the destruction of native stands of timber (Red gum), which will be destroyed by the mine. These trees have taken many years to grow, and the loss of these trees would have a terrible effect on the bird population and flora and fauna.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 1 18    |
| Flora          | Community 2  | When more than 90% of the Swan Coastal Plain has already been cleared, it is vandalism to clear these remnants. Habitat is very scarce and is irreplaceable except over hundreds of years.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 1 19    |
| Flora          | Community 2  | There would appear to be different rules for the clearing of land for developers to that of farmers. Developers can bulldoze all the vegetation, whereas farmers are very restricted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 1 32    |
| Flora          | Community 2  | Concern regarding the clearing of 60 hectares of good condition bushland and hundreds of hectares of mature trees over the project area. This vegetation cannot be replaced.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 1 7     |
| Flora          | Community 2  | Why hasn't the 60 hectares of bushland been conserved under Bush Forever?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 3 17    |
| Flora          | Community 2  | Concern regarding the destruction of the Jarrah forest, and loss of habitat for the wildlife, especially the bandicoot.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 3 2     |
| Flora          | Community 2  | There is not very much water in the ground already, and groundwater abstraction associated with the mine may kill the trees.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 4 12    |
| Flora          | Community 2  | When dewatering occurs as part of the mining operation then it is not just the bushland that is to be mined that is destroyed, but all the surrounding bush land that taps into that water table.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 3     |
| Flora          | Community 60 | Flora and fauna studies are incomplete, selective and not representative.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 1 1     |
| Flora          | Community 60 | Government funded and local Landcare programs - revegetation efforts will be desecrated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 18    |
| Flora          | Community 60 | Destruction of mature trees.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 1 20    |
| Flora          | Community 60 | Government funded and local Landcare programs - revegetation efforts will be desecrated                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 28    |
| Flora          | Community 60 | Flora and fauna survey are inadequate, with an inaccurate species lists. Removal of habitat for birdlife is not addressed (not needed based on Olympia's species list, which is incomplete). Detrimental effects on nearby high quality conservation protected, native bushlands.                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 1 30    |
| Flora          | Community 65 | 'The remaining 60 hectares has been assessed as remnant vegetation with native under storey in a range of conditions. Only 2 of the 21 quadrats surveyed scored a condition rating of 3 – very good or above.' Recent flora surveys indicate much greater diversity of species in more than 2 quadrats.                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 18    |
| Flora          | Community 65 | Quote: "Reporting any non-compliance with respect to land clearance..." There should be fencing around trees that need to be protected, allowing an extra buffer zone for systems prior to commencing development, so that non-compliances are stopped before they start. Reporting after the fact will not bring the trees back                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 1 29    |
| Flora          | Community 65 | No mining should occur on Area 7 in the Mostert Property. No mining should be allowed if there is even the slightest chance that the Leederville aquifer and Ramsar listed wetlands are adversely impacted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 1 31    |
| Flora          | Community 65 | 'The remaining 60 hectares has been assessed as remnant vegetation with native under storey in a range of conditions. Only 2 of the 21 quadrats surveyed scored a condition rating of 3 – very good or above.' Recent flora surveys indicate much greater diversity of species in more than 2 quadrats.                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 7     |
| Flora          | Community 65 | No mining should occur on Area 7 in the Mostert Property. No mining should be allowed if there is even the slightest chance that the Leederville aquifer and Ramsar listed wetlands are adversely impacted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 1 7     |
| Flora          | Community 65 | No mining should occur on Area 7 in the Mostert Property. No mining should be allowed if there is even the slightest chance that the Leederville aquifer and Ramsar listed wetlands are adversely impacted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 2 11    |
| Flora          | Community 65 | No mining should occur on Area 7 in the Mostert Property. No mining should be allowed if there is even the slightest chance that the Leederville aquifer and Ramsar listed wetlands are adversely impacted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 2 11    |
| Flora          | Community 65 | No mining should occur on Area 7 in the Mostert Property. No mining should be allowed if there is even the slightest chance that the Leederville aquifer and Ramsar listed wetlands are adversely impacted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 4 2     |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Reference |
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| Flora          | Community 65 | No mining should occur on Area 7 in the Mostert Property. No mining should be allowed if there is even the slightest chance that the Leederville aquifer and Ramsar listed wetlands are adversely impacted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 4 3     |
| Flora          | Community 70 | <ul style="list-style-type: none"> <li>• Concern regarding the clearing of Forest Community Type (FCT) 20b in Lots 3 and 56 even though 'FCT 20b was considered to be in good condition' (p84).</li> <li>• All vegetation communities identified in Lots 3 and 56 as per Figure 16 should be excised from the proposed mining area.</li> <li>• The statement on p90 of the PER: 'Bennett (2004) concluded the vegetation condition of FCT 3a and 3c (quadrats 11, 7 and 8) were recorded as mainly degraded to completely degraded and are not considered worthy of conservation' is inconsistent with Table 19 (p85) which describes the condition of FCT 3c to be good to degraded (Rating 4-5).</li> <li>• FCTs with vegetation condition classed as good, that is, 'Retains basic vegetation structure or ability to regenerate it', should remain uncleared.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 1 16    |
| Flora          | Community 70 | <ul style="list-style-type: none"> <li>• The areas proposed to be cleared are significant as they comprise remnant stands of native vegetation in an area that has been extensively cleared, that being the eastern side of the Swan Coastal Plain.</li> <li>• This is supported by Gibson et al (1994), Recommendation 5: 'As a consequence of the small amount of remnant vegetation on the eastern side of the plain, all such remnants in the study area with the basic vegetation intact or able to be regenerated are of high conservation value.'</li> <li>• The 244 hectares of 'parkland cleared remnant vegetation' and 60 hectares of remnant vegetation in 'good condition' should be excised from the proposed mining area.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 1 18    |
| Flora          | Community 70 | <ul style="list-style-type: none"> <li>• Concern regarding the clearing of Forest Community Type (FCT) 20b in Lots 3 and 56 even though 'FCT 20b was considered to be in good condition' (p84).</li> <li>• All vegetation communities identified in Lots 3 and 56 as per Figure 16 should be excised from the proposed mining area.</li> <li>• The statement on p90 of the PER: 'Bennett (2004) concluded the vegetation condition of FCT 3a and 3c (quadrats 11, 7 and 8) were recorded as mainly degraded to completely degraded and are not considered worthy of conservation' is inconsistent with Table 19 (p85) which describes the condition of FCT 3c to be good to degraded (Rating 4-5).</li> <li>• FCTs with vegetation condition classed as good, that is, 'Retains basic vegetation structure or ability to regenerate it', should remain uncleared.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 1 31    |
| Flora          | Community 70 | As <i>Corymbia calophylla</i> , <i>Banksia attenuata</i> and <i>Banksia ilicifolia</i> have been surveyed in the proposed mining area the value of the remnant vegetation as feeding and nesting habitat for Carnaby's Cockatoos and Forest Red-tailed Black-Cockatoos must be further researched.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 3 20    |
| Flora          | DEC-CALM     | Agrees the original plant communities are degraded and cannot be interpreted to contain intact TEC's                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 1 1     |
| Flora          | DEC-CALM     | The PER does not address the potential value of fencing remnant vegetation in areas that will not be mined as a means of protecting and enhancing this vegetation and mitigating the effects of clearing other vegetation. DEC (CALM) recommend fencing the area of remnant vegetation on Lot 56 that has been excised from the mine plan. The placing of conservation covenants on the areas of native vegetation to be excluded from mining or established as a result of the project would help protect conservation values long-term.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 1 2     |
| Flora          | DEC-CALM     | Provide a map with response document showing mineral resource to prove the statement that considerable heavy mineral has been forgone to preserve bush.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 1 4     |
| Flora          | EPASU        | Exec Summary Table 1 pge 12. A statement is made that there are no established corridor linkages within the mine area. No criteria are provided to define corridor linkages. For many species not only does the project area contain significant habitat remnants for regionally significant species but numerous dispersal features including remnants of various sizes as well as scattered or clumped trees in paddocks. All of these facilitate movement for a range of species                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 3 11    |
| Flora          | EPASU        | Page 7 of the Executive Summary in the PER states that the "majority of the area to be mined (95%) has been either totally or parkland cleared for agricultural purposes, with the remaining native vegetation areas highly fragmented." This statement understates the importance of faunal habitats in the project area as was revealed through a single brief site visit on 25 July 2006 when two areas with significant habitat were visited.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 3 7     |
| Flora          | EPASU        | The value of other areas was not determined as access to other areas had not been organized prior to the visit. During the visit a large area of contiguous or near contiguous habitat comprising a dense canopy of Jarrah, Marri, <i>Banksia attenuata</i> , <i>B. menziesii</i> , and <i>Allocasuarina fraseriana</i> was examined on Lot 56 and in a relatively short period of time at least 8 bird species listed as significant on the Coastal Plain (Bush Forever Table 15) were recorded. Another remnant with similar canopy species was visited on Lot 59 and at least 4 regionally significant bird species were recorded. The significance of the remaining vegetation as fauna habitat reflects the density and diversity of plant species in the canopy, the range of upland and lowland (including wetland) environments represented and the close proximity of a series of patches of remnant bushland/vegetation that are ecologically linked, and contrast with the surrounding more extensively cleared environments. The PER presents no fauna information on these or similar areas, and does not recognize their value for fauna especially regionally significant declining bird species. A survey of the faunal values of these areas needs to be undertaken as part of the PER to determine their regional significance. Areas de | 6 3 8     |

| Specific Topic | Submitter | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reference |
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| Flora          | KNAG      | 100-year-old trees and grass trees ( <i>Kingia australis</i> ) cannot be replaced. It just takes too long for them to grow to present impressive stature and to provide the ecological values of mature vegetation. If the recommended species list is to be used, then there will be great loss of native vegetation. A much healthier and diverse revegetation outcome can be achieved by using a full range of native species: tall trees, tall shrubs, medium and small shrubs, herbs, grasses and sedge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 1 27    |
| Flora          | KNAG      | 100-year-old trees and grass trees ( <i>Kingia australis</i> ) cannot be replaced. It just takes too long for them to grow to present impressive stature and to provide the ecological values of mature vegetation. If the recommended species list is to be used, then there will be great loss of native vegetation. A much healthier and diverse revegetation outcome can be achieved by using a full range of native species: tall trees, tall shrubs, medium and small shrubs, herbs, grasses and sedge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 12    |
| Flora          | KNAG      | 100-year-old trees and grass trees ( <i>Kingia australis</i> ) cannot be replaced. It just takes too long for them to grow to present impressive stature and to provide the ecological values of mature vegetation. If the recommended species list is to be used, then there will be great loss of native vegetation. A much healthier and diverse revegetation outcome can be achieved by using a full range of native species: tall trees, tall shrubs, medium and small shrubs, herbs, grasses and sedge.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 9     |
| Flora          | PHCC      | Loss of vegetation in a highly cleared landscape; destruction of Threatened Ecological Communities, Declared Rare Flora and loss of vegetation complexes of which less than 5% remain on the eastern side of the Swan Coastal Plain, with some estimates at 3%.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 1 19    |
| Flora          | PHCC      | A tree survey should be undertaken for the entire mining area. This survey should tag each tree, including all paddock trees, obtain a GPS point, identify the species, the health, approximate age and habitat features such as hollows, stags and loose bark [see "Vegetation and Fauna Assessment" p.33, which states that "Bats rely heavily on old trees that have crevices and hollows to provide shelter".] This survey will then allow a determination of the habitat provision, including roosting, feeding and breeding habitat for Black Cockatoos, that the entire proposed mining area, including the parkland cleared areas, provides for the Cockatoos and other threatened species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 1 33    |
| Flora          | PHCC      | We believe that the PER should address all remnant vegetation, including parkland cleared areas in respect to the 10 Principles in Schedule 5, Part V of the Act. We request the PER provides the analysis as per the Schedule 5 Principles. Although Table 6 implies a separate clearing permit will be obtained this is in fact not the case.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 1 34    |
| Flora          | PHCC      | We are concerned that the PER flora and vegetation assessments have focused in the areas of remnant vegetation on certain Lots, and do not appear to have assessed the values of the trees in the "parkland cleared" (PER p.5) areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 1 35    |
| Flora          | PHCC      | This section should describe FCT 3a and 3b as well as FCT 21a, 21b and 21c and outline the area remaining, area currently protected and area the PER proposes to clear.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 1 8     |
| Flora          | SJLC      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 1 1     |
| Flora          | SJLC      | The statement on p.90 of the PER: 'Bennett (2004) concluded the vegetation condition of FCT 3a and 3c (quadrats 11, 7 and 8) were recorded as mainly degraded to completely degraded and are not considered worthy of conservation' is inconsistent with Table 19 (p.85) which describes the condition of FCT 3c to be good to degraded (Rating 4-5). FCTs with vegetation condition classed as good, that is, 'Retains basic vegetation structure or ability to regenerate it', should remain uncleared (as per Gibson et al 1994, see above). FCT 20b, quadrats 1, 2, 9, 10, 12 and 16 varied in vegetation condition from very good to completely degraded. Where the vegetation was recorded as very good the area was small and surrounded by degraded vegetation or pasture. The good to very good covers of this FCT covered an area of under two hectares, less than the Urban Bushland Strategy's lowest preferred area limit of 20 hectares (EPA 2003).' (p.90). Gibson et al (1994, p.63) state 'that while a community type is reserved in two or more National Parks or Nature Reserves it can still be considered vulnerable. This is because of the almost total clearance of these vegetation types and the small size of the residual remnants. Their size makes them particularly vulnerable | 6 1 16    |
| Flora          | SJLC      | The areas proposed to be cleared are significant as they comprise remnant stands of native vegetation in an area that has been extensively cleared— the eastern side of the Swan Coastal Plain. The 244 hectares of 'parkland cleared remnant vegetation' and 60 hectares of remnant vegetation in good condition' should be excised from the proposed Mining Area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 1 17    |
| Flora          | SJLC      | The areas proposed to be cleared are significant as they comprise remnant stands of native vegetation in an area that has been extensively cleared— the eastern side of the Swan Coastal Plain. The 244 hectares of 'parkland cleared remnant vegetation' and 60 hectares of remnant vegetation in good condition' should be excised from the proposed Mining Area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 1 18    |
| Flora          | SJLC      | The project compromises vegetation types that are below the 'threshold level' of 30 per cent of the pre-clearing extent of vegetation, according to the Position Statement No 2 for the Environmental Protection of Native Vegetation in Western Australia, Clearing of Native Vegetation with particular reference to the agricultural region of Western Australia (EPA, 2000) (p.121). According to Hick (1994, p.26) it is estimated that less than 5% of native vegetation remains on the Pinjarra Plain. This is further supported by Weaving (1995, p.8), 'The Swan Coastal Plain is one of the most drastically altered environments in the south-west of Western Australia. Large sections of the plain, particularly on the eastern side, are over 95% cleared. Many plant communities are now seriously threatened.'                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 19    |
| Flora          | SJLC      | Reduction in buffers around TECs can increase disturbance (including increased runoff, light, soil disturbance) and the associated invasion of introduced species. Existing problem weeds may spread further into the TEC. Best practice indicates that buffers should be at least 500m.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 1 3     |



| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reference |
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| Flora          | SJLC        | The project compromises vegetation types that are below the 'threshold level' of 30 per cent of the pre-clearing extent of vegetation, according to the Position Statement No 2 for the Environmental Protection of Native Vegetation in Western Australia, Clearing of Native Vegetation with particular reference to the agricultural region of Western Australia (EPA, 2000) (p.121). According to Hick (1994, p.26) it is estimated that less than 5% of native vegetation remains on the Pinjarra Plain. This is further supported by Weaving (1995, p.8), 'The Swan Coastal Plain is one of the most drastically altered environments in the south-west of Western Australia. Large sections of the plain, particularly on the eastern side, are over 95% cleared. Many plant communities are now seriously threatened.'                                 | 6 1 31    |
| Flora          | SJLC        | All vegetation communities identified in Lots 3 and 56 as per Figure 16 should be excised from the proposed Mining Area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 1 31    |
| Flora          | SJLC        | Potential presence of declared rare or priority flora. Table 22 (pp. 88-89) indicates a moderate to high probability of three declared rare or priority flora species occurring in the proposed mining areas. Further floristic surveys performed to verify the extent of the presence of declared rare or priority flora.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 1 6     |
| Flora          | SJLC        | All vegetation communities identified in Lots 3 and 56 as per Figure 16 should be excised from the proposed Mining Area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 1 7     |
| flora          | SJS         | The vegetation and fauna assessment recommended that all practical measures be undertaken to ensure that the regional connectivity of habitat is maintained. Clearing of further vegetation does not achieve this goal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 1 17    |
| Flora          | SJS         | Given that the existing remnant vegetation onsite only accounts for approximately 4.9 % of the total land area, it is concerning that further efforts to conserve these areas have not been made. Clearing this additional vegetation will reduce species diversity in the area. The areas of remnant vegetation onsite (particularly to the north) may warrant some further vegetation work, particularly given that they are possible significant FCTs and provide valuable fauna habitat and food. The Department of Environment and Conservation is likely to undertake a site visit to determine mechanisms for protection of FCT 3c and 3a located onsite. Lot 56 is a potential location for listed Declared Rare Flora (DRF) species, although this was not identified during the survey work undertaken. Further work may be required in this regard. | 6 1 6     |
| Flora          | SJS         | It is not clear from the documentation why one area of bushland in Lots 3 and 56 is to be cleared whilst the other area is not. Given that they represent less than 5% of the total mining area, consideration of retaining both areas of vegetation should be seriously considered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 1 7     |
| Flora          | WS          | The proposal, if approved, will involve significant loss of flora and habitat for native fauna species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 1 18    |
| Flora          | KNAG        | The Flora studies are incomplete and no studies have been undertaken in the area that straddles Readheads Road.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 1 17    |
| Flora          | KNAG        | The remnant vegetation is the last of less than 3 % of the Jarrah bushlands remaining on the Swan Coastal Plain.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 1 19    |
| Flora          | KNAG        | Olympia seeks to bulldoze a combined total of 304 hectares of bush and parkland cleared farmland. There are thousands of mature jarrah trees within this remnant bushland. There is no plan to preserve any of this save for a "billboard strip of bush" on Elliott Road that happens to be close to an owner's house.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 1 20    |
| Flora          | KNAG        | Quote: "Selectively remove any large mature trees within the annual mine plan that contain potential cockatoo nesting sites." How will the proponents "save" these nesting sites? There are hundreds of very old trees (at least 100 years old or more) within the sites to be cleared, not the few mentioned in the mining proposal. The greater percentage of these trees display several nesting sites per tree. How do the proponents propose to selectively remove and save so many?                                                                                                                                                                                                                                                                                                                                                                      | 6 1 26    |
| Flora          | KNAG        | The PPG suggests fencing around trees that need to be protected, allowing an extra buffer zone for systems prior to commencing development, so that non-compliances are stopped before they start. Reporting after the fact will not bring the trees back.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 1 29    |
| Flora          | KNAG        | "The remaining 60 hectares has been assessed as remnant vegetation with native under storey in a range of conditions. Only 2 of the 21 quadrants surveyed scored a condition rating of 3 – very good or above." The PPG refutes this statement as recent flora surveys conducted by Marion Timms (2006) and MBS Environmental (2004) indicate much greater diversity of species in more than 2 quadrants. (See MBS Environmental Study Appendix 2)                                                                                                                                                                                                                                                                                                                                                                                                             | 6 1 6     |
| Flora          | KNAG        | The very best of the old growth Corymbia Calophylla grow on the sand rises or dunes on the eastern side of the Swan Coastal Plain and fall within the boundaries of the proposed sand mining project of Olympia Resources. It is strongly recommended that all parkland cleared remnant vegetation, 304 hectares, be retained.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 1 23    |
| Flora & Fauna  | Community 2 | What will happen in 8 years time the proposed lifespan of the mine? Could the proponent leave an area of DEAD Land? Nobody can really ascertain what the end result of this massive clearing will do to this country. Native flora are not just of intrinsic value but also help to improve air quality and encourage rainfall.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 1 22    |

| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reference |
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| Flora & Fauna  | Community 2 | An issue of major concern is the protection of the <i>Kingia Australis</i> . This plant similar looking to the grasstree but of a completely different variety is critically endangered. There are approximately only 86 hectares of this plant growing at present. They are restricted to the sandplains of the South West of WA. They, like the grass tree, grow at approximately 1 centimetre every 10 years. The school children have spent many hours researching these plants and are extremely serious about protecting the small remaining number of plants. These plants have yet to be successfully propagated for regrowth. The piece of remnant bush to be cleared for sandmining encompasses a number of these rare and endangered plants. This is of great concern. These plants cannot be successfully regrown at this point in time and will take hundreds of years to grow to the state they are in at present. We must not allow the destruction of these ancient plants and the equally aged jarrah and Marri trees, and we need to do all we can to preserve them for our children and future generations. | 6 1 27    |
| Flora & Fauna  | Community 2 | The land to be mined is too close to the Perth metropolitan area, and on an urban development corridor, due to proximity to the railway and the South Coast Highway. After the eight year life of the project, we could find that we have a sand mine in suburbia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 2 25    |
| Flora & Fauna  | KNAG        | The flora and fauna studies have not been completed and are absent from the North Dandalup area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 1 17    |
| Ground water   | CC          | The proponent claims that their significant extra extraction of two thousand million litres of fresh water per annum from the Leederville aquifer can be managed without impact on other users or groundwater dependent ecosystems. This statement cannot be supported by evidence. Local groundwater levels are dropping through a combination of climate change and increased abstraction by local landholders from the superficial aquifer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 4 5     |
| Ground water   | CC          | It is very important to note the proponents hydrogeological consultant's comment – "The hydraulic parameters have largely not been calculated from field testing at the site. Values of the parameters used in calculations and modelling are necessarily estimations based on published values for like materials, experiences and calibration techniques' (Appendix 4, p. 15, PER). Caution must be used when considering the cumulative impact of estimations of proposed pumping rates against assumed climatic condition. It is also of cautionary note to highlight the model-calculated aquifer drawdowns are based on anticipated mine progress, assumed climate and does not include the influence of other local and regional groundwater abstraction. Nor does the model include the possibility for further local and regional groundwater abstraction for agricultural production, nor for ever deeper abstraction as farmers chase the falling groundwater. In this scenario it is vital a precautionary approach is taken that ensures the sustainability of precious Western Australian biodiversity. I        | 6 4 8     |
| Ground water   | CC          | The proponent claims that their significant extra extraction of two thousand million litres of fresh water per annum from the Leederville aquifer can be managed without impact on other users or groundwater dependent ecosystems. This statement cannot be supported by evidence. Local groundwater levels are dropping through a combination of climate change and increased abstraction by local landholders from the superficial aquifer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 4 9     |
| Ground water   | CC          | It is very important to note the proponents hydrogeological consultant's comment – "The hydraulic parameters have largely not been calculated from field testing at the site. Values of the parameters used in calculations and modelling are necessarily estimations based on published values for like materials, experiences and calibration techniques' (Appendix 4, p. 15, PER). Caution must be used when considering the cumulative impact of estimations of proposed pumping rates against assumed climatic condition. It is also of cautionary note to highlight the model-calculated aquifer drawdowns are based on anticipated mine progress, assumed climate and does not include the influence of other local and regional groundwater abstraction. Nor does the model include the possibility for further local and regional groundwater abstraction for agricultural production, nor for ever deeper abstraction as farmers chase the falling groundwater. In this scenario it is vital a precautionary approach is taken that ensures the sustainability of precious Western Australian biodiversity. I        | 6 4 9     |
| Ground Water   | Community 1 | There has been no estimate of the rapid growth of housing developments within the proposed mining period, which will place enormous demands on ground water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 2 25    |
| Ground Water   | Community 1 | The water studies have failed to address the massive future developments in the area immediately adjacent to the proposed mine, and their subsequent demand for water. A numerical model was constructed to represent aquifers of the Bassendean Sand, Guildford Formation by Rockwater Pty Ltd., to predict changes in groundwater levels as a result of the operation at the Keysbrook project. Theories and assumptions on paper are fine, but that's all they are, theories. When things go wrong, it will be the landholders who will pay the price. The water studies have failed to factor in the declining rainfall and run-off reducing the recharge to the aquifers. The water studies failed to include numerous borehole logs that show a decline in water levels. The decline in water levels, as a result of the proposal, will affect the ability of surrounding landowners to water stock.                                                                                                                                                                                                                     | 6 2 25    |
| Ground Water   | Community 1 | The proposed water consumption may have a negative impact on fresh water aquaculture potential within the vicinity of the mine site, leaving not only aquaculture, but many industries at a loss from this proposal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 4 16    |
| Ground Water   | Community 1 | The proposed 2 gegalitre per annum consumption of bore water within the region has a strong potential to further decline the available water from bores. The need for separate night and day pits, and different mining locations based on the prevailing winds will mean a larger area of stripped land is exposed, which will require more water for dust suppression.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 16    |



| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Reference |
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| Ground Water   | Community 1 | The extraction of 2GL of water from the Leederville aquifer will also impact seriously on landholders as the Waters and Rivers Commission is attempting to strip artesian licences from landholders to accommodate Olympia's excessive requirements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 16    |
| Ground Water   | Community 1 | There has been no mention of the fact that Olympia will require an addition bore field near Elliott Road because pipe access will not be granted by the property owners between the northern mine site and the southern mine site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 17    |
| Ground Water   | Community 1 | If they move the processing plant to that section of the mine, they will have to run kilometres of water pipe across private property and under the road or put in a fourth artesian bore.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 4 17    |
| Ground Water   | Community 1 | Out of date information was used for the location of existing bores. The surrounding landowners are dependant on these bores for water. Who will pay the cost of many of these bores having to be re-drilled to a deeper depth, assuming the Water and Rivers Commission would allow this. What would landholders do for water while waiting for these permits and the availability of drilling rigs?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 4 18    |
| Ground Water   | Community 1 | Some bores, cannot be deepened without considerable cost because they are sitting on granite, which dictated the bore depth initially.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 4 18    |
| Ground Water   | Community 1 | Olympia's plan to drain the aquifer will exacerbate this problem leading to the destruction of not only the Jarrahs, but also a large variety of trees, all of which are already under stress.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 4 2     |
| Ground Water   | Community 1 | The draining of the aquifer also poses the problem that pollutants, nutrients and any fuel and oil spills could not only contaminate the ground and surface water, but also get sucked down into the aquifer. Breaking the coffee rock layer could impact on the surface water table and mix the surface aquifer layers. This is why the artesian bores must be encased in cement.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 2     |
| Ground Water   | Community 1 | Pit dewatering causing water table draw down will have a disastrous impact on the ground water supply and the wetlands.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 4 3     |
| Ground Water   | Community 1 | Olympia's plan to drain the aquifer will exacerbate this problem leading to the destruction of not only the Jarrahs, but also a large variety of trees, all of which are already under stress.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 4 3     |
| Ground Water   | Community 1 | The draining of the aquifer also poses the problem that pollutants, nutrients and any fuel and oil spills could not only contaminate the ground and surface water, but also get sucked down into the aquifer. Breaking the coffee rock layer could impact on the surface water table and mix the surface aquifer layers. This is why the artesian bores must be encased in cement.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 3     |
| Ground Water   | Community 1 | Olympia admits that the superficial aquifer will be affected by pit dewatering leading to bore levels dropping in the surrounding area, but they assume that this will not extend beyond the boundary of the resource area. This needs to be demonstrated.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 4 5     |
| Ground Water   | Community 1 | Groundwater research was done by Rockwater Pty Ltd, which stated that: quote <i>"the amounts of water available from individual locations is not very large"</i> . The research also does not make allowances for the reduction of rainfall and surface run off over the past years.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 5     |
| Ground Water   | Community 1 | The proposed water consumption may have a negative impact on fresh water aquaculture potential within the vicinity of the mine site, leaving not only aquaculture, but many industries at a loss from this proposal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 5     |
| Ground Water   | Community 1 | The proposed 2 gigalitre per annum consumption of bore water within the region has a strong potential to further decline the available water from bores. The need for separate night and day pits, and different mining locations based on the prevailing winds will mean a larger area of stripped land is exposed, which will require more water for dust suppression.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 4 5     |
| Ground Water   | Community 1 | The extraction of 2GL of water from the Leederville aquifer will also impact seriously on landholders as the Waters and Rivers Commission is attempting to strip artesian licences from landholders to accommodate Olympia's excessive requirements.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 9     |
| Ground Water   | Community 1 | Trees throughout the area are already dying because of a lowering of the water table over the years due to a reduction in our rainfall. Wetlands are also drying at an alarming rate.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 4 9     |
| Ground Water   | Community 1 | The water studies have failed to address the massive future developments in the area immediately adjacent to the proposed mine, and their subsequent demand for water. A numerical model was constructed to represent aquifers of the Bassendean Sand, Guildford Formation by Rockwater Pty Ltd., to predict changes in groundwater levels as a result of the operation at the Keysbrook project. Theories and assumptions on paper are fine, but that's all they are, theories. When things go wrong, it will be the landholders who will pay the price. The water studies have failed to factor in the declining rainfall and run-off reducing the recharge to the aquifers. The water studies failed to include numerous borehole logs that show a decline in water levels. The decline in water levels, as a result of the proposal, will affect the ability of surrounding landowners to water stock. | 6 4 9     |
| Ground Water   | Community 1 | The draining of the aquifer also poses the problem that pollutants, nutrients and any fuel and oil spills could not only contaminate the ground and surface water, but also get sucked down into the aquifer. Breaking the coffee rock layer could impact on the surface water table and mix the surface aquifer layers. This is why the artesian bores must be encased in cement.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 6 1     |
| Ground Water   | Community 1 | The draining of the aquifer also poses the problem that pollutants, nutrients and any fuel and oil spills could not only contaminate the ground and surface water, but also get sucked down into the aquifer. Breaking the coffee rock layer could impact on the surface water table and mix the surface aquifer layers. This is why the artesian bores must be encased in cement.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 6 1     |
| Ground water   | DEC KwP     | Concerns re modelling of dewatering impacts involving no field measurements. The DEC cannot be confident with the modelling results if it has not been verified with site specific characteristics.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 4 8     |

| Specific Topic | Submitter | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reference |
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| Ground water   | KNAG      | The water studies have failed to address the massive future developments in the area immediately adjacent to this mine and their subsequent demand for water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 2 25    |
| Ground water   | KNAG      | The Greenacre Turf Farm employs approximately 20 people plus sub contractors and is strictly restricted to 150 mega litres per year. This is essentially a sustainable industry and could grow if extra water was allocated. Whereas the Olympia mining is unsustainable and requires more than 10 times the water. Other similar horticultural industries and nearby future housing developments could make much better use of this water than Olympia.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 4 11    |
| Ground water   | KNAG      | The amount of water required has not been adequate represented and cannot be supplied from the proposed source without severe depletion of the resource.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 4 16    |
| Ground water   | KNAG      | There has been no attempt to update the increased usage of water from the Leederville Aquifer. The major users of ground water in the area were never consulted when modelling studies were done. Greenacres Turf Farms are in the immediate area and were never consulted. Local borehole data has not been used in the modelling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 4 16    |
| Ground water   | KNAG      | The impacts of such a massive drawdown are difficult to quantify, however almost certainly neighbouring bore users will have their supply reduced, and the wetlands in the area will dry out. This is because the superficial aquifers recharge the Leederville aquifer. If the Leederville is drawn down, the hydraulic head driving water from the surface to depth will increase, so net downward flow will increase                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 16    |
| Ground water   | KNAG      | There has been no consideration that an additional bore field will be required in the area that straddles Elliott Road because pipe access will not be granted by property owners between the northern mine site and the southern mine site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 4 17    |
| Ground water   | KNAG      | The amount of water required has not been adequate represented and cannot be supplied from the proposed source without severe depletion of the resource.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 4 2     |
| Ground water   | KNAG      | The Leederville aquifer is already under pressure before the mine commences operations. Western Australia has just had the driest year on record, with very low rainfall. Landholders who have licensed bores currently tap the Leederville aquifer, which due to low rainfall has already dropped 7 metres this year (Lyn and Chad Smith, 2006).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 4 5     |
| Ground water   | KNAG      | There has been no attempt to update the increased usage of water from the Leederville Aquifer. The major users of ground water in the area were never consulted when modelling studies were done. Greenacres Turf Farms are in the immediate area and were never consulted. Local borehole data has not been used in the modelling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 4 5     |
| Ground water   | KNAG      | The impacts of such a massive drawdown are difficult to quantify, however almost certainly neighbouring bore users will have their supply reduced, and the wetlands in the area will dry out. This is because the superficial aquifers recharge the Leederville aquifer. If the Leederville is drawn down, the hydraulic head driving water from the surface to depth will increase, so net downward flow will increase                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 5     |
| Ground water   | KNAG      | Quote: "Using sprinkler systems around high activity infrastructure areas for dust control..." The PPG draws your attention to the fact that this will contribute to further depletion of the Leederville aquifer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 4 7     |
| Ground water   | KNAG      | The impacts of such a massive drawdown are difficult to quantify, however almost certainly neighbouring bore users will have their supply reduced, and the wetlands in the area will dry out. This is because the superficial aquifers recharge the Leederville aquifer. If the Leederville is drawn down, the hydraulic head driving water from the surface to depth will increase, so net downward flow will increase                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 9     |
| Ground water   | KNAG      | The water modelling studies failed to use up to date information from the area. There has been no heed taken of the dramatic reduction of rainfall and surface run off in the last 30 years. There has been no estimate of the rapid growth of housing developments within the proposed mining period placing massive demands on ground water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 4 9     |
| Ground water   | PHCC      | The PER does not detail whether the flocculant used during processing has the potential to affect the environment. Further, it does not indicate whether it will remain as part of the soil profile and/or enter the superficial aquifer, and so eventually the waterways and estuary. This information must be provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 19    |
| Ground water   | PHCC      | <u>Protection of Groundwater: Leederville and Superficial.</u> 1. As the mine will be located within the Proposed Karnup-Dandalup Underground Water Control Area we seek assurances that the mine will not impact on the future availability, or the quality, of this water source. 2. We request that the stringent pollution control measures for a P2 area are applied to this proposal. 3. There appears to have been no analysis of what affect these drawdown levels will have on nearby watercourses and wetlands. This assessment must be undertaken. "Wetlands" (p.13) states the modelling has shown that drawdown effects are confined to levels that are less than the seasonal watertable fluctuations. The timing of the drawdown and the impacts should this occur outside the natural drying cycle must be addressed. 4. As part of this assessment the modelling should be repeated using only hydraulic parameters that are calculated from field-testing of the mining area. | 6 4 2     |
| Ground water   | PHCC      | Design of the dams must be determined to ensure that the three dams do not a) draw water from the superficial aquifer b) release nutrients or sediment to this aquifer. Design detail should also outline the source and quantity of limestone required, any off-site impacts related to obtaining this limestone, and how the limestone will be managed upon decommissioning of the dams.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 4 4     |

| Specific Topic | Submitter     | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Reference |
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| Ground water   | PHCC          | <u>Protection of Groundwater: Leederville and Superficial</u> . 1. As the mine will be located within the Proposed Karnup-Dandalup Underground Water Control Area we seek assurances that the mine will not impact on the future availability, or the quality, of this water source. 2. We request that the stringent pollution control measures for a P2 area are applied to this proposal. 3. There appears to have been no analysis of what affect these drawdown levels will have on nearby watercourses and wetlands. This assessment must be undertaken. "Wetlands" (p.13) states the modelling has shown that drawdown effects are confined to levels that are less than the seasonal watertable fluctuations. The timing of the drawdown and the impacts should this occur outside the natural drying cycle must be addressed. 4. As part of this assessment the modelling should be repeated using only hydraulic parameters that are calculated from field-testing of the mining area.                                                                                            | 6 4 5     |
| Ground water   | PHCC          | Effects on groundwater as the proposed mining area lies within a proposed UWPCA and the need to ensure protection of this water source.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 4 5     |
| Ground water   | PHCC          | <u>Protection of Groundwater: Leederville and Superficial</u> . 1. As the mine will be located within the Proposed Karnup-Dandalup Underground Water Control Area we seek assurances that the mine will not impact on the future availability, or the quality, of this water source. 2. We request that the stringent pollution control measures for a P2 area are applied to this proposal. 3. There appears to have been no analysis of what affect these drawdown levels will have on nearby watercourses and wetlands. This assessment must be undertaken. "Wetlands" (p.13) states the modelling has shown that drawdown effects are confined to levels that are less than the seasonal watertable fluctuations. The timing of the drawdown and the impacts should this occur outside the natural drying cycle must be addressed. 4. As part of this assessment the modelling should be repeated using only hydraulic parameters that are calculated from field-testing of the mining area.                                                                                            | 6 4 8     |
| groundwater    | Anonymous 1   | We had been advised by a friend living near a sand mine that it is highly likely the water table will drop significantly, given the amount of water Olympia will be consuming. We rely on our bore water for our garden and, more importantly, to water our livestock. At the Olympia meeting we were told they had already considered what they would do if bores became dry for people living in a certain vicinity of the proposed mine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 4 5     |
| Groundwater    | Community 1   | Olympia requires 1,820 kilolitres per hour for the mining and processing, of which it estimates 220 kilolitres per hour, will come from the bore. This equates to 5,280 kilolitres per day, or 36,960 kilolitres per week of bore water. And this does not include the water required for continual reticulation to keep 30 to 60 hectares of the mined or rehabilitated sand 'in a moist state' to avoid wind erosion nor watering of the roadways and infrastructure areas. Surely this valuable water resource could be better used and apportioned in a fairer manner? Olympia has estimated that it will lose 2 gigalitres of waste water per annum into "a wetland chain all the way to the Peel-Harvey estuary". During the winter this entire area of flat ground is covered with surface water, which washes into a variety of streams and drains flowing to the Peel estuary via numerous wetlands. This massive excess of waste water will carry possible pollutants from the mine site plus the build up of years of fertilizers etc. into the Peel estuary via these wetlands. | 6 4 14    |
| Groundwater    | Community 1   | Olympia requires 1,820 kilolitres per hour for the mining and processing, of which it estimates 220 kilolitres per hour, will come from the bore. This equates to 5,280 kilolitres per day, or 36,960 kilolitres per week of bore water. And this does not include the water required for continual reticulation to keep 30 to 60 hectares of the mined or rehabilitated sand 'in a moist state' to avoid wind erosion nor watering of the roadways and infrastructure areas. Surely this valuable water resource could be better used and apportioned in a fairer manner? Olympia has estimated that it will lose 2 gigalitres of waste water per annum into "a wetland chain all the way to the Peel-Harvey estuary". During the winter this entire area of flat ground is covered with surface water, which washes into a variety of streams and drains flowing to the Peel estuary via numerous wetlands. This massive excess of waste water will carry possible pollutants from the mine site plus the build up of years of fertilizers etc. into the Peel estuary via these wetlands. | 6 4 20    |
| Groundwater    | Community 1   | Olympia requires 1,820 kilolitres per hour for the mining and processing, of which it estimates 220 kilolitres per hour, will come from the bore. This equates to 5,280 kilolitres per day, or 36,960 kilolitres per week of bore water. And this does not include the water required for continual reticulation to keep 30 to 60 hectares of the mined or rehabilitated sand 'in a moist state' to avoid wind erosion nor watering of the roadways and infrastructure areas. Surely this valuable water resource could be better used and apportioned in a fairer manner? Olympia has estimated that it will lose 2 gigalitres of waste water per annum into "a wetland chain all the way to the Peel-Harvey estuary". During the winter this entire area of flat ground is covered with surface water, which washes into a variety of streams and drains flowing to the Peel estuary via numerous wetlands. This massive excess of waste water will carry possible pollutants from the mine site plus the build up of years of fertilizers etc. into the Peel estuary via these wetlands. | 6 4 7     |
| groundwater    | Community 112 | The proponent predicts that there will be no impacts on surrounding groundwater users from the mining activities. Again the proponent has only considered existing groundwater abstraction and has not considered potential future users. It is not possible for the proponent to predict where and when additional groundwater licences will be granted but it is not unforeseen that additional licences will be granted before mining operations cease.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 4 6     |
| groundwater    | Community 112 | The proponent should be required to have an adaptive management plan to deal with changing circumstances during the life of the mining operations that may occur on surrounding privately owned land.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 9     |

| Specific Topic | Submitter     | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Reference |
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| groundwater    | Community 112 | The proponent predicts that there will be no impacts on surrounding groundwater users from the mining activities. Again the proponent has only considered existing groundwater abstraction and has not considered potential future users. It is not possible for the proponent to predict where and when additional groundwater licences will be granted but it is not unforeseen that additional licences will be granted before mining operations cease.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 4 9     |
| Groundwater    | Community 2   | Australia is the driest continent on earth and the amount of rainfall is reducing. Going ahead with the proposal would result in billions of litres of groundwater being wasted with possibly unforeseen consequences. Olympia will be pulling 2 gigalitres a year from the Leederville aquifer, which has retracted in size over the last 25 years due to decreased rainfall and recharge. The proposed drawing of 2 gigalitres a year must have an effect on the level of the water table. There is a danger should this aquifer drop below sea level, saline water could flow back from the west and pollute this aquifer permanently. With all the climate change models pointing to even less rain in the South West, the recharge will be less and we need to protect all the potable water for as many people as possible, and not let it be exploited by one mining company. The mining operation will need to draw gigalitres of water from underground aquifers, for mining and to attempt to suppress dust and erosion problems. The resultant draw down on water tables will affect the wells and bores of all the residents in the area | 6 4 16    |
| Groundwater    | Community 2   | Australia is the driest continent on earth and the amount of rainfall is reducing. Going ahead with the proposal would result in billions of litres of groundwater being wasted with possibly unforeseen consequences. Olympia will be pulling 2 gigalitres a year from the Leederville aquifer, which has retracted in size over the last 25 years due to decreased rainfall and recharge. The proposed drawing of 2 gigalitres a year must have an effect on the level of the water table. There is a danger should this aquifer drop below sea level, saline water could flow back from the west and pollute this aquifer permanently. With all the climate change models pointing to even less rain in the South West, the recharge will be less and we need to protect all the potable water for as many people as possible, and not let it be exploited by one mining company. The mining operation will need to draw gigalitres of water from underground aquifers, for mining and to attempt to suppress dust and erosion problems. The resultant draw down on water tables will affect the wells and bores of all the residents in the area | 6 4 2     |
| Groundwater    | Community 2   | • How can a mining company use large amounts of water, when the public must stick to water restrictions? All operations should be water conserving.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 4 20    |
| Groundwater    | Community 2   | Underground streams which flow from east to west, and usually are a water source for windmills will be mined out and permanently lost.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 4 21    |
| Groundwater    | Community 2   | Concern regarding the removal of approximately 2 gigalitres of water per annum impacting on the quantity and quality of the bores of the surrounding land users. There has been very little rainfall this year, and drawing such a huge amount of water for mining is not the best use of this water resource. Concern regarding the drastic lowering of the water table from which enormous quantities of water will be drawn as a result of the proposal. Concern regarding the pollution of existing bores, dams, creeks and the Peel Inlet from unexplained pollutants. Olympia do not make mention of local bore monitoring for land owners in the mining area (or in the vicinity of the mining area). Olympia should commit to regular monitoring of local bores. Olympia should be held responsible for the costs to replace bores and dams should they run dry as a result of the proposed mining operation.                                                                                                                                                                                                                                | 6 4 5     |
| Groundwater    | Community 2   | Australia is the driest continent on earth and the amount of rainfall is reducing. Going ahead with the proposal would result in billions of litres of groundwater being wasted with possibly unforeseen consequences. Olympia will be pulling 2 gigalitres a year from the Leederville aquifer, which has retracted in size over the last 25 years due to decreased rainfall and recharge. The proposed drawing of 2 gigalitres a year must have an effect on the level of the water table. There is a danger should this aquifer drop below sea level, saline water could flow back from the west and pollute this aquifer permanently. With all the climate change models pointing to even less rain in the South West, the recharge will be less and we need to protect all the potable water for as many people as possible, and not let it be exploited by one mining company. The mining operation will need to draw gigalitres of water from underground aquifers, for mining and to attempt to suppress dust and erosion problems. The resultant draw down on water tables will affect the wells and bores of all the residents in the area | 6 4 5     |
| Groundwater    | Community 2   | • How can a mining company use large amounts of water, when the public must stick to water restrictions? All operations should be water conserving.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 4 7     |
| Groundwater    | Community 65  | The Leederville aquifer is already under pressure before the mine commences operations. Western Australia has just had the driest year on record, with very low rainfall. Landholders who have licensed bores currently tap the Leederville aquifer, which due to low rainfall has already dropped dramatically this year.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 4 5     |
| Groundwater    | Community 65  | Quote: "Using sprinkler systems around high activity infrastructure areas for dust control..." This will contribute to further depletion of the Leederville aquifer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 4 7     |
| Groundwater    | Community 65  | Quote: "Permits will be obtained to divert watercourses." Diversions of watercourses will affect the adjoining or interconnected wetlands. Past experiences have shown considerable loss of damp land vegetation when natural flows are altered/diverted. Disturbing the natural water flows has been seen to render many wetlands defunct                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 5 6     |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reference |
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| Groundwater    | Community 65 | The large amounts of water nominated and required for the purpose of dust and erosion control, coupled with nutrient rich mineral sand extraction water, must filter down and spread out over clay/coffee rock underlay to the drains and lake systems. This will eventually feed into the Dirk Brook Tributary, Nambellup Brook and Balgobin Brook, then into the Serpentine River and Goegrup Lake System eventually reaching the Peel Inlet and the Harvey Estuary. The Serpentine River, as well as the inlet and estuary, has a long history of extreme eutrophication, algal blooms anoxia, acid sulphate soil activation and fish kills. These issues can only be exacerbated if the mine goes ahead.          | 6 6 1     |
| Groundwater    | Community 65 | The Peel Inlet and Harvey estuary elements of the Ramsar listed Peel-Yalgorup system, and the Serpentine and Murray Rivers that feed them, are already staggering under the pressures of an explosion of urban development, unsewered semi-rural and residential subdivisions, canal developments and 4,200 kilometres of nutrient rich drainage from farmlands on the Pinjarra Plain. The quality of water in the Leederville aquifer should be protected at all costs. Consideration should be given to the risk of contamination from, nutrients, minerals or chemical filtration or residues from mineral sand extraction. It would only take one disastrous decision or mistake to reach the point of no return. | 6 6 1     |
| Groundwater    | Community 70 | The water studies have failed to factor in the declining rainfall and run-off reducing the recharge to the aquifers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 4 2     |
| Groundwater    | Community 71 | Potable water is precious and the 220 Kl per hour for 365 days of the year for 8 years that Olympia wish to use for mining should be kept for domestic use and the mine project should be rejected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 4 9     |
| Groundwater    | DEC KwP      | Proposed buffers between mining area and EPP /draft EPP wetlands are not considered adequate. The proponent has not utilised any of the EPA's or DEC's buffer requirements such as the <i>Wetlands Position Statement</i> which requires a minimum 50m buffer, the <i>Draft Guidelines for the Determination of Wetland Buffer Requirements</i> , or the EPA's <i>Guidance 33 Determination of interim waterways buffers</i> .                                                                                                                                                                                                                                                                                        | 6 15 2    |
| Groundwater    | DEC KwP      | The PER states that the proposed dewatering will effect other users and the natural system, however little information has been provided on these impacts or the proposed mitigation measures. The DEC KwP is concern that wetlands will be affected. The PER states that dewatering affects will be fluctuations in groundwater levels no greater than normal seasonal movement, resulting in negligible impact. However if dewatering occurs in winter this could potential affect the ephemeral hydrological regime resulting in vegetation death and degradation of the wetland                                                                                                                                   | 6 4 3     |
| Groundwater    | DEC KwP      | The DEC recommends that the environmental water requirements and conservation values of these wetlands is determined prior to the commencement of works. The determination of the wetlands water requirements will indicate if the dewatering is acceptable without detrimental impact to the wetlands. Determination of the conservation value of the wetlands will indicate if dewatering may pose a risk to an important protected wetland                                                                                                                                                                                                                                                                         | 6 4 3     |
| Groundwater    | DEC KwP      | Proposed buffers between mining area and EPP /draft EPP wetlands are not considered adequate. The proponent has not utilised any of the EPA's or DEC's buffer requirements such as the <i>Wetlands Position Statement</i> which requires a minimum 50m buffer, the <i>Draft Guidelines for the Determination of Wetland Buffer Requirements</i> , or the EPA's <i>Guidance 33 Determination of interim waterways buffers</i> .                                                                                                                                                                                                                                                                                        | 6 4 3     |
| Groundwater    | DEC KwP      | Monitoring section of the PER states that results will be compared with existing baseline data. No detail of this baseline data is supplied such as location of monitoring sites, monitoring frequency, parameters and source. The DEC would expect to see baseline data determined from 2 years pre development monitoring                                                                                                                                                                                                                                                                                                                                                                                           | 6 5 1     |
| Groundwater    | DEC KwP      | Monitoring section of the PER states that results will be compared with existing baseline data. No detail of this baseline data is supplied such as location of monitoring sites, monitoring frequency, parameters and source. The DEC would expect to see baseline data determined from 2 years pre development monitoring                                                                                                                                                                                                                                                                                                                                                                                           | 6 5 4     |
| Groundwater    | DOW          | Insufficient information is provided within the Rehabilitation Management Plan in regards to Ground and Surface Water Management. Table 6 of the Rehabilitation Management Plan is deficient in defining location, and parameters and frequency to be monitored. More detail is required.                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 2 5     |
| Groundwater    | DOW          | Water and Rivers Commission Statewide Policy No. 10 – Use of Operating Strategies in the Water Licensing Process should be included in Table 6.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 1     |
| Groundwater    | DOW          | There are concerns regarding the potential for upward flow from the Leederville aquifer during dewatering of the overlying superficial aquifer. The hydrogeologic report in Appendix 4 commented that the (semi-confined) Leederville formation was recharged from the overlying (unconfined) superficial aquifer. The potential for impact on recharge to the Leederville should be more thoroughly assessed.                                                                                                                                                                                                                                                                                                        | 6 4 10    |
| Groundwater    | DOW          | The modelling simulated recharge from rainfall as being 0.36mm per day for the wet season and zero for the dry season. It should be noted that the dewatering of the superficial aquifer during the wet season will impact on recharge to the underlying Leederville formation under the foot print of the dewatered area. The impact to water levels in the Leederville aquifer as a result of the reduction in recharge has not been adequately assessed.                                                                                                                                                                                                                                                           | 6 4 10    |

| Specific Topic | Submitter | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reference |
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| Groundwater    | DOW       | Figure 3 of Appendix 4 shows 25 production bores completed in the superficial aquifer and 11 production bores completed in the Leederville aquifer which are 2,000 metres or less from the proposed mining areas. It is highly recommended that the proponent conduct a risk analysis of potential impacts to the local bores in the event that the drawdowns estimated by the numerical model are underestimated. Depending on the availability of construction data, each bore should be assessed separately regarding screened interval, available drawdown and current trends in local groundwater levels. Superimposed on this information should be gradational scenarios where drawdown impact is incrementally increased to define failure thresholds. | 6 4 11    |
| Groundwater    | DOW       | These sections are considered to be within the scope of the PER, but highly deficient in supplying the level of detail necessary as required for groundwater licensing. The proponent should be made aware that the operation will require a rigorous groundwater monitoring program due to the volume of water required for dewatering and processing, the density of local bores and the vicinity of EPP rated wetlands. The proponent should also note that any water management plan and operating strategy required as a licensing condition will require monitoring well beyond the life of the mine and should be recognised in the mine closure plan.                                                                                                  | 6 4 13    |
| Groundwater    | DOW       | It is unclear as to what impacts the discharge of excess water into drainage channels will have on downstream areas in regards to water quality. During the peak of the wet season, discharge into drainage channels may have significant impacts in regard to flooding and water quality issues. The impacts to downstream users in regard to water quantity and quality have not been adequately addressed                                                                                                                                                                                                                                                                                                                                                   | 6 4 14    |
| Groundwater    | DOW       | The main concern is that it will not be able to achieve the min 2 metre separation to groundwater table per WRC statewide policy No.1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 15    |
| Groundwater    | DOW       | Point 19 provided in our previous comments. "Pg 58, section 4.6, Construction of containment bunding to statutory and guideline requirements for all hazardous and potential contaminating material will occur". In PER, now on p.58, section 4.17. This statement has only been partially considered in this section.                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 15    |
| Groundwater    | DOW       | Point 20 provided in our previous comments. "Pg 62, 4.17 Induction and training needs to include making employees aware that they are operating within the proposed Karnup-Dandalup UWPCA and Water Reserve." In PER, now on p. 59, section 4.19. This statement has not been considered in the PER, but our Branch is of the opinion that the proponent should be made aware of the importance of addressing this issue in their training programs.                                                                                                                                                                                                                                                                                                           | 6 4 15    |
| Groundwater    | DOW       | Point 21 provided in our previous comments. "Pg 78, 5.7.4 Water Quality data for the bores should refer to a map with the bore locations on it. ..." In PER, now on p 78, section 5.6.1.4. This comment has not been considered in the PER.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 4 15    |
| Groundwater    | DOW       | Point 22 provided in our previous comments: "Figure 9 – this map should include the Karnup-Dandalup proposed boundary...." This map has not been included in the PER. A map showing the boundaries and priority classification of the proposed Public Drinking Water Source Areas should be included in the PER.                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 4 15    |
| Groundwater    | DOW       | Point 23 provided in our previous comments: "Pg 118 – the environmental impacts list should include pollution to the public and private water sources, particularly the proposed Public Drinking Water Source Areas (PDWSA)". This statement has partly been incorporated, but there is no referral to the proposed PDWSA. The proponent should be advised that the proposed PDWSA is considered in their management approach.                                                                                                                                                                                                                                                                                                                                 | 6 4 15    |
| Groundwater    | DOW       | Point 24 provided in our previous comments: "Pg 120 – the list of plans and procedures to be prepared should include the Hydrocarbon Management Procedure. ..." The Hydrocarbon Management Procedure has not been referred to in section 9.2 p120. This procedure is important to prevent any surface and groundwater pollution in the future drinking water source area. Therefore this procedure should be listed under section 8.2.                                                                                                                                                                                                                                                                                                                         | 6 4 15    |
| Groundwater    | DOW       | Point 2 "The Department of Water Kwinana Peel-Regional office ... should be contacted with regards to the RIWI Act licensing requirements for diverting watercourses, dewatering and groundwater abstraction.....on the aquifers". The proponent should apply for a licence under RIWI Act not only for diverting watercourses and abstracting groundwater, but also for the dewatering process of the pits (see Table 1, p. 15, groundwater, Environmental Management, p.25, Management Action, Groundwater 9.6.4b).                                                                                                                                                                                                                                          | 6 4 15    |
| Groundwater    | DOW       | Point 3 provided in our previous comments: "1.38 and Management Action 9.6.3e – Underground fuel and chemical storage in P2 areas of Public Drinking Water Areas is prohibited via by-laws... ", in PER, now on p 25, point 9.6.4e, Management Actions, Groundwater. The proponent should be encouraged to install the fuel storage tanks above-ground, as underground fuel and chemical storage in P2 areas in proclaimed Public Drinking Water Source Areas is prohibited via by-laws.                                                                                                                                                                                                                                                                       | 6 4 15    |
| Groundwater    | DOW       | Point 5 provided in our previous comments: "There should be a contingency plan in place for the transport routes through the proposed Public Drinking Water Area in case of events such as a truck roll over or fuel spill." This comment has not been taken into consideration in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 4 15    |
| Groundwater    | DOW       | Point 12 provided in our previous comments: "Pg 32 Management Action 9.6.3b. What issues will be addressed in the Water Management Strategy? ....". In PER, now p 25, 9.6.4b. This comment has not been addressed in the PER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 4 15    |
| Groundwater    | DOW       | Point 11 provided in our previous comments: "Potential impacts should include other impacts such as dust, accidents, chemicals, lubricants, engine oil etc not just hydrocarbons". This comment has not been considered in the PER.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 4 15    |



| Specific Topic | Submitter | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reference |
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| Groundwater    | DOW       | Point 14 provided in our previous comments: "Pg 32 Management Action 9.11.4, ...Any spills should also be reported to the appropriated authorities. This should form part of a contingency plan, or part of the Hydrocarbon Management Procedure." It is not clear from the PER whether this comment has been taken on board.                                                                                                                                                                                                                                                                                                                                   | 6 4 15    |
| Groundwater    | DOW       | Point 14 provided in our previous comments: "Pg 34 Management Action 9.11.4, p.59 4.9.4 and pg 61 4.13 – This branch would like to see further details of the numbers, locations, types and approximate proposed usage rates of effluent disposal systems. In PER, now p27, 9.11.4, p.58, section 4.15 and section 4.16.1. This comment has not taken into consideration                                                                                                                                                                                                                                                                                        | 6 4 15    |
| Groundwater    | DOW       | Point 18 provided in our previous comments. Most recommended documents were added to table 6, p 36 and section 9.7.2, p 159, apart from WAPC's Statement of Planning Policy 2.7 Public Drinking Water Source Policy. WAPC's draft Statement of Planning Policy 2.9 Water Resources is also of relevance to this project proposal. This draft Policy provides measures to protect, conserve and enhance surface and groundwater catchments which have been identified for existing and future human consumption. The policy also addresses the importance to take into consideration the potential adverse impacts that development may have on catchment areas. | 6 4 15    |
| Groundwater    | DOW       | Only numerical modelling has been used in the hydrogeological report to predict changes in groundwater levels as a result of the Keysbrook project. More information is required regarding this in the form of pump test data to validate the model given that it is acknowledged in the PER that there is hydraulic connection between aquifers, and the project is located within a recharge area for the Leederville and Yarragadee aquifers. Concern is raised and more information is required as to the potential for leakage between the Superficial and Leederville Aquifer from dewatering activities.                                                 | 6 4 2     |
| Groundwater    | DOW       | The hydrologic report states that mining/dewatering operation causes "negligible" change in groundwater level in the Leederville aquifer. From Figure 3 and from Figure 22 it can be concluded that the impacts to licensed bores in the Leederville aquifer after 8 years of mining operation is a reduction in water levels of 0.5 to 2 meters. It is assumed that recharge to the underlying Leederville aquifer will be reduced as a result of dewatering the superficial aquifer. There are concerns that "negligible" change in water levels in the Leederville aquifer is incorrect and understated.                                                     | 6 4 2     |
| Groundwater    | DOW       | There are concerns that the proposed mining areas (Figure 2, Fauna Management Plan) are adjacent to EPP rated wetlands. There are also major and medium drainage features through the middle of mining areas with buffers of only 20 meters. The modelling estimates potential impacts at the pit edge and at distances much further away from the pit. The model does not provide an indication of the drawdowns in the EPP rated wetlands adjacent to the mine areas nor to the drainage features with only 20 meter buffers. Drawdowns at these specific distances and the impacts to these sites need to be assessed further.                               | 6 4 3     |
| Groundwater    | DOW       | Buffers of 20 metres have been proposed around major and minor watercourses and the effect of winter dewatering of mine pits adjacent to drainage lines is said to have a negligible effect on the creek flow, however the dewatering impact on groundwater (base flow) contribution to streams has not been demonstrated. It is not clear that dewatering will not impact on native retained vegetation, existing groundwater users and EPP wetlands.                                                                                                                                                                                                          | 6 4 3     |
| Groundwater    | DOW       | A Site Water Storage dam with a storage capacity of 74,000kL is proposed to be constructed near the thickener and wet concentrator. From the figures provided, it is not clear exactly where this is located. Construction details and full dimensions should also be provided                                                                                                                                                                                                                                                                                                                                                                                  | 6 4 4     |
| Groundwater    | DOW       | Figure 5 proposes Water Dam discharge during periods of high rainfall. What is considered to be high rainfall? Further information is required as the location of the sedimentation basin and discharge point.                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 4 4     |
| Groundwater    | DOW       | The hydrologic report states that mining/dewatering operation causes "negligible" change in groundwater level in the Leederville aquifer. From Figure 3 and from Figure 22 it can be concluded that the impacts to licensed bores in the Leederville aquifer after 8 years of mining operation is a reduction in water levels of 0.5 to 2 meters. It is assumed that recharge to the underlying Leederville aquifer will be reduced as a result of dewatering the superficial aquifer. There are concerns that "negligible" change in water levels in the Leederville aquifer is incorrect and understated.                                                     | 6 4 5     |
| Groundwater    | DOW       | More information is required as to the impact of dewatering of the superficial aquifer and extraction from the Leederville aquifer on the Leederville aquifer. Regional Water and Rivers Commission monitoring bores in the Serpentine and Murray Groundwater Areas show decreasing water levels in both the Leederville and Yarragadee aquifers. Exploratory drilling should be undertaken and lithological, natural gamma, resistivity logging and pump testing should be undertaken to determine the resource and potential impacts.                                                                                                                         | 6 4 5     |
| Groundwater    | DOW       | However, it is recommended to treat these areas as potential Public Drinking Water Source Areas, particularly considering the superficial aquifer is an unconfined aquifer that is in hydraulic continuity with the underlying aquifers (depending on the local stratigraphy and geological structure). Careful land use planning and management is required to prevent any surface and groundwater pollution.                                                                                                                                                                                                                                                  | 6 4 5     |

| Specific Topic | Submitter            | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Reference |
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| Groundwater    | DOW                  | It is recommended that all nearby groundwater users be identified and communicated with. Insufficient information is provided to give a high level of confidence that neighbouring ground water users will not be impacted. Bore depths, screen intervals, water levels and water quality should be identified in neighbouring bores to ensure water levels and quality are not impacted. There are concerns that reductions in recharge to the Leederville aquifer may have unacceptable effects to surrounding users with licensed bores that abstract from the Leederville aquifer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 4 5     |
| Groundwater    | DOW                  | Figure 3 of Appendix 4 shows 25 production bores completed in the superficial aquifer and 11 production bores completed in the Leederville aquifer which are 2,000 metres or less from the proposed mining areas. It is highly recommended that the proponent conduct a risk analysis of potential impacts to the local bores in the event that the drawdowns estimated by the numerical model are underestimated. Depending on the availability of construction data, each bore should be assessed separately regarding screened interval, available drawdown and current trends in local groundwater levels. Superimposed on this information should be gradational scenarios where drawdown impact is incrementally increased to define failure thresholds.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 4 5     |
| Groundwater    | DOW                  | Licenses under the Rights in Water and Irrigation Act 1914 will be required for the construction of wells and to take water in both of these instances. The Department of Water can make no guarantee that either licence will be issued at the conclusion of the assessment process. Additional information may be requested, if required. An Operating Strategy in accordance with Statewide Policy No. 10 – The Use of Operating Strategies in the Water Licensing Process will be required.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 4 6     |
| Groundwater    | DOW                  | It is proposed that water will be taken from the superficial aquifer during pit dewatering and from the Leederville aquifer for additional process requirements. Licenses under the Rights in Water and Irrigation Act 1914 will be required for the construction of wells and to take water in both of these instances. An Operating Strategy in accordance with Statewide Policy No. 10, The Use of Operating Strategies in the Water Licensing Process will be required. A plan should be developed to deal with existing groundwater licenses that will be within the mining area. Temporary transfers may be required to ensure water entitlements are maintained for existing licensees. At the completion of mining all new bores constructed will require a Permit to Construct or Alter Wells. It is expected that developments that are re-established after mining will require new development plans using best management practice and efficient irrigation systems. The Department of Water Kwinana Peel-Regional office ... should be contacted with regards to the RIWI Act licensing requirements for diverting watercourses, dewatering and groundwater abstraction.....on the aquifers". The proponent should apply for a licence under RIWI Act not only for diverting waterco | 6 4 6     |
| Groundwater    | DOW                  | A draft hydrogeological report provided in March of 2006 indicated that the water requirements from the Leederville aquifer were about 1 GL per annum. The hydrogeological report (Rockwater, 2006) in appendix 4 of the PER states that the water requirement for processing is actually 2 GL per annum. It is recommended that the proponent refine their estimates of their processing water requirements. It is also strongly recommended that the abstraction volumes be limited to what is required for safe mining conditions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 4 7     |
| Groundwater    | DOW                  | The numerical model in Appendix 4 approximates the local hydrogeology and applies aquifer parameters that are accepted by the DoW as being representative of the aquifer units on a regional scale. The model estimates that groundwater in the superficial aquifer will be lowered by up to 4.5 meters in excavation pits, but generally less than 0.2 meters elsewhere. The model also estimates that the mining/dewatering operation had negligible change in groundwater levels in the Leederville aquifer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 4 8     |
| Groundwater    | DOW                  | There are concerns that the model takes into account only those pumping bores associated with either mine dewatering or processing supplies. The model does not take into account the collective impacts of the local bores abstracting from the superficial aquifer and from the underlying Leederville aquifer. There is also an increase in abstraction from the Leederville aquifer from new users in this region which could add to the collective regional impacts. The cumulative impact of the mine operation and surrounding users could have significantly more impact than what is estimated in the model. The model may underestimate the impacts to the Leederville aquifer as a result of the mining operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 4 9     |
| Groundwater    | DOW                  | Surface hydrology has been discussed however ecological water requirements, social water values and aquatic flora and fauna have not been identified.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 5 2     |
| Groundwater    | DOW                  | A Water Management Plan should be approved for the project prior to the start of mining, defining proposed ground and surface water monitoring locations, frequency and parameters. The PER states that water quality results will be compared with existing baseline data. No monitoring locations are included within the PER or baseline monitoring results. It is recommended that Olympia Resources should undertake two years pre-development monitoring particularly of groundwater levels                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 5 3     |
| Groundwater    | Greenacres Turf Farm | The proposed Leederville 2GI water license is offensive as Greenacres has been negotiating for over 14 Years and could better utilise the allocation and employ more local people. Greenacres Turf employs over 20 local people.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 4 23    |
| Groundwater    | Greenacres Turf Farm | If the mining was to proceed, Greenacres would require some assurances in terms of water quality and quantity for its sustainability issues. Greenacres has concerns regarding the potential impacts on water quality and quantity from the Dirk Brook Dirk Brook water course. It is a primary source of superficial water supply to the farm.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 4 9     |



| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference |
|----------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Groundwater    | PHCC        | Figure 5 is just a schematic representation of the piping infrastructure that will need to be installed in order to link the ground water bores, the pit-de-watering and the processing water recycling, to the water storage dam in each of the (three) mine processing locations. This schematic representation does not permit assessment of the potential impacts of the installation and operation of the piping infrastructure especially as the distance between the pit site and processing may be 2kms (and possibly over 5kms if three separate processing locations are not used) depending on final mine operation designs.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 4 17    |
| Groundwater    | PHCC        | States that, "In summer the groundwater level will usually be below the level of the pit floor". We argue that aerial photography for the mining area, which is taken in summer, shows stock-watering soaks that contain water. These demonstrate the summer groundwater level and we suggest that dewatering is highly likely to be required in summer.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 4 22    |
| Groundwater    | PHCC        | Concerned that wetlands will be affected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 4 3     |
| Groundwater    | PHCC        | It is stated that "Major" and "Medium" watercourses will not be mined and will be protected by 20m buffers. 1. These buffers need to be established through permanently fencing and revegetating all waterways & buffers should be a minimum of 60m. 2. We do not support the disturbance of any waterways including "Minor watercourses". 3. Should disturbance be permitted we request detailed management plans that outline the specific actions that will ensure that a) the diversion of these watercourses will be manageable with earthworks such as bunds and drains around mine pits. b) Water re-enters natural drainage lines at a velocity and depth that can be accommodated by the natural stream line without increasing scouring. c) Mitigation and management strategies exist to ensure water quality meets discharge criteria.                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 3     |
| groundwater    | SJLC        | Size of buffers between mining area and EPP /draft EPP wetlands (pp.81-82). The PER does not appear to have referred to the WAPC's Guideline for the Determination of Wetland Buffer Requirements (Draft), in determining proposed buffers. Buffers should be determined according to the WAPC's guidelines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 15 2    |
| groundwater    | SJS         | DoE management category for EPP wetlands has not been included so appropriate buffers and management requirements cannot be determined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 15 2    |
| Groundwater    | SJS         | Given that the site is located within the Peel-Harvey catchment, any overflow from the mining operations will need to be appropriately monitored and managed to minimise potential downstream impacts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 4 12    |
| Groundwater    | SJS         | Some further comment should be provided regarding the nature of the flocculant to be used and whether it poses a potential risk to the environment if released.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 4 19    |
| Groundwater    | SJS         | Whilst the rate of dewatering in summer is unlikely to be substantial, there are likely to be some localised impacts on the local groundwater table as a result of the operations. Further information should be provided regarding this, particularly with respect to the duration and extent of these impacts, as well as the 'negligible' impact on the Leederville aquifer. Secondly, the information suggests that there will be some groundwater table elevation (mounding) effects associated with the tailings deposition area(s). Further comment should be provided on this to determine the potential environmental impacts of this mounding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 4 2     |
| Groundwater    | WS          | Watertable drawdown may impact on vegetation which is already under considerable pressure from grazing and agriculture and may degrade wetlands. Mining operations would require 1.5-2GL of water per year. Although no EPP wetlands are located directly within the mining area, a few mine cells would occur only a few metres from wetlands. Figures 11, 12 and 13 show buffer distances as little as 9.72m. It can therefore be expected that mining operations will have an effect on surrounding EPP wetlands. The impact of changed hydrology on surrounding vegetated areas and EPP wetlands is also of concern.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 4 3     |
| Heritage       | CC          | The proposed management of aboriginal heritage for this proposed mine is non-existent.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 12 1    |
| Heritage       | Community 1 | There needs to be consultation with the indigenous people of the region, local flora and fauna studies, and wildlife corridors.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 12 1    |
| Heritage       | DIA         | Due to the existence of a number of previously recorded archaeological and ethnographic sites in the vicinity of the proposed works it is highly recommended that archaeological field inspections and consultations are conducted with relevant Aboriginal people prior to any developments commencing at the project area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 12 1    |
| Heritage       | DIA         | Provided that Olympia Resources fulfils their commitments outlined at page 100 and 175 of the PER they have to date adequately considered Aboriginal heritage issues. Further, they are aware of their obligations under the Act and have committed to abide by them.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 12 1    |
| Legislation    | PHCC        | Items of primary Legislation and policy that we believe the Olympia Resources Ltd PER document does not addresses with sufficient detail: Environmental Protection (Peel Inlet Harvey Estuary) Protection Policy (and reviews): not addressed as a reference in PER, p. 36-40, Table 6: "Legislation, Policies and Guidelines Applicable to the Proposal". Aboriginal Heritage Act 1972: especially with respect to the disturbance of waterways and wetlands to which the PER does not refer to at Section 1.3 q) on p.8. Environment Protection and Biodiversity Conservation Act (1999) (Cth) with respect to matters of National Environmental Significance including the Ramsar-listed Peel-Yalgorup System, Threatened Ecological Communities, threatened species including Carnaby's and Baudin's White-tailed Black Cockatoo and migratory species. Japan-Australia Migratory Bird Agreement and China-Australia Migratory Bird Agreement. Western Australia Wildlife Conservation Act (1950): listed Threatened Ecological Communities, threatened and priority species. Environmental Protection Authority, 1992, Environmental Protection (Swan Coastal Plain Lakes) Policy 1992 and the Environmental Protection Authority, 2004, Revised Draft Environmental Protection (Sw | 6 16 3    |

| Specific Topic        | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Reference |
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| Light                 | Community 1 | Olympia states that as this is a rural area, and there are no existing issues of light overspill from another major contributor, that this will not be an issue. Shouldn't that be the other way around?                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 9 8     |
| Location of wet plant | KNAG        | Wet Plant located in wooded creek.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 10 7    |
| Loss of topsoil       | Community 2 | This sand area is very fragile and different to the heavy clay soil. The top couple of inches are where all the good soil is. There is no way that this precious topsoil can be separated when digging 2 metres of soil for the extraction of the minerals. This is of great concern as the loss of the topsoil would render this land almost useless for the future of pasture growing                                                                                                                                                                                                                                                                              | 6 2 30    |
| Mine Plan             | Community 1 | Before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba. | 6 12 1    |
| Mine Plan             | Community 1 | The comparison with other sand mining operations fails to highlight the massive area needed for such a low-grade deposit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 13 32   |
| Mine Plan             | Community 1 | Due to the inadequacies of the PER document to date, the studies should be completed, resubmitted and be subjected to the higher level of assessment, namely an "Environmental Review and Management Programme".                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 16 1    |
| Mine Plan             | Community 1 | Before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba. | 6 16 6    |
| Mine Plan             | Community 1 | Before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba. | 6 3 1     |
| Mine Plan             | Community 1 | Before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba. | 6 4 3     |
| Mine Plan             | Community 1 | Before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba. | 6 4 8     |
| Mine Plan             | Community 1 | Before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba. | 6 6 2     |
| Mine Plan             | Community 1 | Before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba. | 6 7 1     |

| Specific Topic | Submitter     | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Reference |
|----------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Mine Plan      | Community 1   | Before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba. | 6 9 4     |
| Mine Plan      | Community 1   | Before any serious consideration could be given to assessing the environmental impact of the project, the shortcomings of the studies presented in the PER document should be addressed. Water study based on models – no field testing or measurement; North Dandalup has not been addressed; Wind studies are from the Perth Airport – not local data; Wetland study is an office based survey; ASS study – less than 15% of the area; Salinity evidence is not addressed; flora studies are incomplete; Fauna studies are incomplete; Aboriginal heritage study is not done; Noise impact study – only 1 scraper; Dust management – copy and pasted from Eneabba. | 6 9 7     |
| Noise          | Community 1   | There appears to be no allowance for noise reduction during the day. The sound travels further in this area, as it is flat land. The company should have a noise complaints register. Olympia will be mining within 500 metres of houses in the township of North Dandalup plus many others on the outskirts.                                                                                                                                                                                                                                                                                                                                                        | 6 10 1    |
| Noise          | Community 1   | Only houses directly alongside the mining have been listed in the PER report. Houses next to or across the road from these are not shown. If night time restrictions were placed on these operations, as would be the case for all the areas that straddle Readheads Road, then 4 scrapers would be required. This requires remodelling, given that the Wet Plant already reaches the maximum limit for houses in the area.                                                                                                                                                                                                                                          | 6 10 2    |
| Noise          | Community 1   | The sound impact diagram has not included the residence on Lot 105. Notice that the mining contractors will be required to wear acceptable noise protection equipment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 10 2    |
| Noise          | Community 1   | Noise modelling fails to include a minimum of 2 scrapers and possibly 4 if operation hours are restricted. The sound impact diagram has not included the residence on Lot 105. Noise modelling fails to include the fact 2 scrapers, not the 1 mentioned, will be required to supply 600 tonnes per hour across a 24 hour period.                                                                                                                                                                                                                                                                                                                                    | 6 10 5    |
| Noise          | Community 1   | One of the pleasures of living in a rural community is the serenity, the peace, the quiet and tranquility. This tranquility will be shattered by blazing lights, the sound of graders, front end loaders, scrapers, dozers, excavators, tractors, heavy cartage trucks, generators, pumps and the sound of rocks being dumped onto metal hoppers – 24 hours per day.                                                                                                                                                                                                                                                                                                 | 6 10 5    |
| Noise          | Community 112 | The NMP needs to be adaptive & be continually reassessed to determine that noise impacts are fully compliant with the noise regulations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 10 2    |
| Noise          | Community 112 | The proponent proposes to comply with the Noise Regulations 1997, however their assessment of potential impacts is flawed. Firstly the proponent has not used up to date land use maps for the area. For example, Figure 21 only shows one residence within the noise shed of mine area 8 south of Readheads Rd. There are several houses on the eastern side of McMahon Rd which are not shown and therefore no assessment has been made of the noise impacts on these residences.                                                                                                                                                                                  | 6 10 2    |
| Noise          | Community 112 | Also no assessment has been made as to the adaptive management required and proposed measures if the land uses change during the lifetime of the mining operations. For example if new residences were built on the surrounding properties.                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 10 2    |
| Noise          | Community 112 | Some areas may not be able to be mined. The impact on the townsite of North Dandalup from noise is not assessed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 10 2    |
| Noise          | Community 112 | Using the sound power levels typical for the types of operations proposed and the Environmental Noise Model (ENM) experience shows that it is possible that residences to the south of the mine area 8 in North Dandalup will experience unacceptable noise under certain meteorological conditions. Particularly, during night time with slight northerly winds and temperature inversions                                                                                                                                                                                                                                                                          | 6 10 2    |
| Noise          | Community 112 | The generators, pumps, pipelines, and ancillary equipment that will be required for mining operations will produce unacceptable noise (>30 dB(A)).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 10 3    |
| Noise          | Community 112 | It appears that the noise assessments documented in the PER have been carried out for individual equipment items and operational activities. That is, the cumulative noise impacts from all equipment operating at one time have not been determined. The Noise Regulations require that cumulative noise impacts (excluding transport noise) be considered in determining compliance.                                                                                                                                                                                                                                                                               | 6 10 3    |
| Noise          | Community 112 | The PER is dismissive of the noise impacts of caretaker residences, the Noise Regulations apply to caretaker residences in Industrial areas and no assessment of the noise impacts on these was presented in the PER therefore it is not possible to determine if compliance with the Noise Regulations is possible with the proposed operations.                                                                                                                                                                                                                                                                                                                    | 6 10 4    |
| Noise          | Community 2   | Potential impacts on the town of North Dandalup is not mentioned in the PER, despite the proximity of the proposed operations to the town. Some residences are 250 metres from the proposed mining area, and will be impacted by the operations. Some of the dwellings within close proximity to the mine site do not appear on the proponent's mapping.                                                                                                                                                                                                                                                                                                             | 6 10 2    |
| Noise          | Community 2   | Scrapers operating 24 hours a day will have a noise impact on the local residences, with the prevailing winds. Noise will be hard to control and will affect landowners living in close proximity to the mine, with scrapers and trucks operating 24 hours a day.                                                                                                                                                                                                                                                                                                                                                                                                    | 6 10 3    |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Reference |
|----------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Noise          | Community 2  | Scrapers operating 24 hours a day will have a noise impact on the local residences, with the prevailing winds. Noise will be hard to control and will affect landowners living in close proximity to the mine, with scrapers and trucks operating 24 hours a day.                                                                                                                                                                                                           | 6 10 5    |
| Noise          | Community 2  | The proposal will create a lot of noise that will impact on the local residences, particularly at night. Concern regarding impacts from noisy machines and the plant (300 metres from residences). The clearing of vegetation and operation of machinery would become a nuisance to nearby residences                                                                                                                                                                       | 6 10 5    |
| Noise          | Community 2  | The proposal will create a lot of noise that will impact on the local residences, particularly at night. Concern regarding impacts from noisy machines and the plant (300 metres from residences). The clearing of vegetation and operation of machinery would become a nuisance to nearby residences                                                                                                                                                                       | 6 10 6    |
| Noise          | Community 2  | To minimize impact on a local resident who suffers from sleeping conditions, operations near her residence should cease from 11:00pm to 6:00am. The link to Atkins Road should be located as far away as possible from her residence.                                                                                                                                                                                                                                       | 6 13 38   |
| Noise          | Community 53 | At present, the rural locality is peaceful and quiet at night, with little noise pollution. This will be changed if a 24 hour mine was to operate.                                                                                                                                                                                                                                                                                                                          | 6 10 1    |
| Noise          | Community 71 | The proposed operation will create a noise impact on the local community, even though Olympia has advised that noise should not be a problem and they will have the reversing buzzers in scrapers and loaders (the most complained noise) turned off at night.                                                                                                                                                                                                              | 6 10 5    |
| Noise          | DEC - LWQB   | An NMP should be prepared by the proponent. The NMP should incorporate some basic details re. construction noise management. Should "out of hours" construction be proposed at a later date, further information will be required in the NMP.                                                                                                                                                                                                                               | 6 10 9    |
| Noise          | DEC - LWQB   | Concerns that the use of a value of 0.65 for ground absorption may be excessively attenuating the predicted noise levels by approx 2-3dB. It is perhaps more appropriate to re-examine this issue as an element of the proponents NMP i.e. verifying the model                                                                                                                                                                                                              | 6 10 9    |
| Noise          | KNAG         | There is no mention of the town of North Dandalup despite the fact that mining is planned to come within 500 metres of houses in the Coral Park subdivision of the town of North Dandalup.                                                                                                                                                                                                                                                                                  | 6 10 2    |
| Noise          | KNAG         | The noise modelling study is entirely theoretical. It has not included additional machinery and fails to recognize that the town or North Dandalup is 500 metres from the edge of the pit. (see Figure 2 for houses with 1km buffer)                                                                                                                                                                                                                                        | 6 10 2    |
| Noise          | KNAG         | No mentioned of the incessant beeping noises from a myriad of mine vehicles has been included in the study.                                                                                                                                                                                                                                                                                                                                                                 | 6 10 3    |
| Noise          | KNAG         | Noise modelling fails to include the fact that 2 scrapers (not 1) will be required to supply the 600 tonnes per hour across a 24-hour period. If night-time restrictions were placed on these operations, as would be the case for all of the areas that straddle Readheads Road, then 4 scrapers would be required. This requires remodelling given that the Wet Plant already reaches the maximum limit for houses in the area                                            | 6 10 5    |
| Noise          | KNAG         | Noise modelling fails to include a minimum of 2 scrapers and possibly 4 if operation hours are restricted. The constant noise of reversing beepers from multiple scrapers, front-end loaders and other mine vehicles will be unbearable. Have the generators been included in the Noise Modelling.                                                                                                                                                                          | 6 10 5    |
| Noise          | KNAG         | No mentioned of the incessant beeping noises from a myriad of mine vehicles has been included in the study.                                                                                                                                                                                                                                                                                                                                                                 | 6 10 5    |
| Noise          | KNAG         | Noise modelling confirms the need for separate night and day pits, thus doubling the exposed areas and the amount of water required for dust control.                                                                                                                                                                                                                                                                                                                       | 6 10 6    |
| Noise          | KNAG         | The noise modelling suggests that scrapers cannot operate at night for much of the area. This will necessitate at least 2 pits to be open at any given time (a night time pit and a day time pit) i.e. at least 60 hectares will be exposed at any time. This will be further complicated if additional pits are required during times of high winds to avoid impact on neighbours.                                                                                         | 6 10 6    |
| Noise          | KNAG         | Executive Summary 1.6 Table 2 Summary of Environmental Activities "1" The Wet Concentrator Plant been located to minimize impact on native vegetation" The image from Figure 4 of the Mining Schedule clearly shows where noise-modelling studies have positioned the wet plant. It cannot be moved further north or west as shown because people live there. Below is the plan showing the location of the wet plant in a wooded creek that drains to the Mandurah Estuary | 6 10 7    |
| Noise          | KNAG         | Figure B01 placed a wet plant on a property holding that has not yet signed an agreement for mining. Figure B03 places the wet plant as close as possible to houses 8 and 10. This location is in a wooded creek.                                                                                                                                                                                                                                                           | 6 10 8    |
| Noise          | Murray Shire | The Applicant's Noise Management Plan should include the movement of heavy haulage vehicles on local roads and potential for restricting activity to 7am to 7pm Monday to Saturday, not at all on Sunday. Upon final scheduling of work the applicant shall submit the NMP to Council for approval. The plan should be adaptive, i.e.. subject to amendment should further issues arise .                                                                                   | 6 10 9    |
| Noise          | Community 60 | Noise containment is not adequately addressed.                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 10 1    |
| Noise          | Community 60 | Noise containment is not adequately addressed.                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 10 2    |
| Noise          | KNAG         | The Coral Park subdivision on the western side of North Dandalup town site is located 500 metres from the proposed pit. There are numerous lifestyle blocks immediately adjacent to the mine-site across the entire lease                                                                                                                                                                                                                                                   | 6 10 2    |
| Noise          | KNAG         | The Coral Park subdivision on the western side of North Dandalup town site is located 500 metres from the proposed pit. There are numerous lifestyle blocks immediately adjacent to the mine-site across the entire lease.                                                                                                                                                                                                                                                  | 6 13 13   |

| Specific Topic   | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Reference |
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| nutrients        | Community 65 | It is proposed by Olympia Resources that mineral sand will be extracted to a depth of 5 metres. The extraction of minerals will require large quantities of water to be drawn from the Leederville aquifer which will then be used to wash the sand. The mineral slurry will be retained while the quartz sand residue will be returned to the excavation. Where ancient sand dunes have built up over a clay base, vast quantities of nutrient rich water filtering down will reach the barrier of clay underlay and of necessity spread out over the clay and filter into the wetlands and creeks                                                                                                                                                                                                                                          | 6 6 1     |
| Nutrients        | SJLC         | It is also unclear whether revegetation success will be hindered by any losses in nutrient requirements due to removal of minerals. Determine impact of removing mineral on water and nutrient uptake of native plants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 6 6     |
| Nutrients & Salt | Community 1  | Pit dewatering during winter in this highly permeable sand will allow nutrients from the mine to enter Nambeelup Creek, which flows to the Peel Harvey Estuary catchment area, and is already under stress. It also poses the risk of contaminating Nambeelup Creek, which flows diagonally through several properties, and is used for much of the year by some cattle. Pit dewatering during winter when the ground water is at surface level or above, will definitely flood into neighbouring properties creating an increased risk of salinity and acidity because land will take longer to drain. Pit dewatering during winter will cause massive erosion and collapse of Nambellup Creek South's banks due to the additional volume of water entering the creek. It already runs in a torrent after rain.                             | 6 4 12    |
| Nutrients & Salt | Community 1  | Pit dewatering during winter in this highly permeable sand will allow nutrients from the mine to enter Nambeelup Creek, which flows to the Peel Harvey Estuary catchment area, and is already under stress. It also poses the risk of contaminating Nambeelup Creek, which flows diagonally through several properties, and is used for much of the year by some cattle. Pit dewatering during winter when the ground water is at surface level or above, will definitely flood into neighbouring properties creating an increased risk of salinity and acidity because land will take longer to drain. Pit dewatering during winter will cause massive erosion and collapse of Nambellup Creek South's banks due to the additional volume of water entering the creek. It already runs in a torrent after rain.                             | 6 6 1     |
| Nutrients & Salt | Community 1  | The possibility of mobilisation of agricultural nutrients bound in the soil profile has not even been considered as the Bassendean sands are "highly leached" (p65) and the current use is "not regulated", implying any nutrient release won't be their problem. The cause and extent of salinity within the mining lease have not been addressed, nor does there seem to be a proposed plan should the problem be exacerbated. Concern regarding the upset of fertiliser that has been embedded in the soil for the past century. With fertiliser run-off entering the Peel Inlet, the consequence of fertiliser spreading throughout the entire region could damage the entire Peel region. Soil samples should be analysed before fertilizer application to ensure the correct fertilizer blend and quantity is applied, when re-seeding | 6 6 1     |
| Nutrients & Salt | Community 1  | Pit dewatering during winter in this highly permeable sand will allow nutrients from the mine to enter Nambeelup Creek, which flows to the Peel Harvey Estuary catchment area, and is already under stress. It also poses the risk of contaminating Nambeelup Creek, which flows diagonally through several properties, and is used for much of the year by some cattle. Pit dewatering during winter when the ground water is at surface level or above, will definitely flood into neighbouring properties creating an increased risk of salinity and acidity because land will take longer to drain. Pit dewatering during winter will cause massive erosion and collapse of Nambellup Creek South's banks due to the additional volume of water entering the creek. It already runs in a torrent after rain.                             | 6 6 2     |
| Nutrients & Salt | Community 1  | The possibility of mobilisation of agricultural nutrients bound in the soil profile has not even been considered as the Bassendean sands are "highly leached" (p65) and the current use is "not regulated", implying any nutrient release won't be their problem. The cause and extent of salinity within the mining lease have not been addressed, nor does there seem to be a proposed plan should the problem be exacerbated. Concern regarding the upset of fertiliser that has been embedded in the soil for the past century. With fertiliser run-off entering the Peel Inlet, the consequence of fertiliser spreading throughout the entire region could damage the entire Peel region. Soil samples should be analysed before fertilizer application to ensure the correct fertilizer blend and quantity is applied, when re-seeding | 6 6 2     |
| Nutrients & Salt | KNAG         | The PPG is adamant that the quality of water in the Leederville aquifer should be protected at all costs. Consideration should be given to the risk of contamination from, nutrients, minerals or chemical filtration or residues from mineral sand extraction. It would only take one disastrous decision or mistake to reach the point of no return.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 4 11    |
| Nutrients & Salt | KNAG         | There are MULTIPLE POINTS in the submission regarding the risk of pollution of surface water, Nambeelup Creek & Peel Harvey Estuary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 6 1     |
| Nutrients & Salt | KNAG         | Pit dewatering in a highly permeable sand in an area subject to sheet wash during wet winters will mean that the 2 Gigalitres of mine waste water lost each year will carry nutrients remobilised by the mining operation directly into the Nambeelup drainage system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 6 1     |
| Nutrients & Salt | KNAG         | The mining operation has budgeted to lose 2 Gigalitres of mine wastewater per year into "a wetland chain all the way to the Peel Estuary". During wet winters this entire area is subject to sheetwash and there is no means of confining the 60 years of accumulated nutrients that will be remobilised by the mining operation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 6 1     |
| Nutrients & Salt | KNAG         | The mineral slurry will be retained while the quartz sand residue will be returned to the excavation. Where ancient sand dunes have built up over a clay base, vast quantities of nutrient rich water filtering down will reach the barrier of clay underlay and of necessity spread out over the clay and filter into the wetlands and creeks.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 6 1     |

| Specific Topic         | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Reference |
|------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Nutrients & Salt       | KNAG        | The PPG feels that the large amounts of water nominated and required for the purpose of dust and erosion control, coupled with nutrient rich mineral sand extraction water, must filter down and spread out over clay/coffee rock underlay to the drains and lake systems. This will eventually feed into the Dirk Brook Tributary, Nambellup Brook and Balgobin Brook, then into the Serpentine River and Goegrup Lake System eventually reaching the Peel Inlet and the Harvey Estuary (see Appendix 4). The Serpentine River, as well as the inlet and estuary, has a long history of extreme eutrophication, algal blooms anoxia, acid sulphate soil activation and fish kills. These issues can only be exacerbated if the mine goes ahead. The Peel Inlet and Harvey estuary elements of the Ramsar listed Peel-Yalgorup system, and the Serpentine and Murray Rivers that feed them, are already staggering under the pressures of an explosion of urban development, unsewered semi-rural and residential subdivisions, canal developments and 4,200 kilometres of nutrient rich drainage from farmlands on the Pinjarra Plain. | 6 6 1     |
| Nutrients & Salt       | KNAG        | The full long term data set of water quality of Nambeelup Brook (not included in the PER) shows that, after many years of study and progressive change by the farming community in the way they use phosphate fertilisers and the pasture species they grow, there has been a slow but steady improvement by reduction in total P. The mining proposal would ruin these gains and set back progress in the Peel Harvey system nutrient management by decades.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 6 1     |
| Nutrients & Salt       | KNAG        | The PPG is adamant that the quality of water in the Leederville aquifer should be protected at all costs. Consideration should be given to the risk of contamination from, nutrients, minerals or chemical filtration or residues from mineral sand extraction. It would only take one disastrous decision or mistake to reach the point of no return.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 6 1     |
| Nutrients & Salt       | KNAG        | The cause and extent of salinity within the mining lease has not been addressed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 6 2     |
| Nutrients & Salt       | KNAG        | There has been no effort to address the death of marri trees on the western side of the mine area that have been linked to salinity. This salinity has been mapped by surface conductivity surveys. There is also visual evidence of dominant salt tolerant grasses in the area. Salt pans have been observed on Lot 62.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 6 2     |
| Nutrients & Salt       | KNAG        | Will this bunding be lined with polythene? Where does this polluted water end up??                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 6 3     |
| Nutrients & Salt       | KNAG        | Nutrient measurements have been restricted to the upper two metres (the leached zone) yet mining depths are planned to 5 metres. Given the flushing effect of returning the tailings by water slurry, any nutrients at the clay sand interface at the base of the mine will be remobilised to the Nambeelup drainage                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 6 4     |
| Nutrients & Salt       | PHCC        | We request, as part of the assessment process, the establishment of a detailed Nutrient Management and Drainage Management Plan that includes pre-mining on-site testing and modelling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 31    |
| Nutrients & Salt       | PHCC        | We request that the proponents be required to demonstrate that the mining process will result in no net loss of nutrients to the catchment. We do not believe the PER had addressed this factor in any detail to date. The proponent must detail what investigations have been or will be undertaken to ensure that this mining process will not lead to the mobilisation of the nutrients (and salts) stored in the soil being released into the ground water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 19    |
| Nutrients & Salt       | PHCC        | We request, as part of the assessment process, the establishment of a detailed Nutrient Management and Drainage Management Plan that includes pre-mining on-site testing and modelling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 5 3     |
| Nutrients & Salt       | PHCC        | All water quality monitoring and management needs to consider not only nutrients in solution (filterable reactive Phosphorus) but also those carried by sediment especially in respect to the clay fraction (particulate Phosphorus) of the soils that are being mined.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 6 1     |
| Nutrients & Salt       | PHCC        | As part of the assessment of this proposal we request that the proponents be required to demonstrate that the mining process will result in no net loss of nutrients to the catchment. We do not believe the PER had addressed this factor in any detail to date.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 6 1     |
| Nutrients & Salt       | PHCC        | We request, as part of the assessment process, the establishment of a detailed Nutrient Management and Drainage Management Plan that includes pre-mining on-site testing and modelling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 6 1     |
| Nutrients & Salt       | PHCC        | We request that the proponents be required to demonstrate that the mining process will result in no net loss of nutrients to the catchment. We do not believe the PER had addressed this factor in any detail to date. The proponent must detail what investigations have been or will be undertaken to ensure that this mining process will not lead to the mobilisation of the nutrients (and salts) stored in the soil being released into the ground water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 6 1     |
| Nutrients & Salt       | PHCC        | We request that the proponents be required to demonstrate that the mining process will result in no net loss of nutrients to the catchment. We do not believe the PER had addressed this factor in any detail to date. The proponent must detail what investigations have been or will be undertaken to ensure that this mining process will not lead to the mobilisation of the nutrients (and salts) stored in the soil being released into the ground water.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 6 2     |
| Nutrients and salinity | Community 1 | "Groundwater is a significant environmental agent that can discharge large amounts of nutrients and other chemicals into estuarine or coastal marine environments. Because aquatic ecosystem health is inextricably linked to uptake and release of nutrients, changes in groundwater discharge may impact on the cycle of uptake and release of nutrients, which may in turn propagate higher up the food chain." (The Centre for Groundwater Studies – groundwater and the environment.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 6 1     |



| Specific Topic         | Submitter            | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reference |
|------------------------|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Nutrients and salinity | Community 1          | If Lot 56 (Mostert) and Lot 3 (Hill) were cleared, there will be salinity encroachment in the Nambeelup Catchment, especially near Elliott Road and Hopeland Road intersection which is adjacent to the bush concerned. The cause and extent of salinity within the mining lease have not been addressed, nor does there seem to be a proposed plan should the problem be exacerbated. Nutrient measures have been restricted to the upper 2 metres (the leached zone) yet mining depth is planned to 5 metres. Given the flushing effect of returning the tailings by water slurry, any nutrients at the clay sand interface at the base of the mine will be remobilized to the Nambellup drainage system.                                    | 6 6 1     |
| Nutrients and salinity | Community 1          | If Lot 56 (Mostert) and Lot 3 (Hill) were cleared, there will be salinity encroachment in the Nambeelup Catchment, especially near Elliott Road and Hopeland Road intersection which is adjacent to the bush concerned. The cause and extent of salinity within the mining lease have not been addressed, nor does there seem to be a proposed plan should the problem be exacerbated. Nutrient measures have been restricted to the upper 2 metres (the leached zone) yet mining depth is planned to 5 metres. Given the flushing effect of returning the tailings by water slurry, any nutrients at the clay sand interface at the base of the mine will be remobilized to the Nambellup drainage system.                                    | 6 6 2     |
| Nutrients and salt     | CC                   | Another potential impact is the mobilization of fertilizers trapped in the soil after years of agriculture on the poor sandy soils of the area. Given that eutrophication is listed as a major threatening process to these systems, it is unbelievable that the proponent has not given this impact more serious consideration.                                                                                                                                                                                                                                                                                                                                                                                                               | 6 6 1     |
| Nutrients and salt     | Community 112        | It is stated the HMC will be pumped onto stockpiles to drain water off prior to transport. No information is provided as to the quality of the water draining from the HMC stockpile. Leaching of minerals and other inorganic contaminants is likely to occur as the water will be slightly saline and this could contaminate soil and groundwater under the stockpile.                                                                                                                                                                                                                                                                                                                                                                       | 6 6 5     |
| Nutrients and salt     | Community 2          | Unfortunately what happens at surface is only part of the problem. When mining on such a massive scale, very small problems become very large problems and because the permeable and porous sand dune system drains directly into Peel Inlet, these problems will become very public. The remobilization of 60 years of fertilizer, ground water salinity, ASS and arsenic contamination are all documented problems that occur on our coastal plain.                                                                                                                                                                                                                                                                                          | 6 6 1     |
| Nutrients and salt     | Community 2          | Unfortunately what happens at surface is only part of the problem. When mining on such a massive scale, very small problems become very large problems and because the permeable and porous sand dune system drains directly into Peel Inlet, these problems will become very public. The remobilization of 60 years of fertilizer, ground water salinity, ASS and arsenic contamination are all documented problems that occur on our coastal plain.                                                                                                                                                                                                                                                                                          | 6 6 2     |
| Nutrients and salt     | Community 2          | If the mine was to go ahead, the salt levels will rise, and future farming will be gone in the area                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 6 2     |
| Nutrients and salt     | Community 2          | Unfortunately what happens at surface is only part of the problem. When mining on such a massive scale, very small problems become very large problems and because the permeable and porous sand dune system drains directly into Peel Inlet, these problems will become very public. The remobilization of 60 years of fertilizer, ground water salinity, ASS and arsenic contamination are all documented problems that occur on our coastal plain.                                                                                                                                                                                                                                                                                          | 6 7 6     |
| Nutrients and salt     | Community 2          | Unfortunately what happens at surface is only part of the problem. When mining on such a massive scale, very small problems become very large problems and because the permeable and porous sand dune system drains directly into Peel Inlet, these problems will become very public. The remobilization of 60 years of fertilizer, ground water salinity, ASS and arsenic contamination are all documented problems that occur on our coastal plain.                                                                                                                                                                                                                                                                                          | 6 7 7     |
| Nutrients and salt     | Community 53         | Water drainage off the mine site There has been no detailed investigation or study within the PER document to deal with this issue.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 4 12    |
| Nutrients and salt     | Community 53         | Possible salt release from mine site. The extraction process involves washing all of the soil profile to extract the heavy mineral required. Salt mineralisation held within the current soil profile will be released into the water, and when returned to the mine pits or pumped into the surface drainage system, what is to occur with this potentially salty water? The PER does not deal with the issues of salt release. The proponent must address the crucial environmental impact of salt release by the mineral extraction process. The surface flow of all surface drains from the mine site will end up in either the Balgobin Brook or the Nambeelup Brook. Both of these Brooks are said to contain draft EPP listed wetlands. | 6 6 2     |
| Nutrients and salt     | Community 60         | Nutrient run off into world listed Ramsar wetlands is not considered to be important. Release of concentrated salinity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 6 1     |
| Nutrients and salt     | Community 60         | Nutrient run off into world listed Ramsar wetlands is not considered to be important. Release of concentrated salinity.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 6 2     |
| Nutrients and Salt     | Greenacres Turf Farm | The disturbance of the accumulated nutrients and the subsequent release due to the mining procedures is of concern, especially phosphorus.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 6 1     |
| PER Report Format      | KNAG                 | 5. CRITIQUE OF EXECUTIVE SUMMARY Refer to numbering system of PER CD Version.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 13 29   |
| Pollution              | Community 60         | Waterway contamination is not adequately addressed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 5 9     |
| Power                  | Community 2          | Will Olympia be providing their own generators to power their mine site or do they plan to connect to Western Power? If generators are being used the noise will be quite substantial.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 9 10    |
| Power                  | Community 2          | If they propose to connect into Western Power, Olympia maybe surprised how many surges and power blackouts this area experiences every day. This has been taken up with Western Power without much success. Have Olympia done a survey on this matter?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 9 10    |

| Specific Topic          | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference |
|-------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Process                 | Community 2  | We are committed to protecting our environment for now and future generations and feel the proposal for this sandmining be subjected to the higher level of assessment, namely an "Environmental Review and Management Programme".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 16 1    |
| Process                 | Community 60 | Department of Industrial Resources' guidelines, controls and protections have been bypassed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 2 4     |
| Process                 | DOIR         | The Department notes that Keysbrook Minerals Sand Project proposal submitted by Olympia Resources Limited is located on private land where the mineral rights remain with the private land holder. As such the project is therefore exempt from the provisions of the Mining Act 1978 and Mining Regulations 1981. It is unknown if the proponent proposes to lodge a Mining Proposal as per the Department of Industry and Resources Mining Proposal Guidelines.                                                                                                                                                                                                                                                                                                                                                                                        | 6 2 4     |
| Project                 | Community 2  | A claim by Olympia that mining can be done to within 4 metres of neighbouring shelterbelts is proven to be false, as the existing trees will eventually die.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 16 4    |
| Project description     | PHCC         | The specific locations for the processing plant in each of the three proposed locations within the mine area should be clearly identified so potential impacts may be assessed. The fact that there are likely to be three Processing locations is not clearly detailed under c) or d) (pages 2. & 3.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 14 6    |
| Project Phases & Design | EPASU        | Olympia needs to clearly define the activities that represent the design, construction, operation and closure phases of the proposal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 16 2    |
| Radiation               | Community 1  | What is the possibility of radioactive elements being found in the mineral sands, and possibly the airborne dust in the area? There is no mention of this in the PER, apart from the community concerns question 49 in section 6.4 (p112). The prospect of radioactive dust on the ground, in the drinking water and in the air, is of great concern. Questions posted to Olympia's website:<br>Will the minerals at the proposed site increase radiation in the surrounding area? Answer: In some mineral sand deposits, naturally occurring radiation levels are increased slightly by a mineral called Monazite. However, our test drill has found no Monazite in the Keysbrook area. The Land has the same radiation levels as the rest of the Swan Coastal Plain. The same answer again was given at a community meeting.                           | 6 11 1    |
| Radiation               | Community 1  | If there is Monazite in the mineral sand, then residents are entitled to know the level of radiation expose. Cattle sold for slaughter are stringently regulated to ensure they have not been exposed to any chemicals, or fed any drugs or hormones. If the mining proceeds, cattle in the area could become contaminated with the radioactive dust, which would settle on the pasture and in the surface and ground water. During the summer months, when the east wind blows, Olympia will not be able to control the radioactive dust emissions, as no amount of water will keep the ground sufficiently damp during the mining operations. Reticulation water literally evaporates as it leaves the pipes due to the strong hot winds                                                                                                               | 6 11 1    |
| Radiation               | Community 1  | Under the heading of Keysbrook mine site;<br>Quote (1) "Minor elements in the products, including radioactive elements, are considered acceptably low for use in the Chloride process" (2) "The balance is made up of minor amounts of other heavy minerals (trash) which are not of general economic interest." (Olympia's Share Prospectus)<br>'Trash' or 'other minerals' is what mining companies now call Monazite as it is no longer commercially mined because of the radiation stigma and issues with radioactive waste disposal.                                                                                                                                                                                                                                                                                                                | 6 11 2    |
| Radiation               | Community 1  | Returning the concentrated Monazite back to the pit would be totally unacceptable as this waste material is classified as 'hazardous' waste under the EPA guidelines and has to be disposed of in a regulated waste management site. There have been no assays done in relation to the Monazite. An independent study should be done. There have not been any surface studies presented to establish the background radiation levels in the area. There have been no down hole radiation logs presented in the PER to establish possible increases in radiation when mining commences.                                                                                                                                                                                                                                                                   | 6 11 3    |
| Radiation               | Community 1  | Because of the current market conditions, Monazite is not usually marketed, but is transported with the other sand residues, from the Mineral Separation Plant (in this case Picton) back to the mine site for blending with mine sand tailings and disposed of in the mine pit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 11 3    |
| Radiation               | Community 1  | If there is Monazite in the mineral sand, then residents are entitled to know the level of radiation expose. Cattle sold for slaughter are stringently regulated to ensure they have not been exposed to any chemicals, or fed any drugs or hormones. If the mining proceeds, cattle in the area could become contaminated with the radioactive dust, which would settle on the pasture and in the surface and ground water. During the summer months, when the east wind blows, Olympia will not be able to control the radioactive dust emissions, as no amount of water will keep the ground sufficiently damp during the mining operations. Reticulation water literally evaporates as it leaves the pipes due to the strong hot winds                                                                                                               | 6 11 5    |
| Radiation               | KNAG         | Has Olympia Resources Limited identified the "Critical Group" in relation to the proposed mining activities? Critical Group = Members of the population who because of their habits or sources of foodstuff are likely to have the highest exposure to radiation from a particular source. Has Olympia Resources Limited estimated how much additional radiation above background the Critical Group might be exposed to? Is this exposure well within accepted international guidelines? How would Olympia Resources Limited ensure this exposure, and exposure of the local population generally was as low as reasonably practicable? How would they monitor the Critical Group? How does Olympia Resources Limited propose to protect their workers from radiation exposure and ensure that international standards of radiation protection are met? | 6 11 1    |



| Specific Topic | Submitter            | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference |
|----------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Radiation      | KNAG                 | No radiation monitoring results provided to support the statement that no Monazite was detected in the testing conducted. Olympia Resources Limited has not presented any surface or down hole measurements of radiation. It is therefore not possible to guarantee that radioactive elements do not exist.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 11 5    |
| Radiation      | KNAG                 | No radiation monitoring results provided to support the statement that no Monazite was detected in the testing conducted. Olympia Resources Limited has not presented any surface or down hole measurements of radiation. It is therefore not possible to guarantee that radioactive elements do not exist.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 11 6    |
| Radiation      | Radiological Council | No radiation monitoring results are provided to support the statement that no Monazite was detected in the testing conducted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 11 1    |
| Radiation      | Radiological Council | The PER should include requirement for registration & licensing under Radiation Safety Act 1975.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 11 1    |
| Radiation      | Radiological Council | Radiological Council comments that the PER should include requirement for registration and licensing under Radiation Safety Act 1975. The Radiological Council also requires compliance with the Radiation and Radiation Waste Management Plan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 11 4    |
| Radiation      | Radiological Council | The Radiological Council will require compliance with the Radiation and Radiation Waste Management Plan.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 11 4    |
| Rehabilitation | CC                   | The list of species proposed for the rehabilitation corridor is grossly inadequate. It does not even replace the diversity inherent in the stands of parkland cleared trees on the affected land, let alone the vegetation communities to the North of the proposed project area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 2 12    |
| Rehabilitation | Community 1          | The planned re-vegetation into straight lines along the fences will be highly artificial and not a re-establishment of the previous natural bushlands setting. Parkland cleared areas should be returned to their original state, not the artificial straight fence lined corridors that are planned.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 2 12    |
| Rehabilitation | Community 1          | One of the tree species listed for planting has been removed from the recommended land care planting list as it is classed a pest. The revegetation list is insufficient and includes species regarded as weeds. The revegetation list is incomplete (and also subject to change) and currently includes at least one species locally regarded as a weed ( <i>Eucalyptus camaldulensis</i> ).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 2 13    |
| rehabilitation | Community 1          | Placing a layer of clay on the surface to aid moisture retention as stated will require blending, otherwise it will encourage water runoff.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 2 14    |
| Rehabilitation | Community 1          | As there is no digital terrain model for the area and there is no on ground mapping of the wetlands in the PER, it is not possible to re-establish the area as existed previously.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 2 18    |
| Rehabilitation | Community 1          | While revegetating the proposed mine area with a greater area of local species would be a bonus, it would come at the expense of a number of older established trees. While these trees may not have hollows for nests, they will be the next generation of hollows unless they are knocked down. Any trees that need to be cleared and are not "economic" should be used in rehabilitation areas as protection for smaller species rather than burnt. The eastern end of Readheads Road from the processing plant to the South West Highway should be widened to accommodate 2 lanes and verge to be re-planted with indigenous species. The crude and unnatural revegetation plan will be a visible scar from the South West Highway, railway line and the tourist drives along the Darling Scarp. The bulk of the proposed revegetation is a highly artificial set of straight lines. There has been no attempt to re-establish a natural bush setting. The lack of thought used in this plan has left a massive exposed land area on the southern margin of Lot 300. | 6 2 22    |
| Rehabilitation | Community 1          | The eastern end of Readheads Road from the processing plant to the South West Highway should be widened to accommodate two lanes and verge to be re-planted with indigenous species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 2 24    |
| Rehabilitation | Community 2          | Olympia has no tract record in the area of rehabilitation, and given their revegetation list includes eastern states eucalypts, I am very skeptical about their ability to reinstate the land                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 2 12    |
| Rehabilitation | Community 2          | There area also some areas of remnant vegetation which will be bulldozed, with the total loss of flora and native fauna. The area may (if not too acidic) be replanted, but only a small percentage of existing flora will be represented, and the token strips left will not support native fauna of any size.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 2 12    |
| Rehabilitation | Community 2          | The proponent is of the opinion that tree planting of fast growing Victorian trees is all they have to do. Local trees and shrubs should be considered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 12    |
| Rehabilitation | Community 2          | Olympia has no tract record in the area of rehabilitation, and given their revegetation list includes eastern states eucalypts, I am very skeptical about their ability to reinstate the land                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 2 13    |
| Rehabilitation | Community 2          | The proponent is of the opinion that tree planting of fast growing Victorian trees is all they have to do. Local trees and shrubs should be considered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 13    |
| Rehabilitation | Community 2          | There area also some areas of remnant vegetation which will be bulldozed, with the total loss of flora and native fauna. The area may (if not too acidic) be replanted, but only a small percentage of existing flora will be represented, and the token strips left will not support native fauna of any size.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 2 19    |
| Rehabilitation | Community 2          | The long term planning for this corridor of land must be seriously considered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 2 20    |
| Rehabilitation | Community 2          | We do find it hard to understand that already Olympia is planting trees when the proposal is still being considered by the EPA.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 2 21    |
| Rehabilitation | Community 2          | Much of the proposed mining area is open parkland, with grazing areas surrounding many fine trees, mainly Jarrah and Marri. Olympia may replant such trees, but with the decreasing rainfall it is very unlikely that they will be replaced with trees of comparable size.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 2 22    |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference |
|----------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Rehabilitation | Community 2  | Hopefully, the trees will grow and withstand the long dry summers, rabbits, grasshoppers and fires. Some of the problems the local landowners have experienced in our effort to re-vegetate our properties. It will take between 10 to 20 years for the trees to grow for the complete screening effect; in the meantime the scar of the mine site will be very visible for all to see.                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 27    |
| Rehabilitation | Community 2  | Hopefully, the trees will grow and withstand the long dry summers, rabbits, grasshoppers and fires. Some of the problems the local landowners have experienced in our effort to re-vegetate our properties. It will take between 10 to 20 years for the trees to grow for the complete screening effect; in the meantime the scar of the mine site will be very visible for all to see.                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 28    |
| Rehabilitation | Community 2  | Olympia proposes to mine 150 hectares mined per year, with at least 3 years before any substantial tree cover (if they survive). This will mean at least 450 hectares exposed at any given time. Add to that, the dust impact of the infamous easterly winds. The beautiful bush that is part of the properties to be mined will become a scar visible from the railway line, the South West Highway, and the Darling Scarp tourist drives                                                                                                                                                                                                                                                                                                                                               | 6 2 28    |
| Rehabilitation | Community 2  | The crude revegetation plan will be a visible scar on this attractive rural setting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 2 28    |
| Rehabilitation | Community 2  | One species listed in the rehabilitation program has never been successfully propagated and hence is not a feasible prospect. It would appear it was only added because it exists presently and quantities will be destroyed in the mining process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 2 9     |
| Rehabilitation | Community 53 | The PER does not define or set out the size of any rehabilitation bonds. It has been standard practice for the Department of Industry and Resources to require the operators of a mine to arrange for either cash deposits or banker's guarantees as bonds to ensure that there are funds available to complete any necessary rehabilitation work in the event of the insolvency of the company.                                                                                                                                                                                                                                                                                                                                                                                         | 6 2 29    |
| Rehabilitation | Community 60 | The revegetation by Olympia is not researched, and includes species locally considered as a pest.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 2 13    |
| Rehabilitation | Community 65 | Quote 1: "No net loss of vegetation in the mine area and maintaining the overall target of 304 hectares" 100-year-old trees and grass trees ( <i>Kingia australis</i> ) cannot be replaced. It just takes too long for them to grow to present impressive stature and to provide the ecological values of mature vegetation. If the recommended species list is to be used, then there will be great loss of native vegetation. A much healthier and diverse revegetation outcome can be achieved by using a full range of native species: tall trees, tall shrubs, medium and small shrubs, herbs, grasses and sedge. All of the vegetation on the Mostert property should be retained in area 7. Area 7 should not be mined due to the good quality vegetation remaining in this area. | 6 2 10    |
| Rehabilitation | Community 65 | Quote 1: "No net loss of vegetation in the mine area and maintaining the overall target of 304 hectares" 100-year-old trees and grass trees ( <i>Kingia australis</i> ) cannot be replaced. It just takes too long for them to grow to present impressive stature and to provide the ecological values of mature vegetation. If the recommended species list is to be used, then there will be great loss of native vegetation. A much healthier and diverse revegetation outcome can be achieved by using a full range of native species: tall trees, tall shrubs, medium and small shrubs, herbs, grasses and sedge. All of the vegetation on the Mostert property should be retained in area 7. Area 7 should not be mined due to the good quality vegetation remaining in this area. | 6 2 11    |
| Rehabilitation | Community 65 | The species list supplied for revegetation of 1288 hectares is inadequate. Three of the species listed are from the Eastern States and two local species are difficult to propagate and very slow growing (including the <i>Kingia australis</i> ). This leaves only 12 indigenous species, all of which are tall trees. There are no understorey species included. No introduced species should be used in revegetation. <i>Eucalyptus camaldulensis</i> from the Eastern States has been found to cross pollinate with our eucalypts and so degrade our indigenous species.                                                                                                                                                                                                            | 6 2 12    |
| Rehabilitation | Community 65 | The species list supplied for revegetation of 1288 hectares is inadequate. Three of the species listed are from the Eastern States and two local species are difficult to propagate and very slow growing (including the <i>Kingia australis</i> ). This leaves only 12 indigenous species, all of which are tall trees. There are no understorey species included. No introduced species should be used in revegetation. <i>Eucalyptus camaldulensis</i> from the Eastern States has been found to cross pollinate with our eucalypts and so degrade our indigenous species.                                                                                                                                                                                                            | 6 2 13    |
| Rehabilitation | Community 65 | Quote 2: "Minor corridor linkages following internal fence lines and drainage..." Aerial photographs do not show minor corridor linkages of vegetation rather the forest canopy at present is seen as extensive tree cover in random blocks to the north and south of the mine site while scattered areas of under storey shrub and sedges indicate damp lands, sump lands, creeks, floodplain and palusplain.                                                                                                                                                                                                                                                                                                                                                                           | 6 2 15    |
| Rehabilitation | Community 65 | All relocated drainage lines and wetlands require full rehabilitation, which must include large trees, tall and medium shrubs, rushes and sedges indigenous to the area. This is necessary to assist in the filtration of unknown quantities of nutrients laid down by 60 to 100 years of farming practices. If it is to be a bushland corridor, it needs to be more than just a minor corridor along a fence line three trees wide.                                                                                                                                                                                                                                                                                                                                                     | 6 2 17    |
| Rehabilitation | Community 65 | The species list supplied for revegetation of 1288 hectares is inadequate. Three of the species listed are from the Eastern States and two local species are difficult to propagate and very slow growing (including the <i>Kingia australis</i> ). This leaves only 12 indigenous species, all of which are tall trees. There are no understorey species included. No introduced species should be used in revegetation. <i>Eucalyptus camaldulensis</i> from the Eastern States has been found to cross pollinate with our eucalypts and so degrade our indigenous species.                                                                                                                                                                                                            | 6 2 28    |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Reference |
|----------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Rehabilitation | Community 70 | The proponent should be responsible for a) fencing all native revegetation areas and b) establishing regulated management agreements with the landowners to ensure that landowners are penalised for any passive or active clearing or destruction of the revegetation areas. The proponent should also be responsible for management of the revegetation areas for a period of not less than 20 years after revegetation establishment to ensure self-sustaining ecosystems are created which reflect similar natural ecosystems.                                                                                                                                                                               | 6 1 12    |
| Rehabilitation | Community 70 | Human induced revegetation approaches can not replace original natural ecosystems. The CRP proposed whereby corridors will be planted along fence lines and some drainage lines will not provide the structural vegetation components to establish a functioning ecosystem. Revegetation should be designed in more natural random clumpings. All watercourses to be revegetated at an appropriately buffer size and permanently fenced to exclude stock.                                                                                                                                                                                                                                                        | 6 1 12    |
| Rehabilitation | Community 70 | Human induced revegetation approaches can not replace original natural ecosystems. The CRP proposed whereby corridors will be planted along fence lines and some drainage lines will not provide the structural vegetation components to establish a functioning ecosystem. Revegetation should be designed in more natural random clumpings. All watercourses to be revegetated at an appropriately buffer size and permanently fenced to exclude stock.                                                                                                                                                                                                                                                        | 6 1 2     |
| Rehabilitation | Community 70 | Human induced revegetation approaches can not replace original natural ecosystems. The CRP proposed whereby corridors will be planted along fence lines and some drainage lines will not provide the structural vegetation components to establish a functioning ecosystem. Revegetation should be designed in more natural random clumpings. All watercourses to be revegetated at an appropriately buffer size and permanently fenced to exclude stock.                                                                                                                                                                                                                                                        | 6 2 12    |
| Rehabilitation | Community 70 | The rehabilitation species list lacks diversity, contains an introduced invasive species - Eucalyptus camaldulensis, and is 'subject to change'. Species should be planted to reflect components of the pre-cleared forest community type. The revegetation plan should be concise as to the revegetation methods and species chosen to enable sufficient comment. It is also unclear how the revegetated areas and fences will be managed and maintained in the long-term.                                                                                                                                                                                                                                      | 6 2 12    |
| Rehabilitation | Community 70 | The rehabilitation species list lacks diversity, contains an introduced invasive species - Eucalyptus camaldulensis, and is 'subject to change'. Species should be planted to reflect components of the pre-cleared forest community type. The revegetation plan should be concise as to the revegetation methods and species chosen to enable sufficient comment. It is also unclear how the revegetated areas and fences will be managed and maintained in the long-term.                                                                                                                                                                                                                                      | 6 2 13    |
| Rehabilitation | Community 70 | The rehabilitation species list lacks diversity, contains an introduced invasive species - Eucalyptus camaldulensis, and is 'subject to change'. Species should be planted to reflect components of the pre-cleared forest community type. The revegetation plan should be concise as to the revegetation methods and species chosen to enable sufficient comment. It is also unclear how the revegetated areas and fences will be managed and maintained in the long-term.                                                                                                                                                                                                                                      | 6 2 16    |
| rehabilitation | DEC-CALM     | The re-establishment of local native species and original (threatened) plant communities in disturbed areas of native vegetation through rehabilitation has not been adequately addressed. DEC recommends reestablishment of the suite of plant species occurring within the original plant communities in some of the rehabilitation areas using seed of local provenance. DEC can assist by providing suitable species lists and locations from where native seed can be collected.                                                                                                                                                                                                                            | 6 2 1     |
| Rehabilitation | DEC-CALM     | Excessive use of chip mulch can inhibit establishment of some species. Chips may contain Dieback.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 2 2     |
| Rehabilitation | DOIR         | The proponent has committed to reinstating the area subjected to mining to pre mining condition i.e. pasture land returned to pasture land remnant vegetation returned to remnant vegetation which appears to be generally acceptable.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 2 4     |
| Rehabilitation | KNAG         | The bulk of the planned re-vegetation is a highly artificial set of straight lines. There has been no attempt to re-establish a natural bushland setting. The lack of thought used in this plan has left a massive exposed land area on the southern margin of lot 300.                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 2 12    |
| Rehabilitation | KNAG         | The species list supplied for revegetation of 1288 hectares is totally inadequate. (See Appendix 3). Three of the species listed are from the Eastern States and two local species are difficult to propagate and very slow growing (including the Kingia australis). This leaves only 12 indigenous species, all of which are tall trees. There are no understorey species included whatsoever. Since it is believed our South Western Australian species have already adapted to climate change no introduced species should be used (Prof Stephen Hopper, 2006). Eucalyptus camaldulensis from the Eastern States has been found to cross-pollinate with our eucalypts and so degrade our indigenous species. | 6 2 12    |
| Rehabilitation | KNAG         | The vegetation will be an artificial sequence of straight lines and will be dominated by more competitive non-local species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 2 12    |
| Rehabilitation | KNAG         | There is no plan to return the parkland cleared areas back to their original state, but to plant an artificial looking series of straight lines that will be a visible scar from the SW highway, Railway line and the tourist drives from the Darling Scarp.                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 2 12    |
| Rehabilitation | KNAG         | It should be understood that if we ever return to normal winters, then much of the area between the dune systems is subject to inundations. There will simply be no areas on the dry sand that has any natural cover.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 2 12    |
| Rehabilitation | KNAG         | The bulk of the planned re-vegetation is a highly artificial set of straight lines. There has been no attempt to re-establish a natural bushland setting. The lack of thought used in this plan has left a massive exposed land area on the southern margin of lot 300.                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 2 13    |

| Specific Topic | Submitter | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reference |
|----------------|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Rehabilitation | KNAG      | The species list supplied for revegetation of 1288 hectares is totally inadequate. (See Appendix 3). Three of the species listed are from the Eastern States and two local species are difficult to propagate and very slow growing (including the <i>Kingia australis</i> ). This leaves only 12 indigenous species, all of which are tall trees. There are no understorey species included whatsoever. Since it is believed our South Western Australian species have already adapted to climate change no introduced species should be used (Prof Stephen Hopper, 2006). <i>Eucalyptus camaldulensis</i> from the Eastern States has been found to cross-pollinate with our eucalypts and so degrade our indigenous species. | 6 2 13    |
| Rehabilitation | KNAG      | Rehabilitation Plan shows Table 6 upland species to be used in Rehabilitation. " <i>Eucalyptus Camaldulensis</i> " is now considered a weed and has been removed from all land care recommended planting lists.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 2 13    |
| Rehabilitation | KNAG      | One of the tree species listed for planting ( <b><i>Eucalyptus camaldulensis</i></b> ) is a well-known pest and has been removed from recommended land care planting lists.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 2 13    |
| Rehabilitation | KNAG      | Since it is believed our South Western Australian species have already adapted to climate change no introduced species should be used (Prof Stephen Hopper, 2006). <i>Eucalyptus camaldulensis</i> from the Eastern States has been found to cross-pollinate with our eucalypts and so degrade our indigenous species.                                                                                                                                                                                                                                                                                                                                                                                                          | 6 2 13    |
| Rehabilitation | KNAG      | What has not been addressed is that the vegetation plan does not establish local flora, but will be dominated by fast growing eastern states eucalyptus grown in artificial straight lines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 2 13    |
| Rehabilitation | KNAG      | The use of the clay fraction to hold the surface layers from erosion will mean that the underlying quartz sand will be inherently unstable. This will make the land useless for any future housing, road and infrastructure developments. Major damage to buildings was caused on the Swan Coastal plain during the Meckering earthquake and this was on land that has been undisturbed for 10000 years.                                                                                                                                                                                                                                                                                                                        | 6 2 14    |
| Rehabilitation | KNAG      | Quote 2: "Minor corridor linkages following internal fence lines and drainage..." The PPG is adamant that aerial photographs do not show minor corridor linkages of vegetation rather the forest canopy at present is seen as extensive tree cover in random blocks to the north and south of the mine site while scattered areas of under storey shrub and sedges indicate damp lands, sump lands, creeks, floodplain and palusplain                                                                                                                                                                                                                                                                                           | 6 2 15    |
| Rehabilitation | KNAG      | Will revegetation be covenanted? If not, how will it be guaranteed, managed and maintained in the long-term by private owners? A landholder (already signed for mining) has previously removed fencing and allowed the grazing of understorey of a revegetation site. This project was initiated by Keith Bradbury to demonstrate the effectiveness of direct seeding understorey species. Permanent exclusion of livestock from these covenanted areas is necessary                                                                                                                                                                                                                                                            | 6 2 16    |
| Rehabilitation | KNAG      | The PPG insists that all relocated drainage lines and wetlands require full rehabilitation, which must include large trees, tall and medium shrubs, rushes and sedges indigenous to the area. This is necessary to assist in the filtration of unknown quantities of nutrients laid down by 60 to 100 years of farming practices. If it is to be a bushland corridor, it needs to be more than just a minor corridor along a fence line three trees wide.                                                                                                                                                                                                                                                                       | 6 2 17    |
| Rehabilitation | KNAG      | There is no detailed digital terrain model for the area. There is no on ground mapping of wetlands presented in the PER. It is not possible to re-establish existing landforms if they are not initially understood.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 2 18    |
| Rehabilitation | KNAG      | The internal drainage will be altered from the original with no long term plan to monitor the spread of salinity, acid sulphate soils, radiation levels and nutrient discharge                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 18    |
| Rehabilitation | KNAG      | Overgrazing and neglect have degraded much of this land. If mining was to occur then it should be returned in better condition than before. This should include a much larger area to be permanently re-vegetated to prevent the increase in salinity already seen on the western margin of the mine-site                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 2 20    |
| Rehabilitation | KNAG      | The use of the clay fraction to hold the surface layers from erosion will mean that the underlying quartz sand will be inherently unstable. This will make the land useless for any future housing, road and infrastructure developments. Major damage to buildings was caused on the Swan Coastal plain during the Meckering earthquake and this was on land that has been undisturbed for 10000 years.                                                                                                                                                                                                                                                                                                                        | 6 2 25    |
| Rehabilitation | KNAG      | This describes the end product after mining as a 1,234 hectare tailings dam full of free draining quartz sand that has been slurried into position by mine waste water of which 2 Gigalitres per annum is lost into the Nambeelup drainage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 2 25    |
| Rehabilitation | KNAG      | It is not valid to simply return it to farmland after mining. If mined, all of the area must be compacted back to building standards. This has not been possible in the Joshua Brook subdivision in Capel Shire and building restrictions have been placed over all mined areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 2 25    |
| Rehabilitation | KNAG      | The land will be unstable and thus unavailable for any future building developments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 2 25    |
| Rehabilitation | KNAG      | The proposal to slurry the tailings back to the pit, after removing much of the clay for bunding and surface erosion control, will result in a highly unstable quartz sand that will be too unstable to build on. It should be understood that this area is part of a major growth corridor and much of it will eventually used for housing                                                                                                                                                                                                                                                                                                                                                                                     | 6 2 25    |
| Rehabilitation | KNAG      | The resultant landform will be a 1,234-hectare tailings dam, which has been slurried back into place using mine wastewater.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 2 25    |
| Rehabilitation | KNAG      | Land may/will be unstable & unsuitable for housing developments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 2 25    |

| Specific Topic | Submitter | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Reference |
|----------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Rehabilitation | KNAG      | The bulk of the planned re-vegetation is a highly artificial set of straight lines. There has been no attempt to re-establish a natural bushland setting. The lack of thought used in this plan has left a massive exposed land area on the southern margin of lot 300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 2 28    |
| Rehabilitation | KNAG      | The species list supplied for revegetation of 1288 hectares is totally inadequate. (See Appendix 3). Three of the species listed are from the Eastern States and two local species are difficult to propagate and very slow growing (including the <i>Kingia australis</i> ). This leaves only 12 indigenous species, all of which are tall trees. There are no understorey species included whatsoever. Since it is believed our South Western Australian species have already adapted to climate change no introduced species should be used (Prof Stephen Hopper, 2006). <i>Eucalyptus camaldulensis</i> from the Eastern States has been found to cross-pollinate with our eucalypts and so degrade our indigenous species.                                | 6 2 28    |
| Rehabilitation | KNAG      | The vegetation will be an artificial sequence of straight lines and will be dominated by more competitive non-local species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 2 28    |
| Rehabilitation | KNAG      | There is no plan to return the parkland cleared areas back to their original state, but to plant an artificial looking series of straight lines that will be a visible scar from the SW highway, Railway line and the tourist drives from the Darling Scarp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 2 28    |
| Rehabilitation | KNAG      | It should be understood that if we ever return to normal winters, then much of the area between the dune systems is subject to inundations. There will simply be no areas on the dry sand that has any natural cover.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 2 28    |
| Rehabilitation | KNAG      | What has not been addressed is that the vegetation plan does not establish local flora, but will be dominated by fast growing eastern states eucalyptus grown in artificial straight lines.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 2 28    |
| Rehabilitation | KNAG      | The plan fails to comprehend the rate of mining at 150 hectares per year. Given the best case scenario it will take 3 years of fast growing eastern states varieties to achieve any sort of protection against the elements. This means that at least 450 hectares of a barren sterile landscape will be exposed at any one time. Fauna will simply not survive in this environment                                                                                                                                                                                                                                                                                                                                                                            | 6 2 28    |
| Rehabilitation | PHCC      | Should mining be approved, 1. No mining be permitted in any areas of remnant vegetation, not just the exclusion of the portion on Lot 56; 2. All remnant bushland and wetlands in the mining area should be permanently protected including fencing to prevent stock grazing 3. Conservation Covenants should be applied to the titles of the properties. 4. All rehabilitation needs to be permanently fenced. 5. Rehabilitation should include linkages between remnants.                                                                                                                                                                                                                                                                                    | 6 1 12    |
| Rehabilitation | PHCC      | In such a highly cleared landscape the PER should identify the sources of the seed for both propagation of seedlings and direct seeding for rehabilitation. The presented species list does not reflect the diversity of species recorded in the site assessments. The species list contains three non-local species and no middle or understorey species. The species list presented does not meet the (p.17) "Predicted Outcome" that "Rehabilitation will focus on corridor linkages with increased community diversity by both upland and lowland planting"                                                                                                                                                                                                | 6 2 10    |
| Rehabilitation | PHCC      | In such a highly cleared landscape the PER should identify the sources of the seed for both propagation of seedlings and direct seeding for rehabilitation. The presented species list does not reflect the diversity of species recorded in the site assessments. The species list contains three non-local species and no middle or understorey species. The species list presented does not meet the (p.17) "Predicted Outcome" that "Rehabilitation will focus on corridor linkages with increased community diversity by both upland and lowland planting"                                                                                                                                                                                                | 6 2 12    |
| Rehabilitation | PHCC      | In such a highly cleared landscape the PER should identify the sources of the seed for both propagation of seedlings and direct seeding for rehabilitation. The presented species list does not reflect the diversity of species recorded in the site assessments. The species list contains three non-local species and no middle or understorey species. The species list presented does not meet the (p.17) "Predicted Outcome" that "Rehabilitation will focus on corridor linkages with increased community diversity by both upland and lowland planting"                                                                                                                                                                                                | 6 2 13    |
| Rehabilitation | PHCC      | Potential cockatoo nesting hollows should be salvaged and erected in other trees.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 2 22    |
| Rehabilitation | PHCC      | Due to air quality issues, we do not support the burning of vegetation that is cleared (Item 4.2, p.46, para.2.) Cleared vegetation that cannot be salvaged for timber, fence posts, firewood or mulch should be used as "large woody debris" in riparian restoration activities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 2 23    |
| Rehabilitation | PHCC      | The PER needs to demonstrate how the rehabilitation completion criteria will be met when the land to be mined is in private ownership and what measures will be put in place to ensure the revegetation can be maintained in the long term.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 2 3     |
| Rehabilitation | PHCC      | The rehabilitation plan needs to consider the use of tree guards. In regard to the rehabilitation of pasture areas the PER has only considered the re-instatement of annual pastures and has failed to consider the use of perennial pastures. We suggest that Olympia address the use of perennial pastures within the pasture element of their rehabilitation plan.                                                                                                                                                                                                                                                                                                                                                                                          | 6 2 31    |
| Rehabilitation | PHCC      | <ul style="list-style-type: none"> <li>We do not support the Rehabilitation Management Plan as presented. In the first instance fencing and revegetation of riparian habitats should be a focus to obtain multiple benefit linkages through the landscape. Block plantings need to be undertaken as natural sites not for future harvesting; timber species have been included in the species list</li> <li>Values lost through clearing mature revegetation are not re-gained with no net loss by revegetating an equivalent area.</li> <li>Trials for the relocation of Kingias should not be required as there are established practices for the successful relocation of these species. However we do not support the clearing of this species.</li> </ul> | 6 2 10    |

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|----------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Rehabilitation | PHCC      | <ul style="list-style-type: none"> <li>• We do not support the Rehabilitation Management Plan as presented. In the first instance fencing and revegetation of riparian habitats should be a focus to obtain multiple benefit linkages through the landscape. Block plantings need to be undertaken as natural sites not for future harvesting; timber species have been included in the species list</li> <li>• Values lost through clearing mature revegetation are not re-gained with no net loss by revegetating an equivalent area.</li> <li>• Trials for the relocation of Kingias should not be required as there are established practices for the successful relocation of these species. However we do not support the clearing of this species.</li> </ul>                                                                          | 6 2 12    |
| rehabilitation | SJLC      | All native vegetation areas to remain permanently fenced. Regulated management agreements to be signed with the landowners with Olympia funding maintenance. Preferably covenants should be placed on rehab'd land. Proponent should be responsible for revegetated areas for 20 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 1 12    |
| Rehabilitation | SJLC      | Human induced revegetation approaches can not replace original natural ecosystems. The proposed CRP whereby corridors will be planted along fence lines and some drainage lines will not provide the structural vegetation components to establish a functioning ecosystem. Revegetation to be designed in more natural random clumpings. All watercourses to be revegetated at an appropriately buffer size and permanently fenced to exclude stock.                                                                                                                                                                                                                                                                                                                                                                                         | 6 2 12    |
| Rehabilitation | SJLC      | Human induced revegetation approaches can not replace original natural ecosystems. The proposed CRP whereby corridors will be planted along fence lines and some drainage lines will not provide the structural vegetation components to establish a functioning ecosystem. Revegetation to be designed in more natural random clumpings. All watercourses to be revegetated at an appropriately buffer size and permanently fenced to exclude stock.                                                                                                                                                                                                                                                                                                                                                                                         | 6 2 13    |
| Rehabilitation | SJLC      | List of native species to be used in rehabilitation lacks diversity. Nearby, at 'Kingia,' 300 plant species have been identified, The list also contains an introduced invasive species, Eucalyptus camaldulensis, which is listed as a 'Declared Pest Plant' by the Serpentine-Jarrahdale Shire; contains a large number of dieback susceptible species; and is 'subject to change'. This is not satisfactory. Plantings should reflect pre-cleared community. RMP should be more precise to enable sufficient comment.                                                                                                                                                                                                                                                                                                                      | 6 2 13    |
| Rehabilitation | SJLC      | Human induced revegetation approaches can not replace original natural ecosystems. The proposed CRP whereby corridors will be planted along fence lines and some drainage lines will not provide the structural vegetation components to establish a functioning ecosystem. Revegetation to be designed in more natural random clumpings. All watercourses to be revegetated at an appropriately buffer size and permanently fenced to exclude stock.                                                                                                                                                                                                                                                                                                                                                                                         | 6 2 28    |
| rehabilitation | SJLC      | List of native species to be used in rehabilitation lacks diversity. Nearby, at 'Kingia,' 300 plant species have been identified, The list also contains an introduced invasive species, Eucalyptus camaldulensis, which is listed as a 'Declared Pest Plant' by the Serpentine-Jarrahdale Shire; contains a large number of dieback susceptible species; and is 'subject to change'. This is not satisfactory. Plantings should reflect pre-cleared community. RMP should be more precise to enable sufficient comment.                                                                                                                                                                                                                                                                                                                      | 6 3 12    |
| rehabilitation | SJS       | • Further information will be required to clarify the methods of rehabilitation, particularly in terms of the long-term goals for the site, the mix of seeds to be utilised and the focus of the rehabilitation works.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 2 12    |
| Rehabilitation | WS        | Olympia Resources has ownership rights over one lot of land within the mine area (Lot 112). This area is currently proposed to be only partially revegetated according to Figure 2. The land should be fenced, completely revegetated and managed for a minimum of three years after closure of all mining operations. It would also be appropriate for this land to be included into the conservation estate for management by the Department of Environment and Conservation and vested in either the Conservation Commission or the local Shire. The property would then provide a valuable refuge for fauna in the area and would aid in obtaining connectivity of the area.                                                                                                                                                              | 6 1 5     |
| Rehabilitation | WS        | Section 4.1 of the Rehabilitation Management Plan recognises it is unlikely that the topsoil will contain any native understorey seed. Considering the proposal area currently does not contain any understorey due to continuous grazing and is instead covered by weed species, weed management through the application of herbicides will be conducted in the first year of rehabilitation and in the second year only if needed. The rehabilitation plan would have to include planting of native understorey species to ensure effective weed control. So long as the land lacks groundcover and soil is exposed, the area will be susceptible to recolonisation by weed species. This would significantly reduce the benefits of any rehabilitation efforts as weeds would inhibit the establishment and survival of replanted species. | 6 2 10    |
| Rehabilitation | WS        | The proposal will undoubtedly result in a significant loss of vegetation in an already extensively cleared area. A comprehensive rehabilitation strategy will be required to mitigate the impacts on biodiversity values. About 60ha of remnant vegetation and 244ha of parkland cleared vegetation will be cleared during the life of the project, requiring 304ha to be revegetated. The Rehabilitation Management Plan proposes to revegetate 312ha to fulfill the objective of 'no net loss' of vegetation. This is an initial figure only and is subject to change and so may still be reduced.                                                                                                                                                                                                                                          | 6 2 12    |
| Rehabilitation | WS        | The list of plant species to be used in revegetation work does not even come close to reflecting the diversity of the original area. Should also include understory species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 2 12    |



| Specific Topic             | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Reference |
|----------------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Rehabilitation             | WS           | Vegetation surveys revealed a total of 40 vascular plant families, 119 genera and 169 taxa (Section 1.3.4). Table 6 of Section 3.5 of the Rehabilitation Management Plan indicates only 19 plant species will be used for revegetation. This is clearly insufficient. More species should be included in revegetation in order to provide a more representative end result. Understorey species are also currently not included in the revegetation plan. These are essential if any improvement on the current weed infested state of the area is to be made.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 2 12    |
| Rehabilitation             | WS           | The objective of the Rehabilitation Management Plan (Section 1.2) is to rehabilitate remnant vegetation to "at least the pre-mining condition". Currently, the mining area consists of numerous islands of remnant vegetation including two areas of good quality vegetation at the northern end of the area, one of which will be mined. It is clear from this that the majority of revegetation will occur as boundary planting. Only three areas of block planting are proposed, two of which are quite small in area. Such a method of planting is insufficient and has little ecological value. Vegetation occurring in long, narrow areas holds little value for fauna species as habitat as it is highly susceptible to edge effects. Although the proposed rehabilitation plan would improve connectedness of vegetation by providing corridors, due to a lack of significant block planting there would be very little to connect to. A much better approach would be to rehabilitate areas of remnant vegetation more or less as they currently are and then create corridor linkages between these areas as additional rehabilitation over and above the 304ha cleared. Only then would the proposed Keysbrook Mineral Sand Mine truly result in a better environmental outcome and its associated loss in biodiversity could b | 6 2 12    |
| Rehabilitation             | WS           | The ecological value of planted vegetation will be much lower than that of the original flora, therefore the area of revegetation should be sufficiently large to compensate for this difference. It is important to recognise that any planted vegetation will take years to establish fully and to grow sufficiently to replace the composition and structure of the original vegetation.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 2 27    |
| Rehabilitation             | WS           | The objective of the Rehabilitation Management Plan (Section 1.2) is to rehabilitate remnant vegetation to "at least the pre-mining condition". Currently, the mining area consists of numerous islands of remnant vegetation including two areas of good quality vegetation at the northern end of the area, one of which will be mined. It is clear from this that the majority of revegetation will occur as boundary planting. Only three areas of block planting are proposed, two of which are quite small in area. Such a method of planting is insufficient and has little ecological value. Vegetation occurring in long, narrow areas holds little value for fauna species as habitat as it is highly susceptible to edge effects. Although the proposed rehabilitation plan would improve connectedness of vegetation by providing corridors, due to a lack of significant block planting there would be very little to connect to. A much better approach would be to rehabilitate areas of remnant vegetation more or less as they currently are and then create corridor linkages between these areas as additional rehabilitation over and above the 304ha cleared. Only then would the proposed Keysbrook Mineral Sand Mine truly result in a better environmental outcome and its associated loss in biodiversity could b | 6 2 28    |
| Rehabilitation             | WS           | Rehabilitation planting occurs once per year (in May), meaning up to 150ha will be cleared at any given time. Effectively, all of the available fauna habitat will be lost by the eighth year of the operation and will not be replaced for many years to come since revegetation is a slow process.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 2 28    |
| Rehabilitation             | KNAG         | The PPG argues the project may have an adverse impact on the Ramsar Listed wetlands in the Peel-Harvey Estuary System and the Environmental Protection Policies for the Goegrup and Black Lake system and the Serpentine River. It is essential to leave Area 7, on the Mostert property, untouched, due to the good quality vegetation remaining in this area; to ensure that the revegetation corridors along the internal fences and drainage lines be more than a minor corridor; and ensure that the Leederville aquifer and the Ramsar listed wetlands of the Swan Coastal Plain are not adversely affected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 2 11    |
| Rehabilitation             | KNAG         | There are MULTIPLE POINTS in the submission referring to " the crude and unnatural revegetation plan will be a visible scar from the SW Highway, the Railway line and the tourist drives from the Darling Scarp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 2 12    |
| Rehabilitation             | KNAG         | There are MULTIPLE POINTS in the submission referring to " the crude and unnatural revegetation plan will be a visible scar from the SW Highway, the Railway line and the tourist drives from the Darling Scarp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 2 28    |
| Rehabilitation             | KNAG         | The PPG argues the project may have an adverse impact on the Ramsar Listed wetlands in the Peel-Harvey Estuary System and the Environmental Protection Policies for the Goegrup and Black Lake system and the Serpentine River. It is essential to leave Area 7, on the Mostert property, untouched, due to the good quality vegetation remaining in this area; to ensure that the revegetation corridors along the internal fences and drainage lines be more than a minor corridor; and ensure that the Leederville aquifer and the Ramsar listed wetlands of the Swan Coastal Plain are not adversely affected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 4 3     |
| Rehabilitation and Closure | DEC KwP      | Closure criteria should be prepared before EPA report recommendation bulletin is developed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 2 3     |
| Rehabilitation and Closure | Murray Shire | Ensure no net loss of vegetation; use a mix of mature and seedling replacement vegetation to accelerate rehabilitation; relocate trees on site where possible; se seed collected on site and locally. Revegetation to commence no later than 1 month after mining. Undertake additional watering and maintenance when outside peak growing season to ensure survival rates.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 2 7     |
| Rehabilitation and Closure | SJLC         | Any revegetation should occur according to rainfall patterns. Weed control to be monitored quarterly with works undertaken according to optimum time for control of individual species. Infill planting to be performed for at least five years.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 2 28    |
| Rehabilitation and Closure | SJLC         | Any revegetation should occur according to rainfall patterns. Weed control to be monitored quarterly with works undertaken according to optimum time for control of individual species. Infill planting to be performed for at least five years.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 2 28    |

| Specific Topic             | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reference |
|----------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Rehabilitation and Closure | SJS         | The proposed approach to rehabilitation is to return the site to its current agricultural use. Some further comment should be provided with respect to the remnant vegetation onsite -proposed to be cleared, the ultimate aim for rehabilitation of these areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 2 16    |
| Rehabilitation and Closure | SJS         | The proposed approach to rehabilitation is to return the site to its current agricultural use. Some further comment should be provided with respect to the remnant vegetation onsite -proposed to be cleared, the ultimate aim for rehabilitation of these areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 2 8     |
| Social Impact              | Community 1 | The town of North Dandalup is not mentioned in any of the impact statements despite being within 500 metres of a proposed pit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 10 2    |
| Social Impact              | Community 1 | In the Review, Olympia admits that they have not yet consulted with the aboriginal elders of this district.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 12 1    |
| Social Impact              | Community 1 | The potential associated environmental impacts could unleash a snowball of effects on the Keysbrook area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 13 1    |
| Social Impact              | Community 1 | According to Olympia's shareholders prospectus, the Keysbrook and North Dandalup tenement E70/2407 covers an area of 188 square kilometres. It is inconceivable that an area of this magnitude, practically an outer suburb to Mandurah, will have development restricted for at least the next 10 years, because of mineral sand mining.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 13 1    |
| Social Impact              | Community 1 | Adjacent property sales will be difficult to negotiate with the threat of mining for the next 10 years (in public meetings, this life of mine has ranged from 7 to 18 years). Real estate worth billions of dollars in the area will be devalued by more than the mining project is worth.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 13 10   |
| Social Impact              | Community 1 | Naturally, if the mining goes ahead this will seriously impact on the value of nearby properties and all the others in the district for at least 10 years or longer if Olympia continues with their pending tenements in the area. Who will compensate the landholders for this loss?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 13 10   |
| Social Impact              | Community 1 | North Dandalup School is renowned for being environmentally conscious and active. A sand mine has no place in that community.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 13 11   |
| Social Impact              | Community 1 | The project is 50km from Perth and part of it is in the outer metropolitan area. If it goes ahead it may open the floodgates for further sand mining along the coastal strip within the metro area as well as to the north and south. How suitable is rehabilitated sand mining for building houses on in the future, especially in the current housing climate, and will insurer's cover damage should the ground be less stable than it would have otherwise been?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 13 12   |
| Social Impact              | Community 1 | Once it has been mined for mineral sands, the unstable soil will make the ground useless for any future housing, roads or infrastructure developments.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 13 12   |
| Social Impact              | Community 1 | The backfill into the open pit with the mined rock, quartz and clay will lead to unstable ground not suitable for any future infrastructure developments. Nature has compacted the clay soil over millions of years and aerating it by mining, then putting it back in the hole will create a sludge effect as clay will not consolidate, especially when it is wet. This ground can stay wet for 8 months of the year because the water table is at the surface. Even if the clay was returned to the pit dry and compacted, as soon as it came into contact with water, it would turn into gel again. This could result in a repeat of the problems encountered by BHP at Beenup on the Scott River.                                                                                                                                                                                                                                                                                                                                          | 6 13 12   |
| Social Impact              | Community 1 | The issue of compaction after the mine passing is not addressed with the serious possibility that it may not be useable for any future housing development.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 13 12   |
| Social Impact              | Community 1 | Major development and housing proposals would be restricted if mineral sand mining was allowed to extract 2 gigalitres from a diminishing water resource.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 13 16   |
| Social Impact              | Community 1 | In the Olympia propaganda, they state; Quote " The Keysbrook deposit is situated in the southwest of W.A. Southwest W.A. is one of the world's great mineral sands provinces where mineral sands mining has been carried out for 50 years by companies such as Cable Sands, Iluka Resources and more recently, Doral." Part of that statement may be true, but the locations are a world apart. Southwest W.A. is a huge area, and the linking of those mines to an area like Keysbrook, makes it sound as if we were down south near Capel, instead of only a stones throw from Perth and Mandurah.                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 13 2    |
| Social Impact              | Community 1 | In the same submission under section 3, description of the project area and the affected area (3.2.e), it states: "Hopelands and Readheads Roads are two gazetted unsealed roads running to the west and south of the project area respectively." Hopelands Road is a long, good quality wide bitumen road and has been bitumen for over 20 years. Readheads Road on the other hand is narrow and only 6 kilometres long, the 4 kilometres from the South West Highway end is bitumen, and it also has been bitumen for over 20 years. The remaining 2 kilometres is gravel, mainly because the residents preferred it left as gravel to discourage traffic using the road as a short-cut to Mandurah. It seems Olympia is trying to give the impression that North Dandalup is only agricultural land, in a remote isolated area serviced by unsealed roads - nothing could be further from the truth. This is a rapidly growing community, consisting mainly of people wanting a quiet country lifestyle, while still close to all amenities. | 6 13 2    |
| Social Impact              | Community 1 | At the community meetings, Olympia gave evasive answers to the local residents. It is no wonder the residents are distrustful of Olympia                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 13 3    |
| Social Impact              | Community 1 | Why would Olympia persist in attempting to mine in this area when they are fully aware that the local community is completely against the idea?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 13 3    |
| Social Impact              | Community 1 | Mandurah is the fastest growing area in Australia and there are massive developments planned in the immediate future.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 13 37   |
| Social Impact              | Community 1 | To protect the known fragile and deteriorating environment of the Peel and Nambelup area the government has been funding the rehabilitation and reforestation of the land and water ways in the proposed mining area. Approval of the mining proposal would completely negate the work and money already invested in saving this environment for future generations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 13 4    |



| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reference |
|----------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Social Impact  | Community 1 | The area is an attractive rural setting with numerous lifestyle blocks and is incompatible with mining. I like to travel to this area to visit and appreciate for its natural beauty, not mining.                                                                                                                                                                                                                                                                                                                                     | 6 13 4    |
| Social Impact  | Community 1 | Olympia stated in an earlier EPBC Referral to the Department of Environment and Heritage on 3rd June 2005, under section 2.6 asking if this action relates to other actions in this area, they stated that: 'There are several undeveloped mineral sand deposits located within eight to 15 kilometres of the proposed project area.' Considering Olympia holds the majority of these pending mining leases all the way to Baldivis, this is hardly a reason to assume that this is a potential mining area.                          | 6 13 42   |
| Social Impact  | Community 1 | Unlike other narrow high-grade deposits, the mineral sand deposits in this ground are low grade and broad acre, requiring massive clearing and mining to retrieve only a small quantity of minerals. The majority of the ground mined will be only 2 metres deep. Is so much destruction for such an insignificant return really worth it?                                                                                                                                                                                            | 6 13 5    |
| Social Impact  | Community 1 | Most mining developments offer substantial benefits to a community. This proposal will have an overwhelmingly negative effect. Olympia seems to offer no benefits to the community other than employment, and support to the Murray Shire in the Pinjarra bypass. Olympia should offer more benefits to the local communities that they choose to be part of.                                                                                                                                                                         | 6 13 5    |
| Social Impact  | Community 1 | The landholders have also been told repeatedly that the mining will be for 8 years. But Olympia is advising shareholders that it intends to extend the Keysbrook mining life by further drilling in the area.                                                                                                                                                                                                                                                                                                                         | 6 13 6    |
| Social Impact  | Community 1 | In the Review, Olympia admits that they have not yet consulted with the aboriginal elders of this district.                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 13 8    |
| Social Impact  | Community 1 | So far, only a couple of the landholders have actually signed the agreement, while others have changed their minds.                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 13 8    |
| Social Impact  | Community 1 | There has been no mention that caveats are placed on the properties being mined, ensuring the owner of the land cannot sell without the purchaser accepting and signing the mining agreement prior to settlement.                                                                                                                                                                                                                                                                                                                     | 6 13 8    |
| Social Impact  | Community 1 | This threat of mining is destroying our lifestyles, creating hardship and stress, concern for our safety and devaluing our properties.                                                                                                                                                                                                                                                                                                                                                                                                | 6 13 9    |
| Social Impact  | Community 1 | If the mining goes ahead, I envisage the next community action group will be formed to seek compensation because of health fears and property value losses                                                                                                                                                                                                                                                                                                                                                                            | 6 13 9    |
| Social Impact  | Community 1 | Has Olympia made arrangements with Western Power to upgrade the local power grids, as they will be using a massive amount of energy? Jarrahdale, Keysbrook, North Dandalup and Ravenswood suffer more power outages than any other area in Perth because of overloaded transformers at the sub-station. The extra draw will ensure even more lengthy power disruptions for this area.                                                                                                                                                 | 6 9 10    |
| Social Impact  | Community 2 | We are extremely concerned about many of the issues raised by the Keysbrook North Dandalup Action Group and as highlighted above we have grave concerns about the effect this mining operation will have on already fragile habitats and the rare and endangered flora and fauna.                                                                                                                                                                                                                                                     | 6 1 1     |
| Social Impact  | Community 2 | We are extremely concerned about many of the issues raised by the Keysbrook North Dandalup Action Group and as highlighted above we have grave concerns about the effect this mining operation will have on already fragile habitats and the rare and endangered flora and fauna.                                                                                                                                                                                                                                                     | 6 1 6     |
| Social Impact  | Community 2 | The extensive environmental education at the North Dandalup Primary School and the conscientious efforts by the school children will be seriously undermined by allowing a mining proposal of this nature to go ahead.<br>• The destruction of remnant bushland on this proposed site is against all the teachings at the school, and is extremely difficult to justify given all the other issues of concern highlighted by the Keysbrook North Dandalup Action Group. A great many species of flora and fauna are being threatened. | 6 1 6     |
| Social Impact  | Community 2 | Our rainfall is decreasing, and agricultural areas nearer to the South West coast will become more valuable as a source of grazing land and hay. The valuable thoroughbred horse industry is centred on this area, and the presence of a noisy and dusty neighbour will certainly damage this local industry.                                                                                                                                                                                                                         | 6 10 2    |
| Social Impact  | Community 2 | Adjustments in property values with the threat of mining                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 13 10   |
| Social Impact  | Community 2 | The extensive environmental education at the North Dandalup Primary School and the conscientious efforts by the school children will be seriously undermined by allowing a mining proposal of this nature to go ahead.<br>• The destruction of remnant bushland on this proposed site is against all the teachings at the school, and is extremely difficult to justify given all the other issues of concern highlighted by the Keysbrook North Dandalup Action Group. A great many species of flora and fauna are being threatened. | 6 13 11   |
| Social Impact  | Community 2 | The North Dandalup Primary School won the Premier's Award for environmental initiatives last year. The students have set up nesting boxes for the endangered Red-tailed and White-tailed Black Cockatoos, and want to be able to see these birds when they grow up.                                                                                                                                                                                                                                                                   | 6 13 11   |
| Social Impact  | Community 2 | If farmers are being refused permission to clear land, how can we justify wholesale clearing for mining, especially when it is so close to the metropolitan area?                                                                                                                                                                                                                                                                                                                                                                     | 6 13 14   |
| Social Impact  | Community 2 | The mining project is at the stage where a small company with no history of successful mining is embarking on a major project that drains into waterways of the fastest growing tourist resort areas of Western Australia.                                                                                                                                                                                                                                                                                                            | 6 13 18   |
| Social Impact  | Community 2 | Does Olympia have the financial resources to fulfill all the commitments promised and also adequate funding to cover any blowout in their budget?                                                                                                                                                                                                                                                                                                                                                                                     | 6 13 18   |

| Specific Topic | Submitter            | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Reference |
|----------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Social Impact  | Community 2          | If environmental problems occur either during or after mining, a small company with no other asset backing would be unable to meet the environmental damage bill.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 13 18   |
| Social Impact  | Community 2          | Having attended a presentation by Olympia, I found their information to be confusing and ill-founded. For example, the presenting geologist first informed the public that there was a 100m barrier between the mine and boundary fences, but he was later corrected to 4m by his own staffers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 13 19   |
| Social Impact  | Community 2          | The Shire of Serpentine-Jarrahdale has a "No Mineral Sand Mining" policy, which it has had for a number of years to prevent the degradation caused by this type of mining.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 13 30   |
| Social Impact  | Community 2          | The PER appears to ignore the potential impact of the proposal on possible future development in the area over the next decades. Nearby Mandurah has grown beyond expectation in the recent past and it seems certain that this will be followed by the development of Pinjarra, North Dandalup, Keysbrook and surrounding areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 13 37   |
| Social Impact  | Community 2          | The proposed deposit is an old dune system. The mineral content is about a quarter of the other style of deposit and spread over a much wider area. In this case it will be mined across an area of 9,000m long and 5,000m wide to a depth of 5m.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 13 39   |
| Social Impact  | Community 2          | Early colonists have left a reminder of massive clearing where areas of land are now unproductive and not suitable for housing because of the salinity. We think the risks are too high to gamble in granting permission to the proponent to commence their sand mining operation. Some families have lived here since colonization in the early 1830. We came, like they did, to live in this quiet countryside, where you can hear the birds singing, and frogs croaking, with clean air and clean water. This could all be destroyed by a signature giving Olympia the rights to opening up this sand mine. If the mine goes ahead, after 8 years, will Olympia move further down to Pinjarra, or eastwards towards the scarp, it would be never ending. Our land is very fragile and this should be given great consideration before permitting a sand mine of this nature to proceed. The very short term economic benefits of the Project will inevitably be outweighed by the irreversible long-term damage to the environment. | 6 13 4    |
| Social Impact  | Community 2          | The proposal would result in the destruction of native Jarrah bushland. This is a feature that gives the area a special appeal to visitors and to residents.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 13 4    |
| Social Impact  | Community 2          | The proposed mine site will result in a reduction in my life style, including solitude, creek, forest, valley, flora and fauna. Are there any alternative sites that would not impact on the community as much? The view for local residences would be lost. A mine does not fit in with the lifestyle of the people in the area                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 13 4    |
| Social Impact  | Community 2          | The mining proposal will not have any short term or long term benefits to the surrounding neighbours. Rather, it would destroy the environment and be detrimental to the area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 13 5    |
| Social Impact  | Community 2          | From a social point, the way Olympia has gone about its business is destroying the social fabric of a once very strong rural community. To offer royalties to some landowners to mine on their land, to the detriment of their neighbours and other members of the community has caused bad feelings amongst neighbours. This threat of mining has caused great stress and hostility in the community                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 13 9    |
| Social Impact  | Community 2          | We are extremely concerned about many of the issues raised by the Keysbrook North Dandalup Action Group and as highlighted above we have grave concerns about the effect this mining operation will have on already fragile habitats and the rare and endangered flora and fauna.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 3 1     |
| Social Impact  | Community 2          | Our rainfall is decreasing, and agricultural areas nearer to the South West coast will become more valuable as a source of grazing land and hay. The valuable thoroughbred horse industry is centred on this area, and the presence of a noisy and dusty neighbour will certainly damage this local industry.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 9 3     |
| Social Impact  | Community 70         | The impact on the town of North Dandalup has not been assessed, despite the town being within 500 metres of a proposed pit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 10 2    |
| Social Impact  | Community 71         | Concern regarding impacts on land values. Olympia has advised that land values should not be a problem as it was not to be adversely effected. This was because the mine would move quickly and they would complete mining in 8 years. However, the media has stated that the project has a life of 12 years                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 13 10   |
| Social Impact  | Community 71         | The local primary school has over the years shown the way for land care and environmental projects. As a result it has been recognised by winning many awards for its achievements. How would the school fair if many of the projects they have participated in are in line for removal by the proposed mine and haul roads?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 13 11   |
| Social Impact  | Community 71         | There is reference to Geraldton in the PER, and one can only assume that they have not taken the time to do a proper PER, but copied and pasted form another PER. This again does not inspire me with confidence in the company.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 13 15   |
| Social Impact  | Community 71         | The mine plan presented by Olympia at community meetings is different to that in the PER.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 13 19   |
| Social Impact  | Community 71         | The PER has raised more questions than answers for the community.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 13 19   |
| Social Impact  | Community 71         | Olympia should go back to the drawing board and get it right. The whole community involved should be included the community consultation, accurate studies of the area they affecting should be undertaken, with the use real data rather than other PER's.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 13 3    |
| Social Impact  | Community 71         | Olympia should go through a higher level of assessment such as an "Environmental Review and Management Programme".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 16 1    |
| Social Impact  | Greenacres Turf Farm | The impact on the surrounding land holdings in terms of economic consequences is an unknown.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 13 7    |

| Specific Topic | Submitter | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference |
|----------------|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Social Impact  | KNAG      | The North Dandalup and surrounding Landcare communities have been very active in preserving remnant bushland and planting shelterbelts, streamlining and preserving wetlands. A significant amount of money has been received from government and Alcoa grants, and matched by landholders for a total of almost \$500,000 in the last 6 years.                                                                                                                                                                                                                                                                          | 6 13 11   |
| Social Impact  | KNAG      | The North Dandalup Primary School has received numerous state and federal awards for active involvement in land care activities. One of their themes is to preserve remnant native bush. Many of their revegetation projects and the school itself are within 2 kilometres of areas to be bulldozed for mining.                                                                                                                                                                                                                                                                                                          | 6 13 11   |
| Social Impact  | KNAG      | If mining were to go ahead the school focus would be lost and children would be influenced to leave school at fifteen to get a job bulldozing remnant vegetation.                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 13 11   |
| Social Impact  | KNAG      | Much of the mine area is underlain by "coffee rock", an organic sulphidic sand, that has been cemented by limonite. Above this sits coarse quartz sand that is in many cases saturated by water i.e. there is a "perched" or superficial water table above the coffee rock. The shear wave velocity for the coffee rock is significantly higher than the loose sand above it. This is a classic scenario for liquefaction and significant earthquake damage can result.                                                                                                                                                  | 6 13 12   |
| Social Impact  | KNAG      | Dubious financial stability                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 13 18   |
| Social Impact  | KNAG      | The last capital raising from "sophisticated" investors was at a share value of 20 cents. Current trading of shares on the ASX is as low as 15 cents/share.                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 13 18   |
| Social Impact  | KNAG      | With a history of misleading the audience most of the community is completely distrustful of anything that the company says and have shown little interest in the misleading public displays in which the figures presented differ from what was shown in the PER documents.                                                                                                                                                                                                                                                                                                                                             | 6 13 19   |
| Social Impact  | KNAG      | "Hopelands and Redheads Roads are two unsealed roads, west and south of the project" Hopelands Rd has been sealed for at least 25 years. This was an obvious attempt to display North Dandalup as some rural backwater.                                                                                                                                                                                                                                                                                                                                                                                                  | 6 13 2    |
| Social Impact  | KNAG      | The company has no mining record in Australia. Therefore, it has no systems and procedures in place to ensure that the management plans in the PER are actually carried out.                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 13 20   |
| Social Impact  | KNAG      | In a release to the ASX 16 March 2006 Olympia Resources Limited details how it plans to buy Zircon from artisanal miners in Kalimantan. The zircon is to be extracted from gold tailings. What is not stated are the likely contaminants of mercury, cyanide and arsenic that would be associated with these tailings. This part of the world has been devastated by illegal logging and mining. For a company to promote the reworking of these contaminated gold tailings by indigenous people using unsafe methods would suggest a lack of "Duty of Care" that would not be welcome in the Australian Mining Industry | 6 13 20   |
| Social Impact  | KNAG      | The PER has been submitted by a mining company that does not own the minerals within the mining lease and has not completed compensation agreements with the landholders that do. It is impossible to seek EPA approval for this project when it relies on modelling surveys to position mine infrastructure; water bores and haul roads if they may never have access to the land. It is further impossible to talk about redirecting watercourses and linking vegetation corridors if they do not have contiguous access to the land.                                                                                  | 6 13 21   |
| Social Impact  | KNAG      | Examples of Olympia Resources Limited Media Statement and announcements: All public notices advertising the PER were placed without the Olympia Resources Limited logo. What have they got to hide???                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 13 22   |
| Social Impact  | KNAG      | Serpentine-Jarrahdale Examiner Newspaper Article (3rd August 2006) "Vegetation to be cleared for mineral sands plan". Olympia Resources Limited spokesperson claimed that only 100 trees that would date back more than a century would be bulldozed. A conservative estimate is 4500 trees greater than 100 years old.                                                                                                                                                                                                                                                                                                  | 6 13 23   |
| Social Impact  | KNAG      | No long term pool of experienced staff                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 13 24   |
| Social Impact  | KNAG      | The company claims to have personnel with a long history of experience. Is it possible that these people are at the end of their working life, have migrated to the fringe of the mining industry and are hoping to cash in on the current commodity boom before retirement? Would this leave the company devoid of experienced people before the project is completed?                                                                                                                                                                                                                                                  | 6 13 24   |
| Social Impact  | KNAG      | At the public display at Keysbrook and North Dandalup: Examples of rehabilitation at South Dandalup Dam showed complete reforestation of the area whereas Olympia Resources Limited plans no such thing. Road haulage routes had been changed from the PER document. Rehabilitation plans had changed from the PER document                                                                                                                                                                                                                                                                                              | 6 13 25   |
| Social Impact  | KNAG      | 14th February 2006 Sandra Jamieson (Public Relations Manager) Olympia Resources Limited stated that the Pinjarra Project did not show any promise and was to be abandoned. This conflicted with Olympia Resources Limited submissions to the ASX that work was continuing.                                                                                                                                                                                                                                                                                                                                               | 6 13 26   |
| Social Impact  | KNAG      | At a meeting arranged by the Dandalup and Districts Community Association and a presentation by Olympia's community relations officer, Sandra Jamieson was given. There were a total of 14 questions put to her about the project and the only answer she gave was later found to conflict with what the company was telling the ASX.                                                                                                                                                                                                                                                                                    | 6 13 26   |
| Social Impact  | KNAG      | Oly handout Oct 2005. On the back page a picture of a "rehabilitated lake" is shown. In words of State Opposition Environment Minister Steve Thomas (who lives in the area) "that's a dead lake". i.e. the water quality is unsuitable for any biodiversity.                                                                                                                                                                                                                                                                                                                                                             | 6 13 27   |

| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reference |
|----------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Social Impact  | KNAG        | Environmental Scoping document Dec 2005 (draft 2, fig 3), landowner boundaries are incorrectly located by almost 1 kilometre. This is an attempt to compress the apparent size of the project and move it away from North Dandalup town site.                                                                                                                                                                                                                                                       | 6 13 28   |
| Social Impact  | KNAG        | Public meeting held <b>25th October 2005</b> The first at the North Dandalup Hall was attended by at least 90 residents. There was stunned silence after Olympia gave its presentation and then there was a loud applause for the argument presented that outlined the negative aspects of the project. The vast majority of the audience went away annoyed that mining on such a massive scale was proposed in their community.                                                                    | 6 13 3    |
| Social Impact  | KNAG        | Of the 16 other mineral sand deposits seeking development in Australia, this has the lowest grade, smallest capital expenditure and is the only one located in the growth corridor of a metropolitan area.                                                                                                                                                                                                                                                                                          | 6 13 30   |
| Social Impact  | KNAG        | The bauxite mining is hidden behind the Darling Scarp 10's of kilometres to the east.                                                                                                                                                                                                                                                                                                                                                                                                               | 6 13 30   |
| Social Impact  | KNAG        | Normally a mining proposal of this magnitude would be subject to the appeals process of the Mine Warden's Court. However, because of a technicality with the land titles, this process has been bypassed                                                                                                                                                                                                                                                                                            | 6 13 31   |
| Social Impact  | KNAG        | Most mineral sand deposits are narrow high-grade strand deposits, not massively broad acre, low grade, strip mining operations like this proposal.                                                                                                                                                                                                                                                                                                                                                  | 6 13 32   |
| Social Impact  | KNAG        | The comparison with other sand mining operations fails to highlight the massive aerial extent for such a low-grade deposit.                                                                                                                                                                                                                                                                                                                                                                         | 6 13 32   |
| Social Impact  | KNAG        | Population pressures forced mines from Australia's eastern coast                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 13 34   |
| Social Impact  | KNAG        | There is no mention of any bond money to be kept in reserve. Even a slight blow out in costings could bankrupt this junior company and it would be unable to meet its rehabilitation commitments. Who pays for the clean up?                                                                                                                                                                                                                                                                        | 6 13 35   |
| Social Impact  | KNAG        | In Appendix 2 of the Ground Water Report Figure 3 shows drilling activity. The image clearly shows an illegal drill traverse by OLY across private land.                                                                                                                                                                                                                                                                                                                                            | 6 13 36   |
| Social Impact  | KNAG        | Landholders with specific health problems would be directly affected by mining. Shift workers will be affected.                                                                                                                                                                                                                                                                                                                                                                                     | 6 13 38   |
| Social Impact  | KNAG        | Land holders in ill health problems and need to retire are unable to sell their properties at expected returns.                                                                                                                                                                                                                                                                                                                                                                                     | 6 13 38   |
| Social Impact  | KNAG        | The area is an attractive rural setting with numerous lifestyle blocks and is incompatible with mining. We chose to live in a rural, not a mining area                                                                                                                                                                                                                                                                                                                                              | 6 13 4    |
| Social Impact  | KNAG        | Young families with children who planned to build their dream home in an idyllic rural setting have been forced to postpone building and are living in sheds.                                                                                                                                                                                                                                                                                                                                       | 6 13 4    |
| Social Impact  | KNAG        | The area is rural and does not have any other mining in the area. There are hundreds of hobby and lifestyle blocks in close proximity to the area.                                                                                                                                                                                                                                                                                                                                                  | 6 13 4    |
| Social Impact  | KNAG        | There has been a steady increase in essentially sustainable industries based lifestyle and tourism. These industries would be severely impacted by the change of the idyllic rural setting into a dirty dusty and noisy mining area with narrow local roads becoming haul roads.                                                                                                                                                                                                                    | 6 13 4    |
| Social Impact  | KNAG        | 26 July 2006, KNAG meeting Between 80 and 90 people attended and the vast majority were unconvinced by Olympia's answers and remained firmly opposed to the mining proposal.                                                                                                                                                                                                                                                                                                                        | 6 13 43   |
| Social Impact  | KNAG        | The failure to even mention the township of North Dandalup in the Executive Summary of the PER highlights the lack of concern shown by the company, towards the community                                                                                                                                                                                                                                                                                                                           | 6 13 44   |
| Social Impact  | KNAG        | There is less than 3% remnant coastal Jarrah bushland on the Swan Coastal Plain. If a farmer with remnant vegetation over a sand dune (that's where the best Jarrah bushland is) wishes to sign up for sand mining, all he has to do is graze out the understory. This remnant vegetation is then mapped as "Degraded Bushland" and can then be mined.                                                                                                                                              | 6 13 45   |
| Social Impact  | KNAG        | Workforce requirements if sourced locally would intensify labour shortages already experienced in sustainable and value adding industries                                                                                                                                                                                                                                                                                                                                                           | 6 13 5    |
| Social Impact  | KNAG        | This is the tax-free diesel for a mining operation that pays no state or federal royalties.                                                                                                                                                                                                                                                                                                                                                                                                         | 6 13 5    |
| Social Impact  | KNAG        | Olympia has not done an on ground aboriginal heritage study and has not consulted with local aboriginal Elders.                                                                                                                                                                                                                                                                                                                                                                                     | 6 13 8    |
| Social Impact  | KNAG        | The negotiations with the land holders are described as advanced, however, due to the rapid increase in the real estate value of the land it would appear that many of the negotiations have not only stalled, but have broken down.                                                                                                                                                                                                                                                                | 6 13 8    |
| Social Impact  | KNAG        | The project is within the Perth Metropolitan area only 50 kms from the Perth CBD and 20 kms from Mandurah. The North Dandalup town is growing rapidly (the planned pit is only 500 metres from the Coral Park subdivision) and major housing developments are planned only a few kilometres away.                                                                                                                                                                                                   | 6 2 25    |
| Social issues  | Anonymous 1 | Our final main concern is for the value of our home and land. We feel that being within such a short range from the mine, our values will drop dramatically.                                                                                                                                                                                                                                                                                                                                        | 6 13 10   |
| Social issues  | Anonymous 1 | As a community we are very environmentally aware ( North Dandalup School are renown as a land care school, winning various awards), it is extremely distressing to us that Olympia plan to mine and destroy such a vast amount of bush land and old trees which are well known nesting areas for the Redtail Black Cockatoo. In a time when environmental consciousness and awareness is such a priority, we are appalled that such a proposal as a sand mine in this area would ever be considered | 6 13 11   |
| Social Issues  | Community 1 | The absence of any financial test that would confirm Olympia's capacity to mine responsibly, and to rehabilitate in a timely way during the mining operation and post mining.                                                                                                                                                                                                                                                                                                                       | 6 13 18   |

| Specific Topic     | Submitter              | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference |
|--------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Social Issues      | Community 1            | The Dandalup & Districts Community Association Inc has been omitted from Section 6.3 Consultation Programme, Table 27. Concerns and questions raised at a community meeting on the 14 <sup>th</sup> February 2006 (submitted to Olympia 20/02/06 and not answered to date) are not included in Section 6.4, Table 29.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 13 30   |
| Social issues      | Community 60           | What will the future hold? A devastated landscape. Irreplaceable, destructed flora and fauna habitat. Underlying unstable soils unable to ever sustain housing, buildings, Rds etc. Peoples' homes, farms, fresh air etc gone in their lifetime.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 1 1     |
| Social issues      | Community 60           | Olympia has no proven background in mineral sand mining.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 13 17   |
| Social issues      | Community 60           | Inaccurate and flexible figures relayed to EPA, community, & financial sector                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 13 18   |
| Social issues      | Community 60           | They have no planned contingent to deal with problems foreseen by the community and appear to be financially inept to deal with unforeseen problems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 13 18   |
| Social issues      | Community 60           | Unlawful trespass on private property                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 13 36   |
| Social issues      | Community 60           | Visual degradation affects landowners, visitors and tourism.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 13 4    |
| social issues      | Community 60           | The time frames for the working life of mine change, and do not add up.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 13 46   |
| Social issues      | Community 60           | The working area of the mine shown in the maps in the PER have been altered                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 13 46   |
| Social issues      | Community 60           | They will contribute nothing to community, state and federal government royalties                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 13 5    |
| Social issues      | Community 60           | What will the future hold? A devastated landscape. Irreplaceable, destructed flora and fauna habitat. Underlying unstable soils unable to ever sustain housing, buildings, Rds etc. Peoples' homes, farms, fresh air etc gone in their lifetime.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 2 25    |
| Social issues      | Nth Dand Primary P & C | We are concerned that by allowing the destruction of 300 hectares of natural bushland, if this mining project were to proceed, would send a very poor message to our children                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 13 11   |
| Social Issues      | PHCC                   | Please note that the land within the mine area is NOT predominately used for <i>dairy</i> cattle grazing as is repeatedly stated throughout the PER. There has been a substantial decline in our catchment of dairy cattle grazing since deregulation of the Dairy Industry in July 2000. We suggest the predominant land use is best described as beef cattle grazing.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6 13 41   |
| soil fungi         | SJLC                   | Detailed surveys of microbial and fungal species be undertaken and an impact report be prepared.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 6 8 1     |
| Soils and Landform | Community 2            | Clearing all the dune systems in the proposed mining area will change the contour of the landform, let alone the mature vegetation to be removed. These dune systems act as wind breaks and wind calmers from the very strong easterlies experienced over 9 months of the year. To remove these vegetated dunes will create a flat wind tunnel across the Coastal Plain, and permanently affect the people living there.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 2 12    |
| Soils and Landform | Community 2            | There appears to be some concern that permission would not be granted for this land to be used for housing. The media releases about the growing shortage of suitable land for housing has become daily news. Land within the precincts of one and a half hours from the centre of Perth surely must be earmarked for such housing developments. This mine site could be rendered unsuitable for housing, farming etc. through the aggressive clearing and removal of so much soil. Mistakes have been made in the past, where over clearing has caused salinity problems, and also other nasties which affect people's health and livelihood that are not apparent in the initial stages of such developments                                                                                                                                                                                                                                                                                                                                                                                           | 6 2 25    |
| Surface water      | Anonymous 1            | Also, where we reside, we are cut off from the mains water supply and are concerned at the amount of contaminant which we feel will end up in our only source of drinking water, our rain tank.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 9 5     |
| Surface Water      | CC                     | Wetlands on the Swan Coastal Plain have been dramatically erased from the landscape. The proponent has acknowledged the presence of these wetlands by identifying their boundaries. However identified buffer zones appear to be inadequate. There should not be only a separation buffer but also a functional buffer established where human processes may detrimentally impact on the ecological function of the wetland. In many cases adjacent wetlands should be allowed a linking buffer to ensure sustainable ecological practices and functions continue. The proponent identifies many instances where the mine site pit wall will impinge on the proposed statutory buffer. No justification has been given for this proposed management practice despite the acknowledged impact dewatering will have on wetland function. Mining to the very margin of the wetland will drain all water from the ecosystem due to the soil structure in the higher levels of the soil profile. How will the proponent manage the impacts from dewatering adjacent to wetlands categorised by the Draft EPP? | 6 15 2    |
| Surface water      | Community 1            | There is conflicting data as to whether there is 78% (main text p80) or 38% (Appendix 9 p7) of the Nambelup Brook gauging station catchments area "within or upstream of the project area".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 5 10    |
| Surface water      | Community 1            | What disposal system will be in place to protect the water table from pollutants generated from the bunded washdown pad, which will be used for maintenance of contractors' vehicles? What disposal system will be in place to protect the water table from pollutants from fuels and oils?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 5 5     |

| Specific Topic | Submitter            | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Reference |
|----------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Surface water  | Community 1          | Olympia admits that surface runoff could result in contamination of surface water with sediment and they envisage capturing and treating this water prior to release from their catchments. During a normal wet winter while the surface water is at ground level, this will be difficult to contain, leading to polluted water entering surrounding creeks, drains and flat areas. Olympia plans to divert some of the minor watercourses around the mine pits during winter. This will mean additional water being directed into already saturated neighbouring properties. Because of poor drainage and water logging, the flats are already very acid and saline, despite the spreading of lime. This additional water will add an extra burden on properties around the mine site. | 6 5 9     |
| Surface Water  | Community 112        | No information was provided as to the routes that the water supply network will take therefore it was not possible to determine if all possible measures are proposed to be taken to avoid impacts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 4 17    |
| Surface water  | Community 2          | The water drawn is to be used to 'flush' the minerals from the sand, with no plan to collect this water other than a surface pond. The water table reaches the surface in winter in North Dandalup. There will be a seepage/flow of this water into local waterways with an unknown and unplanned effect. Nearby residence could easily be subject to inundation through any localised addition to the water table in winter.                                                                                                                                                                                                                                                                                                                                                           | 6 4 14    |
| Surface water  | Community 53         | The PER does not show any drainage design work to cope with the outflows from dewatering the mine pits, nor does it show the calculations of the amount of water to be removed from the mine pits. There may be substantial drain overflow arising from the dewatering discharge. The proposal by the proponent is to take water from dewatering of the mine pit, during winter, and divert it to the processing plant. Where will the surplus dewatering from pits move into the existing drainage system? The current drainage is not designed to cope with the dewatering required for 24 hours per day dewatering                                                                                                                                                                   | 6 4 20    |
| Surface water  | Community 53         | The PER states that the operating mine will require 1.82 megalitres per hour to be drawn down from the Leederville aquifer, a total of 15,899 megalitres per year. There are no calculations on how this annual drawdown will affect the water table in the immediate area of the mine bore field. What is the local effect of this proposal?                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 4 20    |
| Surface water  | Community 53         | The propose pit will be more than 2 metres below the surface. The evidence of water table levels shows that the mine pits will be 1 – 2 metres below the water table in winter, and in summer there is likely to be some water inflow into the mine pits.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 4 4     |
| Surface water  | Community 53         | The Keysbrook/Westcott Road has a rainfall estimated in an average year of 1 metre (1000mm). In mid winter in an average year the water table in low areas is at the surface or within inches of the surface, and at the end of summer is no more than 1½ to 2 metres below the surface. The PER does not contain any piezometer water level test points on the proposed mine sites, and provides no records or investigations relating to water levels, other than generalized statements.                                                                                                                                                                                                                                                                                             | 6 5 7     |
| Surface Water  | Community 70,        | Insufficient explanation of how 'diversion shall be managed'.<br>The proponent should provide a supplementary report on when and how surface water drainage will be diverted prior to EPA consideration of the proposal.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 6 5 6     |
| Surface Water  | DEC - LWQB           | Advice that the mining is restricted to within the seasonal watertable variation, expected to be at 1.5 – 2.0mbgl was not supported hydrological information or modelling to substantiate this assumption.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 5 8     |
| Surface Water  | DEC - LWQB           | Advice that the mining is restricted to within the seasonal watertable variation, expected to be at 1.5 – 2.0mbgl was not supported hydrological information or modelling to substantiate this assumption.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 7 ###   |
| Surface Water  | DEC KwP              | Water storage dam. There is no detail on its location, size (other than capacity of 74,000 litres) and whether licences will be required from the DOW                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 4 4     |
| Surface Water  | DEC KwP              | The section detailing reduced surface flows to wetlands states there will be no change of surface flows to wetlands, however the current hydrological state of these wetlands has not been accurately determined to confidently state that the wetlands are wholly dependent on creek flow. There is potential for these wetlands to have a groundwater inflow component. Therefore the hydrological nature of these wetlands and their geomorphology needs to be accurately determined.                                                                                                                                                                                                                                                                                                | 6 5 4     |
| Surface water  | Greenacres Turf Farm | The release of sediment contained in the soil profile which would be released from the excavation would result in an increase in the nutrient loads on the surrounding water courses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 5 9     |
| Surface water  | KNAG                 | "Permits will be obtained to divert watercourses." The PPG suggests diversions of watercourses will affect the adjoining or interconnected wetlands. Past experiences have shown considerable loss of damp land vegetation when natural flows are altered/diverted. Disturbing the natural water flows has been seen to render many wetlands defunct.                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 4 3     |
| Surface water  | KNAG                 | "Permits will be obtained to divert watercourses." The PPG suggests diversions of watercourses will affect the adjoining or interconnected wetlands. Past experiences have shown considerable loss of damp land vegetation when natural flows are altered/diverted. Disturbing the natural water flows has been seen to render many wetlands defunct.                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 5 6     |
| Surface Water  | PHCC                 | PHCC data supplied by the Department of Environment shows 9 conservation category wetlands on Lot 59 that are not reflected in Figure 10 of the PER or in the general documentation. • Fails to note that the Peel-Harvey estuary is Ramsar-listed as part of the Peel-Yalgorup System.<br>• Fails to identify that Nambelup Brook is one of the most nutrient enriched catchments in the Peel-Harvey .                                                                                                                                                                                                                                                                                                                                                                                 | 6 15 2    |

| Specific Topic | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Reference |
|----------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Surface Water  | PHCC        | Should mining of "minor watercourses" be permitted then a mitigation measurement should be the rehabilitation of damaged or drained wetlands within the mine area (regardless of their classification level) and the reinstatement of the natural watercourse lines through Lot 6                                                                                                                                                                                                                                                                                                                                                                        | 6 5 6     |
| Surface Water  | PHCC        | Disturbance of waterways and wetlands in a catchment with a long history of waterway modification or "training"; the impacts of which the NRM community has been working to rectify for the past two decades.                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 5 6     |
| Surface Water  | SJLC        | The PER appears also only to consider EPP wetlands in this 'wetland chain', other significant wetlands (categories C, R, M wetlands) will be affected & impact on these should be managed.                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 4 3     |
| Surface Water  | SJS         | • Given the excavations that are occurring (down to 5m in places) it is likely that topography of the mining area will be modified. Some comment should be provided regarding whether this will have any impacts on the surface flow regime across the site, and whether localised ponding / water retention will occur and whether there will be any impacts associated with this.                                                                                                                                                                                                                                                                      | 6 2 18    |
| Surface Water  | SJS         | • Given the excavations that are occurring (down to 5m in places) it is likely that topography of the mining area will be modified. Some comment should be provided regarding whether this will have any impacts on the surface flow regime across the site, and whether localised ponding / water retention will occur and whether there will be any impacts associated with this.                                                                                                                                                                                                                                                                      | 6 5 6     |
| The proposal   | Community 2 | This proposed sand mining project is unlike others that operate reasonably unobtrusively in the Capel region of our South West. These deposits are relatively narrow high-grade zones that have formed along ancient beachfronts. Because they are relatively narrow and high grade (usually a few hundred metres wide) the mining companies can start planting belts of trees before mining, to reduce the visual impact and also the impact of wind that can create massive dust and erosion problems.                                                                                                                                                 | 6 13 32   |
| The proposal   | Community 2 | The mine will cover a massive area due to the low grade of the deposit                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 13 39   |
| The proposal   | Community 2 | The huge volume and areal extent of material to be mined, means that it will be impossible to hide the visual impact                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 13 4    |
| Topsoil        | CC          | The proponents plan to stockpile topsoil as a noise barrier is concerning considering that the maximum depth for topsoil storage should be less than 2m. It is also not possible if they are to be undertaking progressive rehabilitation of areas behind the mine path, as is claimed elsewhere in the PER (Section 4.2). This inconsistency shows a concerning lack of planning, where one very important resource has two important functions that it cannot fulfill simultaneously.                                                                                                                                                                  | 6 10 8    |
| Transport      | Community 1 | Road haulage of concentrate fails the "preference for rail transport policy" (as claimed by the proponent, it would make the mine unviable, highlighting the marginal nature of the operation).<br>• At community meetings, Olympia has identified alternative haulage routes, but these have not been included in the PER.<br>• The Shire requires 2 km of Atkins Road be sealed to reduce/slash dust when transporting.                                                                                                                                                                                                                                | 6 14 1    |
| Transport      | Community 1 | • These roads should be left for the recreational use of the local people. The mineral sands should be transported by rail, especially as the proposed mining site is directly opposite the railway line, so a siding could be built right at the mine site.<br>• Olympia's excuse that this would not solve the problem about trucks using the road, as they would still have to cart the ore to the siding, is questionable. It means instead of requiring 8 trucks to travel the long distance to Picton, now only 2 would be required to ferry the ore the short distance to the siding. This would be more practical with less traffic on the road. | 6 14 1    |
| Transport      | Community 1 | Road haulage of concentrate fails the "preference for rail transport policy" (as claimed by the proponent, it would make the mine unviable, highlighting the marginal nature of the operation)                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 6 14 1    |
| Transport      | Community 1 | The transport route for the trucks is along Atkins Road which is one of the few low traffic gravel roads left that can safely be used by walkers, joggers, cyclists and horse riders. It is also used for the transport of slow moving farm machinery between properties.<br>• Atkins Road itself is clay and gravel and would not take the pressure of constant heavy truck movements.<br>• Readheads Road is narrow with clay and gravel edges which would also disintegrate with heavy truck usage. It is also the route for the school bus.                                                                                                          | 6 14 2    |
| Transport      | Community 1 | At community meetings, Olympia has identified alternative haulage routes, but these have not been included in the PER. • The haul roads are planned along narrow country roads, school bus routes and an overcrowded South West Highway. • The proposed haulage roads include those of recreational routes for cyclists, horse riders and walkers. • The proponent claims that the traffic increase is minimal. However, 12 to 14 movements of 50 tonne trucks, plus additional light vehicles, is not a minimal traffic increase.                                                                                                                       | 6 14 2    |



| Specific Topic          | Submitter              | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Reference |
|-------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Transport               | Community 1            | Olympia intends to request the Murray Shire to upgrade Atkins and Readheads Roads and the Main Roads to upgrade the South West Highway turnoff. Readheads Road is heavily tree lined with some very large old trees which overhang the road giving it an 'avenue' effect. If the road were widened, many of these trees would have to be removed. It also has several large culverts under the road and deep drains running parallel with the road and as it is undulating, would require building up in the hollows. This expense would increase the rates for the local residents, or mean the deferment of other more urgent works in the shire.<br>• Olympia say that there will be 14 – 16 truck movements every day along Atkins and Readheads Road while they are mining the northern end of the site, but there is no mention of how they will transport the minerals to and from the processing plant while they are mining on both sides of Readheads Road, 3 kilometres past the Atkins Road intersection. | 6 14 3    |
| Transport               | Community 1            | At community meetings, Olympia has identified alternative haulage routes, but these have not been included in the PER. • The haul roads are planned along narrow country roads, school bus routes and an overcrowded South West Highway. • The proposed haulage roads include those of recreational routes for cyclists, horse riders and walkers. • The proponent claims that the traffic increase is minimal. However, 12 to 14 movements of 50 tonne trucks, plus additional light vehicles, is not a minimal traffic increase.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 14 5    |
| Transport               | Community 1            | It seems some sections of the PER were not very clear and even copied from other companies. Sections of the PER state that the concentrate was going to be transported to the yet to be built plant at Picton. However Management Plan 2.4, Item 12.12, p20, states "Spillage from loads bound for Geraldton is negligible".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 9 7     |
| Transport               | Community 2            | Haul roads are planned along narrow (single lane) country roads making it dangerous for other traffic. The haul trucks on Atkins Road will pose a safety risk to bike riders along the road. Concern regarding noise and safety impacts from the trucks going past the school. The transport of mined minerals will be by large road trains thundering along our roads and through our town with 12-14 truck movements per day. When the children ride down Atkins Road to visit their friends they will have a window of about 30 minutes between road trains to avoid being run over. Concern regarding the dangers of road trains turning onto Readheads Road while the school buses are pickup up the children.                                                                                                                                                                                                                                                                                                   | 6 14 1    |
| Transport               | Community 2            | Haul roads are planned along narrow (single lane) country roads making it dangerous for other traffic. The haul trucks on Atkins Road will pose a safety risk to bike riders along the road. Concern regarding noise and safety impacts from the trucks going past the school. The transport of mined minerals will be by large road trains thundering along our roads and through our town with 12-14 truck movements per day. When the children ride down Atkins Road to visit their friends they will have a window of about 30 minutes between road trains to avoid being run over. Concern regarding the dangers of road trains turning onto Readheads Road while the school buses are pickup up the children.                                                                                                                                                                                                                                                                                                   | 6 14 2    |
| Transport               | Community 2            | The access roads and South West Highway are not constructed to carry extra heavy road transport (proposed 50 tonne trucks and trailers, at least 12-14 trips per 24 hour day). The narrow main streets of North Dandalup, Pinjarra, Waroona etc to the Picton works will bear the pressure. Already the traffic flow has increased, with many more trucks using the South West Highway to avoid the delays experienced on the Coast Road. The roads in the area are old and narrow, and would be destroyed if subjected to heavy haulage. The use of Westcott Road for the 50 tonne trucks will further damage the narrow limestone road.                                                                                                                                                                                                                                                                                                                                                                             | 6 14 3    |
| Transport               | Community 71           | traffic that Readheads Road carries. Not just in local car traffic but also in children and adults running, walking and riding bikes and horses. All of these activities are under threat from not only truck traffic heading towards the Highway but also service vehicles travelling to and from the Mandurah area. Sections of Readheads Road are gravel and already in need of repair.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 6 14 2    |
| Transport               | EPASU                  | The planned haulage route must be confirmed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 14 1    |
| Transport               | KNAG                   | Young children unable to ride to bus stops if haul roads feed into school bus routes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 14 1    |
| Transport               | KNAG                   | Road Haulage of concentrate fails the "preference for rail transport policy"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 14 1    |
| Transport               | KNAG                   | Impacts of increased traffic movements through southern towns on route eg Pinjarra, and towns from Waroona south that already have increased truck movements from Iluka's mines north of Waroona and at Wagerup.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 14 5    |
| Transport               | Nth Dand Primary P & C | Our school will be 1 kilometre of a proposed pit, with increasing traffic along south west highway our children's safety is threatened.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 14 5    |
| Transport, road quality | Community 60           | The use of local roads is not designed for ongoing use by heavy haulage vehicles.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 14 2    |
| Transport, roads, trees | KNAG                   | Atkins Road is used as a recreation route for cyclists, walkers, horse riding and access for slow moving farm machinery between farms. It is unsuitable for heavy trucks and is lined with trees donated by the Murray Shire and planted by caring farmers for the State's 150-year anniversary.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 14 2    |



| Specific Topic           | Submitter   | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Reference |
|--------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Transport, safety, noise | Anonymous 1 | We were advised that Olympia will have a haulage route through North Dandalup to Pinjarra. This obviously raises concerns for numerous reasons, the main being the safety of our children on the roads, especially the children venturing to the BMX track and park on Railway Ave, North Dandalup. The proposal by Olympia is not just one or two truck movements but sixteen per day. As we have been advised by Olympia at the town meeting Tuesday 25th July, not only truck but they will be towing trailers as well. The noise of these vehicles we feel will also pose a problem to the residents on the proposed routes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 6 14 5    |
| Transport, school        | KNAG        | Will the shift change occur during school bus times?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 14 1    |
| Transport, school        | KNAG        | Redheads Road is a school bus route and is narrow.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 14 1    |
| Typographical error      | Community 1 | It seems some sections of the PER were not very clear and even copied from other companies. Sections of the PER state that the concentrate was going to be transported to the yet to be built plant at Picton. However Management Plan 2.4, Item 12.12, p20, states "Spillage from loads bound for Geraldton is negligible".                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 14 4    |
| Visual Impact            | SJS         | One issue that was not addressed was the potential visual impacts of the mining operation. Whilst it is acknowledged that mining will be restricted to 30-hectare areas and that rehabilitation will be progressive, the topography of the landscape lends itself to the operations being visible from the surrounding region. Some discussion is warranted on this matter.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 2 28    |
| Waste disposal           | CC          | Proponent should be recycling office and food waste wherever possible. It is also possible to recycle the poly pipe used for water supply. The proponent should commit to recycling all materials that can be recycled locally                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 16 5    |
| Weeds                    | DOW         | Page 23, Vegetation and Flora, 9.1.49c and Rehabilitation and Closure, 9.3.4a, p138, 9.3.4, state "weed control" as a Management Action. Not much detail is provided as to how the weed control will be undertaken. Pesticide use for weed control in a Public Drinking Water Source Area is regulated by By-laws under the Metropolitan Water Supply Sewerage and Drainage Act 1909 and Country Areas Water Supply Act 1947. Under these Acts pesticide use within PDWSA specifically require the approval of the Department of Water. The proponent should comply with Statewide Policy No 2 Pesticide use in Drinking Water Source Areas, 2000 and the Department of Health Circular No. PSC 88 – Use of Herbicides in Water Catchment Areas. Our Branch recognises that the UWPCA and Water Reserve are not proclaimed Drinking Water Source Areas, but they have been identified as future Public Drinking Water Sources, so all practical protective measures should be taken to protect this potential drinking water source.                                                                                                                                                             | 6 2 6     |
| Wetlands                 | Anonymous 1 | But what will they do when the wetlands around the area also become dry? We heard no satisfactory response to this question.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6 4 3     |
| Wetlands                 | CC          | Comments on wetlands do not recognize the potential to impact on the Ramsar listed Peel-Yalgorup System, Becher Point Wetlands and Thompsons Lake; or the Peel-Harvey system, despite this being a controlled action under the EPBC act for this very reason.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 15 1    |
| Wetlands                 | Community 1 | If the wetlands are starved for water during the winter months, they cannot store sufficient moisture to carry them through the long summer and they may not recover. The need for wetlands for sustaining the environment and the value of preserving wetlands is important to the community. The high and increasing people population within the Mandurah-Peel region causes increasing pressure on the wetlands. This pressure will be further increased by mining, and will be detrimental to the environment. There has not been any detailed on ground mapping done of the wetlands in the area. Aerial photography was obviously used to identify the boundaries as they cease at boundary fences. The lack of a detailed digital terrain model prevents the identification of wetlands and the smaller drainage patterns. This will lead to unrecoverable areas after mining. This mining proposal will be mining below the water table. The Mandurah waterways are connected by a chain of wetlands (containing Ramsar Wetlands) that are already under threat from nutrient overload. This is the path of the mines water shed, which will contain the bi-products of this operation. | 6 2 18    |
| Wetlands                 | Community 1 | If the wetlands are starved for water during the winter months, they cannot store sufficient moisture to carry them through the long summer and they may not recover. The need for wetlands for sustaining the environment and the value of preserving wetlands is important to the community. The high and increasing people population within the Mandurah-Peel region causes increasing pressure on the wetlands. This pressure will be further increased by mining, and will be detrimental to the environment. There has not been any detailed on ground mapping done of the wetlands in the area. Aerial photography was obviously used to identify the boundaries as they cease at boundary fences. The lack of a detailed digital terrain model prevents the identification of wetlands and the smaller drainage patterns. This will lead to unrecoverable areas after mining. This mining proposal will be mining below the water table. The Mandurah waterways are connected by a chain of wetlands (containing Ramsar Wetlands) that are already under threat from nutrient overload. This is the path of the mines water shed, which will contain the bi-products of this operation. | 6 4 3     |
| Wetlands                 | Community 2 | It should be noted that if the remnant vegetation on the sand dunes (which is the deposit) were preserved and enhanced then the streamlining project would be far more effective.<br>If the mining project were to be approved it would undermine the efforts and investment by the Department of Environment, Waters & Rivers Commission, and the volunteer groups.<br>The Nambeelup-Sub-Catchment is in an environmentally sensitive area and for approval to be granted would be seen as hypocritical.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 2 28    |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Reference |
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| Wetlands       | Community 2  | At the last official meeting of the North Dandalup Landcare Group Inc. held on 11 March 2004 the subject of the meeting was Coastal Catchments Initiative (CCI) and in particular the Nambeelup Sub Catchment.<br>The purpose of this project was to encourage landholders to become aware of the Water Quality Improvement Plan for the Nambeelup Sub-catchment and the advantages of fencing of remnant vegetation and planting along creeks and streams in this area.<br>The North Dandalup school children planted some 5,000 trees on one property, just west of the proposed mineral sand mine site.<br>With all the positive efforts made by the CCI Project it would seem inconceivable that the EPA is considering a broad acre low-grade strip mining operation, which will destroy all the remnant vegetation in the area and severely disturb natural landform and drainage in the area, for approval.                                                                                                                                                                                                                                            | 6 2 28    |
| Wetlands       | Community 2  | Olympia is mining right up to Conservation Category Wetlands, with little or no buffers, their dewatering and mining activities will most definitely interfere with these very important eco-systems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 6 4 3     |
| Wetlands       | Community 60 | Mining adjacent to wetland areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 6 4 3     |
| Wetlands       | KNAG         | The PER does not appear to have referred to the WAPC's, "Guideline for the Determination of Wetland Buffer Requirements", Dec 2005 for Public Comment, in determining proposed buffers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 6 15 2    |
| Wetlands       | KNAG         | This area shows heavily grazed bulrushes, indicating wetland status not mapped.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6 15 2    |
| Wetlands       | KNAG         | There has been no detailed on ground mapping of wetlands in the area. The wetlands shown have been identified by aerial photography as is obvious by the fact that those identified stop at fenced boundaries because cattle grazing has removed the vegetation evidence. The lack of a detailed digital terrain model prevents the identification of wetlands and subtle drainage patterns. This means that they can never be recovered after mining.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 15 2    |
| Wetlands       | KNAG         | The PER appears also only to consider EPP wetlands in this 'wetland chain', it does not appear to consider the presence of "Conservation Category", "Resource Enhancement" or "Multiple Use" wetlands. Other significant wetlands will be affected. Waterways buffer should be 30 metres. Waterways should be permanently fenced & conservation covenants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 15 2    |
| Wetlands       | KNAG         | There has been no detailed on ground mapping of wetlands in the area. The wetlands shown have been identified by aerial photography as is obvious by the fact that those identified stop at fenced boundaries because cattle grazing has removed the vegetation evidence. The lack of a detailed digital terrain model prevents the identification of wetlands and subtle drainage patterns. This means that they can never be recovered after mining.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 6 2 18    |
| Wetlands       | KNAG         | The PER does not clearly explain the direct impacts that will occur on the "Major watercourses", the "Medium watercourses" and the "Minor watercourses". The proposed 20m buffers (insufficient) imply that no direct (within 20m) impacts will occur on the Major and Medium watercourses but this needs to be made clear. The actual impacts, extent, methods of impact on the minor watercourses must be detailed so that the affects can be understood and assessed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 4 3     |
| Wetlands       | KNAG         | The PER appears also only to consider EPP wetlands in this 'wetland chain', it does not appear to consider the presence of "Conservation Category", "Resource Enhancement" or "Multiple Use" wetlands. Other significant wetlands will be affected. Waterways buffer should be 30 metres. Waterways should be permanently fenced & conservation covenants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6 4 3     |
| Wind           | CC           | The assumption that the wind data at the Perth airport is the same as at the Keysbrook site is not accurate. The scarp shape is different and local knowledge suggests that there is a significant funnelling affect due to the steeply incised valley of the North Dandalup River as it cuts through the Darling Scarp.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6 9 4     |
| Wind           | Community 1  | There is no on-site wind data presented in the report; instead they have used Perth Airport as the measure. They might as well have used Sydney. This shows how little Olympia knows about this area and the intensity of the gale force east winds that roll down the Darling Escarpment all summer. The absence of in situ wind monitoring fails to address the severe wind velocities enhanced by local topographic features. Wind monitoring has not been conducted in the location of the project and fails to tackle the erosive winds especially during the summer months. There have been no local wind studies. Perth Airport has been used instead. In the PER there were at least two weather stations identified closer to the proposed area at Karnet and Medina as well as the station at Wokalup, 80km away (p60). Was data from these stations not available or not wanted, even to use in addition to that of the Perth Airport? Wokalup was certain good enough for the climate comparison even if it is 80km away. There is failure to indicate what the wind strength measurement will be to suspend topsoil stripping during high winds. | 6 9 4     |
| Wind           | Community 1  | Could a wind study not have been set up in the proposed area when the first fauna studies were being done? There would have then been at least two years of data. Will Olympia set up a weather monitoring station if the mining should occur? The proponent has given no satisfactory plan of action to allow for the severe wind factors in the area, with regards to dust and noise. Will Olympia set up a weather monitoring station if mining should occur?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6 9 4     |
| Wind           | Community 1  | The proponent's claim to only mine on the down wind side of any residence is not possible with houses surrounding the mine, and summer winds changing 180 degrees in a day.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 6 9 9     |

| Specific Topic | Submitter    | Submission                                                                                                                                                                                                                                                                                                                                                            | Reference |
|----------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| Wind           | Community 53 | The Keysbrook site is subject to prolonged high intensity easterly winds, and valley winds in the late spring and summer months. These winds are constant in summer and do severe damage to unprotected soil. The surrounding landowners may be impacted from wind erosion on the mine site causing large quantities of sterile silica sand to deposit on their land. | 6 9 3     |
| Wind           | Community 53 | The Keysbrook site is subject to prolonged high intensity easterly winds, and valley winds in the late spring and summer months. These winds are constant in summer and do severe damage to unprotected soil. The surrounding landowners may be impacted from wind erosion on the mine site causing large quantities of sterile silica sand to deposit on their land. | 6 9 4     |
| Wind           | Community 60 | Wind monitoring needs to be locally specific. Dust containment - hazards are not addressed (rain water is the primary drinking source in the area).                                                                                                                                                                                                                   | 6 9 4     |
| Wind           | Community 60 | Wind monitoring needs to be locally specific. Dust containment - hazards are not addressed (rain water is the primary drinking source in the area).                                                                                                                                                                                                                   | 6 9 5     |
| Wind           | Community 70 | The absence of in situ wind monitoring fails to address the severe wind velocities enhanced by local topographic features                                                                                                                                                                                                                                             | 6 9 4     |
| Wind           | KNAG         | SUMMARY OF SEVERAL SIMILAR POINTS: The wind speed data from the Perth Airport underestimates the katabatic wind speeds at Keysbrook and this is not acknowledged in the PER document. Data from Iluka (Waroona) and Alcoa should be used.                                                                                                                             | 6 9 4     |
| Wind           | KNAG         | The absence of in situ wind monitoring fails to address the severe wind velocities enhanced by local topographic features.                                                                                                                                                                                                                                            | 6 9 4     |
| Wind           | KNAG         | Olympia's token effect of a wind monitoring station situated on the lee (west) side (from the easterly winds) of this dune system confirms that they are not serious about community concerns.                                                                                                                                                                        | 6 9 4     |
| Wind           | SJLC         | The wind speed data from the Perth Airport underestimates the katabatic wind speeds at Keysbrook and this is not acknowledged in the PER document. Further study of the local katabatic winds and assessment of impacts on soil erosion, vegetation removal (and establishment) be undertaken.                                                                        | 6 9 4     |
|                |              |                                                                                                                                                                                                                                                                                                                                                                       |           |

## **APPENDIX 2: ISSUES RAISED IN COMMUNITY MEETINGS**

**EPA Comment 34**  
**Community Concerns - Revised Response**

**Submission 5.13.30**

- a) KNAG comments that of the 16 other mineral sand deposits seeking development in Australia, this has the lowest grade, smallest capital expenditure and is the only one located in the growth corridor of a metropolitan area,

**Response**

The Keysbrook Deposit is listed in the DoIR's *Geological Survey of Western Australia, Resource Potential for Land use Planning Data Base (Titanium/Zircon mineralisation, Fremantle to Jarrahdale)* as a strategic mineral resource protection area. The proponent believes that The Keysbrook mineral sands mine is not incompatible with future urban growth.

- b) ...that the bauxite mining is hidden behind the Darling Scarp 10's of kilometres to the east.

**Response**

The comment is acknowledged. The Keysbrook mineral sands deposit is a dunal deposit, located on the site of ancient ocean coastline which at times reached close to the foot of the Scarp. Rock from the Scarp has over time been washed into these oceans and ground to fine grains by the actions of waves. Such natural actions which are necessary for the formation of the mineral sands on the Swan coastal plain are therefore not found behind the Scarp.

- c) Community 2 states that the Shire of Serpentine-Jarrahdale has a "No Mineral Sand Mining" policy, which it has had for a number of years to prevent the degradation caused by this type of mining.

**Response**

Acknowledged. The proponent has held discussions with Councillors and employees of the Shire of Serpentine-Jarrahdale and is aware that the Shire has a "No Mineral Sand Mining" policy.

- d) Community 1 comments that the Dandalup & Districts Community Association Inc has been omitted from Section 6.3 Consultation Programme, Table 27.

**Response**

Table 27 has a listing under the heading "Community" titled "Local Community Groups", which was intended to be inclusive of organisations such as the Dandalup & Districts Community Association Inc. The proponent regrets any offence caused by the exclusion of the titles of individual community groups.

Community 1 comments that

- e) i) Concerns and questions raised at a community meeting on the 14<sup>th</sup> February 2006 are not included in Section 6.4, Table 29.

**Response**

The names of those people at the meeting on 14 February 2006 who asked questions was not noted by the Minutes Secretary, therefore it was not possible for the proponent to accurately attribute questions to individuals.

The questions from the meeting were included in the PER Section 6.4, Table 29 attributed to KNAG, which at the time of the meeting was a group of individuals who had come to the meeting specifically to discuss Agenda Item 6.4, the Keysbrook Project.

e ii) Concerns and questions raised at a community meeting on the 14<sup>th</sup> February 2006 submitted to Olympia 20/02/06 have not been not answered to date.

**Response.**

The proponent responded to as many questions as possible at the meeting on 14 February 2006. At the time of the meeting, the environmental studies initiated by the proponent for the PER were at an early stage, and information from these studies was not yet available.

The agreed reason for the proponent to attend the meeting on 14<sup>th</sup> February 2006 was to gather information from the community regarding people's questions and concerns about the project, which would then be incorporated into the research.

The proponent made a commitment that responses to the questions raised would be provided as data became available. As the information became available, it was distributed in the following ways:

- The Olympia website
- Newsletters mailed to 117 people on mailing list
- One-on-one meetings
- Media releases
- Briefings to Local, State, Federal government and local NGO's
- Community Open Days
- By individual correspondence
- By accepting invitations to present at community meetings
- In the PER

Information provided to the community between December 2005 and August 2006 (the closing date for submissions to the PER) is attached at below.

**Information provided to the Community by  
Olympia Resources regarding the  
Proposed Keysbrook project.**

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## **1.0 Information provided to the Community by Olympia Resources regarding the proposed Keysbrook project.**

Comments were made in submissions to the PER criticising the lack of information provided to the community by the proponent, and alleging that the proponent had provided misleading information.

These submissions have been addressed individually in section 5.13.30 of the Response to Submissions document, however it is not practical to incorporate all relevant information, so it is provided in this appendix.

The following information is in chronological order, commencing from information sent in response to issues raised after Olympia's initial public information session on the Keysbrook project on 25 October 2005.

### **Figure 1. Information circular mailed to attendees of the initial public meeting organised by Olympia Resources on 25 October 2005**

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Olympia Resources  
Keysbrook Titanium Minerals Project

December 2005

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#### ***Community Consultation Program***

Olympia Resources has begun its program of consulting with local residents and community groups, identifying and addressing community issues as part of the planning and assessment of the Company's Keysbrook mining project.

Olympia is in the early stages of planning for the short term titanium minerals operation on properties between North Dandalup and Keysbrook.

At present, extensive site studies are being carried out to determine the effect of the proposed mining operation. The results of these studies will be available in the Public Environmental Review in the first half of 2006.

The Company has appointed a community liaison officer, Sandra Jamieson, to discuss local issues with residents and help the Company to address concerns or questions about the mining proposals.

The program will include:

- discussions with land owners and community representatives,
- listing of key community concerns and issues so they can be addressed in the Public Environmental Review
- information briefings for local residents and organisations,
- updates on the project, as information from studies becomes available and development options are more clearly defined,
- regular consultation.

Olympia's consultation program will complement a formal community involvement process required by the State Environmental Protection Authority (EPA).

There will be more opportunities, both formal and informal for public input and review.

In the meantime, community groups have already identified a number of key issues. These – and some current information from Olympia - are listed below.

### ***1. Preservation of native vegetation, particularly mature trees***

The proposed mining area is a combination of cleared farmland, parkland cleared properties and remnant native vegetation. All of the native vegetation will be assessed before mining to identify any areas which should not be disturbed. This process of assessment will involve the Environmental Protection Authority, the Conservation and Land Management Department, the property owner and the Company.

Once mining is finished, the area will be rehabilitated to either pasture or native vegetation. The industry has an excellent success rate with replacement of native plants and habitat.

### ***2: The potential spread of dieback***

Dieback studies are being carried out by Olympia, and will be part of the Public Environmental Review available for public comment in the first half of 2006. Where required, Dieback management strategies will be developed, including vehicle wash-down stations and vehicle movement control.

### ***3: Water Consumption***

Most of the water used on site will be recycled. In addition, Olympia will submit an application to the Water and Rivers Commission for an allocation of 1gigalitre per year from the Leederville aquifer, for up to eight years of mining. This application follows the process required for access approval.

Olympia is carrying out hydrological studies throughout the area of the proposed mine site, including modelling of the effect of mining on a) surface water, b) the superficial aquifer and c) the Leederville aquifer

### ***4: Possible impacts on ground water and surface water quality***

Olympia will carry out test-drilling in the area of the proposed mine site to identify for the presence of salts, fertilizer banks and acid sulphate soils. The level of each will be measured, and the effect on these of the mining operation will be assessed.

Past experience has shown that mining is unlikely to affect the quality of groundwater. Surface drainage lines will be diverted around the mine site to prevent any impact on local waterways.

### ***5: Road transport from the mining operation to processing facilities in the South West***

Olympia would be trucking concentrate from the Keysbrook mine to Picton via the Southwest Highway. It is planned to transport eight loads of concentrate per day from Keysbrook which will require sixteen truck movements to and from the mine site.

The trucks that would be used have not yet been determined, but are likely to be a truck plus a trailer.

Details of the route to be taken from the mine site to the Southwest Highway have yet to be finalised with the Murray Shire and Main Roads WA. These roads will need to be upgraded for safe truck usage and Olympia will provide financial assistance to the Murray Shire and Main Roads WA for this.

### ***6: Noise***

Olympia Is currently carrying out a study of noise at the proposed mine site. This will indicate the level of noise likely to be heard by neighbouring residents. If the pre-mining studies – or monitoring during subsequent mining operations indicate that noise could affect neighbouring residents - Olympia has a range of options to reduce the noise levels. These include the construction of noise bunds (large temporary earth mounds) and installation of silencing equipment. In most areas, operations would not be within earshot for more than six months

### **7: Dust**

Wind conditions in the area will be tracked and recorded with anemometers and computer modelling in various locations around the mine site. Operational strategies to control dust include the use of stabilising mulches and wetting down mining areas with re-cycled water.

### **8: Area of open operations**

Mineral sands production is a continuous process of mining and rehabilitation.

The proposed area to be mined each year is approx. 150 hectares.

The key rehabilitation planting season is in May each year. Before planting, the open areas are protected and stabilised with cover crops or clay mulch.

Proposed revegetation cycle:

Of the approx. 150 hectares to be mined per year

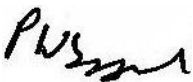
- Approx. 40 hectares would be cover cropped using a 'stubble' crop.
- Approx. 70 hectares would be stabilised with clay mulch.
- Approx. 40 hectares would be under mining or re-contouring

### **9. Radiation**

In some minerals sand deposits, naturally occurring radiation levels are increased slightly by a mineral called monazite. However, our test drilling has found no monazite in the Keysbrook area. The land has the same radiation levels as the rest of the Swan Coastal Plain.

All of these issues will be subject to more detailed studies and investigation. The information will be circulated to interested residents and community representatives as soon as it becomes available.

If you would like to discuss the program or the issues on more detail, please don't hesitate to contact me, or Sandra Jamieson on (08) 9244 1411 or by e-mail, [sandra.jamieson@olympiaresources.com](mailto:sandra.jamieson@olympiaresources.com)



**Peter Gazzard**  
**Managing Director**

## KEYSBROOK MINERAL SANDS PROJECT

In this “FAQ” column, we have listed information provided in response to the questions most often asked about environmental issues.

Ed. The various answers depend on each landowners situation - so we have grouped individual questions and answers under broader headings.

### **WATER**

#### ***Will the proposed mine impact on the quality of ground and surface water?***

Mineral sands mining has been carried out in WA for 50 years - experience has shown that mining is unlikely to affect the quality of ground or surface water.

#### ***Will it pollute waterways in the Peel catchments region?***

Olympia's proposed Keysbrook project will not have any impact on water systems linked to the Peel-Harvey Estuary. The findings of the comprehensive environmental review carried out over the past 12 months support this. There are no chemicals, and no potential pollutants introduced which could affect the water.

Soil samples from across the mine site to a depth of 2 metres were analysed for the major nutrients nitrogen, phosphorous and potassium. Levels were found to be very low. Consequently there is an extremely low risk of residual nutrients being re-mobilised from the site.

88% of the water used on site will be recycled, and there will be no uncontrolled discharge of water from the site.

With the conservation of water on site and the very low level of nutrients held in the sand, no increase in levels of residual nutrient re-mobilisation will occur due to the mining operation.

#### ***Will the mine interfere with our creeks and lower our groundwater?***

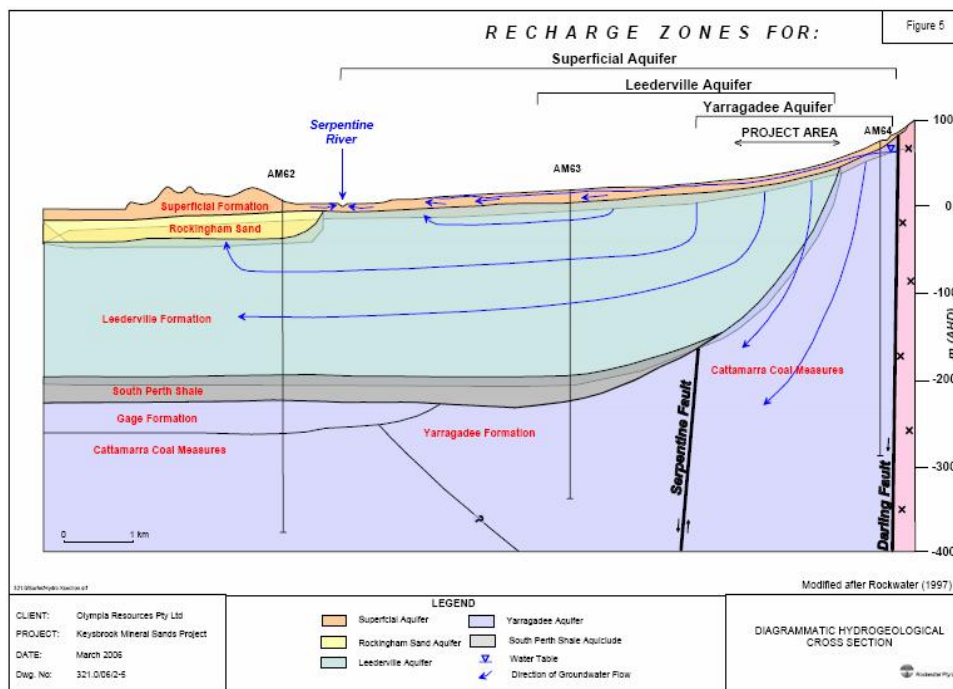
Major waterways within the mine area will be protected by buffer zones and will not be mined. Watercourses may be temporarily diverted around the mine pit and rejoin their natural course behind the mine. As mining moves through the resource, the water will return to its original course.

Because of their shallow base, the sands to be mined are mainly dry in the summer. Winter water levels would be temporarily lowered at the active mining sites, but will subsequently be restored by infiltration of water from tailings and rainfall.

#### ***Will the proposed mine cause the water level in the Leederville aquifer to drop rapidly, allowing sea water in?***

##### ***Is there any control over the use of the aquifer?***

The Department of Water controls extraction from the Leederville aquifer so that the amount being drawn is no more than the quantity of recharge, and so extraction will not cause any depletion of water in the aquifer. Current drought conditions may reduce the seasonal water level oscillations, which are normally about one metre annually.



### ***Does the PER water study factor in the declining rainfall and run-off in the past few years?***

The studies in the PER Water Corporation data current to the end of December 2004, the most current data available for the study. This includes rainfall/recharge data for the past 10 years. Declining rainfall/runoff is included in the data.

The underlying aquifers of the Leederville Formation extend more than 100 m below ground surface in the project area, and the standing water levels are typically about 16-18 m below ground surface.

Water levels are currently showing reductions of about 0.7m/yr, evidently as a result of groundwater pumping from the aquifer. The additional water-level reduction predicted to occur as a result of pumping water supplies for the mining operation (between 1.5 and 2 gigalitres/yr) is approx. 7 m near the pumped bores, decreasing to 0.5 m at distances of 4 km. These levels are not expected to be deleterious in such a thick aquifer.

Reductions of water levels in the Leederville aquifer will tend to increase groundwater recharge because of increased hydraulic gradients from the shallow aquifer and surface water.

### ***What happens if my bore dries up because of mining?***

Should it be established that the proposed Leederville aquifer production bores are likely to significantly affect the operation of existing bores, then the proposed bores could be located further to the west, for example, to limit drawdown effects.

Water levels in shallow aquifers have been shown to rise when sub-divisions are built over shallow aquifers. This contradicts the assertions of Mr Elliot.

### ***Will there be a lot of large trucks from the proposed mine using surrounding roads?***

Olympia would be trucking concentrate from the Keysbrook mine to Picton via the Southwest Highway. It is planned to transport six or seven 50 tonne loads of concentrate per day from Keysbrook which will require twelve to fourteen truck movements to and from the mine site. The trucks that would be used have not yet been determined, but are likely to be a B-double or similar. Vehicle movement will be within the mine site wherever possible. Two exit routes using public roads to transport mineral concentrate off-site have been proposed by Olympia: **Atkins Road, Readheads Road, South West Highway or Atkins Road, Page Road, South West Highway** Six to seven 50-tonne truckloads (similar to a B-double stock truck) of mineral concentrate will leave each day

This equates to only 12 or 14 per truck movements to and from the Keysbrook mine site per day.  
All loads will be covered prior to leaving the site  
Trucks can be rescheduled to avoid school bus times

Details of the route to be taken from the mine site to the Southwest Highway have yet to be finalised with the Murray Shire and Main Roads WA. These roads will need to be upgraded for safe truck usage and Olympia will provide financial assistance to the Murray Shire and Main Roads WA for this.

***Will the proposed mine make excessive noise for neighbours?***

Olympia is currently carrying out a study of noise at the proposed mine site. This will indicate the level of noise likely to be heard by neighbouring residents. If the pre-mining studies – or monitoring during subsequent mining operations indicate that noise could affect neighbouring residents - Olympia has a range of options to reduce the noise levels. These include the construction of noise bunds (large temporary earth mounds) and installation of silencing equipment. In most areas, operations would not be within earshot for more than six months

***Will the strong winds in the area blow dust from the proposed site into neighbouring properties?***

Wind conditions in the area will be tracked and recorded with anemometers and computer modelling in various locations around the mine site. Operational strategies to control dust include the use of stabilising mulches and wetting down mining areas with re-cycled water.

***How much sand will be exposed at any one time?***

Mineral sands production is a continuous process of mining and rehabilitation.

The proposed area to be mined each year is approx. 150 hectares. The key rehabilitation planting season is in May each year. Before planting, the open areas are protected and stabilised with cover crops or clay mulch.

Proposed revegetation cycle:

Of the approx. 150 hectares to be mined per year

- Approx. 40 hectares would be cover cropped using a 'stubble' crop.
- Approx. 70 hectares would be stabilised with clay mulch.
- Approx. 40 hectares would be under mining or re-contouring

***Will the minerals at the proposed site increase radiation in the surrounding area?***

In some minerals sand deposits, naturally occurring radiation levels are increased slightly by a mineral called monazite. However, our test drilling has found no monazite in the Keysbrook area. The land has the same radiation levels as the rest of the Swan Coastal Plain.





**Figure 3. Extract from the minutes of the Dandalup and Districts Community Association Inc. meeting 14 Feb 2006**

This PDF of the meeting minutes is provided in response to a submission which stated that “no answers were provided by the proponent at the meeting”.

## *Dandalup & Districts Community Assoc Inc*

### *Minutes of General Meeting*

*14<sup>th</sup> February 2006*

#### **Extract of minutes**

##### **6.4 Mineral Sand mining**

Jan introduced Darryl Sherman as the facilitator. Darryl gave a pre intro and outlined the agenda for the meeting.

Purpose of meeting

Information – Presentations by Sandra Jamieson and Graham Elliott

Community & Environment input

Status of approvals – process began August 2005. Level of assessment - PER is an 8 week comment period.

A weather study is being conducted. A weather station has been installed on site to record weather patterns and is to be mobile. Station was installed the second week in January.

Objection to the present site of the weather station was stated.

Q. *Why not have 2 weather stations?*

Other weather records will be used in the study from the Perth Airport and Alcoa locations.

Comment: **It must be noted that this summer has been an extremely unexceptional and unusual season.**

Q. *Will a detailed report on how the effects of the weather conditions can be prevented or the steps taken to reduce the effects?*

Q. *Who is carrying out the relevant studies?*

R. A consultancy group has been contracted and specialist companies with the relevant knowledge will carry out the studies.

Q. *How will dust suppression be curtailed during mining?*

R. By spraying, mulching, watering.

Comment made that Olympia has no track record in sand mining.

Q. *What mechanisms will be put to compensate residents who are affected by this project?*

Q. *What replaces the sand when taken out?*

R. Volume of 3% of the sand contains the minerals (titanium and zircon) to be mined and the rest is put back.

Q. *Where else is Olympia looking to sand mine.*

R. No current mine map available.

OLY's December Quarterly Report indicates source on Alcoa's property. **False reporting to Stock Exchange.** Advised resource on Alcoa property was not going ahead.

Q. *How much consultation has been with the Shires of Murray and Serpentine/Jarrahdale?*

R. Talks have been conducted with Administration.

Q. *Why has Olympia chosen this area when there is a lot of community impact?*

R. Value of the mineral ore.

This sand mine proposal was presented to this community as an 8 year project. The West Australian (2 weeks after the 25/10/05) reported an 11 year project. Mineral prices are good at present but what happens when the price falls. No guarantee that this will end by the date given a fear is that it could be forever.

Road planning being discussed (Lakes, McMahon, Readheads and Pinjarra By-pass).

Q. *If the price of minerals increases will production increase?*

**Concern raised regarding the winter running creeks (minor and major) will be dug through during mining.**

R. Major creek lines will not be mined.

Unable to satisfy wind, noise, water effects.

R. The project will be audited by EPA Auditors and any breach could see a significant fine incurred.

Q. *How has the Mine Warden's Court been by-passed?*

R. This hasn't, as the pre-1899 does not require a mining lease and landowners are approached directly.

Cr's Bessant and Birmingham stated this project will proceed through Council as an Extractive License application.

Q. *How many Shire of Murray property owners signing up for mining, currently live on their property and not just own the land that will be impacted?*

Q. *Is there to be a buffer zone between property owners boundary and the mine and what is the distance from the property boundary to the mining area?*

In discussions held with company officials, some residents have been told that reversing beepers on vehicles will be disarmed to reduce the noise factor. It was the meeting attendees understanding that it was illegal not to have beepers.

Q. *What is the mining area at any one time?*

Q. *Once mining starts will there be an end to the mining or as some other mines continue mining for other minerals?*

Q. *Will data be released on what other minerals exist in the sand.*

Notice – As per information supplied all residents were to be notified however one resident was not notified and Olympia entered the property without their knowledge or authorisation. (Some other persons informed the company where the key to the property was.

Q. *How can EPA allow mining to cut down old growth forests and the primary producers can not.*

Water license – only short term, water depletion overtime.

Note regarding ground water – Alcoa could not predict water changes in their mining area and they are mining in clay not sand.

Q. *Would Olympia be able to guarantee that no water supply would be affected by this mining?*

Comments were passed that it would not be easy to be informed of the release of the PER as local papers were not widely available in this area.



Figure 4. Community Newsletter No. 1, February 2006

|  |                              |                                                                                     |
|--|------------------------------|-------------------------------------------------------------------------------------|
|  | <b>OLYMPIA RESOURCES LTD</b> | <a href="http://www.olympiaresources.com">www.olympiaresources.com</a>              |
|  | <b>Keysbrook Plan</b>        |  |
|  | <b>Community Update</b>      | <b>February 2006</b>                                                                |

### What is happening at the moment?

Before a project such as the Keysbrook mineral sands project can go ahead, approval must be gained from the EPA. On 1 February 2006, Olympia gained approval from the EPA for the scope, or range, of studies that must be carried out in order to gain project approval.

MBS Environmental is managing the studies, based on Olympia's commitment to *no net loss of vegetation*, EPA requirements and input from community members. Currently, many studies are complete and a number are nearing completion.

### What are Mineral Sands used for?

Most of Olympia's titanium mineral will be used to produce titanium dioxide pigment, one of the whitest substances on earth. Titanium dioxide is more opaque and reflective than any other pigment. It is used in paints, sunscreens, cosmetics, plastics, paper and textiles.

*Did you know... the colours in fireworks are produced by the addition of certain minerals? Zircon is added to produce the silvery-white colour.*

12 April 2006



Titanium metal is strong, light, and resistant to corrosion, so is used in the aerospace industry, desalination and chemical plants and for high-tech sports equipment. A non-reactive (inert) metal, titanium is used to make artificial joints, pacemakers and dental implants.

Zircon is extremely tough and can withstand extreme temperatures, so is used to line blast furnaces and aircraft engines, for ceramic glazes on tiles, in bathroom fixtures and crockery.



### Olympia's People

Olympia Resources is a Western Australian company established in 1997 to explore for minerals in Australia and elsewhere. Olympia's staff are the 'heart' of the company.



### Introducing... Peter Gazzard.

Olympia's Managing Director Peter Gazzard has 26 years experience in the Western Australian mineral sands industry. Peter originally hails from New Zealand, but saw the light and moved to WA in 1978. Peter and his wife Lee have four children. Peter is responsible for the overall operations of the company, including the planning, development and operation of the Keysbrook mine.

### Weather station installed at Keysbrook

Forty-two years of data from Perth Airport weather station, experience with mining in areas with similar

## Figure 5. Correspondence April 2006.

---

Mr Graham Elliott  
PO Box 41  
NORTH DANDALUP WA 6207

Dear Graham

### **Olympia Resources' Keysbrook Mineral Sands Project**

I have become aware of a letter signed by you on behalf of KNAG Inc. that contains a number of statements that are wrong or misleading about Olympia Resources' Keysbrook mineral sands project.

I would like to provide you with the following clarifying information, based on independent research.

Comprehensive data on all of the environmental research will be in our Public Environmental Review, due for release within the next few months.

#### *1: Olympia is a small company with no mining history and no positive environmental record.*

- Every company starts somewhere.
- Olympia has engaged staff with extensive experience in mineral sands mining in Western Australia and has a Board of Directors with extensive knowledge of the industry.

#### *2: Increasing nutrient overload in the Mandurah Waterways*

- Samples taken across the mine site were analysed for the major nutrients nitrogen (N), phosphorous (P) and potassium (K).
  - The results indicate an extremely low nutrient bank on the site
  - 88% of the water used on site will be recycled.
- There is no reason for nutrients to be mobilized off-site.

#### *3: Olympia has bypassed the Mine Warden's Court*

- The Law in this case decrees that because the land titles in this area can be traced back to before 1899, minerals other than the 'royal minerals' (gold & silver) are owned by the landowner. This requires that Olympia negotiate with individual landowners regarding royalty and compensation payments.
- The operations of the mine are regulated under the Mines Regulation Act and must strictly comply with all its regulations.

#### *4: No royalty payments to State or Federal governments.*

- This is correct, see point 3 above.
- Royalties are paid to the land (and mineral) owners.
- Your property and other KNAG members' land have the same title as those on which it is proposed to mine.
- Landowners may well choose to spend their royalties locally on improving their properties, thus improving farm productivity and increasing property values in the area.

#### *5: Mining will be over a 5,000m x 9,000m area to a depth of 5 metres.*

- The maximum area to be mined is 1,234 hectares, not the 4,500 hectares indicated above.
- The average depth of mine will be 2 metres. Less across lower areas, ranging up to 5 metres on raised sand mounds.
- The open mine area at any one time will be approx 30hectares
- Yes, the mineral deposit is geologically different from that at Capel, being generally shallower.

*6: Use of tax-free diesel to produce royalty exempt minerals.*

- Olympia Resources, as with other primary producers such as farmers, is entitled to receive the Federal diesel fuel rebate.
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*7: Mining will destroy significant area of remnant Jarrah, Marri and endangered Flora, Fauna.*

- The research on these issues is covered comprehensively in the Public Environmental Review.
- The maximum area to be mined will be 1,234 hectares. Of this, 60ha is remnant vegetation in good condition, 244 ha is remnant vegetation, parkland cleared and 930 ha is cleared paddocks.
- Olympia will conserve, by not including in the mine plan, the best 49ha of remnant vegetation that contains approx half the mature trees with suitable hollows for cockatoos. This is the only area with any intact native under-story.
- While suitable stag trees exist in this area, no evidence of Cockatoo nesting has been found.
- 

*8: Removal of mature trees over 1,800 hectares will leave a scar visible from many locations.*

- The maximum mine area is 1,234 hectares.
- 930 hectares of this is cleared paddocks.
- Mining will occur progressively over a period of up to 8 years, not all at once.
- Rehabilitation follows as soon as possible after mining.
- 100% of the land is owned freehold by private owners. These owners are involved in planning the rehabilitation of their properties, along with various government regulators.

*9. Mining below the water table*

- Mining will occur above the water table in summer and within the water table in winter.
- All water from pit de-watering will be used in the plant and recycled.
- During summer, with less water available from pit dewatering, more water will be supplied from two bores into the Leederville Aquifer.

*10: Porous Permeable dune systems draining directly into Nambeelup and the Peel-Harvey estuary.*

- See point 2.

*11: The remobilisation of 60 years of phosphate fertilizer into the Peel Inlet*

- See point 2

*12: Strong Winds*

- The issue of the strong winds in the area is not being underestimated by Olympia.
- Previous mineral sands mines along the Darling Scarp have experienced the same wind conditions and have developed effective methods to control dust and erosion. Olympia will implement similar controls.
- Thorough studies are being conducted as well as many discussions with local people with hands-on experience with the effects of the wind.
- Management plans have been developed to manage the impact of wind on noise, dust, and erosion, including clay shielding, mulching, binding grass crops, watering, etc.

*13: a) Road transport on school bus routes and through towns and*

*b) The company refuses to use rail transport.*

- The rail option is still being assessed; however at this stage trucking is the preferred option.
- The use of rail transport would require the same truck movements on local roads, to transport the mineral concentrate from the mine to the rail siding.
- Truck movements are estimated to be 6 - 7 return trips per day, i.e. 12 -14 movements.
- Road traffic count data obtained from Main Roads shows the Long Vehicles and Road Trains category use on the South Western Highway averages 200 - 240 per day.

- The preferred route on public roadways is from the SE corner of Lot 300 (Murray Shire) onto Atkins Road and South to Readheads Rd, east to the Southwest Highway then south to Picton.
- Olympia will work with the Shires to upgrade roads as required and with Main Roads to construct a safe access onto South-West Highway.

*14: Mining 24 hours per day for an eight year minimum*

- The mine will operate 24 hours per day.
- Mining timetables will be determined according to the research conducted to determine the potential for noise to impact on nearby residences.
- Operating times will be limited in some areas.

*15: Mining will ignore buffer zones with plans to mine up to the boundaries of small landholders who have carefully preserved or planted bushland. No compensation is being offered.*

- Vegetation on landholdings which have not signed mining agreements with Olympia will not be disturbed.
- No compensation is required if no disturbance occurs.

*16: Plan to extract 2 gigalitres per year from Leederville aquifer in an area where bush and resident's bores are already under stress from variations in water level and quality.*

- Mineral separation will require 1.5 to 2 gigalitres per year
- An extraction licence will be applied for before operations begin, consistent with regulations.
- Extraction has been designed to minimize any impact on neighbouring bores.
- 88% of water used will be recycled.

*17 Large areas with inadequate testing for Acid Sulphate Soils, Radiation Hazards Arsenic and salinity.*

- The company's research methodology, including into the factors listed above, has been approved by the EPA and the various expert agencies it uses to assess specialised research.

**Addressing other general comments contained in the letter**

*A: The project is economically marginal*

- Olympia's detailed financial assessments of the Keysbrook project are not publicly available.
- The Keysbrook deposit, while at a low mineral concentration, is viable and valuable because of the high demand worldwide for the minerals on the site, zircon and titanium.
- Export value is approx. \$317million

*B: Members of State and Federal Government are not aware of the project.*

- Both MLA's in the region have been briefed on the project, and when the Public Environmental Review is complete, the company will provide a further briefing.
- State government departments consulted include DoE, DPI, CALM, Water Corporation, WA Museum, Main Roads, DoIR as well as authorities such as Peel Harvey Catchment Council and Peel Development Authority.

The issues raised by members of KNAG are not treated lightly by the company, and effort has been put into researching relevant areas of concern the group has raised.

I trust this information is of use to you. Please don't hesitate to contact me if you have any queries.

Yours sincerely

**SANDRA JAMIESON**

**Community Relations Manager**

Figure 6. Community Newsletter No.2 July 2006.

|  |                              |                                                                                     |
|--|------------------------------|-------------------------------------------------------------------------------------|
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|  | <b>Keysbrook Project</b>     |  |
|  | <b>Community Update</b>      | <b>July 2006</b>                                                                    |

### Environmental Report Released for Public Comment.

Olympia's Public Environmental Review (PER) document for the proposed Keysbrook project has opened for an eight week public review period, from 26 June to 21 August 2006.

The PER describes the proposal, examines the likely environmental effects and the proposed environmental management procedures. The PER will be available at:

Mundijong Public Library  
10 Paterson Road, Mundijong

Department of Environment Library  
Level 4, 168 St Georges Terrace, Perth

Mandurah Public Library  
331 Pinjarra Road, Mandurah

Department of Environment Regional Office  
21 Sholl St, Mandurah

Shire of Murray Public Library  
Corner Pinjarra Road and Forrest Street,  
Pinjarra

J S Battye Library  
Francis Street, Perth

**Website: [www.olympiaresources.com](http://www.olympiaresources.com)**

Copies can be purchased for **\$10** or a CDROM for **\$4.50** from Olympia Resources Ltd, 25 Walters Drive, Herdsman (ph) 9244 1411.

#### How can I provide input or ask questions?

Please contact our Community Relations Manager, Sandra Jamieson on (08) 9244 1411, or

e-mail [sandra.jamieson@olympiaresources.com](mailto:sandra.jamieson@olympiaresources.com)

### New Mining Manager and Project Geologist for Olympia.



Roley Carroll has been appointed Olympia Resources' Mining Manager. Roley has 35 years experience in the mineral sands industry in Western Australia and will be responsible for the planning and operations of the Keysbrook project.

Susan Stewart, project geologist, joined Olympia in April, bringing 5 years of project experience to the company. Susan most recently worked for AngloGold-Ashanti in Laverton. Suse is looking forward to working in the cool of the South West, after a few desert summers!

### Frequently Asked Questions (FAQ's)

In each newsletter, we will answer some questions asked by community members. If you have any questions, please don't hesitate to send them to us.

*Q: I've heard that the planned Keysbrook mine will be 4,500ha in size and 5 metres deep. Is this true?*

*A: No.*

The maximum area to be mined is 1,234 hectares. The average depth of the mine will be 2 metres. Mining will be shallower in low areas,

and up to 5 metres on some raised sand mounds.

*Q: Will the whole area be mined at once?*

*A: No.*

Mining the area will take about 8 years. The site will be mined progressively in individual pits of approx 40 ha each - not all at once. Rehabilitation follows as soon as possible after mining. The maximum mine area is 1,234 hectares. 930ha of this is cleared paddocks used for cattle grazing. 244ha of trees with grazing land underneath and 60ha is bush in good condition.

*Q: I don't know anything about Olympia Resource – can you tell me about them?*

Olympia Resources is a Western Australian company, established in 1997 and floated on the ASX in 2000. The company has recruited staff with substantial experience in the mineral sands industry: Managing Director Peter Gazzard has 27 years experience in the Western Australian mineral sands industry. Director Chris Davies has spent 33 years in the industry, many of them in the South West of WA. Exploration Manager Peter Slyth has worked for 15 years with mineral sands companies in the mid-west and south-west of WA. Our new Mining Manager Roley Carroll has 35 years experience in Western Australian mineral sands mining companies.

Olympia Resources is currently developing an industrial garnet mine in the NT and exploring for other mineral sands deposits.

### **Managing Dust**

Dust management is a key focus for the Keysbrook project team. The issue of the strong winds in the area is not being underestimated by Olympia. A preliminary dust management plan has been developed and monitoring of localised wind conditions is ongoing.

Management strategies include:

- Keeping clearing and open areas to a minimum
- Removing topsoil only in calm conditions
- Watering as required
- Growing temporary 'stubble' crops to bind soil
- Re-establishing pasture as soon as possible
- Using clay and mulch to stabilise stockpiles and non-vegetated backfill areas
- Continuous wind and dust monitoring
- Regular reporting to DoE
- Regular communication with adjacent landowners



Watering and stubble crops will aid dust control

### **Water for the mine site**

The Keysbrook project will use dry mining techniques, extracting the ore with a mechanical scraper.

Because dry soil is needed for the scraper, any groundwater that flows into the mining pit needs to be removed – this is termed 'dewatering'. The water is pumped from the immediate mine pit and stored in a dam on site. From there, the water is cycled through the mining process.

Water is used on site to add to the freshly mined and screened ore to form a slurry, which is then pumped to the mineral concentrator.

In the concentrator, water is used to carry out the gravity separation process. In this process, the ore is washed through a series of spirals, where the heavier mineral separates from the lighter sand and clay. No chemicals are used in this process. The mineral is stockpiled to dry and later transported from site.

Any clay suspended in the water is settled out in a large shallow tank called a clay fines thickener, and returned to the mine pit along with the waste sand.

The water is recycled through the mining process. In this clay settling process, a bio-degradable flocculent such as those used to clarify drinking water and swimming pools may be used to settle the extra fine clay particles.

In summer, the groundwater level will generally be below the level of the pit floor. In winter, the higher groundwater level will generally necessitate dewatering of the mine pit. In autumn and spring, dewatering will be carried out if required.

The use of pit dewatering water in the mining and processing operations replaces bore water, lowering bore water use, especially in winter.



## **Peel-Harvey Catchment Council Community Forum**

Olympia joined many other groups in the Pinjarra Hall displaying information at the PHCC community forum in Pinjarra.

A day of informative presentations and displays was attended by approx 100 interested residents of the broad catchment area, including a number from the wheatbelt.

We would be pleased to provide our display to be used by community groups and meetings. If you would like to use the display, please contact Sandra Jamieson at Olympia Resources, on 9244 1411.

## **Land Rehabilitation**

Mineral sands mining is considered a short-term land use. Olympia is developing a plan to move quickly through the deposit.

The Keysbrook site will be mined progressively in individual pits of approx 40 ha each - not all at once. Each section of the Keysbrook project will take about six months to mine, with the project having a life of up to eight years.

After mining, the land is rehabilitated to a productive and sustainable land use such as agriculture, or to native vegetation. After rehabilitation it is usually very difficult to tell where the mine actually was.

Seed is collected locally and topsoil stockpiled. Waste sand is returned to the mined pit to re-establish as closely as possible the pre-mining

Land contours. Topsoil is then replaced and revegetated with pasture or native plants.



*A mined area in Capel before and after rehabilitation. (Photos courtesy of Minerals Council of Australia)*

## **Tree planting to start soon in Keysbrook**

Close to two thousand metres of boundary vegetation belts, or about 5,000 trees, will be planted at the Keysbrook site during June this year, to take advantage of the 2006 growing season.

The planting will include a variety of species which will be monitored into the future to assess the survival and growth rates of different species in the area.

Plants will be sourced locally from the Hamel Nursery and Plantation and Landcare Services has been contracted to plant the trees. Protective fencing will be provided by Olympia.

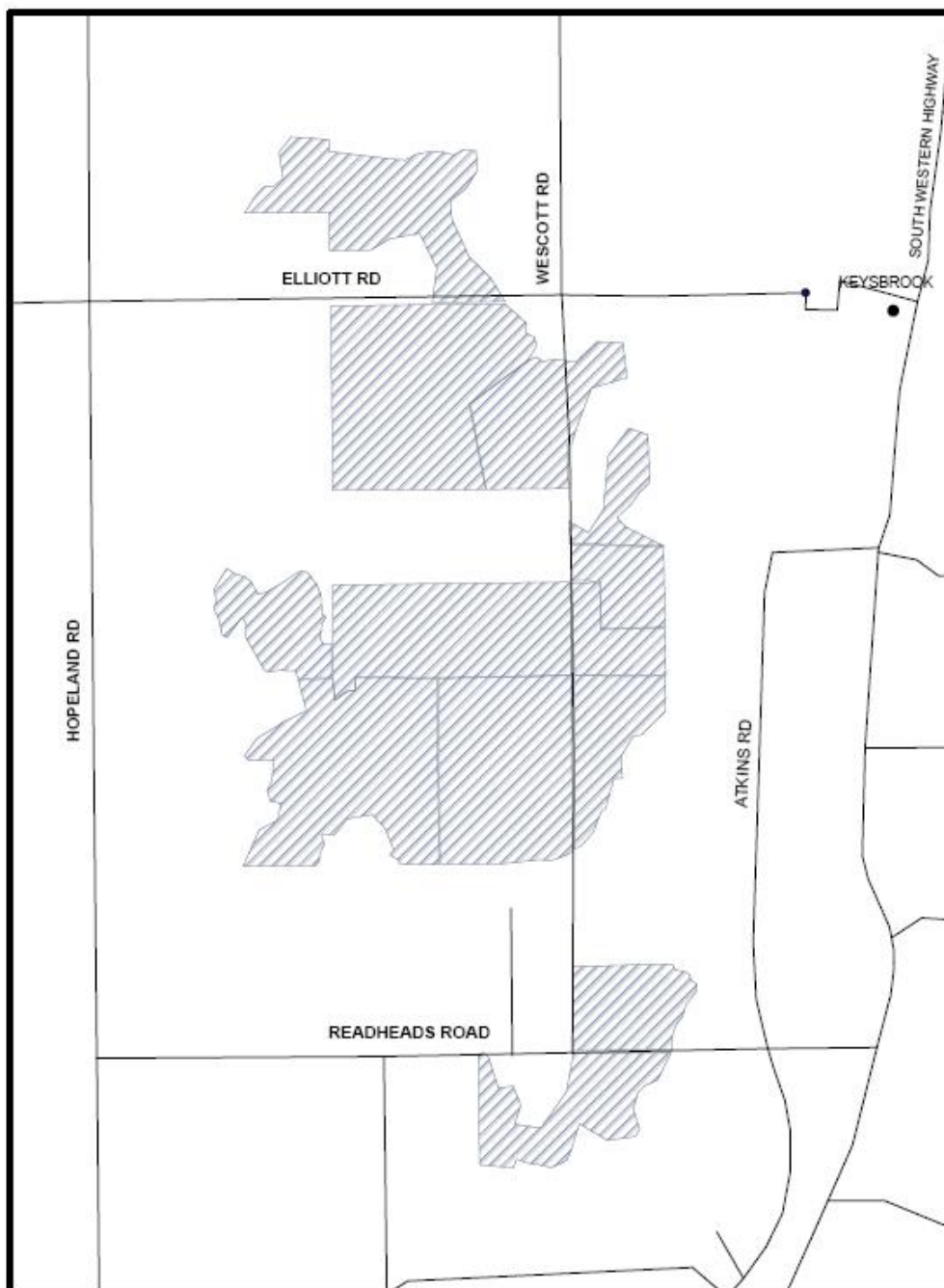
In the future, Olympia hopes to involve local Landcare and other community organisations in the rehabilitation program.



## The Location of the Keysbrook Project

The proposed Keysbrook mine area will be 1,234 hectares on privately-owned land, and will be mined progressively over about 8 years.

The project site is situated along the eastern edge of the Swan Coastal Plain, about 70 kilometres south of Perth and four kilometres west of Keysbrook, bounded by Atkins Road to the east and Hopelands Road to the west. The closest road marking the northern boundary is Elliott Road and Readheads Rd is the closest road to the south. The topography of the mine area is flat to very gently undulating plain.





[Community](#) > Your Questions

**1. Olympia is a small company with no mining history and no positive environmental record - how do we know you can handle the project?**

- Every company starts somewhere.
- Olympia has engaged staff with extensive experience in mineral sands mining in Western Australia and has a Board of Directors with extensive knowledge of the industry.

**2. Will the mine increase nutrient overload in the Mandurah Waterways?**

- Samples taken across the mine site were analysed for the major nutrients nitrogen (N), phosphorous (P) and potassium (K).
- The results indicate an extremely low nutrient bank on the site
- 88% of the water used on site will be recycled. There is no reason for nutrients to be mobilised off-site.

**3. By seeking local government approval, has Olympia bypassed the Mine Warden's Court?**

- The Law in this case decrees that because the land titles in this area can be traced back to before 1899, minerals other than the 'royal minerals' (gold & silver) are owned by the landowner.
- This requires that Olympia negotiate with individual landowners regarding royalty and compensation payments.
- The operations of the mine are regulated under the Mines Regulation Act and must strictly comply with all its regulations.

**4. We believe Olympia will not pay royalties to State or Federal governments?**

- This is correct, see point 3 above.
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Last updated: 30-Aug-06



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|  | <b>Keysbrook Project</b>     |  |
|  | <b>Community Update</b>      | <b>August2006</b>                                                                   |

### Industry's track record provides some of the answers

This newsletter has been prepared to address issues raised by the Keysbrook Mineral Sands Project Public Environmental Review (PER). In particular, the comments and questions from four recent information days and a public meeting at North Dandalup on Wednesday, 26 July. Most public concern has centred on perceived risks of environmental damage, if the project goes ahead.

In some respects, assessing these risks is made easier by the long history of mineral sands mining in the South West.

### What happens to former mine sites?

It's worth noting that some of the most picturesque spots in the South West are former mineral sands mining sites. These areas have been rehabilitated as productive farms, bushland, conservation areas and property subdivisions. Few people know the location of the old mine sites because most of them can't be distinguished from the surrounding countryside. Generally, the established rehabilitation sites are now farms or self-sustaining ecosystems.



The Joshua Brook subdivision near Boyanup features a lake and farmlets developed on an old mineral sands mining-site.

Nowhere is the rehabilitation story more significant than one of WA's earliest mineral sands regions, Between Capel and Busselton.

For 50 years, the area has been producing titanium minerals for world markets, from mine sites immediately east of some of WA's most valuable waterbird habitat in the Vasse-Wonnerup wetlands system.

This complex of thriving wetlands is a graphic demonstration of the ability of miners to operate in a sensitive area without impacting on adjoining land or water regimes. Significantly, none of the waterbird habitats have been affected by mining. This is a very accessible wetland that demonstrates the fact that 40 years of mineral sands mining has not affected the wetland.



Paperbark Lake at Capel Wetlands. Capel Wetlands are a migratory destination and home to scores of waterbirds. Iluka Resources undertook a project to create a Wetlands Centre of international standing on former mining areas.



In fact, rehabilitation teams have created additional man-made wetlands on former mine sites south of Capel.

### **The expert's view**

Environmental consultant Bill Biggs, who worked as a land rehabilitation expert in corporate and Government sectors for 20 years, says that effective rehabilitation is achievable at every mine site – providing the mining company plans ahead.

"The advantage of rehabilitation in the mineral sands industry is the nature of the materials and the style of operation," he said.

"The miner takes out a comparatively small percentage of the ore as valuable heavy minerals. The rest of the sand is returned to the pit. With good topsoil management, the Company can revegetate the area effectively within one or two years of mining.

"On this basis the Company, or the land owner, have the option of restoring the original land forms – or creating something completely different.

"Either way, good rehabilitation can produce healthy and sustainable plant and animal communities."

### **Producing from rehabilitated farmland**

Waroona farmers Vern and Erica Pitter have been farming in the South West for many years. Their land was mined between 1992 and 1994, with Olympia Mining Manager Roley Carroll the manager of the ISK Minerals project at the time.



Waroona farmer Vern Pitter and Olympia Mining Manager Roley Carroll inspect a rehabilitated pasture paddock. In the background is a shelter belt of trees now close to seven metres high.

Mr Pitter says the mining was a temporary disruption. "We couldn't use the land while they were mining of course, and we could hear the operations some of the time".

Mrs Pitter added "although mining came as close as 40 metres from our house, surprisingly, it wasn't a big deal".

"There was one group of 12 old trees we particularly wanted to keep, so mining went right around them. We only lost one of the trees, and that was a couple of years later" Vern said.

"And we wanted some shade and shelter belts, so we agreed at the beginning to include these in the rehabilitation plan."

"The mining didn't affect our water supply, and we were able to get back to full production when the miners moved on."

"We were talking with Roley regularly the whole time, from before mining started to after the rehabilitation was finished. This meant we were aware of everything going on, and could sort out anything we thought of. It was great to catch up with Roley again after twelve years!"

The productivity of sandy soils can be greatly improved by soil conditioning in rehabilitation. By mixing small amounts of clay with the sand. This rehabilitation process improves the moisture and nutrient retention capability of the soil.



Cattle graze in a rehabilitated paddock at the Pitters' farm.



This corner of the Pitter's property was the location of the production plant and site offices for five years, from 1989 to 1993.

### Drawing on experience

Experience like this will be important to the Olympia Resources Keysbrook project. Olympia Managing Director Peter Gazzard has 27 years experience in the industry and mining manager Roley Carroll 35 years. Peter and Roley will be responsible for the operations and rehabilitation at Keysbrook.

### Public Information

In July, Olympia held four open days in Keysbrook and North Dandalup and attended a public meeting in North Dandalup.

People attending the open days and the public meeting could view information and a presentation about Olympia Resources and the mineral sands industry, plus talk to Olympia staff and environmental scientists.



A section of an Outokumpu spiral concentrator that uses water and gravity to separate the heavier minerals from sand was one exhibit at the open days.

### Questions and Answers

In the next few pages, we provide information in response to some of the most often asked questions.

Many of the questions focused on water management and rehabilitation.

#### ***What would be the impact on surface water, the level of the Leederville Aquifer and the Peel Catchment.***

**Surface Water:** The pit floor will generally be above summer groundwater levels with minimal dewatering required. In winter, a sump will be located in the pit base and dewatering discharge will be directed into this for use in the mining process. Clean overflow will be released into a natural drainage channel in a controlled manner and will be regulated in accordance with the Environmental Protection Act.

Temporarily lowered winter water levels will recover as the mined site is backfilled, mining moves to new cells and rainfall recharges the surface water.

**Leederville aquifer:** The Department of Water controls extraction from the Leederville aquifer to ensure that the amount being drawn is sustainable, so extraction will not deplete the aquifer.

In the *Groundwater Allocation Plan* for the area, the Leederville Formation is divided into Upper and Lower segments, with separate resource allocations. Olympia will draw from the lower segment of the Leederville aquifer, to minimise impact on neighbouring bores drawing from the Upper Leederville.

**Peel-Harvey Estuary:** Olympia's proposed Keysbrook project will not have any impact on the Peel-Harvey Estuary.

In mineral sands mining, no toxic chemicals are used. A flocculent, which is commonly used in metropolitan water supplies, is used to settle clay, and diesel fuel for machinery. Fuel storage will be isolated from the soil. Potential pollutants will not be introduced to affect the water. Sampling programs have found retained nutrient levels in the soil to be very low.

At least 88% of the water used on site will be recycled, and there will be no uncontrolled discharge of water from the site.

With the conservation of water on site and the very low level of nutrients held in the sand, no



increase in levels of residual nutrient re-mobilization will occur and the Peel-Harvey estuary will not be affected.

We are confident that our research into water management will result in the operation having no impact on neighboring bores. We will also closely monitor our operations and keep in touch with neighbors to make sure that any unexpected impacts can be addressed immediately.

### **Clearing and Rehabilitation**

The proposed mine area is 1,234 hectares. Of this:

- 930 hectares (75%) is totally cleared
- 244ha (19.79%) is parkland cleared
- 60ha (4.81%) is remnant vegetation in good condition

48.7ha of remnant vegetation in good condition has been removed from the mine plan and will not be mined.

Olympia has prepared a Rehabilitation Management Plan which includes progressive rehabilitation, local seed collection, detailed rehabilitation plans for each property, fencing and weed control.

In the plan, corridor linkages of native vegetation are included, enabling fauna to move more easily between isolated remnant bush patches. During rehabilitation, lowland species long absent due to clearing for grazing can be re-introduced.

**Fast Growing trees:** The planting of some fast-growing Victorian trees along with native species was proposed to establish shelter belts rapidly, protecting stock, crops and the slower-growing local species. These trees can be harvested for use by landowners, as the local varieties grow to take their place.



A shelter belt of trees planted 8 years ago are nearing 7 metres.

### **What will Olympia do for the community?**

- 30 people will be employed locally: \$2m per year
- Local roads will be upgraded where used for trucks: \$650,000
- Construction value of plant: \$31million. South West contractors & suppliers will be used
- Export value of minerals: \$317million
- South West 'Buy Local' policy: contractors for mining, engineering, transport and maintenance; fuel, accommodation, supplies, takeaways.
- Payment of government taxes
- Olympia will support local groups and community organisations. Typically companies like ours contribute to fire brigades, education, sports groups, service clubs, land conservation groups and community development.

Our contribution to community groups will depend on the priorities set by local organizations.

### **Building sites and property values:**

*Will you be able to build on the site after mining?*

Yes – The mining operation at Keysbrook will be similar to the standard cut-and-fill earthworks at a land subdivision.

**Property values:** Mineral sands mining has been operating in the South West of WA for 50 years without any lasting impact on property values. Short-term impacts are possible during mining close to property boundaries. However, the land will be rehabilitated within two years of the start of mining.

The re-combination of clay into sandy soils on the former mine site will increase water and nutrient retention, improving pasture quality and land values.

### **Acid Sulphate Soils**

Tests conducted to a depth of one metre below the proposed mining depth across the mine site show no evidence of significant acid sulphate soils (ASS)

The site will however be constantly monitored throughout the operation of the mine. If any effects are detected, Olympia will implement a management plan approved by the Department of Environment and Conservation.



***Radiation Levels***

The Keysbrook site has the same radiation levels as most other parts of the Swan Coastal Plain and this will not be altered.

***Noise – what areas will be affected?***

The operation will be covered by State Government regulations which control the permissible noise levels at neighbouring homes. Olympia is planning a number of modifications to its operations to make sure that these regulations are met at all times.

For example, reversing 'beepers' will be replaced by directional white noise generators, earth bunds constructed if necessary, and mining schedules altered to daytime only near residences.

***Wind – is the monitoring appropriate?***

Olympia will be monitoring wind levels at various locations around the proposed mine site. Information from this program will complement historical data from the major weather station at Perth Airport – an area which has similar wind conditions to Keysbrook

***Consulting with the community***

Some residents and community representatives have raised concerns with the Company about potential environmental impacts of the project.

We believe that these have been addressed in the PER. However, we would like to work with the community to address any outstanding issues and make sure that the project delivers economic benefits without any significant environmental problems. In fact, we expect to see environmental benefits from the project through the innovative rehabilitation programs planned.

## 2.0 PER Public Information Displays

An information display, photographs below, was displayed by the proponent in community halls in Keysbrook and North Dandalup for four days and one evening.

Four 'information open days were held on 21, 22, 28 and 29 July, and the information was displayed at a public meeting convened by the Keysbrook North Dandalup Action Group (KNAG) on the night of 26 July.

A flyer/poster was produced advertising the open days and was distributed via Shire offices, Public Libraries, Mail Box counters, Keysbrook General Store, by mail with a newsletter and on noticeboards in Keysbrook, North Dandalup and Mundijong.

Details of the open days was also published in all three local newspapers; the Serpentine Jarrahdale Examiner, the Mandurah Coastal Times and the Mandurah Mail

**Figure 9: Flyer /Poster on Information Open Days**

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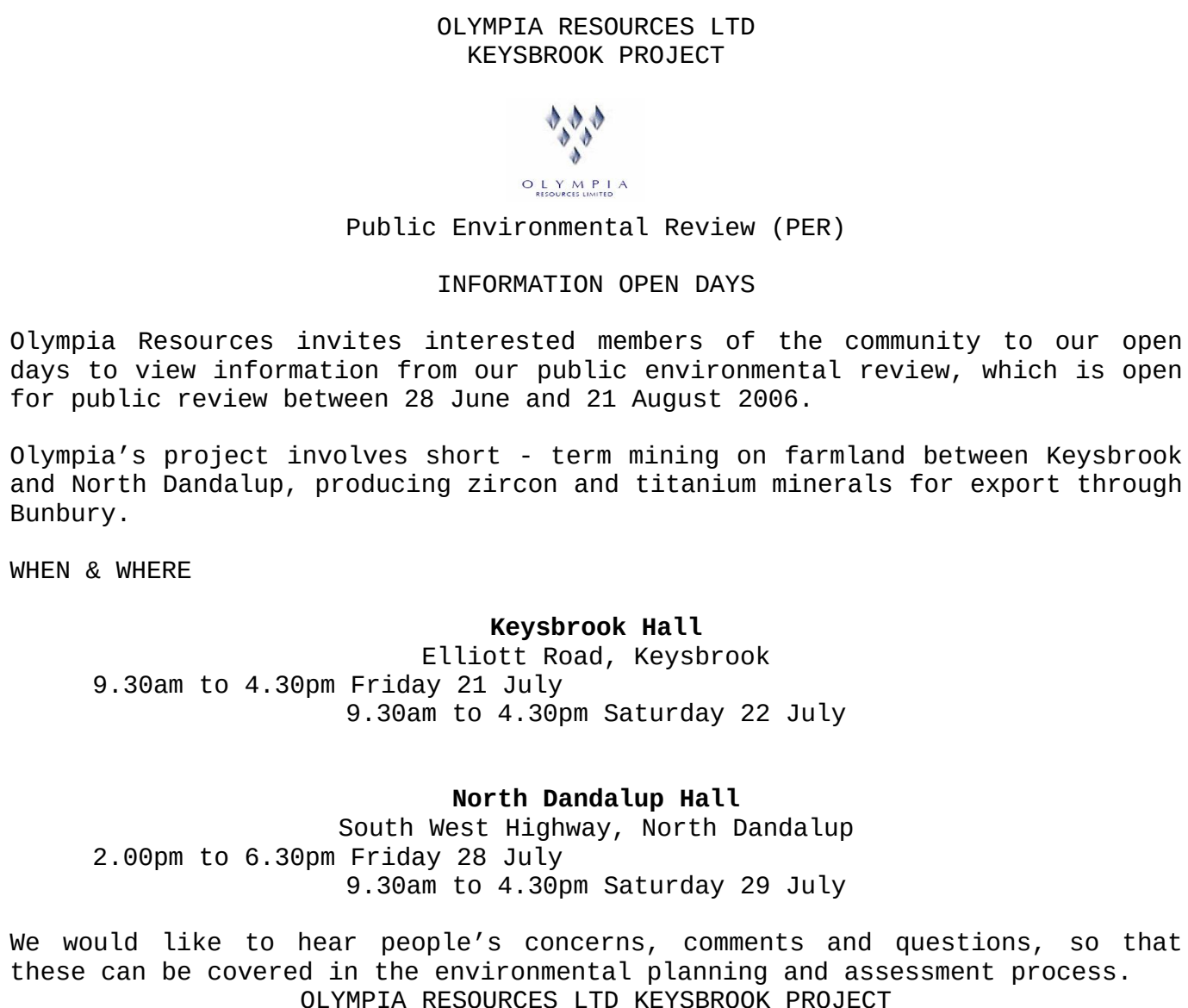


**Figure 10: Olympia Resources Information Display**

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The following photographs show panels from the Olympia Resources Information Display. During the Open Days, Senior Olympia staff were available to talk with people and answer questions.











**Figure 11: Media Coverage of Information Open Days**

## Memories of Hayley

Have your say

Friday, July 21 and 22 (9:30am to 4:30pm), and North Dancship Hall on July 23 (2pm to 6:30pm), and July 29 (9:30am to 4:30pm).

## Animals on agenda

Steelco will be the guest speaker at Southern Estuary Progress Association's meeting at 1:30pm today at Southfork Retreat Inn, Dovesville.

## Research on mums

at York University doctoral student is researching the wellbeing of male mothers.

For more plots, a trend survey or take part in a confidential interview, call Kathryn Russell on 0419 807 143 or email [kellyrussell@bcbn.co.uk](mailto:kellyrussell@bcbn.co.uk).

# Trials give strength to talented artist

in the news

Manitowish Coastal Towers  
July 26 - August 1, 2006

By LUCIEN WILKINSON

IT IS said that from adversity comes strength and such is the case with sword-winning Phibersia artist Oscar Anderson.

Since he was born with spinal bifida, into a dysfunctional family and enduring a troubled childhood, Mr. Anderson has been a magnet for health problems. He has had cancer, polio and lost his leg after being run over by a car.

The Phibersia artist, however, has not let these

The many horror stories from Mr. Anderson's past include those from the times when, as a ward of the State, he called home a dilapidated slaughterhouse and a clothes bin.

As a testament to the fact that Mr. Anderson is alive, let us become scholars of the great things through his brilliant artworks, which included paintings and sculptures. Among the many art awards won by Mr. Anderson was the recently announced 2006 Chester Beckett and Contemporary Art Awards People's Choice award.

The win came after he was invited to submit a selection of paintings for the annual event, which celebrates and recognises emerging indigenous artists in WA.

Mr. Anderson's art, which includes traditional folk motifs and contemporary styled paintings and sculptures, is so popular that demand for it eventually outweighs his rate of output.





**Mandurah Mail**  
Thursday 20/7/2006  
Page: 42  
Section: General News  
Region: Mandurah WA Circulation: 31,620  
Type: Regional  
Size: 65.62 sq.cms  
Published: ---T---

## Mining project plans

A PROPOSED mining project between Keysbrook and North Dandalup will be outlined in public meetings in both towns.

The first meetings will be held at the Keysbrook Hall this Friday and Saturday from 9.30am to 4.30pm.

The second will be at the North Dandalup Hall on July 28 (2-6.30pm) and July 29 (9.30am-4.30pm).

Olympia Resources Limited is inviting local residents to learn more about the company's proposed Keysbrook project producing zircon and titanium minerals for export.

The information program will be a chance for people in the community to discuss the project's Public Environmental Review with Olympia staff.

The events will include displays covering the planned operations and environmental management strategies.

Olympia has released the Public Environmental Review of the Company's Keysbrook mining project for community comment between June 26 and August 21.



**Mandurah Coastal Times**  
Wednesday 19/7/2006  
Page: 9  
Section: Letters  
Region: Mandurah WA Circulation: 33,555  
Type: Regional  
Size: 97.26 sq.cms  
Published: --W---

## Sand mine won't wreak harm

OLYMPIA Resources Ltd welcomes public discussion on the Company's Keysbrook project.

However, some of the comments made by Graham Elliott in the article "Mining plan released", *Coastal Times*, July 5, require correction.

Olympia's proposed Keysbrook mining project will have no negative impact on water systems linked to the Peel-Harvey Estuary, nor on the crabs and fish, as Mr Elliott suggests.

The findings of a comprehensive environmental review carried out over the past 12 months support this. There are no chemicals, and no potential pollutants introduced to affect the water.

As the average mining depth is two metres, mine dewatering will be to the same shallow depth, and confined to small, localised pits for short periods of time.

There is an extremely low risk of residual nutrients being re-mobilised from the site. Soil samples from across the mine site to a depth of 2 metres were analysed for the major nutrients nitrogen, phosphorous and potassium. Levels were found to be very low.

Re Mr Elliott's comments on the increase in vehicle movements, based on WA police and Main Roads figures, the 14 truck movements to and from the Keysbrook site will increase traffic on the South West Highway by 0.3 per cent.

People can view information from the project's Public Environmental Review at Keysbrook Hall, Elliott Road, Keysbrook, 9.30am to 4.30pm Friday, July 21 and Saturday July 22; North Dandalup Hall, South West Highway, North Dandalup, 2pm to 6.30pm, Friday July 28 and 9.30am to 4.30pm, Saturday July 29.

*Roley Carroll,  
Mining Manager,  
Olympia Resources.*



# Comment sought on mining review

By COLLEEN RANKIN

**OLYMPIA Resources Limited has released the Public Environmental Review (PER) for the company's Keysbrook mineral sands mining proposal.**

It is available for community comment until August 21.

Olympia's plan involves shallow pit mining over 1234ha of farmland between Keysbrook and North Dandalup for eight years, with an open pit area of about 30ha at any one time.

Mining manager Roley Carroll hopes to hear of any concerns from the public, so they can be addressed in the final program.

"Some of the work to date reflects the issues which local residents

have raised in the past six months," he said.

"This process of consultation will continue throughout the project planning and operation."

There has been strong opposition from many people living in the area since the plan came to their attention late last year.

Keysbrook resident Graham Elliott said the PER did not address their concerns.

"The most worrying thing is the water table measurements are outdated and haven't allowed for seasonal changes in the past 10 years," he said.

"The acid sulphate soil testing is totally inadequate and the nutri-

ent sampling for phosphate has all been above the water table, instead of down where the nutrients would have accumulated."

Mr Elliott said in addition, the rehabilitation plan looked more suitable for future subdivision than natural forest.

The PER is available at public libraries in Mundijong, Pinjarra, Mandurah and Perth, and can also be downloaded online from [www.olympiaresources.com](http://www.olympiaresources.com)

Information days will be held at the Keysbrook hall on July 21 and 22, from 9.30am to 4.30pm, and at the North Dandalup hall on July 28, from 2pm to 6.30pm, and July 29, between 9.30am and 4.30pm.



## **APPENDIX 3: FAUNA STUDY AUGUST TO SEPTEMBER 2006**

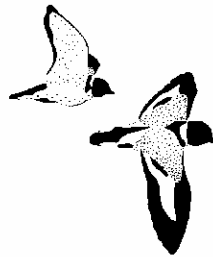
# **Keysbrook Mineral Sand Project Olympia Resources Limited**

## **additional fauna investigations**

**M.J. Bamford**

Prepared for: **MBS Environmental**  
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11<sup>th</sup> September 2006

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## INTRODUCTION

The Keysbrook mineral sand project area lies on the eastern Swan Coastal Plain near Keysbrook and has an area of 1234ha. Approximately 900ha of this area is cleared or parkland cleared, but there are some remnants of more or less intact native vegetation, notably in the north and in the centre of the area. Some of these remnants are small and degraded, but there are several large blocks in which the vegetation condition is at least moderately good. The site lies within an agricultural landscape with very little native vegetation remaining, although Bush Forever Site 77 (Kingia Reserve) lies about 5km to the west. The majority of remnant vegetation lies on Lots 56 and 3 in the north of the mine area and Lots 300, 59 and 62 in the central part of the mine area. , Lot 64 in the north of the mine area was surveyed in 2004 as at that time, it was under consideration for inclusion in the mine plan. This lot has since been excluded from the mine area.

Sand-mining is proposed by Olympia Resources Limited (Olympia) to occur over a period of eight years. Mining would affect much of the remnant native vegetation on the subject lots. Some vegetation will remain in locations where there is no mineralised resource. One vegetated block in the north (on Lot 56 alongside Elliott Road) is within a mineralised zone but is also recognised as having higher environmental value and has been excluded from the mine area. As part of the environmental impact assessment process for the proposed mining, a desktop review and site inspection (level 1 assessment) of fauna of the site was carried out (MBS Environmental 2004). This was followed by a survey targeting nesting and foraging by black-cockatoos of which three species may be present (Wilcox 2005).

The fauna assessment addressed vertebrates only and concluded that the project area might support 10 frog, 39 reptile, over 100 bird and 30 mammal species. Because of the extent of clearing only a few species of conservation significance were expected, including three taxa of black-cockatoos. The extent of clearing also meant, however, that many species, including 32 birds, were considered to be locally or regionally significant because they rely on remnant native vegetation. The majority of these locally or regionally significant birds are listed as significant in the Perth area by Dell and Banyard (2000). Conclusions from the fauna assessment were that parts of the project area was important for fauna because: it provided remnant native vegetation and therefore locally significant populations in a largely cleared landscape; habitats within the project area provided linkage for fauna moving through the cleared landscape, particularly between forests of the escarpment in the east and other areas of remnant vegetation on the coastal plain, such as Kingia Reserve to the west; and habitats within the project area provided foraging and nesting habitat for black-cockatoos.

Subsequent to the preparation of the flora and fauna assessment (MBS Environmental 2004), Olympia Resources Limited sought to prepare a formal Public Environmental Review (PER) and requested advice on additional fauna studies from the Department of the Environment (now the Department of Environment and Conservation (DEC)). Discussions were held between Mr John Dell (DEC), Mr Paul Rokich (MBS

Environmental) and Dr Mike Bamford (Bamford Consulting Ecologists) and the following investigations we proposed to be included or committed to in the PER:

- Short Range Endemic Invertebrates. Discuss likelihood with WA Museum staff.
- Systematic bird surveys. To compare habitat value of different remnants, including any with linkage value.
- Reptiles and frogs. Searching and assessment of value of habitat and remnants.
- Bats. Aural surveys in late spring/summer.
- Quenda. Searching for diggings to establish distribution with respect to proposed mine area.
- Habitat trees and vegetation important for fauna. Inspection of remnants to add to existing records of potential nest trees to include other significant trees, thickets of significant vegetation, etc.
- Wildlife corridors/habitat linkage. Observations to be made that contribute to an understanding of how wildlife makes use of the total landscape, with importance of remnants as stepping stones, and linear remnants along road verges, to be investigated.
- Black-cockatoo nests. Annual searching and monitoring by staff from WA Museum to build upon existing records in Wilcox (2005).

Some of these investigations require an ongoing commitment, such as the searching for and monitoring of black-cockatoo nests, while work on bats is best carried out during the hotter months from late spring to early autumn. Other investigations, however, could be carried out in late winter, and the results of these are presented and discussed in this report.

## **METHODS**

The project area was visited on the 27<sup>th</sup> June, 6<sup>th</sup> and 17<sup>th</sup> July, and 7<sup>th</sup> September 2006. The visit on 27<sup>th</sup> June was a brief reconnaissance and site-familiarisation by Dr Mike Bamford, with the July dates being whole-day visits by Ms J. Wilcox and Mr R. King (Western Wildlife) under instruction from Dr Bamford. Over these two days all remnants were visited, systematic bird surveys were carried out, and opportunistic observations were made on black-cockatoos, reptiles, frogs and Quenda. Notes were also made on significant habitat and potential wildlife corridors. On the 7<sup>th</sup> September, Dr Bamford re-visited Lot 56 to undertake intensive searching for reptiles.

## **SHORT RANGE ENDEMIC INVERTEBRATES**

Short range endemic (SRE) invertebrates may not be listed as significant species, often because they are too poorly known, but they are of interest as they have restricted distributions, making them vulnerable to habitat loss. Short range endemic invertebrates are found amongst groups with poor powers of dispersal and that are associated with restricted and naturally discontinuous habitats (Harvey 2002). Groups with particularly high instances of short-range endemic species include: Gastropoda (snails and slugs),

Oligochaeta (earthworms), Onychophora (velvet worms), Araneae (mygalomorph spiders), Schizomida (schizomids), Diplopoda (millipedes), Phreatoicidea (phreatoicidean crustaceans), and Decapoda (freshwater crayfish).

The project area does not have a natural pattern of rare, discontinuous habitats likely to have given rise to short range endemic invertebrates and therefore the likelihood of such species being present is low. The WA Museum has no records of invertebrate species believed to be SREs from the region, although there is a mite (*Tillia davisae* Mideopsidae) known from only one record from Dirk Brook, which runs along the north of the project area (Harvey 1990). The species is small (0.5mm) and probably occurs within waterlogged soil along the margins of the creek.

During the visit of 7<sup>th</sup> September, two isopods (slaters) were found in a dead Balga (“blackboy” *Xanthorrhoea* sp.) in Lot 56. These were probably one of the species widespread but now in fragmented populations across the Swan Coastal Plain south of Perth. However, the species has yet to be identified.

No threatened or otherwise significant invertebrate fauna were found during database searches carried out as part of the general fauna assessment (MBS Environmental 2004).

## SYSTEMATIC BIRD SURVEYS

The fauna assessment (MBS Environmental 2004) identified several bird species that are significant on the Swan Coastal Plain south of Perth because they survive only in remnant vegetation, and there are likely to be some areas of remnant with more such species than others. Bird surveys were therefore intended to identify areas with the most significant avifauna.

Bird surveys were carried out in remnant vegetation on Lot 56, Lots 300, 59 and Lot 62 properties on the 6<sup>th</sup> and 17<sup>th</sup> July 2006. Some observations were also made on Lot 56 on 7<sup>th</sup> September. In addition, there were some records from Lot 64 collected in 2004 (this lot is now outside the mining area). The aim of the surveys was to record (seen and/or heard) all species that were using a particular vegetation remnant at the time of survey. In large remnants, such as on Lot 56, the approach used in July was to slowly walk transects spaced about 100m apart through the remnant. In more fragmented remnants, such as on Lots 59 and 62, a walk of 10-15 minutes was undertaken in each remnant. Details of bird survey transects are given in Tables 1 to 5. Results of surveys are presented in Tables 6 to 8, and include observations made on Lot 56 on 7<sup>th</sup> September. Table 9 summarises the birds recorded on each property in 2006 as well as past records from 2004 (surveys undertaken for MBS Environmental 2004) and 2005 (surveys undertaken during cockatoo nest searching, Wilcox 2005).

In 2006, a total of 33 species were recorded in the native vegetation on Lot 56 (Table 6), 31 species were recorded on Lots 300 and 59 (Table 7) and 26 were recorded on Lot 62 (Table 8). Across all surveys, Lots 300 and 59 had the greatest number of species (46),

with Lots 56 and 62 having 37 and 31 species respectively (Table 9). The high species count on Lots 300 and 59 was due to waterbirds and the presence of farmland species in addition to woodland species, while Lot 56 had slightly greater representation of species associated with remnant vegetation. For example, it was the only property with the Western Thornbill and one of only two properties with the Common Bronzewing. Lot 64, now outside the mine area, surveyed only in 2004, was comparable to other properties, and was notable for records of three honeyeater species not recorded elsewhere. Overall 59 bird species have been recorded in the project area (Table 9).

The majority of species are those that utilise either the eucalypt canopy (e.g. parrots, pardalotes and Weebill), the Banksia flowers (e.g. honeyeaters) or forage in a relatively open understorey (e.g. Scarlet Robin, Yellow-rumped Thornbill and Grey Fantail). Some are also farmland species (e.g. Straw-necked Ibis, Willie Wagtail).

Species reliant upon understorey vegetation were present but uncommon, reflecting the degraded nature of the understorey in most remnants. For example, the Splendid Fairy-wren was recorded on Lot 56 in July and September 2006 (Table 6), in Lots 59 and 300 (2006 Table 7), Lot 62 (2005) and Lot 64 (2004) (Table 9), but its abundance was generally low. In 2006, there was only one Splendid Fairy-wren record in 10 transects on Lot 56 and only one in 17 on Lots 59 and 300. Only one party of fairy-wrens was located in Lot 56 on 7<sup>th</sup> September; these birds were in the far north of the remnant and this was probably the same party seen on 6<sup>th</sup> July along Transect 8, which lies across the north of the remnant. Other understorey bird species expected to occur in the project area were also very scarce but present in several areas. The White-browed Scrubwren was an exception, being recorded only once, in Lot 64, which is now outside the mine area, in 2004 (Table 9). Vegetation descriptions provided by MBS Environmental (2004) indicate that Lot 64 has some remnant riparian vegetation which may explain the presence of the Scrubwren and several honeyeater species not seen elsewhere.

The Splendid Fairy-wren and two of the three Thornbill species (Western and Inland Thornbills) are probably the best indicators of moderate to good understorey condition, and locations of all sightings were recorded during the 7<sup>th</sup> September visit to the Lot 56 remnant. From south to north, these locations were:

|                      |                                            |
|----------------------|--------------------------------------------|
| 399 605E, 6 410 600N | Western Thornbill, Inland Thornbill        |
| 399 737E, 6 410 998N | Western Thornbill                          |
| 399 720E, 6 411 410N | Splendid Fairy-wren and Western Thornbill. |

It may be significant that two of these locations were in the north of the remnant, in an area where there was some understorey and a mid-storey composed of young *Banksia* and *Allocasuarina*.

Of the 59 bird species recorded, 19 are of conservation significance (Table 9). These include the Red-tailed Black-Cockatoo (forest sub-species) and Peregrine Falcon, listed under the WA Wildlife Conservation Act, the Rainbow Bee-eater (a widespread species listed as migratory under the federal Environment Protection and Biodiversity

Conservation Act), and 16 species listed as having declined in the Perth area by Dell and Banyard (2000).

The cockatoo, falcon and bee-eater are wide-ranging birds that require some native vegetation, but are largely independent of the condition of the understorey and are not likely to be restricted in their movements by fragmented habitat. The Red-tailed Black-Cockatoo is of particular significance because it may breed in the area, and this is discussed below. In contrast, the 16 species listed as having declined in Perth are mostly sedentary and occur in understorey vegetation; therefore the condition and distribution of remnant vegetation is especially important for them. The presence of these species indicates that the remnant vegetation in the project area is providing habitat for them and that the remnants are not so isolated that the species have become locally extinct. With the exception of the White-browed Scrubwren and some honeyeaters recorded only on the lot now outside the mine area, this suite of mostly sedentary, understorey-dependent species is well-represented, albeit at low levels of abundance, on almost all properties. The Lot 56 remnant had slightly better representation of these species (eg. only site within proposed mining with Western Thornbill and Common Bronzewing), and observations made on the 7<sup>th</sup> September provide locations within the remnant that the significant species appear to be favouring.

Among the remaining species, some are associated with agricultural land and may be favoured by clearing, but there are also species that may be utilising the remnants in the project area as they move across the region. They may also be utilizing individual farmland trees. The importance of the remnants and scattered trees within the project area for the status of such species in the region is difficult to assess. It is a question of the distance that individual birds are prepared to fly across paddocks. It is likely, however, that small birds (eg. pardalotes, Brown Honeyeater), fly along lines of trees, such as along Elliott Road, while large birds (eg. parrots) will fly across open ground.



**Table 1.** Bird transects surveyed on the Lot 56 property (6<sup>th</sup> July).

| Transect | Time Start | Time Finish | Easting Start | Northing Start | Easting Finish | Northing Finish |
|----------|------------|-------------|---------------|----------------|----------------|-----------------|
| T1       | 9:15       | 9:45        | 399970        | 6410926        | 399590         | 6410926         |
| T2       | 9:15       | 9:45        | 399970        | 6411026        | 399590         | 6411026         |
| T3       | 9:45       | 10:10       | 399590        | 6411126        | 399970         | 6411126         |
| T4       | 9:45       | 10:10       | 399590        | 6411226        | 399970         | 6411226         |
| T5       | 10:40      | 11:00       | 399970        | 6411326        | 399590         | 6411326         |
| T6       | 10:40      | 11:00       | 399970        | 6411426        | 399590         | 6411426         |
| T7       | 11:05      | 11:25       | 399590        | 6411526        | 399970         | 6411526         |
| T8       | 11:05      | 11:25       | 399590        | 6411626        | 399970         | 6411626         |
| T9       | 11:35      | 11:50       | 400223        | 6411463        | 400223         | 6411032         |
| T10      | 11:35      | 11:50       | 400180        | 6411463        | 400180         | 6411032         |

**Table 2.** Habitat along each transect on the Lot 56 Property.

| Transect | Habitat                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| T1 – T8  | Large rectangular area. Jarrah/Marri/Allocasuarina/Banksia forest. Very little understorey except for some scattered <i>Xanthorrhoea</i> and <i>Hibbertia hypericoides</i> . Some fallen timber/logs and leaf litter. A couple of small sparse areas of tea-tree shrubs present. A creek with a sandy floor and no riparian vegetation other than the surrounding forest runs across the northern edge of the area. Cattle present and strong evidence of trampling and browsing of vegetation. |
| T9 - T10 | Long narrow area. Jarrah/Marri forest with almost no understorey. Many young, closely-spaced trees. Cattle present. Strong evidence of trampling and browsing of vegetation.                                                                                                                                                                                                                                                                                                                    |

**Table 3.** Bird transects surveyed on the Lots 59 and 300 property on July 6<sup>th</sup> (remnants A – K) and July 17<sup>th</sup> (remnants L – Q).

| Remnant | Time Start | Time Finish | Location (Easting & Northing) | Habitat                                                                                                   |
|---------|------------|-------------|-------------------------------|-----------------------------------------------------------------------------------------------------------|
| A       | 13:20      | 13:30       | 401428, 6406136               | Jarrah/Marri/Allocasuarina/Banksia forest with no understorey.                                            |
| B       | 13:35      | 13:40       | 401257, 6405958               | Jarrah/Marri/Allocasuarina/Banksia forest with no understorey.                                            |
| C       | 13:50      | 14:05       | 400983, 6405964               | Jarrah/Marri/Allocasuarina/Banksia forest with very little understorey. Scattered <i>Xylomelum</i> .      |
| D       | 14:10      | 14:20       | 400578, 6406185               | Jarrah/Marri/Allocasuarina/Banksia forest with very little understorey. Scattered <i>Xylomelum</i> .      |
| E       | 14:25      | 14:35       | 400244, 6406314               | Jarrah/Marri/Allocasuarina/Banksia forest with very little understorey. Scattered <i>Xylomelum</i> .      |
| F       | 14:40      | 14:45       | 400653, 6406278               | Jarrah/Marri/Allocasuarina/Banksia forest with very little understorey. Scattered <i>Xylomelum</i> .      |
| G       | 15:10      | 15:20       | 400959, 6406425               | Jarrah/Marri/Allocasuarina/Banksia forest with very little understorey. Scattered <i>Xylomelum</i> .      |
| H       | 15:20      | 15:35       | 400626, 6406476               | Jarrah/Marri/Allocasuarina/Banksia forest with degraded sedge understorey and scattered <i>Kingia</i> and |

|   |       |       |                    |                                                                                                                                    |
|---|-------|-------|--------------------|------------------------------------------------------------------------------------------------------------------------------------|
|   |       |       |                    | <i>Xylomelum</i> .                                                                                                                 |
| I | 16:10 | 16:20 | 399635,<br>6406652 | <b>Jarrah/Marri/Allocasuarina/Banksia forest with degraded sedge understorey and scattered <i>Kingia</i> and <i>Xylomelum</i>.</b> |
| J | 16:30 | 16:45 | 399655,<br>6406135 | <b>Jarrah/Marri/Allocasuarina/Banksia forest with no understorey.</b>                                                              |
| K | 16:45 | 16:55 | 400215,<br>6406029 | <b>Sparse shrubland of <i>Hakea</i> and stunted <i>Melaleuca</i> on dampland.</b>                                                  |
| L | 13:30 | 13:40 | 401824,<br>6406682 | <b>Jarrah/Allocasuarina/Banksia forest with very little understorey and scattered <i>Xylomelum</i>.</b>                            |
| M | 13:40 | 13:50 | 401941,<br>6406841 | <b>Jarrah/Allocasuarina/Banksia forest with very little understorey and scattered <i>Xylomelum</i>.</b>                            |
| N | 13:50 | 14:00 | 402205,<br>6406938 | <b>Jarrah/Allocasuarina/Banksia forest with very little understorey and scattered <i>Xylomelum</i>.</b>                            |
| O | 14:00 | 14:15 | 402294,<br>6406700 | <b>Jarrah/Allocasuarina/Banksia forest with very little understorey and scattered <i>Xylomelum</i>.</b>                            |
| P | 14:30 | 14:40 | 400149,<br>6406977 | <b>Jarrah/Marri forest with very degraded sedge understorey and scattered <i>Kingia</i> and <i>Xylomelum</i>.</b>                  |
| Q | 14:40 | 14:50 | 400272,<br>6406710 | <b>Jarrah/Marri forest with very degraded sedge understorey and scattered <i>Kingia</i> and <i>Xylomelum</i>.</b>                  |

**Table 4.** Transects walked on the Lot 62 property. (S = southern, C = central and N = northern).

| Transect | Time Start | Time Finish | Easting Start | Northing Start | Easting Finish | Northing Finish |
|----------|------------|-------------|---------------|----------------|----------------|-----------------|
| S1       | 10:20      | 10:40       | 399640        | 6405500        | 398788         | 6405500         |
| S2       | 10:20      | 10:40       | 399640        | 6405600        | 398788         | 6405600         |
| C1       | 9:30       | 9:45        | 399430        | 6406396        | 399430         | 6406396         |
| C2       | 9:30       | 9:45        | 399600        | 6406396        | 399600         | 6406396         |
| C3       | 9:50       | 10:10       | 399200        | 6406396        | 399200         | 6405784         |
| C4       | 9:50       | 10:10       | 399300        | 6406396        | 399300         | 6405784         |
| N1       | 11:25      | 11:40       | 399584        | 6406530        | 399584         | 6406850         |
| N2       | 11:25      | 11:40       | 399600        | 6406530        | 399600         | 6406850         |
| N3       | 11:45      | 12:00       | 399317        | 6406740        | 399317         | 6406530         |
| N4       | 11:45      | 12:00       | 399400        | 6406740        | 399400         | 6406530         |

**Table 5.** Habitat along each transect on the Lot 62Property.

| Transect | Habitat                                                                                                                                                                                                                                                         |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| S1 – S2  | Jarrah/Marri/Allocasuarina/Banksia forest with scattered <i>Xylomelum</i> and <i>Kingia</i> and little native understorey. Understorey consists mainly of short introduced grasses. Cattle present and strong evidence of trampling and browsing of vegetation. |
| C1 – C4  | Jarrah/Marri forest with scattered <i>Xylomelum</i> and <i>Kingia</i> and no native understorey. Understorey consists mainly of short introduced grasses. Cattle present and strong evidence of trampling and browsing of vegetation.                           |
| N1 – N4  | Jarrah/Marri forest with scattered <i>Xylomelum</i> and <i>Kingia</i> and no native understorey. Understorey consists mainly of short introduced grasses. Cattle present and strong evidence of trampling and browsing of vegetation.                           |

**Table 6.** Bird species recorded on each transect surveyed on the Lot 56 property on 6<sup>th</sup> July 2006.

| Species                   | Transect (6 <sup>th</sup> July) |    |    |    |    |    |    |    |    |     | 7 <sup>th</sup><br>Sept |
|---------------------------|---------------------------------|----|----|----|----|----|----|----|----|-----|-------------------------|
|                           | T1                              | T2 | T3 | T4 | T5 | T6 | T7 | T8 | T9 | T10 |                         |
| Australian Shelduck       |                                 |    |    |    |    |    |    | X  |    |     |                         |
| Pacific Black Duck        |                                 |    |    |    |    |    |    |    |    |     | X                       |
| Common Bronzewing         |                                 |    |    | X  |    |    |    |    |    |     |                         |
| Red-tailed Black-Cockatoo |                                 |    |    |    |    |    |    |    |    |     | X                       |
| Galah                     |                                 |    |    |    |    |    |    |    |    |     | X                       |
| Australian Ringneck       | X                               | X  | X  | X  | X  | X  | X  | X  | X  | X   | X                       |
| Regent Parrot             |                                 |    |    |    |    |    | X  |    | X  |     | X                       |
| Red-capped Parrot         | X                               | X  |    |    | X  | X  |    | X  |    | X   | X                       |
| Laughing Kookaburra       |                                 |    |    | X  | X  | X  |    | X  |    |     | X                       |
| Splendid Fairy-wren       |                                 |    |    |    |    |    |    | X  |    |     | X                       |
| Striated Pardalote        | X                               | X  | X  |    |    | X  | X  |    | X  |     | X                       |
| Spotted Pardalote         |                                 | X  |    |    |    | X  | X  |    |    |     |                         |
| Weebill                   | X                               | X  | X  |    | X  | X  |    |    | X  |     | X                       |
| Western Gerygone          |                                 | X  | X  | X  |    | X  |    | X  |    | X   | X                       |
| Inland Thornbill          |                                 | X  | X  |    | X  | X  |    | X  |    | X   | X                       |
| Western Thornbill         |                                 |    |    | X  | X  |    |    |    |    |     | X                       |
| Yellow-rumped Thornbill   | X                               |    | X  | X  | X  |    |    | X  | X  | X   | X                       |
| Red Wattlebird            | X                               | X  |    | X  |    |    | X  | X  |    | X   | X                       |
| Brown Honeyeater          |                                 |    | X  |    | X  | X  | X  | X  |    |     | X                       |
| Western Spinebill         |                                 |    | X  |    | X  | X  | X  | X  |    |     | X                       |
| Scarlet Robin             |                                 |    | X  | X  |    |    |    | X  |    | X   | X                       |
| Varied Sittella           |                                 |    |    |    |    |    |    | X  |    |     |                         |
| Rufous Whistler           |                                 |    |    |    |    |    |    | X  |    |     |                         |
| Golden Whistler           | X                               | X  |    | X  |    | X  |    |    |    |     | X                       |
| Grey Fantail              |                                 | X  | X  | X  | X  | X  | X  | X  | X  | X   | X                       |
| Willie Wagtail            |                                 |    |    |    |    |    |    |    |    |     | X                       |
| Magpie-Lark               |                                 |    |    | X  |    |    |    |    | X  | X   | X                       |
| Black-faced Cuckoo-shrike |                                 | X  |    |    |    |    |    |    |    |     |                         |
| Grey Butcherbird          |                                 |    |    | X  |    |    |    |    |    |     | X                       |
| Australian Magpie         | X                               | X  | X  | X  |    | X  |    |    | X  |     | X                       |
| Australian Raven          |                                 | X  | X  | X  |    | X  | X  | X  |    |     | X                       |
| Tree Martin               |                                 |    |    |    |    | X  |    |    |    |     |                         |
| Silveryeye                |                                 | X  |    |    |    |    |    |    |    |     | X                       |
| Number of species:        | 8                               | 14 | 12 | 14 | 10 | 15 | 9  | 16 | 8  | 9   | 26                      |

**Table 7.** Bird species recorded in each vegetation remnant on the Lots 59 and 300 property on the 6<sup>th</sup> July (remnants A – K) and 17<sup>th</sup> July (remnants L – Q) 2006.

| Species                   | Remnant   |          |           |           |          |          |           |           |           |           |          |          |          |          |          |          |          |
|---------------------------|-----------|----------|-----------|-----------|----------|----------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|----------|----------|----------|
|                           | A         | B        | C         | D         | E        | F        | G         | H         | I         | J         | K        | L        | M        | N        | O        | P        | Q        |
| Peregrine Falcon          |           |          |           |           |          |          |           |           |           | X         |          |          |          |          |          |          |          |
| Crested Pigeon            |           |          |           |           |          |          |           |           |           |           |          | X        |          |          |          |          |          |
| Galah                     | X         |          |           |           |          |          |           | X         |           |           |          |          |          |          |          |          |          |
| Australian Ringneck       | X         | X        | X         | X         | X        | X        | X         | X         | X         | X         |          | X        | X        | X        | X        | X        | X        |
| Regent Parrot             | X         |          |           |           |          |          | X         | X         |           |           |          |          |          |          |          |          |          |
| Red-capped Parrot         |           | X        | X         | X         | X        |          |           | X         | X         | X         |          | X        | X        | X        |          | X        | X        |
| Horsfield's Bronze-Cuckoo |           |          | X         | X         |          |          |           |           |           |           |          |          |          |          |          |          |          |
| Splendid Fairy-wren       |           |          |           |           |          | X        |           |           |           |           |          |          |          |          |          |          |          |
| Striated Pardalote        | X         |          |           |           | X        |          |           | X         |           |           |          |          | X        |          |          |          | X        |
| Weebill                   |           |          |           |           |          |          |           | X         |           |           |          |          |          |          |          |          |          |
| Western Gerygone          |           |          | X         | X         | X        |          | X         | X         |           | X         |          |          |          |          |          | X        | X        |
| Inland Thornbill          |           |          | X         | X         |          |          |           | X         |           |           |          |          |          |          |          |          | X        |
| Yellow-rumped Thornbill   | X         | X        | X         | X         |          | X        | X         | X         | X         | X         |          |          | X        |          |          |          | X        |
| Red Wattlebird            |           |          |           |           |          |          |           |           | X         | X         |          |          |          | X        |          |          |          |
| Brown Honeyeater          |           |          | X         | X         |          | X        | X         |           |           | X         |          | X        |          |          |          |          |          |
| Yellow-throated Miner     | X         | X        |           |           |          |          |           |           |           | X         |          | X        | X        | X        | X        |          |          |
| Western Spinebill         |           |          |           | X         |          |          |           |           |           |           |          |          |          |          |          |          |          |
| Scarlet Robin             |           |          |           | X         |          |          |           | X         | X         | X         |          |          |          |          |          |          | X        |
| Rufous Whistler           |           |          |           | X         |          |          |           |           |           |           |          |          |          |          |          |          |          |
| Grey Shrike-Thrush        |           |          | X         |           |          |          |           |           |           |           |          |          |          |          |          |          |          |
| Magpie-Lark               |           | X        |           |           |          |          |           | X         |           |           |          | X        | X        |          |          |          |          |
| Willie Wagtail            | X         |          | X         |           |          | X        |           |           |           |           |          |          |          |          |          |          |          |
| Grey Fantail              |           | X        | X         | X         | X        | X        | X         | X         | X         | X         |          |          |          |          |          | X        | X        |
| Black-faced Cuckoo-shrike |           |          | X         |           | X        |          |           | X         | X         | X         |          |          |          | X        |          |          |          |
| Black-faced Woodswallow   | X         |          |           |           |          |          |           |           | X         | X         |          |          |          |          |          |          |          |
| Dusky Woodswallow         |           |          |           |           |          |          |           |           |           | X         |          |          |          |          |          |          |          |
| Grey Butcherbird          |           | X        |           |           | X        |          |           | X         | X         |           |          |          |          |          |          |          |          |
| Australian Magpie         | X         | X        |           |           |          |          | X         | X         | X         | X         |          |          |          |          |          |          |          |
| Australian Raven          | X         |          |           |           |          |          | X         | X         |           | X         |          |          | X        |          | X        | X        |          |
| Welcome Swallow           |           |          |           |           |          |          | X         | X         |           | X         |          |          |          | X        |          |          |          |
| Tree Martin               |           |          |           |           |          | X        | X         |           |           |           |          |          |          |          |          |          |          |
| Silvereye                 |           |          | X         | X         |          |          |           |           |           | X         |          |          |          |          |          |          |          |
| <b>Number of species:</b> | <b>10</b> | <b>8</b> | <b>12</b> | <b>12</b> | <b>7</b> | <b>7</b> | <b>10</b> | <b>17</b> | <b>10</b> | <b>17</b> | <b>0</b> | <b>6</b> | <b>7</b> | <b>6</b> | <b>3</b> | <b>5</b> | <b>8</b> |

**Table 8.** Bird species recorded on each transect surveyed on the Lot 62 property on 17<sup>th</sup> July 2006.

| Species                 | Transect |    |    |    |    |    |    |    |    |    |
|-------------------------|----------|----|----|----|----|----|----|----|----|----|
|                         | S1       | S2 | C1 | C2 | C3 | C4 | N1 | N2 | N3 | N4 |
| Australian Shelduck     |          |    | X  | X  |    |    |    | X  |    |    |
| Nankeen Kestrel         | X        |    |    |    |    |    |    |    |    |    |
| Australian Ringneck     | X        | X  | X  | X  | X  | X  | X  | X  | X  | X  |
| Red-capped Parrot       |          | X  |    |    |    | X  | X  | X  |    | X  |
| Laughing Kookaburra     | X        | X  |    |    |    |    |    |    |    |    |
| Striated Pardalote      |          |    |    | X  |    |    | X  | X  |    | X  |
| Western Gerygone        |          | X  | X  | X  |    | X  |    |    |    |    |
| Inland Thornbill        |          | X  |    |    | X  |    |    |    |    |    |
| Yellow-rumped Thornbill | X        | X  |    |    | X  | X  | X  |    | X  | X  |
| Red Wattlebird          | X        | X  | X  | X  |    | X  |    | X  |    |    |
| Brown Honeyeater        |          |    |    | X  |    | X  |    |    |    |    |
| Yellow-throated Miner   |          |    |    | X  |    |    |    |    |    |    |
| Scarlet Robin           |          |    |    |    | X  | X  |    |    |    |    |
| Varied Sittella         |          |    |    |    | X  |    |    |    |    |    |
| Rufous Whistler         | X        |    | X  |    |    |    |    | X  |    |    |
| Grey Fantail            | X        |    | X  | X  | X  | X  | X  |    |    |    |
| Willie Wagtail          | X        |    |    |    |    |    |    |    |    |    |
| Magpie-Lark             | X        |    |    |    |    |    |    | X  |    |    |
| Black-faced Woodswallow | X        | X  |    |    |    |    |    |    |    |    |
| Dusky Woodswallow       |          |    |    |    |    | X  |    |    |    |    |
| Grey Butcherbird        |          |    |    | X  | X  | X  |    |    |    |    |
| Australian Magpie       |          | X  | X  | X  |    | X  | X  | X  | X  | X  |
| Australian Raven        |          | X  | X  | X  |    | X  |    | X  | X  | X  |
| Welcome Swallow         | X        |    |    |    |    |    |    |    |    |    |
| Tree Martin             |          | X  |    |    |    |    |    |    |    |    |
| Silvereye               |          |    |    |    | X  |    |    |    |    |    |
| Number of species:      | 11       | 11 | 8  | 11 | 8  | 12 | 6  | 9  | 4  | 6  |

**Table 9.** Summary of birds recorded on each property in 2004, 2005 and 2006 (where available). Species of conservation significance are presented in bold.

| Species                          | Lot 56 |    |    | Lot 62 |    | Lots 59 and 300 |    |    | Lot 64<br>(west) | Lot 64<br>(east) |
|----------------------------------|--------|----|----|--------|----|-----------------|----|----|------------------|------------------|
|                                  | 04     | 05 | 06 | 05     | 06 | 04              | 05 | 06 | 04               | 04               |
| Australian Shelduck              | X      |    | X  |        | X  |                 | X  |    | X                |                  |
| Australian Wood Duck             |        |    |    |        |    |                 | X  |    |                  |                  |
| Grey Teal                        |        |    |    |        |    |                 | X  |    |                  |                  |
| Pacific Black Duck               |        |    | X  |        |    |                 | X  |    |                  |                  |
| White-faced Heron                |        | X  |    |        |    |                 |    |    |                  |                  |
| White-necked Heron               |        |    |    |        |    |                 | X  |    |                  |                  |
| Straw-necked Ibis                |        |    |    |        |    |                 | X  |    |                  |                  |
| <b>Peregrine Falcon</b>          |        |    |    |        |    |                 |    | X  |                  |                  |
| Nankeen Kestrel                  |        |    |    |        | X  |                 | X  |    | X                |                  |
| <b>Common Bronzewing</b>         |        | X  | X  |        |    |                 |    |    | X                |                  |
| Crested Pigeon                   | X      | X  |    |        |    |                 |    |    |                  |                  |
| Laughing Turtle-Dove             |        |    |    |        |    |                 |    |    | X                |                  |
| <b>Red-tailed Black-Cockatoo</b> | X      | X  | X  | X      |    |                 | X  |    |                  |                  |
| Galah                            |        | X  |    | X      |    |                 | X  | X  |                  |                  |
| Purple-crowned Lorikeet          |        |    |    |        |    | X               |    |    |                  |                  |
| Red-capped Parrot                |        | X  | X  | X      | X  | X               | X  | X  | X                | X                |
| Regent Parrot                    | X      |    | X  |        |    | X               |    | X  |                  |                  |
| Australian Ringneck              | X      | X  | X  | X      | X  | X               | X  | X  | X                | X                |
| Elegant Parrot                   |        |    |    |        |    | X               |    |    |                  |                  |
| Horsfield's Bronze-Cuckoo        |        |    |    |        |    |                 |    | X  |                  |                  |
| Shining Bronze-Cuckoo            |        |    | X  |        |    |                 |    |    |                  |                  |
| Laughing Kookaburra              | X      | X  | X  |        | X  |                 |    |    |                  |                  |
| <b>Rainbow Bee-eater</b>         |        |    |    | X      |    |                 | X  |    |                  |                  |
| <b>Splendid Fairy-wren</b>       | X      | X  | X  | X      |    |                 | X  | X  | X                | X                |
| Spotted Pardalote                |        | X  | X  |        |    |                 |    | X  | X                |                  |
| Striated Pardalote               |        | X  | X  |        | X  |                 |    | X  |                  |                  |
| <b>Weebill</b>                   | X      | X  | X  |        |    |                 |    | X  |                  |                  |
| Western Gerygone                 | X      | X  | X  | X      | X  | X               | X  | X  | X                | X                |
| <b>White-browed Scrubwren</b>    |        |    |    |        |    |                 |    |    |                  | X                |
| <b>Inland Thornbill</b>          | X      | X  | X  |        | X  |                 |    | X  | X                | X                |
| <b>Western Thornbill</b>         |        | X  | X  |        |    |                 |    |    |                  |                  |
| <b>Yellow-rumped Thornbill</b>   | X      | X  | X  | X      | X  | X               | X  | X  | X                | X                |
| Red Wattlebird                   | X      | X  | X  |        | X  | X               |    | X  |                  |                  |
| <b>Western Wattlebird</b>        |        |    |    |        |    |                 |    |    | X                | X                |
| <b>Yellow-throated Miner</b>     |        |    |    |        | X  | X               | X  | X  |                  |                  |
| Singing Honeyeater               |        |    |    |        |    |                 |    |    | X                |                  |
| <b>White-naped Honeyeater</b>    |        |    |    |        |    |                 |    |    | X                |                  |
| Brown Honeyeater                 | X      | X  | X  | X      | X  | X               | X  | X  | X                | X                |
| <b>New Holland Honeyeater</b>    |        |    |    |        |    |                 |    |    |                  | X                |
| Western Spinebill                | X      |    | X  |        |    |                 |    | X  |                  |                  |
| White-fronted Chat               |        |    |    |        |    | X               |    |    |                  |                  |
| <b>Scarlet Robin</b>             | X      | X  | X  | X      | X  | X               | X  | X  |                  |                  |
| Varied Sittella                  |        |    | X  |        | X  | X               |    |    |                  |                  |
| Rufous Whistler                  | X      | X  | X  | X      | X  | X               | X  | X  | X                |                  |
| <b>Golden Whistler</b>           | X      | X  | X  |        |    | X               |    |    |                  |                  |
| <b>Grey Shrike-thrush</b>        | X      |    |    |        |    | X               |    | X  | X                |                  |
| Magpie-lark                      | X      |    | X  |        | X  | X               |    | X  | X                |                  |
| Grey Fantail                     | X      | X  | X  |        | X  | X               |    | X  | X                | X                |
| Willie Wagtail                   | X      |    | X  |        | X  | X               | X  | X  | X                | X                |
| Black-faced Cuckoo-shrike        | X      | X  | X  | X      |    |                 | X  | X  |                  | X                |
| White-winged Triller             |        |    |    |        |    |                 | X  |    |                  |                  |
| <b>Black-faced Woodswallow</b>   |        |    |    |        | X  |                 |    | X  |                  | X                |
| <b>Dusky Woodswallow</b>         |        |    |    |        | X  |                 | X  | X  |                  |                  |
| Grey Butcherbird                 |        | X  | X  |        | X  |                 |    | X  | X                |                  |
| Australian Magpie                |        | X  | X  | X      | X  |                 | X  | X  | X                | X                |

Table 9 (cont.)

| Species            | Lot 56 |    |    | Thorn |    | Lots 59 and 300 |    |    | Lot 64<br>(west) | Lot 64<br>(east) |
|--------------------|--------|----|----|-------|----|-----------------|----|----|------------------|------------------|
|                    | 04     | 05 | 06 | 05    | 06 | 04              | 05 | 06 | 04               | 04               |
| Australian Raven   |        | X  | X  |       | X  |                 | X  | X  | X                | X                |
| Welcome Swallow    |        |    |    |       | X  |                 |    | X  | X                |                  |
| Tree Martin        |        |    | X  |       | X  |                 |    | X  |                  |                  |
| Silvereye          |        | X  | X  |       | X  |                 |    | X  | X                |                  |
| Number of species: | 22     | 27 | 33 | 13    | 26 | 19              | 25 | 31 | 25               | 16               |

## REPTILES AND FROGS

Although the fauna assessment (MBS Environmental 2004) suggested that 39 reptile and 10 frog species might be present, only 1 reptile species (the arboreal skink *Cryptoblepharus plagiocephalus*) and 3 frog species were recorded during initial studies. Intensive searching for reptiles on 7<sup>th</sup> September in the Lot 56 remnant located only two additional reptile species, the skink *Hemiergis quadrilineata* and the Bobtail *Tiliqua rugosa*. *H. quadrilineata* was found to be common under logs and mats of dead leaves, with seven specimens captured. A number of other reptile species had been expected to be found during this searching, suggesting that the reptile assemblage is depauperate, probably due to the degradation of habitat by trampling and grazing by cattle. Even the common arboreal gecko *Christinus marmoratus*, for which there was suitable habitat, appeared to be absent.

A trapping survey in late spring/early summer would produce some additional reptile species, but it does seem likely that habitat degradation has badly affected the reptile assemblage. In addition to the species mentioned above, reptiles likely to persist in the project area include Gould's and Rosenberg's Goannas *Varanus gouldii* and *V. rosenbergi*, the Bearded Dragon *Pogona minor*, the skinks *Menetia greyii* and *Lerista elegans*, and snakes such as the Dugite *Pseudonaja affinis* and Tiger Snake *Notechis scutatus*. These and any other reptiles present may be largely confined to where the impact of livestock has been least, such as along road verges and in some of the remnants on Lot 64.

Ninox Wildlife Consulting (J. Henry pers. comm.) has undertaken fauna surveys in undisturbed native vegetation adjacent to the Kingia Reserve, some 5km west of the project area, and found 23 reptile species. Complete data are not available, but this list included the legless lizard *Pletholax gracilis* and the Bluetongue Skink *Tiliqua occipitalis*, both being southern range extensions to the known distributions of these species. It is unlikely that either persists in the project area because of habitat degradation.

The frog fauna also appears to be depauperate, probably because of livestock impacts in woodland and around wetlands. Three species were recorded in 2004: the Moaning Frog *Heleioporus eyrei* (paddocks on Lot 56 and in Lot 64east)), Guenther's Toadlet *Pseudophryne guentheri* (Lot 56) and Sandplain Frog *Crinia insignifera* (Lot 56, Lot 64

(east) and Lots 59 and 300). In 2006, only the Moaning Frog (again at Lot 56, in a sandy creek at 400121mE, 6411568mN (WGS84, Zone 50) and the Sandplain Frog (heard calling from small clumps of vegetation on Lot 56 at 399975mE, 6411328mN and 399595mE, 6410953mN, scattered across Lots 59 and 300 and calling in small numbers from a small dam on the southern part of Lot 62 were recorded. During both survey periods (2004 and 2006), more species of frog should have been heard had they been present, suggesting that other common species in the region (e.g. Glauert's Frog *Crinia glauerti*, Pobblebonk *Limnodynastes dorsalis* and Slender Tree-frog *Litoria adelaidensis*) are uncommon or absent.

## BATS

No surveys have been undertaken for bats in 2006 as conditions are not suitable until later in the year. Some species of bats, such as the White-striped Bat *Tadarida australis* and Gould's Wattled Bat *Chalinolobus gouldii*, range widely even in degraded environments and are therefore very likely to be present. Other species may be affected by fragmentation of native vegetation but may persist in remnants, where even dead trees will provide hollows and loose bark for shelter. The presence of the Western False Pipistrelle *Falsistrellus mackenziei* would be of interest, as this species is listed as priority by DEC.

## QUENDA OR SOUTHERN BROWN BANDICOOT

The Quenda is a Priority species according to the DEC and commonly occurs in areas of dense understorey vegetation, particularly close to wetlands. It is locally common in the general region of the project area and its presence is usually indicated by its characteristic foraging excavations. Such excavations were found on Lot 64 (east) in 2004 (MBS Environmental 2004) which is now outside the mine area. No excavations were found on the lots surveyed inside the mine area (Lots 56, 62, 59 and 300) in 2006. It is likely that there is insufficient dense ground-level habitat to support this species in these areas. The Quenda may occur in the remnants seasonally if the introduced pasture grasses become tall and dense at certain times of year, assuming there are nearby populations present. However, with the constant grazing by cattle, it is unlikely the pasture species would attain such density and height.

Kevin Thorn (pers. comm.) reported the presence of Quenda on the western part of his property (Lot 62) and along Hopelands Rd. There is some dense ground-level habitat (both native understorey and introduced grasses) in these areas, which lie west of the mine area. Quenda are also reported by residents from road and rail verges in the area, where there is dense, low vegetation formed mostly by introduced plant species such as watsonia. Quenda are known to utilise areas infested by weeds where these are sufficiently dense to provide cover (M. Bamford pers. obs.).



From these observations, it appears that the Quenda is mostly absent from remnant vegetation within the mine area but that road and rail verges may support populations. These coincidentally allow for population linkage through otherwise unsuitable habitat.

## **HABITAT TREES AND OTHER VEGETATION IMPORTANT FOR FAUNA**

Surveys for potential nest trees of black-cockatoos were conducted by Wilcox (2005), who located 14 potential nest trees on Lot 56, 2 on Lots 59 and 300, 3 on Lot 3 and 1 on Lot 506. The Lot 56 remnant has a concentration of potential nest trees, particularly in the southern part of the remnant that is to be excluded from mining. These were all large trees that not only had large hollows suitable for use by black-cockatoos, but a range of other hollows and crevices that make them valuable for other species, including hollow-nesting birds, possums, lizards and invertebrates. Large, hollow-bearing trees are conspicuous habitat features, but other aspects of the vegetation can be significant habitat, such as areas of dense understorey of value to some locally significant birds. Therefore, during the 2006 surveys attention focussed on identifying significant habitat other than hollow-bearing trees. In general, the poor condition of understorey vegetation meant that it was difficult to identify any outstanding areas of understorey, although detailed vegetation condition mapping could provide a useful guide. Information on vegetation condition provided by the 2004 survey (MBS Environmental 2004) indicates that the best quality vegetation and fauna habitat in the mine area occurs on Lot 56 – Waypoints 11-15. These were located in the southern vegetated remnant on the lot.

Locations where the Splendid Fairy-wren, and Inland and Western Thornbills, were seen in Lot 56 on 7<sup>th</sup> September suggest that the far north of the Lot 56 remnant may also be of particular significance in providing mid-storey and under-storey vegetation in slightly better condition than elsewhere.

## **WILDLIFE CORRIDORS**

Wildlife corridors can be continuous or discontinuous areas of habitat that allow fauna to survive in an area of otherwise inhospitable habitat. This can allow individual animals to move through the area, and it also allows for gene flow to occur through a population of a species in which the individuals are sedentary. Both these forms of movement can be important for the persistence of species within an area and in adjacent areas. Wildlife corridors are likely to be important in the project area because of the great extent of clearing, and the location of the project area between extensive habitats to the east (on the Darling Scarp) and fragmented but important habitats to the west, such as Kingia Reserve. Understanding the value of wildlife corridors is about understanding how wildlife makes use of the total landscape in a regional context.

Remnant native vegetation in the project area is very fragmented but there are some continuous corridors and some areas that probably act as “stepping stones” for wildlife movement.

- Road and rail verges. There are narrow and in some cases fragmented north-south corridors present outside the proposed mine area along Hopelands Rd and Atkins Rd, and along the railway line. These consist of both native vegetation and areas of tall, introduced grasses and have been identified as supporting Quenda. There is a fragmented east-west corridor along Elliott Rd between the Lot 56 property and Hopelands Rd. This corridor includes native vegetation with understorey on Lot 64.
- Creeks running east-west through Lot 62 and Lots 59 and 300 properties. On the Lot 62 property these creeks have a narrow strip (mostly two trees wide) of vegetation consisting mainly of non-local planted eucalypts and some patches of remnant native vegetation, mostly *Melaleuca* trees.
- Although fragmented, all remnants of native vegetation have some potential to act as east-west “stepping stones”, particularly for birds. The most important are likely to be those associated with road verges, such as the remnants just north of Elliott Road.

## **BLACK-COCKATOO NESTS**

The potential importance of nesting by black-cockatoos in the project area is recognised, although only one species, the Red-tailed Black-Cockatoo, is known to be present regularly. Baudin’s Black-Cockatoo is recorded on the basis of Marri fruit chewed in a distinctive manner, and Carnaby’s Black-Cockatoo is recorded on the basis of land-owners’ reports of large flocks of a white-tailed black-cockatoo. Potential nest trees have been identified (Wilcox 2005) but for further work it is suggested that a team from the WA Museum, already undertaking cockatoo nesting studies in the general area, be approached to include the project area in their study.

During the 7<sup>th</sup> September visit to the Lot 56 remnant, a pair of Red-tailed Black-Cockatoos was seen alongside Elliott Road, and a flock of five was present in the north of the remnant. A fresh but broken black-cockatoo egg was found at 399 717E, 6 411 407N, close to a potential nest tree reported by Wilcox (2005) at 399 817E, 6 411 392N. The egg was white, ovoid and, although damaged, measured *ca.* 49mm by 37mm. These measurements are within the range for Carnaby’s, Baudin’s and the Red-tailed Black-Cockatoo (Higgins 1999, Johnstone and Storr 1998), but it seems likely that the latter species was responsible given the presence of the birds. It is not known if the egg came to be on the ground due to predation, competition for a hollow or an accident, but it indicates the very strong likelihood of Red-tailed Black-Cockatoos breeding in the project area.

## CONCLUSIONS

The fauna of the project area is depauperate due to extensive clearing, fragmentation and degradation of native vegetation. Despite this there is still fauna present, including some species that are of at least regional conservation significance and a small number of species of gazetted significance under legislation. Remnant vegetation is supporting these species and is also facilitating their regional persistence by providing corridors for movement between larger areas of native vegetation to the east and west. A limiting factor for fauna is the poor condition of remnant vegetation, due largely to ongoing grazing by livestock that removes understorey. Virtually any native vegetation, and even non-native vegetation that is not subject to grazing, is significant. This includes road and rail verges within and outside the lease, as well as discrete remnant areas.

Information on fauna, and especially on birds, indicates that the main areas of remnant vegetation are of similar value, with no remnant being particularly outstanding in the suite of species it supports. Detailed information from the Lot 56 remnant suggests that the northern area may be slightly more important for significant birds; this is also the area where an egg of the Red-tailed Black-Cockatoo was found, and is close to Dirk Brook where a possibly significant invertebrate, the mite *Tillia davisae*, has been recorded.

Further studies for assessing fauna values and preparing to manage impacts include:

- Bat surveys;
- Cockatoo surveys and monitoring, especially for nesting (WA Museum to be approached);
- Consideration being given to reptile surveys in spring/summer on road verges and in remnants;
- Production of maps that integrate all remnant vegetation information, including condition and road verges, both within and outside the lease area to give the regional context;
- Development of a mine plan that minimises impacts on cockatoo nesting, retains native vegetation where possible and does not affect wetlands, especially Dirk Brook;
- Development of a rehabilitation plan that will allow rehabilitation to enhance wildlife habitat (emphasis on restoring understorey, creation of foraging habitat for cockatoos) and corridors in the region.

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## **APPENDIX 4: HYDROLOGICAL REPORT (2007)**



**Rockwater**  
P R O P R I E T A R Y L I M I T E D

# **KEYSBROOK MINERAL SANDS PROJECT**

## **KEYSBROOK AREA HYDROGEOLOGICAL ASSESSMENT STAGE 2**

**JUNE 2007**

**REPORT FOR  
OLYMPIA RESOURCES LTD**

321.0/07/04a

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## **Appendices**

- I Bore Census Results
- II Bore Completion and Testing Report





## **1 INTRODUCTION**

This report complements a previous assessment of hydrogeological aspects of the Keysbrook Mineral Sands Project of Olympia Resources Limited (Rockwater, 2006) and should be read in conjunction with that report. The former report utilised published material and information from the databases of the Department of Water. Field testing has been conducted in 2007, and the results are incorporated in the current assessment. Groundwater-related matters that were requested by the Department of Water to be addressed following the review of the project Public Environment Review are summarised below:

- Verification of aquifer coefficients for the Leederville Formation aquifer in this area.
- Confirmation that the predicted groundwater supplies for the project – estimated to be about 1.8 GL/a from the Leederville aquifer plus 0.2 GL/a from the Superficial aquifer – were available without causing deleterious reductions in water levels with respect to other users, and the environment.
- Potential impacts of changes in shallow groundwater levels in the vicinity of wetlands – as a result of mining activities – to be further evaluated by means of shallow aquifer testing and monitoring.
- Locations of designated wetlands to be shown in the diagrams illustrating water-level changes.
- Information on existing bores and wells to be supplemented with a bore census, with the aim of identifying bores that draw water from the Leederville Formation.
- Numerical modelling of the aquifer to be carried out at an agreed level based on the Murray Darling guidelines including sensitivity analysis to predict the level of risk that water use by the Keysbrook project may have on neighbouring bore users.

Additional to the above items, one of the designated wetlands was botanically surveyed to appraise its level of ecological significance.

Plans showing the regional location of the project and site features are presented in Figures 1, 2 and 2A. A more detailed map of part of the area is presented in Figure 3.

The Appendices to this report contain the bore-census material (Appendix I), and data from field operations in the bore completion report (Appendix II).

## **2 FIELD WORK CARRIED OUT**

### **2.1 BORE CENSUS**

Properties in the project area were visited to ask for information on depths of bores/wells, and other factors relevant to the Leederville and Superficial aquifers. A description of the census results is presented in Appendix I; locations of the bores identified as tapping the Leederville

Formation are shown in Figure A1-1. A summary of the responses received is presented in Table 1. Further information is presented in Appendix I.

**Table 1 : Bore Census Response**

|                                                                     |          |
|---------------------------------------------------------------------|----------|
| Number of Properties Visited                                        | 115      |
| Useful Information Provided                                         | 55 (48%) |
| Access or Information Denied                                        | 4 (3%)   |
| No-one at Property                                                  | 56 (49%) |
| Number of Bores Tapping the Leederville Aquifer                     | 23       |
| Number of Bores/Wells in the Superficial Aquifer (incl. Soaks/Dams) | 57       |
| Number of Bores/Wells with Uncertain Aquifer                        | 19       |

## 2.2 LEEDERVILLE AQUIFER TEST BORES

Two production bores and three observation bores were constructed in the Leederville Formation (Mariginiup Member) to depths of 90–156 m below ground surface, in March–May 2007. Their locations are shown in Figures 2 and 3. Details of the strata and bore construction are presented in Appendix II. A summary is given in Table 2.

**Table 2 : Summary of Leederville Bores Constructed by Olympia Resources**

| Bore No. | Location |         | Depth<br>m bgl | Depth<br>m AHD | Screened Internal<br>m bgl |
|----------|----------|---------|----------------|----------------|----------------------------|
|          | MGA E    | MGA N   |                |                |                            |
| KL1Obs   | 401625   | 6406792 | 90             | -57            | 47–83                      |
| KL2Obs   | 399186   | 6406766 | 144            | -117           | 42–48, 54–60, 66–96        |
| KL3Obs   | 398778   | 6405465 | 156            | -131           | 72–102, 120–150            |
| KL2P     | 399190   | 6406893 | 144            | -117           | 58–94, 118–136             |
| KL3P     | 398779   | 6405436 | 150            | -125           | 71–98, 122–146             |

Bore KL1 Obs was drilled in the eastern-central part of the project area and was terminated mid-way through the Mariginiup Member of the Leederville Formation (78 m below the upper contact of the Mariginiup Member with the Guildford Formation). The strata comprised clayey sandstone with numerous granite boulders. The production bores at sites KL2 and KL3, in the western part of the project area, penetrated to the base of the Leederville Formation and were constructed with 54 m and 51 m of screen, respectively. They are sand-packed with 0.8–1.6 mm graded sand; both have an upper 12 m of cement-grouted steel casing set in the superficial strata.

Strata depths at the three sites are listed in Table 3. They are based on lithological examination and correlations using the geophysical logs of these bores and the closest AM series bores (AM63 and AM66 – Davidson, 1995, and DOW data).

The stratigraphic correlations are consistent with a low slope of the formation base, downwards to the west; at AM63 there may be a local trough. A cross section including the recent bores and AM-series bores is presented in Figure 4.

**Table 3 : Stratigraphic Data from Leederville Bores**

| Site | Base of Bassendean Sand |       | Base of Guildford Fm |       | Base of Leederville Fm |       |
|------|-------------------------|-------|----------------------|-------|------------------------|-------|
|      | m bgl                   | m AHD | m bgl                | m AHD | m bgl                  | m AHD |
| KL1  | 3                       | 30    | 12                   | 21    | 133 (by correlation)   | -100  |
| KL2  | 2                       | 25    | 14                   | 13    | 141                    | -117  |
| KL3  | 5                       | 20    | 14                   | 11    | 150                    | -125  |
| AM63 | ND                      | ND    | 15                   | 7     | 216                    | -194  |
| AM65 | ND                      | ND    | 9                    | -7    | 188                    | -186  |
| AM66 | ND                      | ND    | 10                   | 11    | 142                    | -121  |

Sandstone layers in the formation are thinly-interbedded with siltstone and shale, although sandstone predominates in the two sections screened in each bore. These features are illustrated in the geophysical logs of the bores (Appendix II, Figures AII-2 to AII-6).

During development of the production bores, water was air-lifted at rates peaking at 3,500 to 3,900 m<sup>3</sup>/d (40 to 45 L/s). The water is fresh, with salinities in the range 200 to 350 mg/L TDS.

Pumping tests of each bore comprised step-rate tests of six hours and constant-rate tests of 44 hours at 1,700 m<sup>3</sup>/d (19.7 L/s). The pumping rates were limited by the capability of the pump rather than the capacities of the bores.

### 2.3 SUPERFICIAL AQUIFER TEST BORES

Shallow bores were constructed into the Bassendean Sand and the Guildford Formation near the deep observation bores and near two wetlands, for the purpose of:

1. Measuring comparative water levels between deep and shallow aquifers.
2. Measuring water levels near wetlands.
3. Allowing hydraulic testing of the shallow aquifer.

Locations of the bores are shown in Figure 3. Descriptions of the shallow bores and the lithologies intersected are presented in Appendix II.

### 3 RELEVANT HYDROGEOLOGICAL FINDINGS

#### 3.1 LEEDERVILLE AQUIFER

##### 3.1.1 Aquifer Coefficients

The aquifer transmissivity values calculated (from pumping tests) for the KL2 and KL3 locations are respectively 346 m<sup>2</sup>/d and 390 m<sup>2</sup>/d giving average permeability (hydraulic conductivity) values for 125 m aquifer thickness of 2.8 m/d and 3.1 m/d. The adopted average permeability value of 3 m/d is very similar to the previously utilised value of 5 m/d. Based on the lithology of bore KL1 Obs, an average permeability value of 0.8 m/d has been adopted for the eastern part of the project area.

The storage coefficient values calculated (from pumping tests) for the KL2 and KL3 locations are 0.0006 and 0.0001 respectively. The average value of 0.0003 is similar to the previously-used value of 0.0001.

##### 3.1.2 Water Levels

The water levels measured on 16 May 2007 in the bores at the KL2 and KL3 sites, and in AM63 and AM66, are listed in Table 4. Data from additional DoW monitoring bores in the area are given in Table 5. A contour map of the Leederville aquifer water levels is presented in Figure 5.

**Table 4 : Water Levels Measured May 2007**

| Bore   | Water Level |        |        | Aquifer     | Screen or Slots<br>m bgl | Collar Height<br>m agl |
|--------|-------------|--------|--------|-------------|--------------------------|------------------------|
|        | *m btoc     | *m bgl | m AHD  |             |                          |                        |
| KL1OBS | 4.20        | 3.63   | 29.80  | Leederville | 47–83                    | 0.57                   |
| KL1S   |             |        |        | Guildford   | 0–3                      | 0.43                   |
| KL2OBS | 0.28        | +0.16  | 27.36  | Leederville | 42–96                    | 0.44                   |
| KL2P   | 1.20        | 0.6    | 26.90  | Leederville | 58–136                   | 0.60                   |
| KWT2E  | 1.21        | 0.72   | 27.07  | Guildford   | 0–3                      | 0.49                   |
| KL3OBS | 0.004       | +0.62  | 26.10  | Leederville | 72–150                   | 0.62                   |
| KL3P   | +ve         | >+0.55 | >26.00 | Leederville | 71–146                   | 0.55                   |
| KWT3A  | 1.36        | 0.88   | 24.61  | Guildford   | 0–4                      | 0.48                   |
| AM63A  | 9.45        | 8.82   | 13.04  | Leederville | 103–109                  | 0.63                   |
| AM66A  | 16.97       | 16.43  | 4.52   | Leederville | 75–81                    | 0.54                   |
| AM63   | 18.48       | 18.28  | 3.49   | Yarragadee  | 312–320                  | 0.20                   |
| AM66   | 16.87       | 16.33  | 4.45   | Yarragadee  | 341–347                  | 0.54                   |

\* m btoc = metres below top of bore collar; m bgl = metres below ground level; m agl = metres above ground level

From the data, the following points arise:

1. At KL1 the water level in the Leederville Formation is 3.6 m below ground surface (29.8 m AHD) and therefore lower than the water table in the superficial deposits (32 m AHD at LT 620). This is similar to the case adopted in the 2006 assessment, although in the latter, the Leederville water levels were interpreted to be a further 10 m (approx.) lower, based on data from AM66A, discussed below.

**Table 5: Water Levels in Monitoring Bores, from DoW Database Values and Davidson (1995)**

| Bore No. | Summer/Autumn Low 2007 m AHD | Adopted Average Water Level m AHD | Aquifer     |
|----------|------------------------------|-----------------------------------|-------------|
| AM61B    | 28.0                         | 29                                | Leederville |
| AM62A    | N.A                          | 5                                 | Leederville |
| AM63A    | 13.0                         | 14.0                              | Leederville |
| AM65     | N.A                          | 5                                 | Leederville |
| AM65A    | N.A                          | 8                                 | Leederville |
| AM70A    | 16.5                         | 17.5                              | Leederville |
| KL1 Obs  | 29.8                         | 31                                | Leederville |
| KL2 Obs  | 27.4                         | 28                                | Leederville |
| KL3 Obs  | 26.0                         | 27                                | Leederville |
| LT510    | 14.6                         | 15                                | Superficial |
| LT560    | 19.4                         | 20                                | Superficial |
| LT570    | 32.1                         | 32.5                              | Superficial |
| LT600    | 19.3                         | 20                                | Superficial |
| LT610    | 21.3                         | 22                                | Superficial |
| LT620    | 32.8                         | 33.0                              | Superficial |
| LT660    | 15.9                         | 16.5                              | Superficial |
| LT670    | 25.7                         | 26                                | Superficial |
| KWT1D    | 29.9                         | 30.5                              | Superficial |
| KWT2E    | 27.0                         | 27.5                              | Superficial |
| KWT3A    | 24.6                         | 25                                | Superficial |

- At KL2 the Leederville Formation water levels are between 0.16 m above and 0.6 m below ground surface, mainly depending on the ground-surface elevation. They are at similar elevations to water levels in the superficial deposits, differing by +0.29 m to - 0.17 m from those in nearby bore KWT2E.
- At KL3 the Leederville Formation water levels are 0.62 m above ground surface i.e. about 1.49 m higher than water levels in the superficial deposits at nearby bore KWT3A.
- The water level in monitoring bore AM66A (owned by the Department of Water) was measured at 16.43 m below ground surface ie. 4.52 m AHD. This confirms the values reported by DoW, but the values do not agree with those measured at KL2 and KL3 where the water levels are 26 to 27.4 m AHD. These values are also at variance with that measured at AM63A (13.04 m AHD); the latter site is on a longitude 1750 m west of AM66A, therefore its water level should be lower than that at AM66A rather than 8.5 m higher. Possible explanations are that AM66A is actually measuring water levels in the Yarragadee Formation, or that there is a partial hydraulic barrier to the east of AM66A.
- Based on information from AM66A, it was interpreted in the previous assessment (Rockwater, 2006) that water levels in the Leederville Formation were lower than the base of the superficial deposits; therefore water-level reductions in the Leederville would have no effect on the water table. With the water levels as now measured, the drawdown (if any) in the superficial aquifer will depend on the effect of aquitards in limiting vertical permeability in both aquifers.
- At KL2, the water level in KL2 Obs (slotted from 42 to 96 m), is 0.46 m higher than that in KL2P, screened from 58 to 136 m. Hydraulic heads evidently decrease downwards in

the Leederville Formation. They decrease further, in the Yarragadee Formation – as indicated by AM63 and AM63A (Table 4); AM66 and AM66A show almost equal heads, an apparently anomalous result.

7. Water-level effects of pumping were measured in the superficial aquifer at bore KWT3A during the pumping test of bore KL3P. The bores are 24 m apart. A small drawdown response was recorded at KWT3A: 0.04 m after 44 hours, compared with 3.5 m in the Leederville aquifer (KL3 OBS). For a pumping rate of 2,740 m<sup>3</sup>/d (1.6 times that of the test) for 8 years, the drawdown in the superficial aquifer at 24 m is extrapolated to average 0.06 m/a if there were no aquifer recharge. The drawdown will diminish at greater distances from the production bore. Such drawdown is almost certainly so small as to be unmeasurable over a full year, as recharge will make up the deficit. There will be slightly less seepage into the existing drains/water courses.

## **3.2 SUPERFICIAL AQUIFER**

### **3.2.1 Description**

The Superficial aquifer comprises the Bassendean Sand and Guildford Formation, respectively extending to depths below groundwater surface of generally 2 m (but in the range of 0 to 5 m) and 12 m (but in the range of 9 to 15 m). The Bassendean Sand typically is well-sorted, low in clay-content, and has high permeability. The Guildford Formation varies from clay to sand and has generally low permeability, in the range 0.001 to 2 m/d.

Because of its shallow base, the Bassendean Sand is in places fully unsaturated in summer/autumn, and partly-saturated in winter/spring; water levels fluctuate about 1 m annually (Fig. 6). In other areas, the formation extends below the summer water table and is partly- to fully-saturated year-round.

The Guildford Formation lies mainly below water level although locally its upper surface becomes unsaturated by up to one or two metres in dry seasons.

Water levels in the Bassendean Sand and the Guildford Formation are essentially equal, except for the local drying-out of the Bassendean Sand as discussed above.

### **3.2.2 Wetland Sections**

Shallow holes were drilled along two lines leading into nominated wetlands, to examine the strata and provide monitoring bores. Locations of Sections 1 and 2 are shown in Figure 3, and hydrogeological cross sections are presented in Figures 7 and 8. Hydrogeological data are presented in Appendix II (Attachment AII-2).

## Section 1

On Section 1 the Bassendean Sand is unsaturated in summer/autumn. The water table – at near-minimum elevation (May 2007) – lies at 0 to 1.5 m below the top of the Guildford Formation (Fig. 7). Relative levels in May were 29.9 m AHD at bore KWT1D, 31.27 m AHD at KWT1E, and 29.69 m AHD at KWT1F. Given the planned mining base elevation of 29.8 m AHD at Section 1, there can be no discernible lowering of the summer water table at the wetland. If this area was mined in winter/spring, and the water table at the edge of the mining area was maintained at 30 m AHD, the water level could not be lowered below 30 m AHD at the edge of the wetlands. Given (1) the accumulation of surface water in the wetlands, (2) the low permeability of the Guildford Formation, and (3) the 100 m distance from mine to wetland margin, negligible drawdown (if any) can be induced at the wetland.

Based on the measured water levels and allowing for a 1 m rise in winter, the water table would not reach ground surface in the wetland unless there was additional recharge from surface water. It is concluded that the wetland relies on surface water rather than groundwater.

## Section 2

Test holes intersected dry Bassendean Sand, in the southern half of Section 2, but in the northern half the sand extends below the water-table elevation of up to 27 m AHD recorded in the Guildford Formation (Figure 8). In the southern part of the section the water table in May 2007 slopes downwards to 25 m AHD below the wetlands.

Mining in the northern part of Section 2 will lower water levels at the mine edge, to about 26 m AHD, which is about 1 m higher than the summer water level beneath the wetland. Thus, the wetland water table would not be affected by mining in the dry season. Lowering of water levels in the mining area to 26 m AHD in winter/spring will induce a hydraulic gradient (i) of about 0.01 to 0.02 through the Guildford Formation. The amount of groundwater flow from wetland to mine excavation, and water-level reduction at the latter, will depend on the permeability (= hydraulic conductivity, K) of the Guildford Formation. Given that the upper layers of the Guildford at this site has permeability of about 0.01 m/d (discussed below), the groundwater flow rate will be very low: less than 1 m<sup>3</sup>/d per 1,000 m of pit, as calculated using the equation  $Q = KD_iL = 0.02 \times 2 \times 0.02 \times 1,000$  m/d where D, depth of flow section, is 2 m and L, length of flow section, is 1,000 m.

### 3.2.3 Aquifer Properties

The Bassendean Sand is clean medium-grained well-sorted quartz sand which would have permeability values of 5 to 10 m/d. Near the wetlands the sand is more clayey, and would have lower permeability.

The Guildford Formation varies in lithology from sandy clay to coarse-grained sand. Grain-size analyses from four test holes are presented Appendix II. The results (Fig. AII-11 to AII-15) indicate the following:

- (1) At KL1 Obs (Fig AII-11) the material from 2 to 5 m depth is coarse-grained sand with low clay content, while the 5 to 12 m samples are finer-grained and more clayey.
- (2) At KL2 Obs (Fig. AII-12) the material at 1 to 5 m depth is fine-grained and clayey, while the 6 to 10 m samples are coarse-grained.
- (3) At KL3 Obs (Fig. AII-13) the samples at 7, 9, 10 and 12m are fine grained and clayey, while the remainder are coarse grained.
- (4) At KWT1D (Fig. AII-14) the six samples from 3.5 to 6 m depth are fine-grained and clayey.
- (5) At KWT2E (Fig. AII-15) the three samples from 5 to 6 m are fine-grained and clayey; the sample from 4 m is fine grained; those from 3.5 and 4.5 m are coarse grained with high and low clay content, respectively.

The Guildford Formation near the wetlands (bores KWT1D and 2E) is predominantly fine-grained and clayey. At the other two sites assessed, KL1 Obs and KL2 Obs, there are coarse sandy intervals either shallow or deep in the Formation.

Hydraulic testing was conducted on the shallow drill holes constructed at two wetlands areas (Sections 1 and 2). It comprised slug tests using injection on bores KWT 1A, B, and C and KWT 2B, C, D, and F; and water-removal on bores KWT 1D and 2E. The resulting calculated values of strata permeability are listed in Table 6.

The bores with slots from ground surface to depths of 0.9–3.5 m gave low permeability values, over a wide range of 0.001 to 0.09 m/d. The two bores (KWT 1D and 1E) which measured permeability at 5 to 6 m below ground surface gave permeability values of 1.9 and 1.3 m/d.

**Table 6: Calculated Permeability (Hydraulic Conductivity) Values from Slug-tests of Shallow Bores**

| Bore   | Depth<br>m bgl | Water Level<br>m bgl | Slotted Section<br>m bgl | Calculated Permeability<br>m <sup>2</sup> /d | Test Type |
|--------|----------------|----------------------|--------------------------|----------------------------------------------|-----------|
| KWT1A  | 2              | -                    | 0 – 2                    | 0.001                                        | Injection |
| KWT1B  | 2              | -                    | 0 – 2                    | 0.001                                        | Injection |
| KWT1C  | 2              | -                    | 0 – 2                    | 0.001                                        | Injection |
| KWT1D  | 6              | 2.22                 | 5 – 6                    | 1.9                                          | Recovery  |
| KWT2B  | 3.5            | 2.36                 | 0 – 3.5                  | 0.006                                        | Injection |
| KWT2C  | 3              | 1.54                 | 0 – 3                    | 0.002                                        | Injection |
| KWT2D  | 3              | 0.72                 | 0 – 3                    | 0.02                                         | Injection |
| KWT2Ds | 0.9            | -                    | 0 – 0.9                  | 0.09                                         | Injection |
| KWT2E  | 6              | 0.72                 | 5 – 6                    | 1.3                                          | Recovery  |
| KWT2F  | 1.8            | -                    | 0 – 1.8                  | 0.03                                         | Injection |



## 4 NUMERICAL MODELLING OF GROUNDWATER

A three-layer numerical model of the aquifer was operated to predict groundwater levels and changes as a result of the operation of the Keysbrook Mineral Sands Project. The main items examined are

- (1) Drawdown of water levels in the Leederville aquifer as a result of pumping two bores to produce a total of 1.8 GL/a of process water.
- (2) Changes in water levels in the Superficial aquifer as a result of pumping the Leederville aquifer and mining the Bassendean Sand in the areas proposed.

Parameters for the model have been derived from specific hydrogeological testing (test-pumping and slug-testing bores), strata definition by mineral drilling, the WIN database of the Department of Water, and hydrogeological publications e.g. Davidson (1995).

### 4.1 DESCRIPTION OF GROUNDWATER MODEL

The model was set up and operated using Processing Modflow Pro, which incorporates Modflow, the industry-standard finite-difference groundwater modelling software designed by the US Geological Survey (McDonald and Harbaugh, 1988). It consists of a variable rectangular grid of 111 rows and 66 columns covering an area of 8.5 km east-west by 20 km north-south. Figure 9 shows the model grid and the planned mining blocks. Inactive cells have been set in parts of the south-eastern and eastern sectors to simulate areas where the layers are absent or unsaturated. This applies particularly to the Bassendean Sand. A constant-head boundary has been set along the western margin of the model. Cell sizes are as small as 75 m by 67 m in parts of the mine area, and up to 1,050 m by 700 m in the northern sector.

Elevations adopted in the model for the base of Layer 1 and Layer 3 are shown in Figures 10 and 11, respectively. It is noted that the base of Layer 1 has been set a little deeper than the measured depth of the base because the model cannot represent a thin aquifer that dries out and re-wets in an irregular pattern (as a result of seasonal water-level fluctuations and an uneven aquifer base). This Layer 1 represents the Bassendean Sand and up to one metre of the underlying Guildford Formation.

Aquifer coefficients for the three layers were set at values commensurate with those obtained by pumping tests and slug tests. Low values of vertical permeability were assigned to the Guildford Formation and Leederville Formation, reflecting stratification by clay and shale layers. Aquifer parameters adopted after calibration are given in Table 7.

**Table 7: Adopted Model Parameters**

| Parameter        | Layer 1   | Layer 2      | Layer 3 | Remarks                                      |
|------------------|-----------|--------------|---------|----------------------------------------------|
| KH (m/d)         | 1 to 9    | 1            | 0.8, 3  | Low values in east (high values predominant) |
| KV (m/d)         | 0.9       | 0.005, 0.008 | 0.001   |                                              |
| Sc               | N/A       | 0.08         | 0.0003  |                                              |
| SY               | 0.1       | 0.08         | 0.1     |                                              |
| Recharge (mm/yr) | 51 to 171 |              | N/A     | Higher values in east.                       |

## 4.2 MODEL CALIBRATION

The model was run in steady-state mode and aquifer parameters were varied until there was a close correspondence between observed (average), and model-calculated groundwater levels. It was necessary to simulate a relatively high rate of recharge west of the Darling escarpment (171 mm/yr) to provide sufficient recharge to the Leederville aquifer (via the Superficial aquifer). The recharge along the escarpment is likely to include infiltration from run-off water accumulating in this low-lying area.

Root mean square (RMS) errors and scaled RMS errors for model-calculated water levels for the Superficial and Leederville aquifers in the project area are less than 2 %, except for a scaled RMS error of 6 % for the Leederville Formation. Apart from the latter value, the errors are well within the 5 % limit suggested in the Murray-Darling modelling guidelines. As discussed earlier, there is a strong vertical hydraulic gradient within the Leederville Formation and so it is uncertain whether heads measured in monitoring bores represent average heads within the aquifer.

Model values of water levels in the Bassendean Sand (layer 1) and the Leederville Formation (layer 3) are presented in Figures 12 and 13, respectively.

## 4.3 MODELLING OF PUMPING OF LEEDERVILLE BORES

The modelled scenario is that two production bores KL2P and KL3P are pumped for eight years at an average rate of 2,466 m<sup>3</sup>/d each to produce a total of 1.8 GL/a, together with simulation of mining as outlined in Section 4.4 below.

Calculated water-level drawdowns in the Leederville aquifer are presented in Figure 14. They indicate that beyond about 2 km from the pumped bores the drawdowns will be less than 2 m. In this area the productive sandstone aquifers lie at 50 to 150 m below ground surface while standing water levels are 0 to 4 m below ground surface. Given the available drawdown exceeding 45 m, the operation of any other Leederville bores in the area will not be significantly affected.

In the Bassendean Sand, water levels are predicted to be reduced by between 0.05 and 0.10 m by the end of summer, in the area to the north and east of the bores (Fig. 15). In winter, drawdowns would be reduced by additional recharge. The average drawdown rate is calculated to be less than 0.013 m/yr. At about 3 to 4 km east of the bores there is predicted to be 0.2 m drawdown. This larger value is caused by the area being assigned higher vertical permeability values. The average drawdown rate here is calculated to be 0.025 m/yr.

In the Guildford Formation, drawdown values are predicted to be greater than those in the Bassendean Sand: up to 0.6 m in an area 4 km south-east of bore KL2P. The average rate of drawdown is calculated to be less than 0.075 m/yr.

#### **4.4 MODELLING OF MINING WATER-LEVEL EFFECTS**

##### **4.4.1 Mining Scenario**

After calibration, the model was run to simulate the following mining/dewatering scenario:

- (1) Mining will commence in autumn i.e. at the beginning of the wet season.
- (2) Eight mine blocks shown in Figure 9 will each be completely mined in successive years.
- (3) At any one time, the active mining area will be thirty hectares.
- (4) Tailings slurry from the mining concentrating operation will be placed into mined out areas of the block being mined, or an adjacent block.
- (5) Mine blocks will be bunded to prevent surface-water run-off to or from them, while ground-disturbance occurs.
- (6) Creeks and drains crossing the mine area will be bunded (to at least fifteen metres width each side) to contain water flow, but there will be sub-surface flow from creeks/drains to the shallow aquifer and excavations.
- (7) Water will drain from tailings, which will be forty-five percent solids by weight when discharged i.e. about seventy percent moisture. Water for the slurry will be obtained from recycled water plus deep groundwater, in dry months. In wet months there will be additional amounts obtained from rainfall and seepage inflow.
- (8) Water is pumped continuously at a rate of 1.8 GL/a from the two Leederville bores KL2 and KL3.

##### **4.4.2 Modelling Results**

The model was run for 28 periods representing seven of the eight years of planned mining. In the area to be mined in year eight, the Bassendean Sand is above the water table. For each year, two periods of 77 days each were assigned rainfall recharge and two periods of 106 days each were assigned no recharge.

Groundwater inflows to the mine blocks were calculated by simulating the 30 ha of active mining as a groundwater drain. The mined-out areas were simulated to be backfilled with tailings.

Drainage of water from tailings was simulated by allocating relevant areas in the 'General Head Boundary' package which simulates the hydraulic head imparted by the moisture-laden tailings. Generalised geometry was adopted, as the detailed shapes are not relevant to the scale of the current study.

Calculated water volumes and rates were presented in the 2006 report, and are not repeated herein.

### **Water Levels**

The calculated water-level changes in the Bassendean Sand (Layer 1) are shown in Figures 16 to 20 for selected locations of interest and stages of mining with respect to adjacent wetlands.

The results are summarised below:

- (1) Mining operations at Area A are calculated to not produce groundwater-level drawdown at the wetland to the south of it (Figs. 16 & 17).
- (2) Mining operations at Area B are calculated to effect drawdown of up to 0.2 m at the wetland to the south, based on the mine area originally proposed. If the mine perimeter is drawn back about 200 m to the north, there is indicated to be no drawdown at the wetland (Fig. 18).
- (3) Area C, near KWT2 and the nearly wetland, will be mined progressively and two mining blocks are here nominated C1 and C3. There is calculated to be up to 0.37 m drawdown at the eastern edge of the wetland (Figs. 19 & 20). Recovery proceeds after mining moves on from Area C3; the calculated residual drawdown at the edge of the wetland is 0.2 m after 77 days, and 0.04 m after 154 days.

### **Sensitivity Analysis**

Model parameters were varied within possible ranges to determine the effect on the groundwater-level drawdowns calculated at the wetland at KWT2. The results are given in Table 8.

The results indicate that the model is sensitive to the values of specific yield (SY) and horizontal hydraulic conductivity (K).

A lower rate of recharge and higher values of vertical hydraulic conductivity would mean that groundwater levels in Bassendean Sand in the area were only just above the planned mining

**Table 8: Results of Sensitivity Analysis**

| Parameter           | Original Value | New Value    | Calculated Drawdown (m) |
|---------------------|----------------|--------------|-------------------------|
| Calibrated Model    |                |              | 0.37                    |
|                     |                |              |                         |
| Recharge            | 0.00036 m/d    | 0.00028 m/d  | 0.05                    |
| Horizontal K L1     | 9              | 15           | 0.45                    |
| SY L1               | 0.1            | 0.05         | 0.49                    |
| SY L1               | 0.1            | 0.2          | 0.26                    |
| Vertical K L1 to L3 | 0.001 to 0.9   | 0.002 to 1.8 | 0.02                    |

level, and so mining would only result in very small drawdowns. Varying these two parameters affected the model calibration, and so their sensitivity cannot be tested.

## 5 CONCLUSIONS

A bore census was carried out, and where possible, details of bores tapping the Superficial formations and Leederville Formation were recorded.

Two production bores and three observation bores were constructed in the Leederville Formation. The production bores were test-pumped at 1,700 m<sup>3</sup>/d: the rate was limited only by the size of the available pump. The results indicate average hydraulic conductivities for the Formation of 2.8 and 3.1 m/d; and an average storage coefficient of 0.0003. Groundwater from the bores is fresh, of salinity 200 to 350 mg/L TDS.

A number of shallow monitoring bores were installed at two key wetlands that could be impacted by mining to:

- 1 Measure comparative water levels between deep and shallow aquifers;
- 2 Measure water levels near the wetlands; and
- 3 Allow hydraulic testing of the shallow aquifer.

Permeability tests were carried out in the bores, and data from the bores were used in constructing hydrogeological cross-sections through the wetlands. An analysis of the sections, the locations of which are given in Fig. 3, shows that:

### Section 1

On Section 1 the Bassendean Sand is unsaturated in summer/autumn, and there can be no discernible lowering of the summer water table at the wetland. If this area was mined in winter/spring, and the water table at the edge of the mining area was maintained at 30 m AHD, the water level could not be lowered below 30 m AHD at the edge of the wetlands. Given (1) the accumulation of surface water in the wetlands, (2) the low permeability of the

Guildford Formation, and (3) the 100 m distance from mine to wetland margin, negligible drawdown (if any) can be induced at the wetland.

Also, it is concluded that the wetland relies on surface water rather than groundwater.

## Section 2

Mining in the northern part of Section 2 will lower water levels at the mine edge to about 26 m AHD, which is about 1 m higher than the summer water level beneath the wetland. Thus, the wetland water table would not be affected by mining in the dry season. Lowering of water levels in the mining area to 26 m AHD in winter/spring would result in a very small groundwater flow, calculated to be less than 1 m<sup>3</sup>/d per 1,000 m of pit, from beneath the wetland towards the pit.

A numerical groundwater model was constructed and run to determine the impacts of pumping 1.8 GL/a from the Leederville Formation; and groundwater levels in the Superficial formations, particularly at the two wetlands that are close to areas planned for mining. The results indicate that:

- Beyond about 2 km from the Leederville production bores, drawdowns in the Leederville Formation will be less than 2 m. In this area the productive sandstone aquifers lie at 50 to 150 m below ground surface while standing water levels are 0 to 4 m below ground surface. Given the available drawdown exceeding 45 m, the operation of any other Leederville bores in the area will not be significantly affected.
- Pumping from the Leederville Formation is predicted to reduce groundwater levels in the Bassendean Sand by between 0.05 and 0.10 m in general (maximum 0.2 m) at the end of summer, in the area to the north and east of the bores. In winter, drawdowns would be reduced by additional recharge.
- Mining operations at Area A are calculated to not produce groundwater-level drawdown at the wetland to the south of it (at location of Cross-Section 1).
- Mining operations at Area B are calculated to effect drawdown of up to 0.2 m at the wetland to the south (also at location of Cross-Section 1), based on the mine area originally proposed. If the mine perimeter is drawn back about 200 m to the north, there is indicated to be no drawdown at the wetland.
- When Area C near KWT2 is mined there is calculated to be up to 0.37 m drawdown at the eastern edge of the wetland (at location of Cross-Section 2). Groundwater levels would recover after mining moves on from the area; the calculated residual drawdown at the edge of the wetland is 0.2 m after 77 days, and 0.04 m after 154 days.

**Dated:**                      **11 June 2007**                      **Rockwater Pty Ltd**

**J R Passmore**  
**Principal Hydrogeologist**

## **REFERENCES**

Davidson, W. A., 1995, Hydrogeology and groundwater resources of the Perth Region, Western Australia: Western Australian Geological Survey, Bulletin 142.

McDonald, M.G., and W.A. Harbaugh, 1988, MODFLOW, A Modular Three-Dimensional Finite-Difference Ground-Water Flow Model. U.S. Geological Survey, Washington, DC. (A:3980), open file report 83–875, Chapter A1.

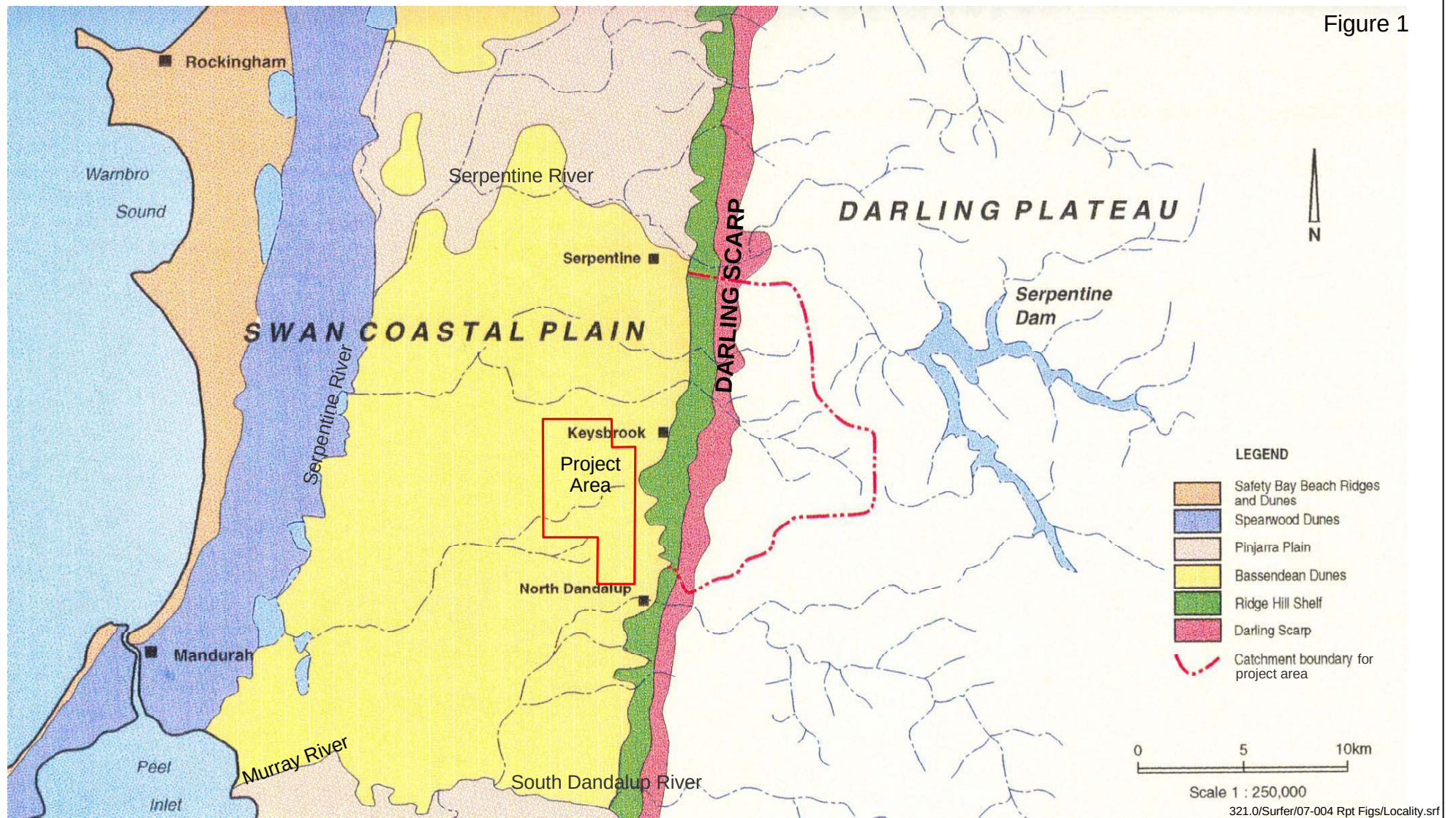
Rockwater, 2006, Keysbrook mineral sands project, hydrogeological assessment for dewatering and water supplies. Unpub. rept. to Olympia Resources Pty Ltd.

## FIGURES





Figure 1



CLIENT: Olympia Resources Pty Ltd

PROJECT: Keysbrook Mineral Sands Project

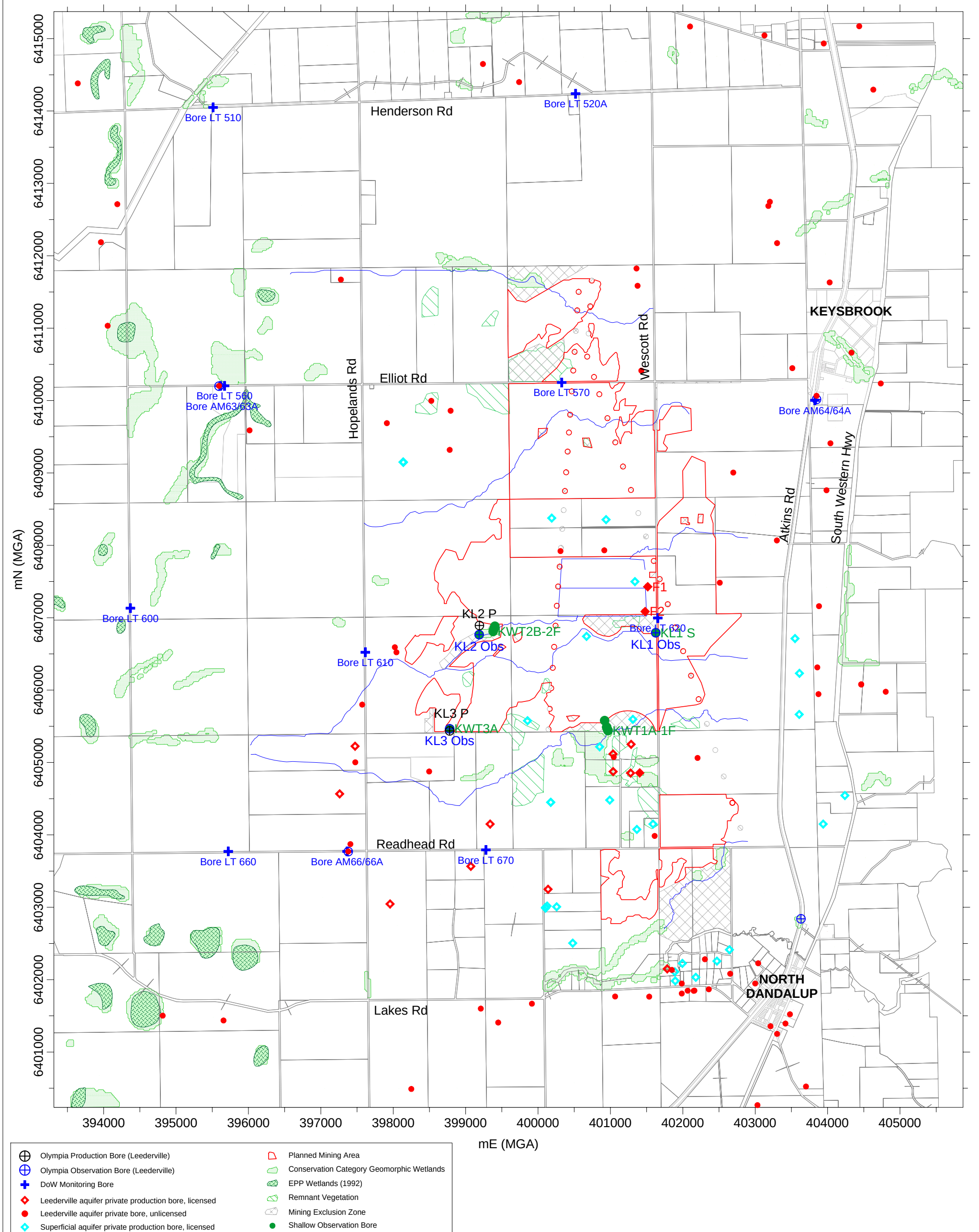
DATE: May 2007

Dwg No: 321.0/07/4-1

LOCALITY MAP



Figure 2



321.0/Surfer/07-004 Rpt Figs/Bore Locality Report.srf

CLIENT: Olympia Resources Pty Ltd

PROJECT: Keysbrook Mineral Sands Project

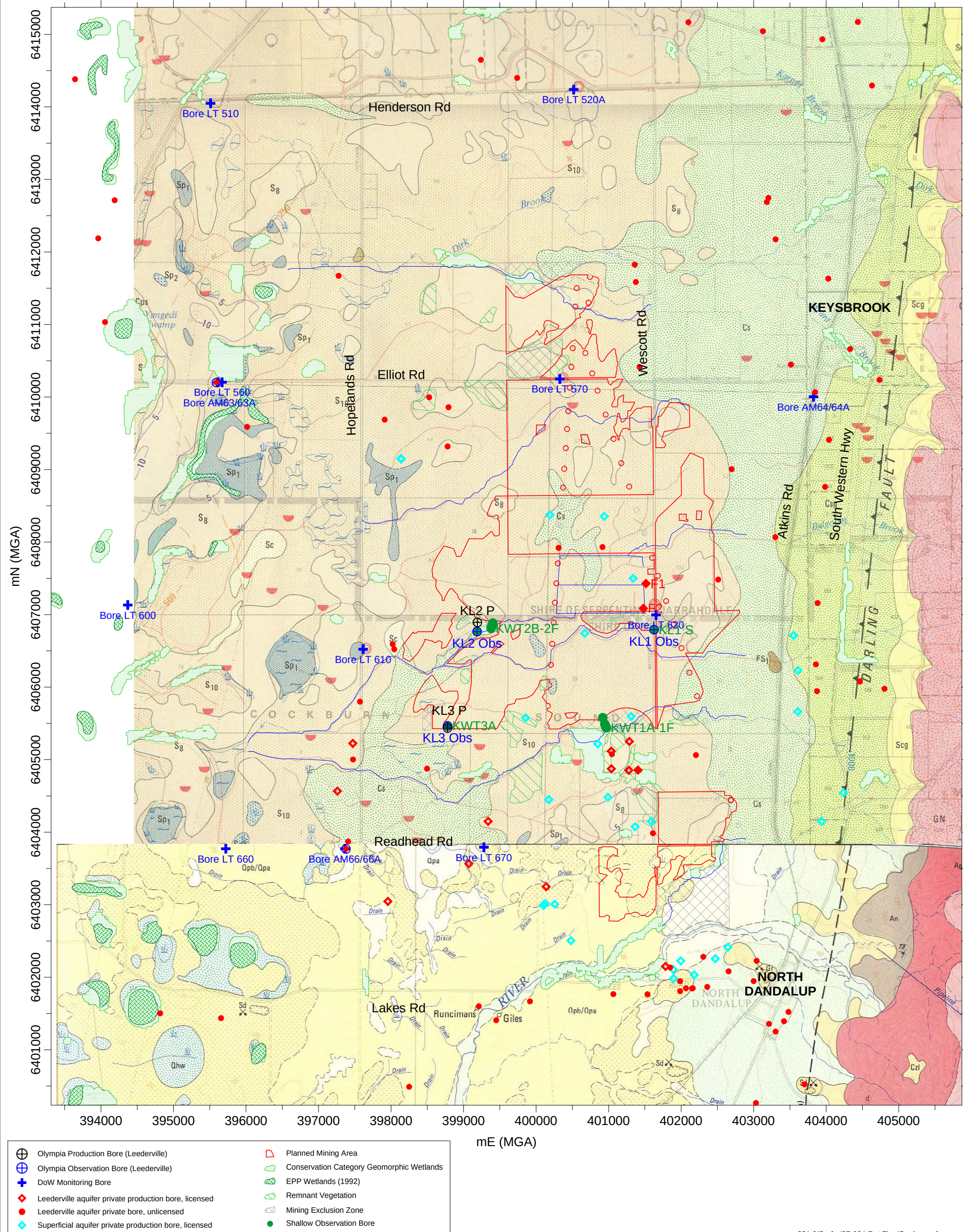
DATE: May 2007

Dwg No: 321.0/07/4-2

KEYSBROOK - NORTH DANDALUP  
LOCALITY MAP  
SHOWING PROPOSED MINING AREA



Figure 2A



321.0/Surfer/07-004 Rpt Figs/Geology.srf

CLIENT: Olympia Resources Pty Ltd

PROJECT: Keysbrook Mineral Sands Project

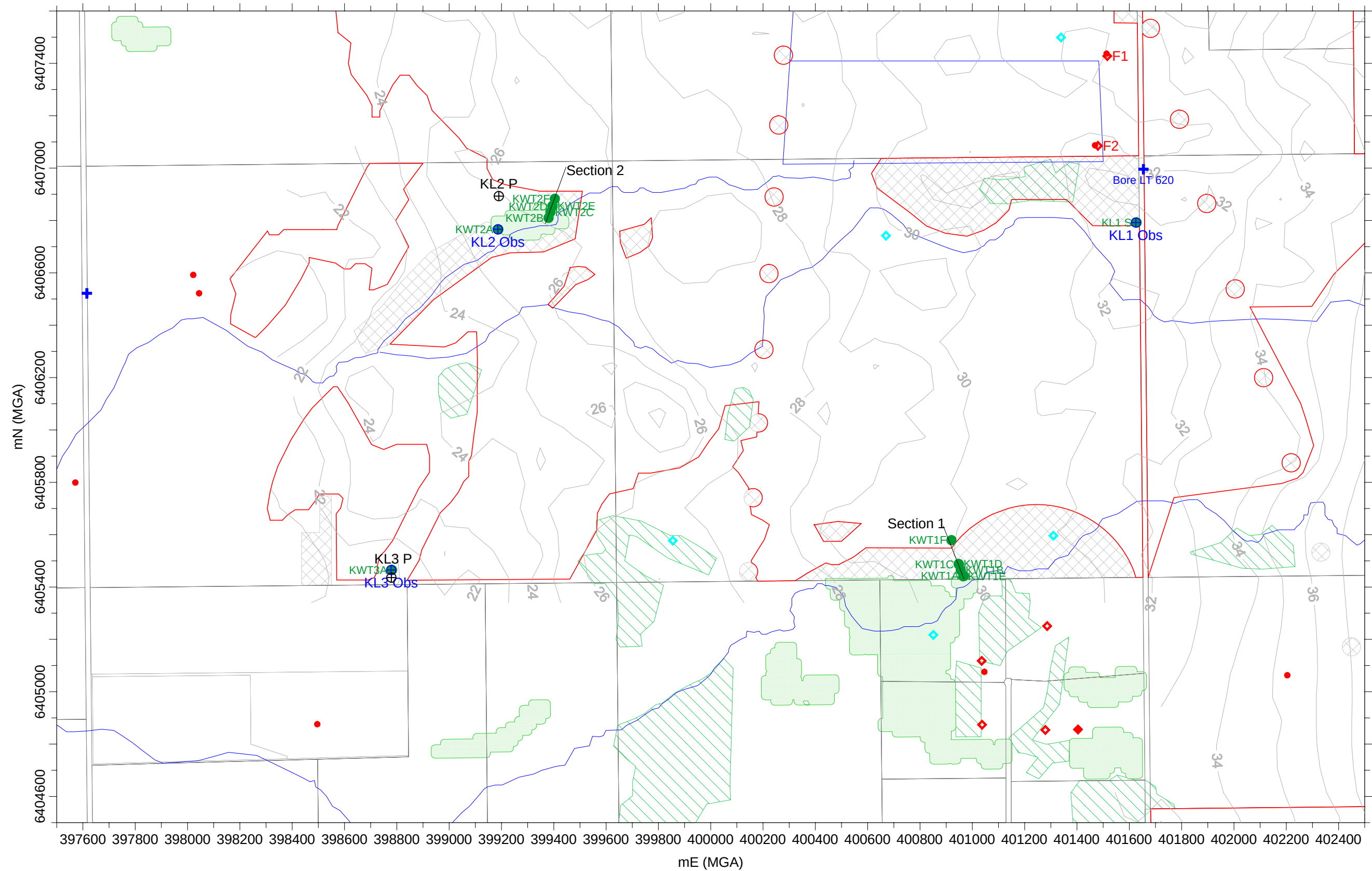
DATE: May 2007

Dwg No: 321.0/07/4-2A

KEYSBROOK - NORTH DANDALUP  
GEOLOGICAL MAP  
SHOWING PROPOSED MINING AREA



Figure 3



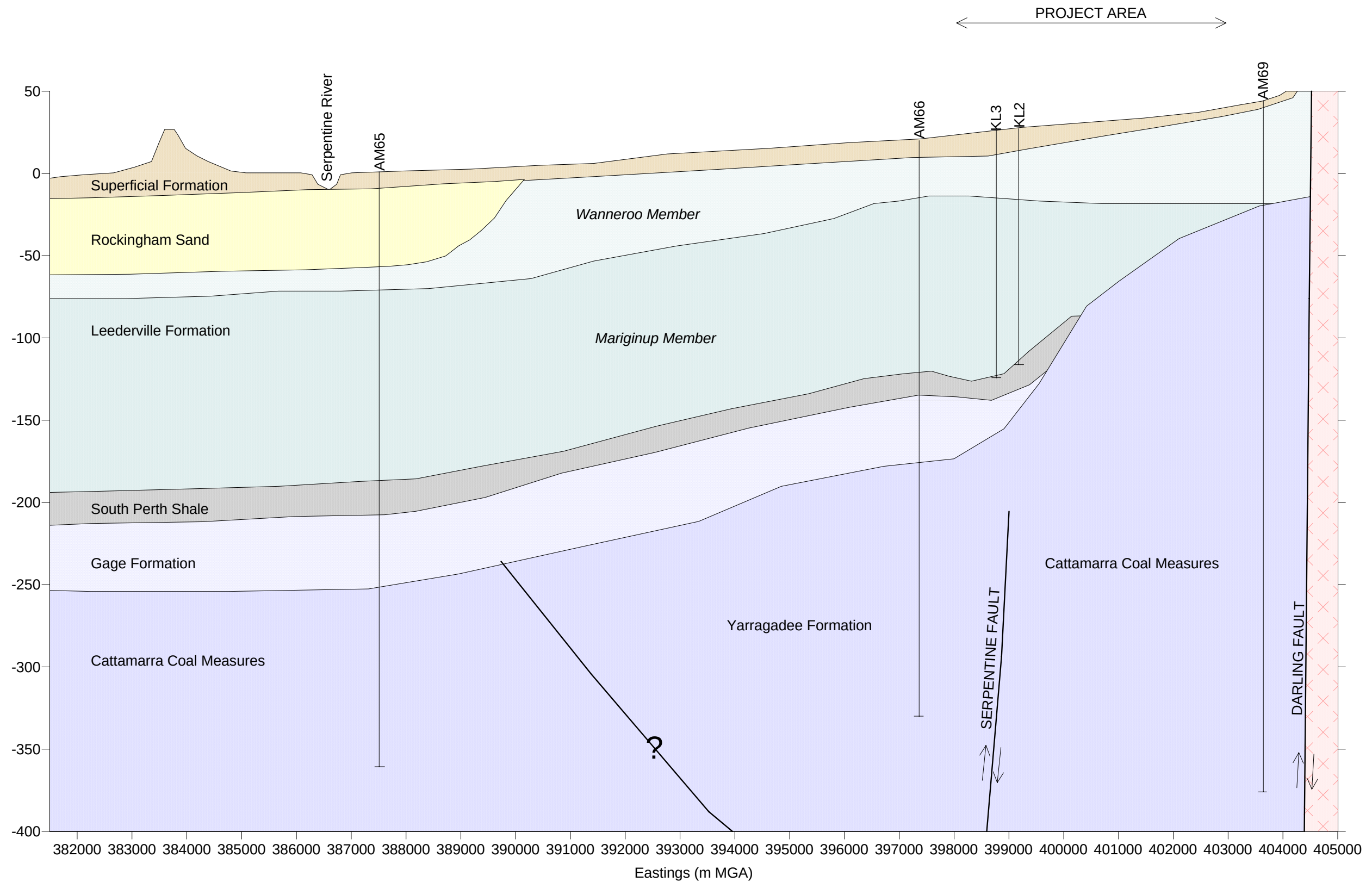
321.0/Surfer/07-004 Rpt Figs/Bore Locality Close-up.srf

CLIENT: Olympia Resources Pty Ltd  
PROJECT: Keysbrook Mineral Sands Project  
DATE: May 2007  
Dwg No: 321.0/07/4-3

- |                                                         |                                             |
|---------------------------------------------------------|---------------------------------------------|
| ⊕ Olympia Production Bore (Leederville)                 | ▭ Planned Mining Area                       |
| ⊕ Olympia Observation Bore (Leederville)                | ▭ Conservation Category Geomorphic Wetlands |
| ⊕ DoW Monitoring Bore                                   | ▭ EPP Wetlands (1992)                       |
| ◆ Leederville aquifer private production bore, licensed | ▭ Remnant Vegetation                        |
| ● Leederville aquifer private bore, unlicensed          | ▭ Mining Exclusion Zone                     |
| ◆ Superficial aquifer private production bore, licensed | ● Shallow Observation Bore                  |
| —26— Base of Bassendean Sand (m AHD)                    |                                             |

## LOCATIONS OF BORES NEAR WETLANDS

Figure 4



321.0/Surfer/07-004 Rpt Figs/Hydro Xsection.srf

CLIENT: Olympia Resources Pty Ltd  
PROJECT: Keysbrook Mineral Sands Project  
DATE: May 2007  
Dwg. No: 321.0/07/4-4

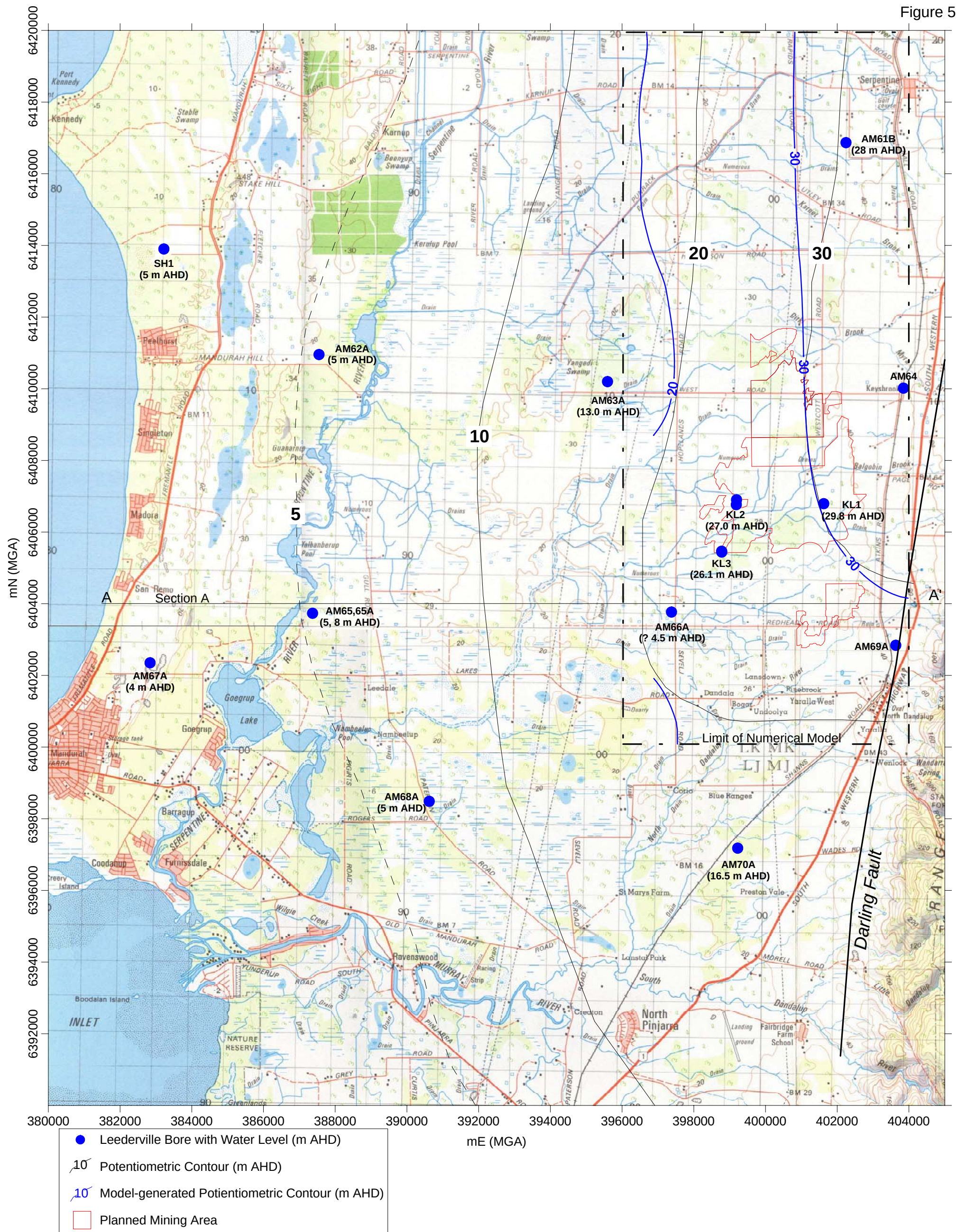
LEGEND

- |                                        |                             |
|----------------------------------------|-----------------------------|
| Superficial Aquifer                    | Yarragadee Aquifer          |
| Rockingham Sand Aquifer                | South Perth Shale Aquiclude |
| Leederville Aquifer                    |                             |
| Wanneroo Member                        |                             |
| Mariginup Member (showing clay layers) |                             |

DIAGRAMMATIC GEOLOGICAL  
CROSS SECTION



Figure 5



321.0/Surfer/07-004 Rpt Figs/Leederville Aquifer Flow System Modelled.srf

Modified after Davidson (1995)

CLIENT: Olympia Resources Pty Ltd

PROJECT: Keysbrook Mineral Sands Project

DATE: May 2007

Dwg No: 321.0/07/4-5

LEEDERVILLE AQUIFER WATER LEVELS  
MAY 2007



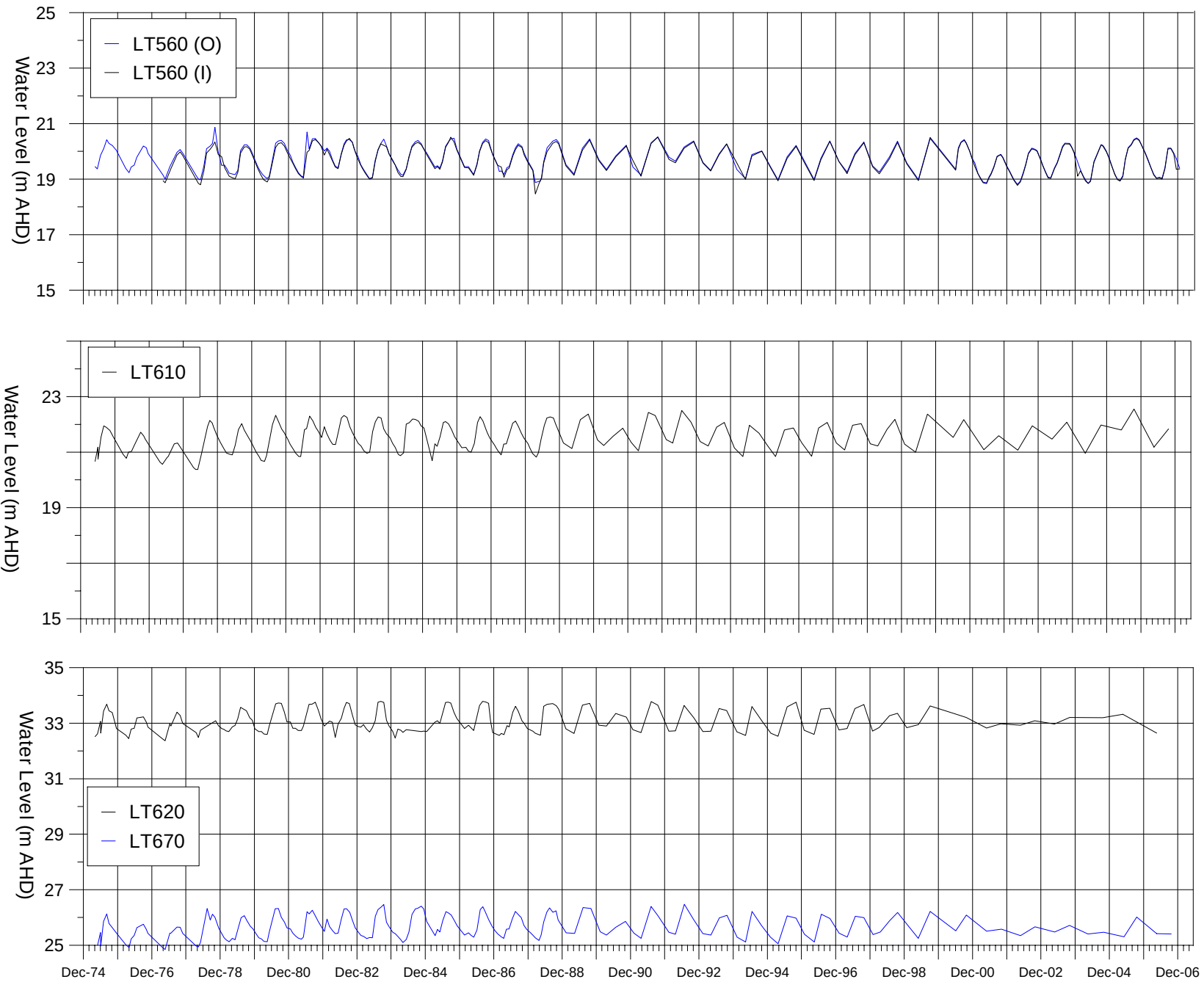


Figure 6

321.0/Grapher/07-004 Rpt FigsWML WLS.grf

Client: Olympia Resources Pty Ltd

Project : Keysbrook Mineral Sands Project

Date : May 2007

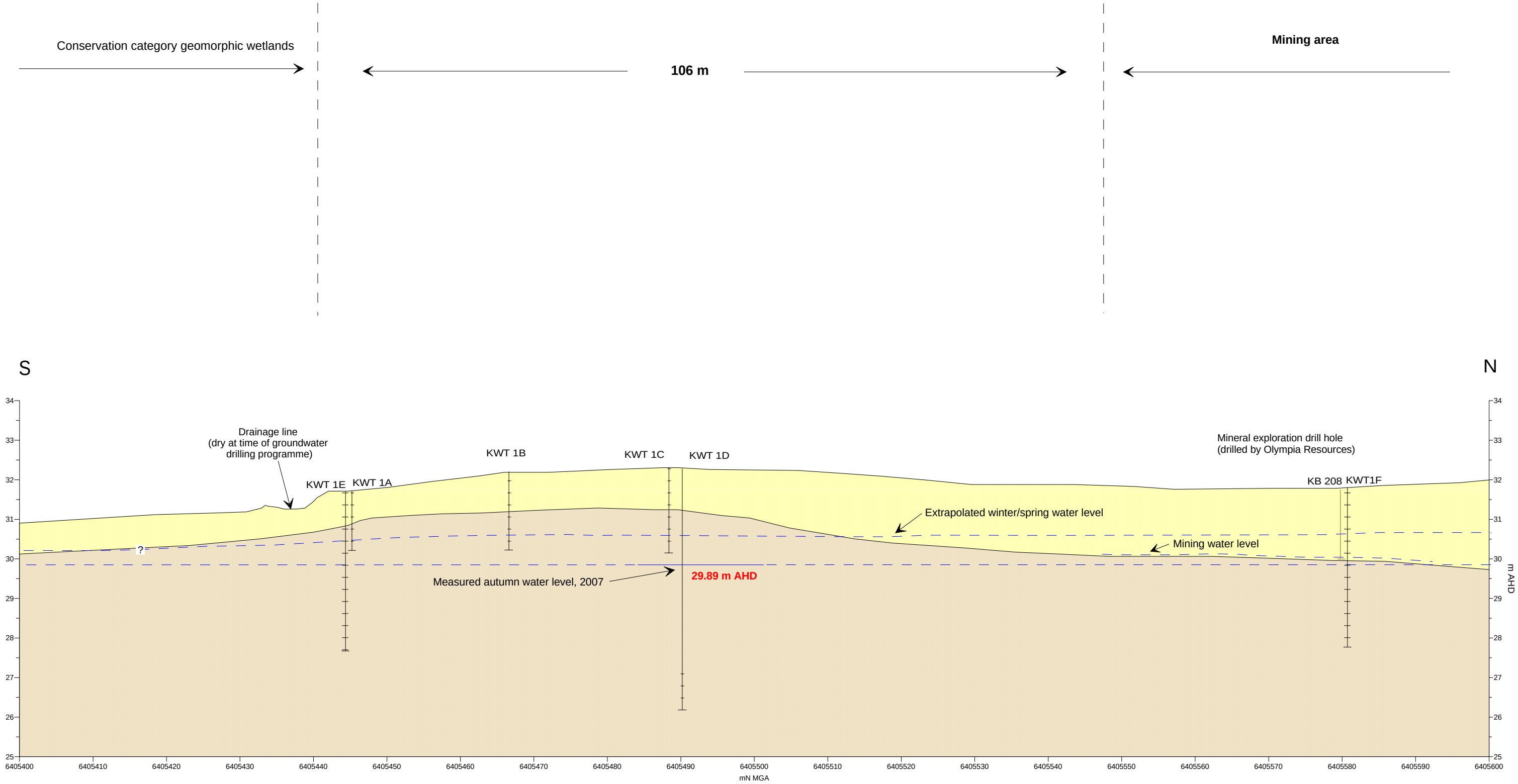
Dwg. No: 321.0/07/4-6

## DOW MONITORING SITES HYDROGRAPHS

BORES LT560, LT610, LT670 & LT620

Figure 7

Wetland Observation Bores, Section 1

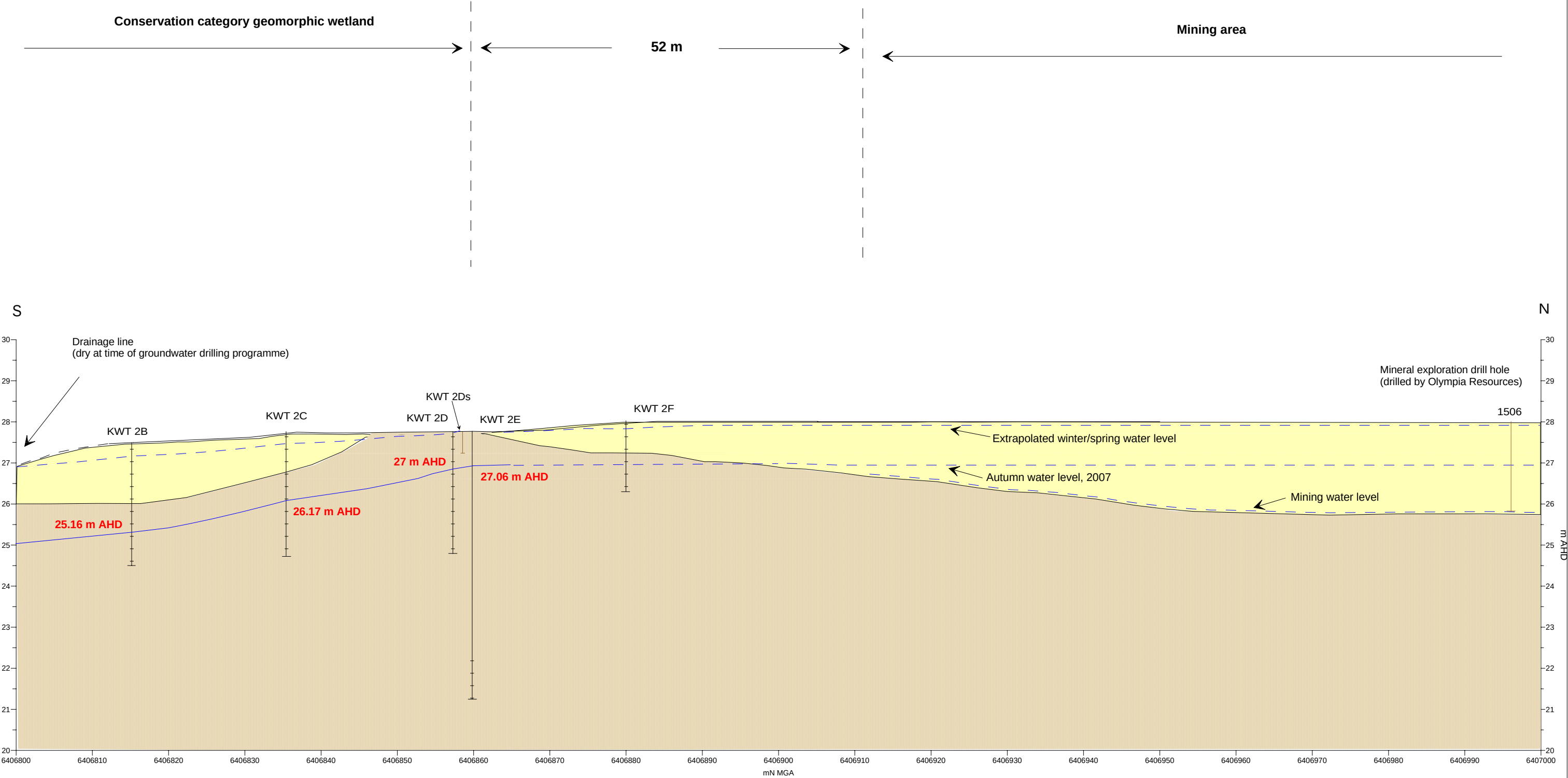


I: 321.0/Surfer/Wetlands X-section 400950E.srf

|                                   |                                 |                                                                                       |                                                 |                                                                   |  |
|-----------------------------------|---------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------|--|
| CLIENT: Olympia Resources Pty Ltd |                                 | <b>LEGEND</b>                                                                         |                                                 | SECTION 1<br>WETLAND OBSERVATION BORES<br>CROSS SECTION 400,950 E |  |
| PROJECT:                          | Keysbrook Mineral Sands Project |    | Bassendean Sand                                 |                                                                   |  |
| DATE:                             | May 2007                        |    | Guildford Formation (clayey sand to sandy clay) |                                                                   |  |
| Dwg. No:                          | 321.0/07/4-7                    |   | 27.0 m AHD Water level (16/5/2007)              |                                                                   |  |
|                                   |                                 |  | Hole uncased                                    |                                                                   |  |
|                                   |                                 |  | Hole cased, blank                               |                                                                   |  |
|                                   |                                 |  | Hole cased, slotted                             |                                                                   |  |



Wetland Observation Bores, Section 2



I: 321.0/Surfer/Wetlands X-section 399400E.srf

CLIENT: Olympia Resources Pty Ltd  
PROJECT: Keysbrook Mineral Sands Project  
DATE: May 2007  
Dwg. No: 321.0/07/4-8

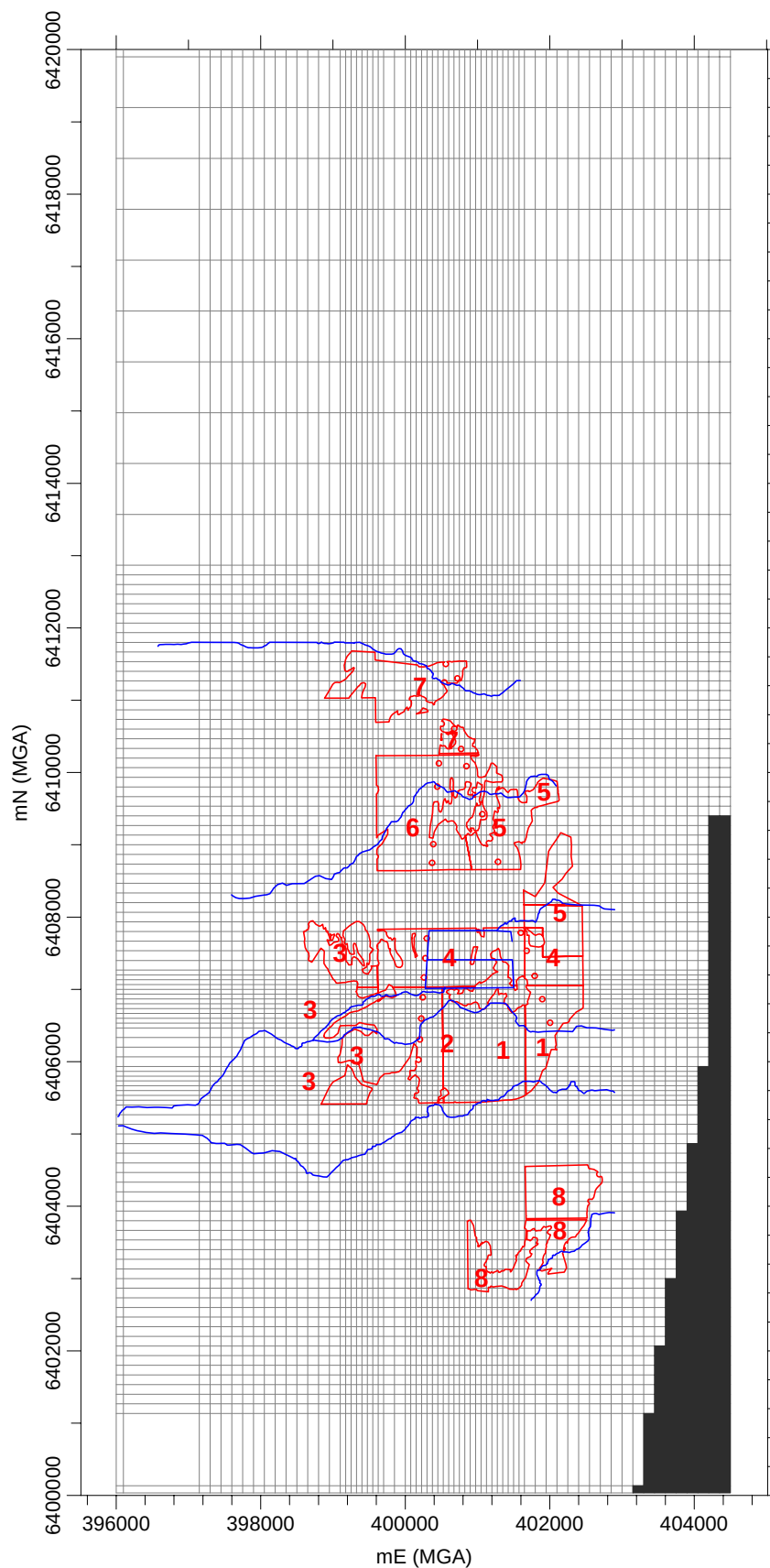
**LEGEND**

|  |                                                 |
|--|-------------------------------------------------|
|  | Bassendean Sand                                 |
|  | Guildford Formation (clayey sand to sandy clay) |
|  | Water level (16/5/2007)                         |

|  |                     |
|--|---------------------|
|  | Hole uncased        |
|  | Hole cased, blank   |
|  | Hole cased, slotted |

SECTION 2  
WETLAND OBSERVATION BORES  
CROSS SECTION 399,400 E

Figure 9

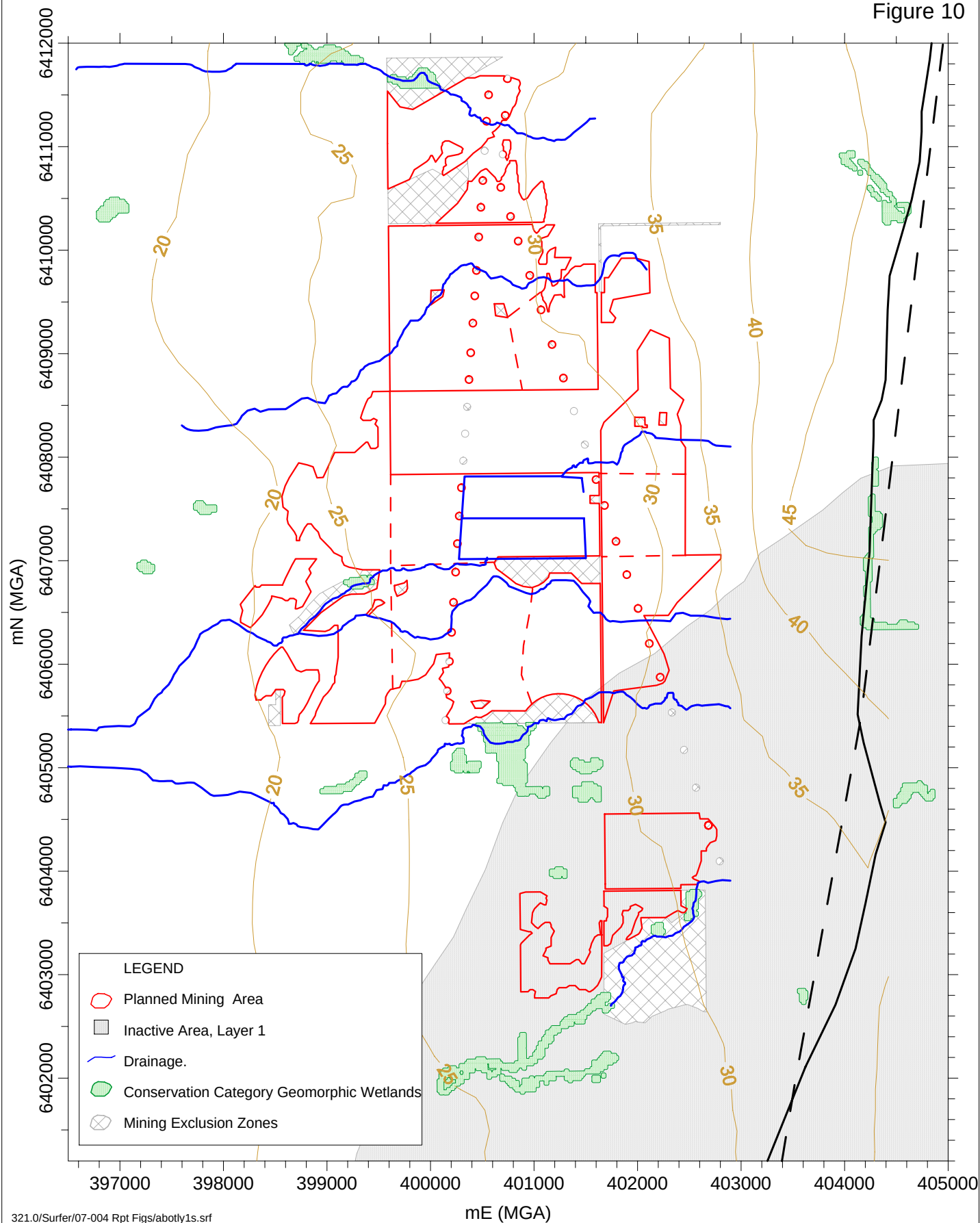


321.0/Surfer/07-004 Rpt Figs/Model Grid.srf

CLIENT: Olympia Resources Pty Ltd  
 PROJECT: Keysbrook Mineral Sands Project  
 DATE: June 2007  
 Dwg No: 321.0/07/4-9

## MODEL GRID AND PLANNED MINING BLOCKS

Figure 10

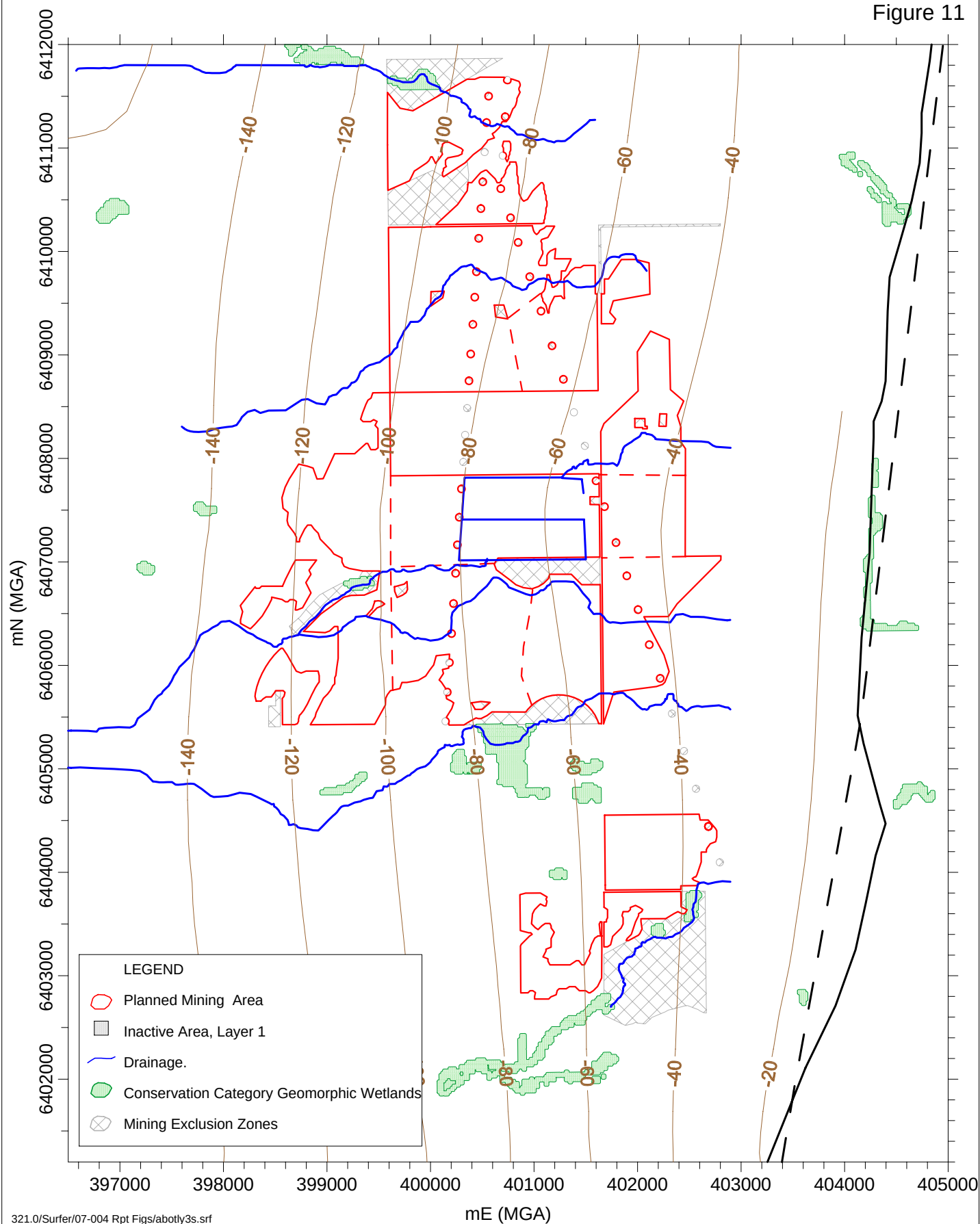


321.0/Surfer/07-004 Rpt Figs/abotly1s.srf

CLIENT: Olympia Resources Pty Ltd  
 PROJECT: Keysbrook Mineral Sands Project  
 DATE: May 2007  
 Dwg No: 321.0/07/4-10

BASE OF LAYER 1  
 (BASSENDEAN SAND)  
 IN MODEL (m AHD)

Figure 11

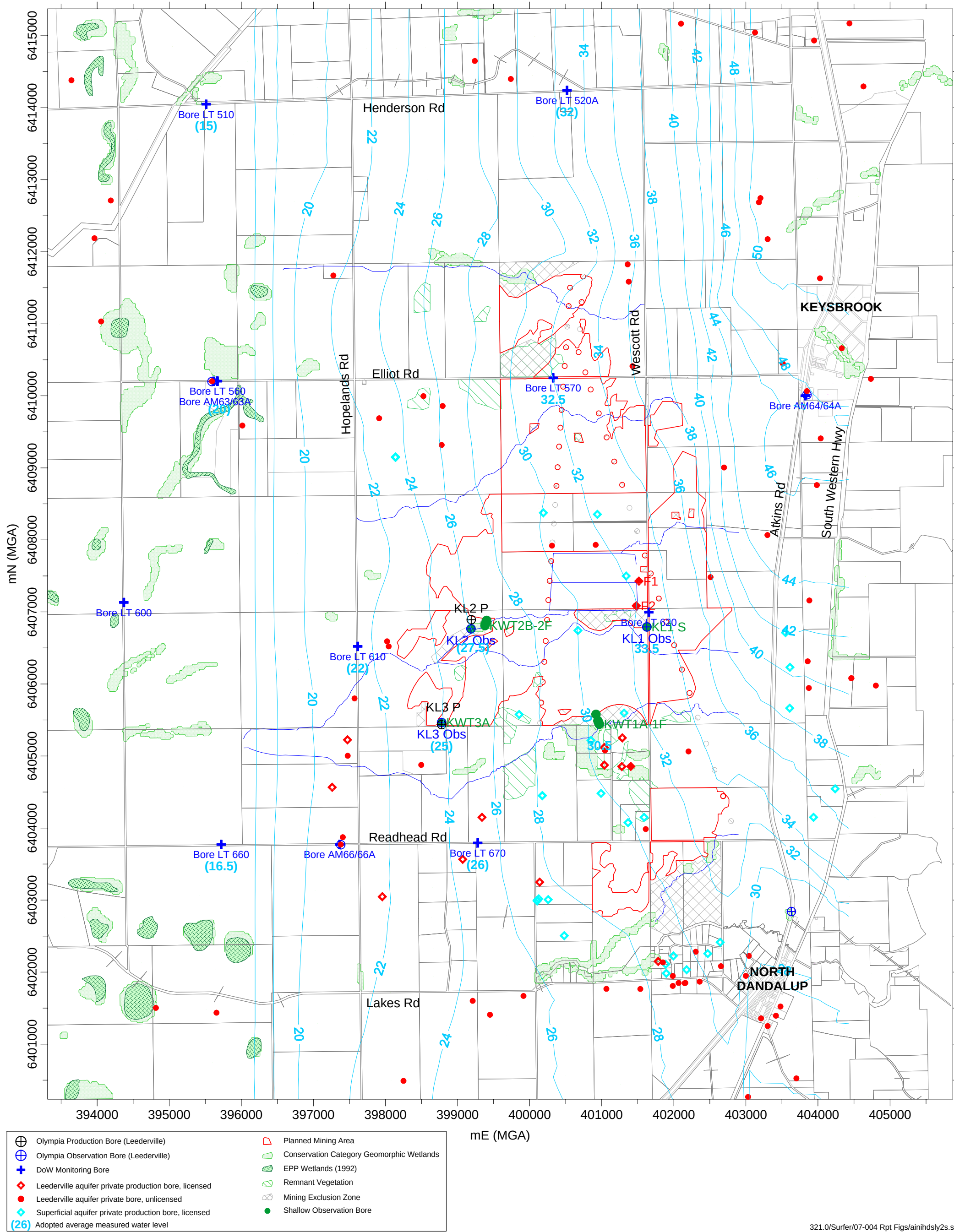


321.0/Surfer/07-004 Rpt Figs/abotly3s.srf

CLIENT: Olympia Resources Pty Ltd  
 PROJECT: Keysbrook Mineral Sands Project  
 DATE: May 2007  
 Dwg No: 321.0/07/4-11

BASE OF LAYER 3  
 (LEEDERVILLE AQUIFER)  
 IN MODEL (m AHD)

Figure 12



CLIENT: Olympia Resources Pty Ltd

PROJECT: Keysbrook Mineral Sands Project

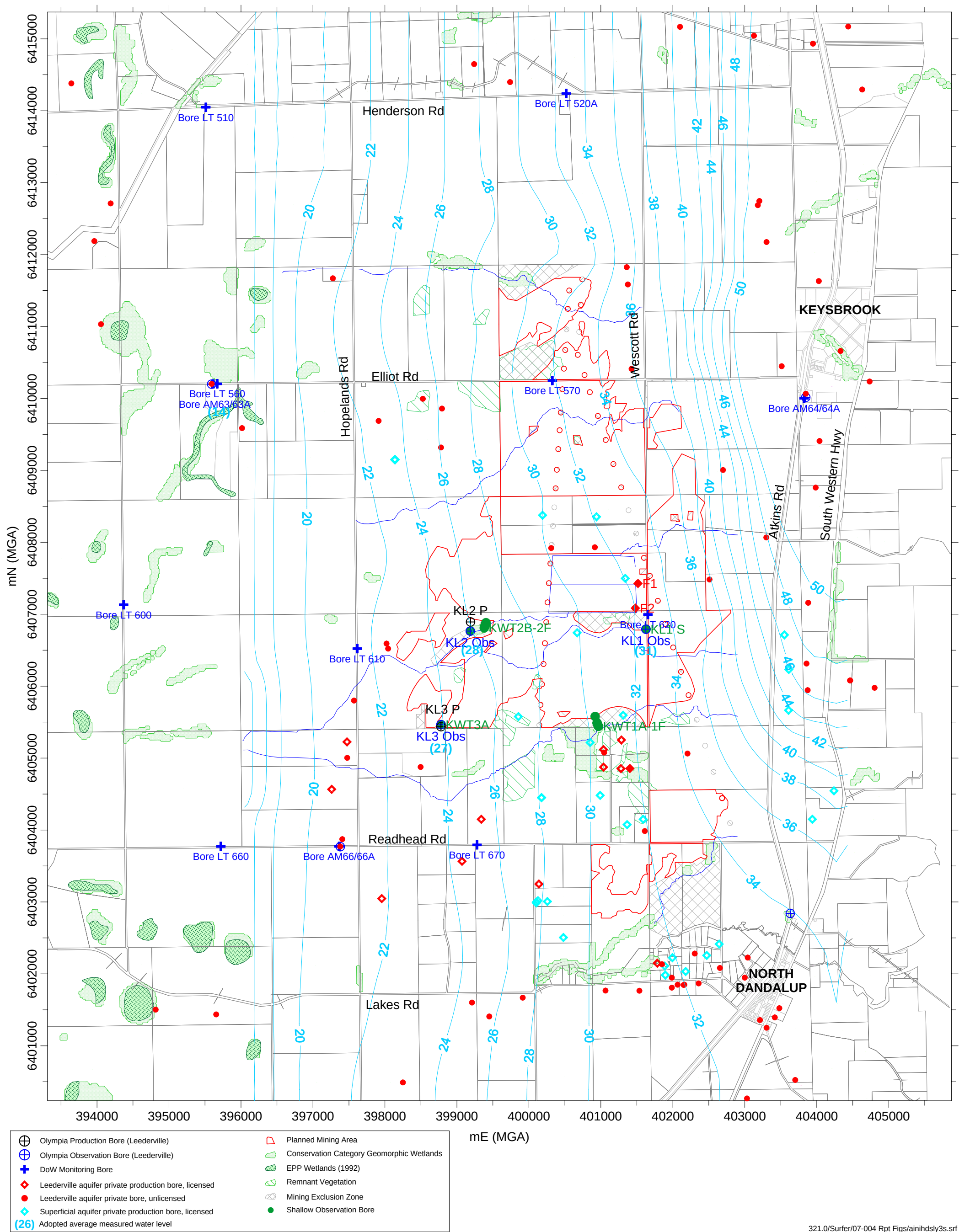
DATE: June 2007

Dwg No: 321.0/07/4-12

MODEL-CALCULATED INITIAL WATER LEVELS  
IN BASSENDEIAN SAND



Figure 13

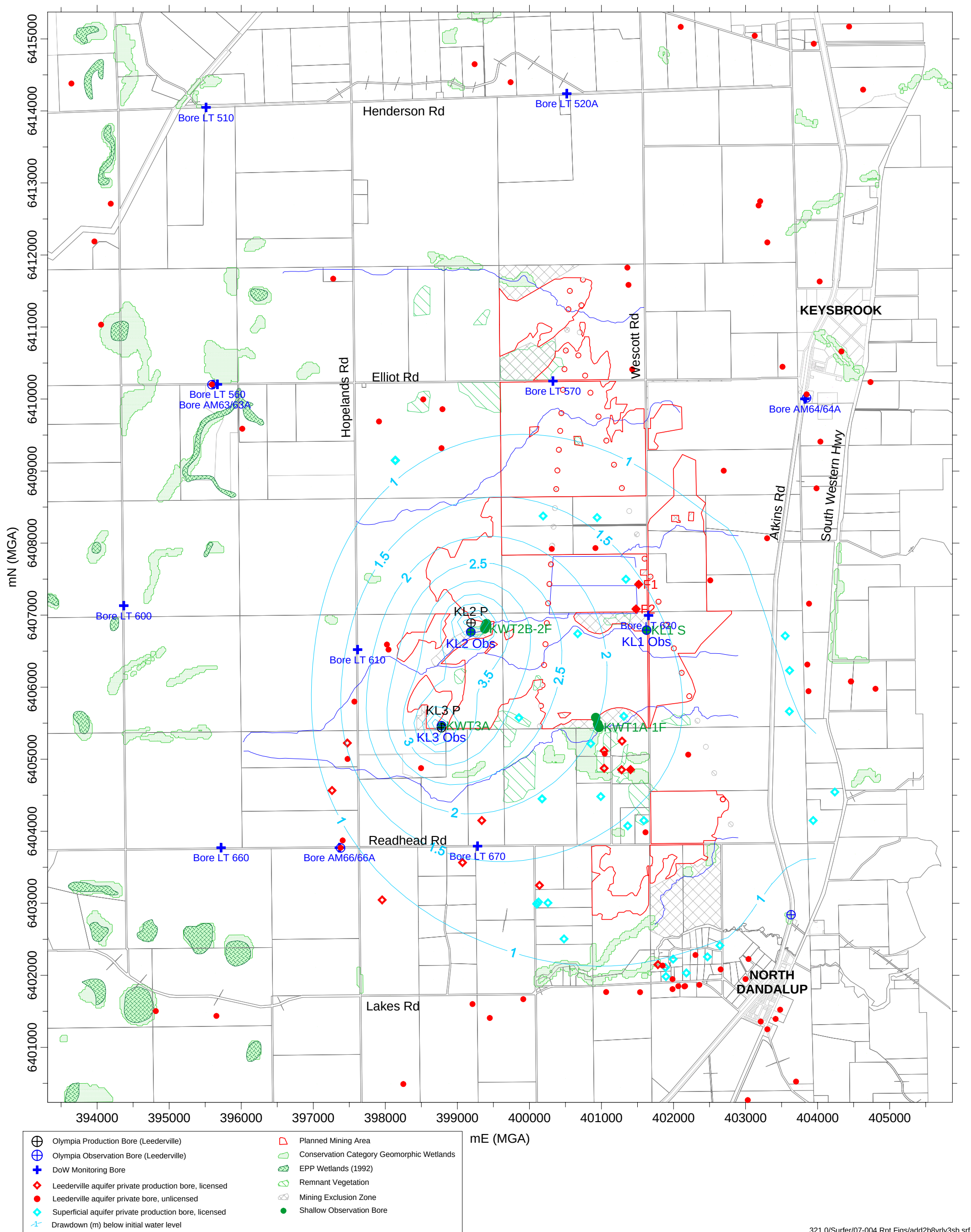


321.0/Surfer/07-004 Rpt Figs/ainihdsly3s.srf

CLIENT: Olympia Resources Pty Ltd  
PROJECT: Keysbrook Mineral Sands Project  
DATE: June 2007  
Dwg No: 321.0/07/4-13

MODEL-CALCULATED INITIAL WATER LEVELS  
IN LEEDERVILLE AQUIFER

Figure 14



321.0/Surfer/07-004 Rpt Figs/add2b8yrlly3sb.srf

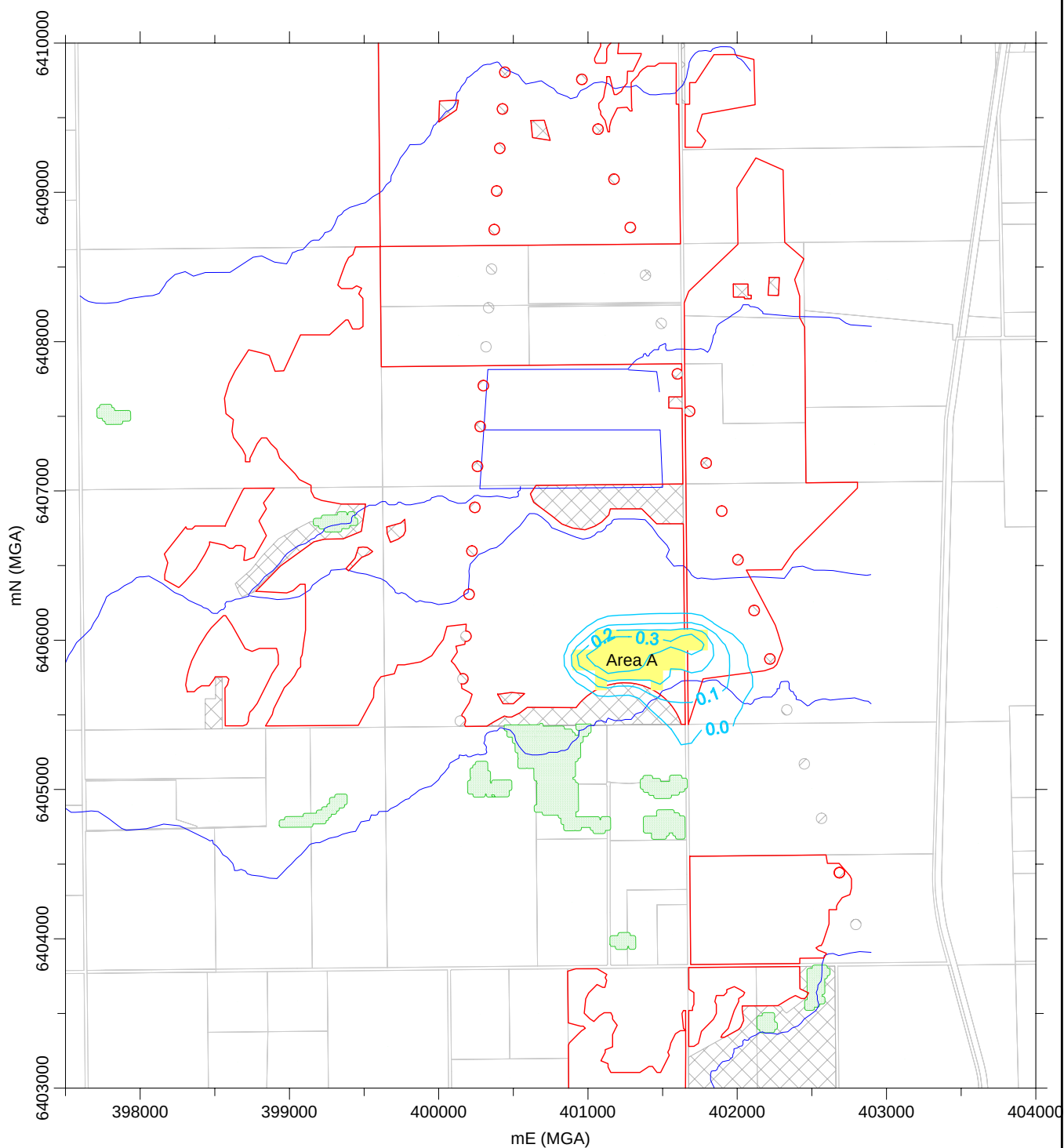
CLIENT: Olympia Resources Pty Ltd  
PROJECT: Keysbrook Mineral Sands Project  
DATE: June 2007  
Dwg No: 321.0/07/4-14

MODEL-CALCULATED DRAWDOWN  
IN LEEDERVILLE AQUIFER:  
8 YEARS PUMPING 1.8 GL/A FROM TWO BORES





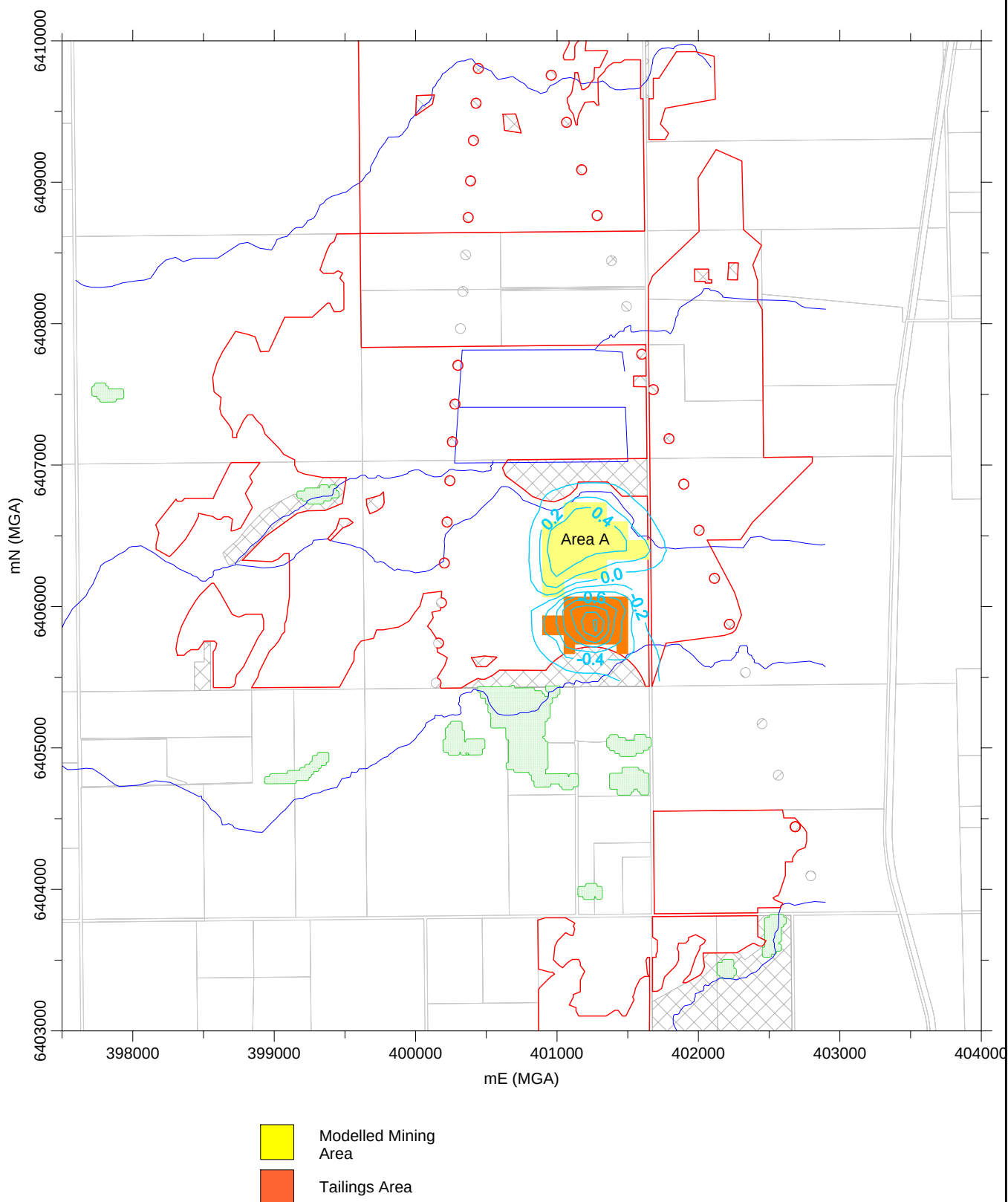




sp1dds.srf

CLIENT: Olympia Resources Pty Ltd  
 PROJECT: Keysbrook Mineral Sand Project  
 DATE: June 2007  
 Dwg No: 321.0/07/4-16

MODEL-CALCULATED DRAWDOWNS (m) AFTER  
 77 DAYS (COMPLETION) OF MINING IN AREA A

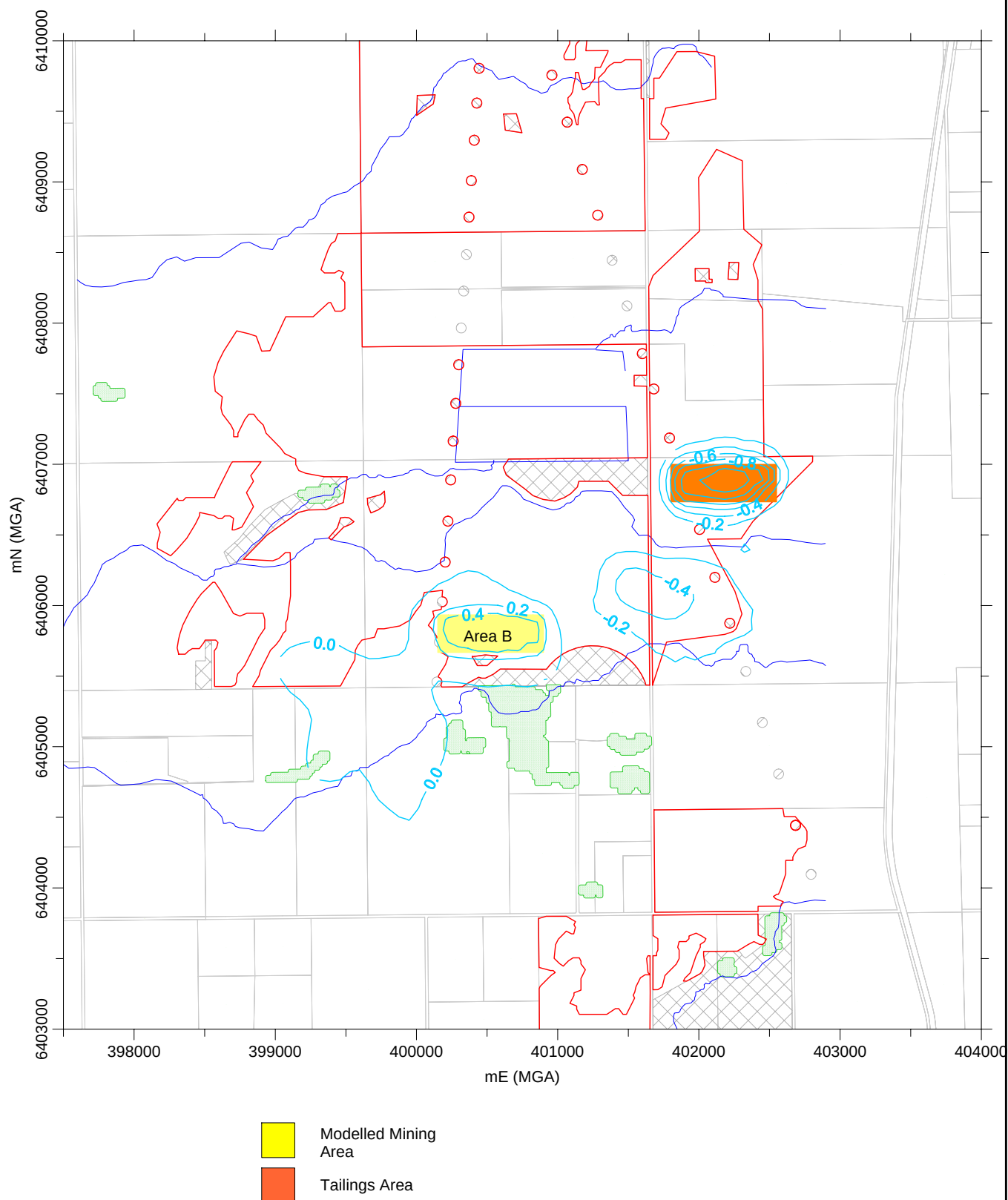


(Negative Value Denotes Water-Level Rise)

sp2dds.srf

CLIENT: Olympia Resources Pty Ltd  
 PROJECT: Keysbrook Mineral Sand Project  
 DATE: June 2007  
 Dwg No: 321.0/07/4-17

MODEL-CALCULATED DRAWDOWNS (m) AFTER  
 154 DAYS OF MINING IN AREA A

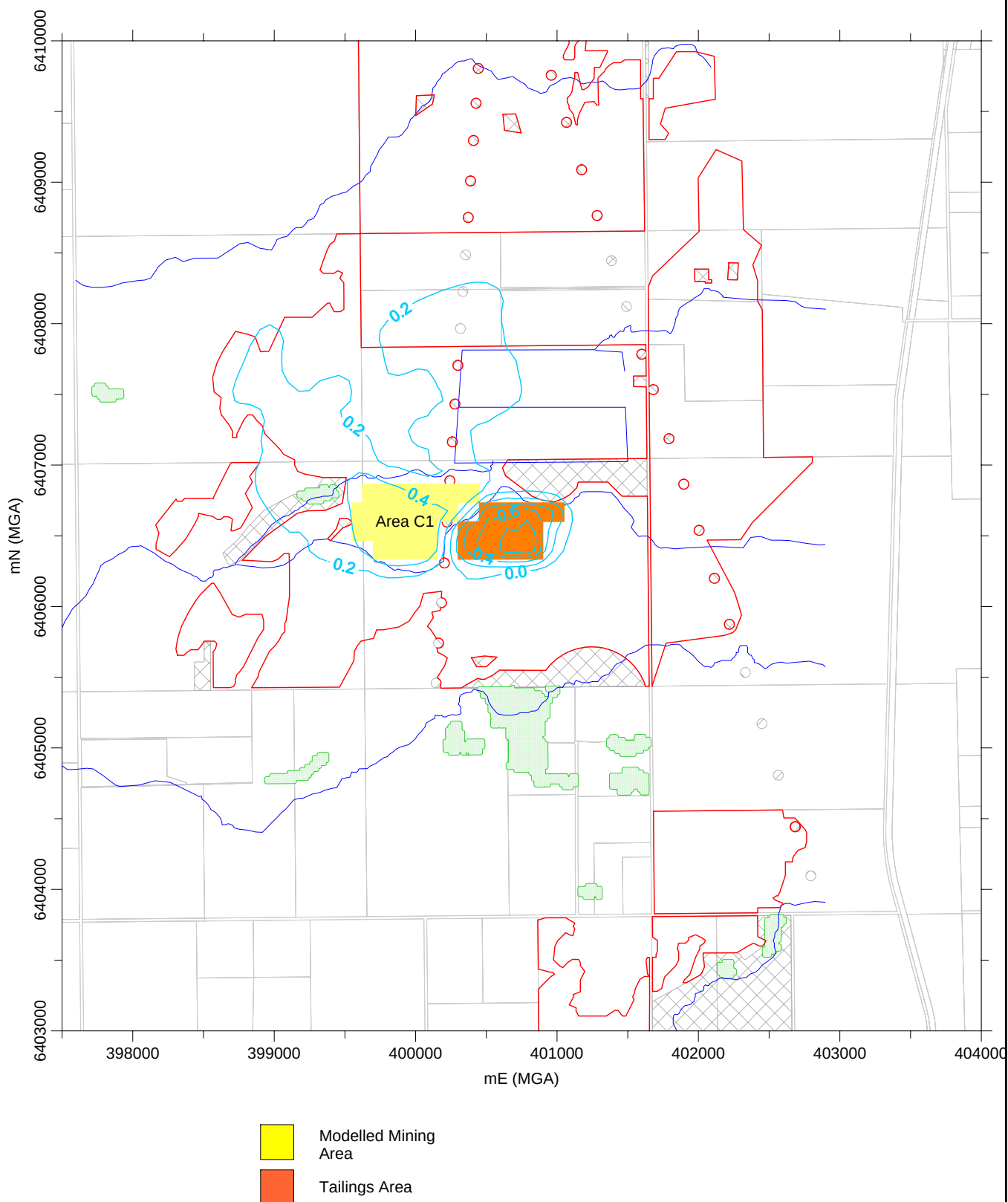


(Negative Value Denotes Water-Level Rise)

sp5dds.srf

CLIENT: Olympia Resources Pty Ltd  
 PROJECT: Keysbrook Mineral Sand Project  
 DATE: June 2007  
 Dwg No: 321.0/07/4-18

MODEL-CALCULATED DRAWDOWNS (m) AFTER  
 443 DAYS, AND END OF MINING IN AREA B

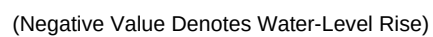


(Negative Value Denotes Water-Level Rise)

sp8dds.srf

CLIENT: Olympia Resources Pty Ltd  
 PROJECT: Keysbrook Mineral Sand Project  
 DATE: June 2007  
 Dwg No: 321.0/07/4-19

MODEL-CALCULATED DRAWDOWNS (m) AFTER  
 732 DAYS, AND END OF MINING IN AREA C1



CLIENT: Olympia Resources Pty Ltd  
PROJECT: Keysbrook Mineral Sand Project  
DATE: June 2007  
Dwg No: 321.0/07/4-20

MODEL-CALCULATED DRAWDOWNS (m) AFTER  
992 DAYS, AND END OF MINING IN AREA C3

## **APPENDIX I**



## APPENDIX I

A census of bores in the vicinity of Keysbrook-North Dandalup was carried out in February 2007 by Rockwater, on behalf of Olympia Resources. Landholders were asked if they wished to volunteer information on groundwater drawing points on their land. Information collected included the type of installation, location, total depth and depth to water. Where possible, it was determined whether water was sourced from the Superficial or Leederville Aquifers. Additional information was collected in May 2007. In some cases where access was not obtained and groundwater sources were visible from the road, some information was gained on location and type of installation. Results are summarised visually in Figure AI-1. Table AI-1 summarises the properties visited, whether access was granted or not and gives a summary of data. Table AI-2 gives further details of type, location, depth, depth to water, and the aquifer. Water draw-point locations from the DoW WIN database are included in Figure AI-1 for comparison with the locations determined in the census.



**Table AI-1:**

| Lot                         | Access Granted | Bores | Soaks/Dams | Wells | Nothing | No-one on Premises |
|-----------------------------|----------------|-------|------------|-------|---------|--------------------|
| <b>South of Readhead Rd</b> |                |       |            |       |         |                    |
| Brian Bowman                | ✓              |       | 1          | 1     |         | ✓                  |
| Lot A40                     |                |       | 1          | 1     |         | ✓                  |
| Lot A44                     |                |       |            |       |         | ✓                  |
| Lot A48                     |                |       |            | 1     |         | ✓                  |
| Lot B38                     |                |       |            |       |         | ✓                  |
| Lot ?? Peter                | ✓              | 1     |            |       |         |                    |
| Lot ?? SW H-Way             | ✓              |       |            | 1     |         |                    |
| Lot 0                       |                |       |            |       |         | ✓                  |
| Lot 1                       | ✓              |       |            |       | ✓       |                    |
| Lot 1 Hopeland Rd           |                |       |            |       |         | ✓                  |
| Lot 1 SW H-Way              | ✓              | 2     |            |       |         |                    |
| Lot 2                       |                |       |            |       |         | ✓                  |
| Lot 2                       |                |       |            |       |         | ✓                  |
| Lot 2 Hopeland Rd           |                |       |            |       |         | ✓                  |
| Lot 5                       |                |       | 1          |       |         | ✓                  |
| Lot 6                       |                |       |            |       |         | ✓                  |
| Lot 7                       |                |       |            |       |         | ✓                  |
| Lot 9                       |                |       |            |       |         | ✓                  |
| Lot 10                      |                |       |            |       |         | ✓                  |
| Lot 11                      |                |       |            |       |         | ✓                  |
| Lot 11                      | ✓              | 1     |            |       |         |                    |
| Lot 12                      |                |       |            |       |         | ✓                  |
| Lot 14                      |                |       |            |       |         | ✓                  |
| Lot 15                      | ✓              | 1     | 1          | 1     |         |                    |
| Lot 15 Lakes Road           | ✓              | 1     |            |       |         |                    |
| Lot 16                      |                |       | 1          |       |         | ✓                  |
| Lot 17                      |                |       |            |       |         | ✓                  |
| Lot 19                      | ✓              |       |            | 1     |         |                    |
| Lot 20                      |                |       |            |       |         | ✓                  |
| Lot 20 Dennis Corteen       | ✓              | 1     |            |       |         |                    |
| Lot 32                      |                |       |            |       |         | ✓                  |
| Lot 33                      | ✓              | 1     |            |       |         |                    |
| Lot 33 Robert Gheng         | ✓              | 1     |            |       |         |                    |
| Lot 34                      |                |       |            |       |         | ✓                  |
| Lot 35                      |                |       |            |       |         | ✓                  |
| Lot 36                      |                |       |            |       |         | ✓                  |
| Lot 38                      | ✓              | 1     |            |       |         |                    |
| Lot 39                      |                |       |            |       |         | ✓                  |
| Lot 39                      | ✓              | 1     |            |       |         |                    |
| Lot 40                      |                |       |            |       |         | ✓                  |
| Lot 41                      |                |       |            |       |         | ✓                  |
| Lot 41                      | ✓              |       |            | 1     |         |                    |
| Lot 42                      |                |       |            |       |         | ✓                  |
| Lot 42                      | ✓              |       |            | 1     |         |                    |
| Lot 43                      |                |       |            |       |         | ✓                  |
| Lot 4338                    |                |       |            |       |         | ✓                  |
| Lot 45                      |                |       |            |       |         | ✓                  |
| Lot 46                      |                |       |            |       |         | ✓                  |
| Lot 48                      |                |       |            |       |         | ✓                  |
| Lot 50 Atkins Road          | ✓              | 1     | 2          |       |         |                    |
| Lot 52                      |                |       |            |       |         | ✓                  |
| Lot 55                      | ✓              |       | 1          |       |         |                    |
| Lot 56                      |                |       |            |       |         | ✓                  |
| Lot 57                      |                |       |            |       |         | ✓                  |
| Lot 57                      | ✓              |       |            | 1     |         |                    |
| Lot 59                      |                |       |            |       |         | ✓                  |
| Lot 60                      | ✓              |       |            |       | ✓       |                    |
| Lot 62                      |                |       |            |       |         | ✓                  |
| Lot 63                      |                |       |            |       |         | ✓                  |
| Lot 65                      |                |       |            |       |         | ✓                  |





| Lot                         | Access Granted | Bores | Soaks/Dams | Wells | Nothing | No-one on Premises |
|-----------------------------|----------------|-------|------------|-------|---------|--------------------|
| Lot 67                      | ✓              |       |            |       | ✓       |                    |
| Lot 67                      | ✓              | 1     |            |       |         |                    |
| Lot 69                      | ✓              | 1     |            |       |         |                    |
| Lot 71                      |                |       |            | 1     |         | ✓                  |
| Lot 84                      | ✓              |       |            | 1     |         |                    |
| Lot 85                      | ✓              |       |            |       | ✓       |                    |
| Lot 100                     | ✓              | 1     |            |       |         |                    |
| Lot 104                     |                |       |            |       |         | ✓                  |
| Lot 105                     | ✓              |       |            |       | ✓       |                    |
| Lot 112                     | ✓              | 1     |            |       |         |                    |
| Lot 200                     | Refused        |       |            |       |         |                    |
| Lot 206                     |                |       |            |       |         | ✓                  |
| Lot 211                     |                |       |            |       |         | ✓                  |
| Lot 212                     |                |       |            |       |         | ✓                  |
| Lot 507                     |                |       |            |       |         | ✓                  |
| <b>North of Readhead Rd</b> |                |       |            |       |         |                    |
| Lot ?? Ambrosa              | ✓              |       |            | 1     |         |                    |
| Lot ?? Donna McCarthy       | ✓              | 1     |            |       |         |                    |
| Lot 1                       | ✓              |       | 3          | 1     |         |                    |
| Lot 1                       | ✓              | 2     |            |       |         |                    |
| Lot 1, Elliot Rd            |                |       |            |       |         | ✓                  |
| Lot 3-6                     | ✓              |       | 1          |       |         |                    |
| Lot 4                       | ✓              |       |            | 1     |         |                    |
| Lot 6-278                   | ✓              |       | 1          |       |         |                    |
| Lot 8                       | ✓              | 1     |            | 1     |         |                    |
| Lot 12                      | ✓              | 1     | 1          |       |         |                    |
| Lot 41                      | ✓              | 1     |            |       |         |                    |
| Lot 44                      | ✓              | 1     |            |       |         |                    |
| Lot 52                      | ✓              | 2     |            |       |         |                    |
| Lot 52                      |                |       |            |       |         | ✓                  |
| Lot 54                      | ✓              | 2     |            |       |         |                    |
| Lot 56 Elliot Rd            | ✓              | 1     |            | 3     |         |                    |
| Lot 57                      | ✓              |       |            | 3     |         |                    |
| Lot 58                      | ✓              |       |            |       |         |                    |
| Lot 59                      | ✓              |       |            | 2     |         |                    |
| Lot 60                      | ✓              | 1     |            | 1     |         |                    |
| Lot 61                      | ✓              | 1     |            |       |         |                    |
| Lot 62                      | ✓              | 2     | 3          | 2     |         |                    |
| Lot 64                      | ✓              | 3     | 1          |       |         |                    |
| Lot 66                      | ✓              |       |            | 2     |         |                    |
| Lot 100 Aitken Rd           | Refused        |       |            |       |         |                    |
| Lot 101, Westcott Rd        |                |       |            | 1     |         | ✓                  |
| Lot 103, Westcott Rd        |                |       |            |       |         | ✓                  |
| Lot 103-105, Aitken Rd      |                |       |            |       |         | ✓                  |
| Lot 104                     | ✓              | 1     |            |       |         |                    |
| Lot 105, Westcott Rd        |                |       |            |       |         | ✓                  |
| Lot 111                     |                |       |            |       |         | ✓                  |
| Lot 112                     |                |       |            |       |         | ✓                  |
| Lot 113                     |                |       |            |       |         | ✓                  |
| Lot 114                     | ✓              | 1     |            |       |         |                    |
| Lot 115                     | ✓              | 1     |            |       |         |                    |
| Lot 500                     | Refused        | 1     |            |       |         |                    |
| Lot 504                     | Refused        |       |            |       |         |                    |
| Lot 505                     |                |       |            |       |         | ✓                  |
| Lot 506                     | ✓              | 1     |            |       |         |                    |
| Lot 507-508, 63-65          | ✓              |       | 6          | 4     |         |                    |



**Table AI-2:**

| Lot No.               | Type Bore/Well    | mE<br>(MGA) | mN<br>(MGA) | Depth<br>(m) | Aquifer     | Water Level<br>(m bgl) |
|-----------------------|-------------------|-------------|-------------|--------------|-------------|------------------------|
| <b>Bores</b>          |                   |             |             |              |             |                        |
| Ambrosia              | Well              |             |             | 6.00         | Superficial |                        |
| Atkins Road           | 100 mm PVC Bore   | 403099      | 6401869     | 10.00        | Superficial | 5.70                   |
| Lot ?? Donna McCarthy | 100 mm PVC Bore   |             |             | 33.00        | Leederville | 10.00                  |
| Lot 1                 | 170 mm Steel Bore | 387705      | 6485041     | 50.00        | Leederville | 11.96                  |
| Lot 1                 | Steel Bore        | 403181      | 6412688     | 50.00        | Leederville | 12.45                  |
| Lot 1 SW H-Way        | Bore 1            | 403417      | 6401394     | 27.00        | Leederville |                        |
| Lot 1 SW H-Way        | Bore 2            |             |             | 25.00        | Leederville |                        |
| Lot 8                 | 100 mm PVC Bore   | 403101      | 6411224     | ?            | na          | 6.20                   |
| Lot 11                | 100 mm PVC Bore   | 402615      | 6402318     | 19.00        | unknown     |                        |
| Lot 12                | 100 mm PVC Bore   | 399269      | 6404827     | 10.00        | Superficial | 1.55                   |
| Lot 15                | 100 mm PVC Bore   | 400538      | 6403655     | ?            | na          | 3.85                   |
| Lot 15 Lakes Road     | 100 mm PVC Bore   | 401951      | 6401933     | ?            | na          | 5.90                   |
| Lot 20 Dennis Corteen | 100 mm PVC Bore   | 401986      | 6401946     | 30.00        | Leederville | 6.00                   |
| Lot 33                | Bore              | 396767      | 6399701     | 12.00        | Superficial | 3.30                   |
| Lot 33 Robert Gheng   | 100 mm PVC Bore   | 402654      | 6402081     | 30.00        | Leederville | Capped                 |
| Lot 38                | 100 mm PVC Bore   | 402190      | 6402286     | ?            | na          |                        |
| Lot 39                | 100 mm PVC Bore   | 402305      | 6402282     | 27.00        | Leederville | Capped                 |
| Lot 41                | Bore              |             |             | 30.00        | Leederville |                        |
| Lot 44                | 100 mm PVC Bore   | 402137      |             | ?            | na          |                        |
| Lot 50 Atkins Road    | Dam               | 403305      | 6402465     | 5.00         | Superficial | 3.00                   |
| Lot 52                | 200 mm PVC Bore   | 401513      | 6407437     | 100.00       | Leederville | 4.60                   |
| Lot 52                | 200 mm PVC Bore   | 401469      | 6407087     | 100.00       | Leederville | 2.30                   |
| Lot 54                | 160 mm PVC Bore   | 462298      | 6412054     | ?            | na          | 3.45                   |
| Lot 54                | 160 mm Steel Bore | 397645      | 6412263     | ?            | na          | 5.15                   |
| Lot 56 Elliot Rd      | 100 mm PVC Bore   | 401564      | 6410549     | ?            | na          | Capped                 |
| Lot 58                | 1 x Bore          |             |             |              | na          |                        |
| Lot 60                | 1 x Bore          |             |             | 30.00        | Leederville |                        |
| Lot 60                | Well              |             |             |              | na          |                        |
| Lot 61                | 1 x Bore          |             |             | 30.00        | Leederville |                        |
| Lot 62                | 100 mm PVC Bore   | 397609      | 6406224     | 8.00         | Superficial | 1.95                   |
| Lot 62                | 120 mm PVC Bore   | 398022      | 6406592     | 27.00        | Leederville | 1.65                   |
| Lot 62 Hopeland Rd    | 100 mm PVC Bore   | 397792      | 6406222     | 10.00        | Superficial | 1.80                   |
| Lot 64                | 100 mm PVC Bore   | 398779      | 6409313     | 18.00        | unknown     | 2.25                   |
| Lot 64                | 150 mm PVC Bore   | 398780      | 6409318     | 55.00        | Leederville | 1.50                   |
| Lot 64                | Bore Steel 200    | 398793      | 6409859     | 45.00        | Leederville | 0.90                   |
| Lot 67                | 150 mm PVC Bore   | 403041      | 6402226     | 30.00        | Leederville | 6.00                   |
| Lot 69                | 100 mm PVC Bore   | 402999      | 6401947     | 35.00        | Leederville |                        |
| Lot 100               | Bore              | 402067      | 6401848     | 21.00        | Leederville | 9.30                   |
| Lot 104               | 160 mm PVC Bore   | 40232       | 6408003     | 42.00        | Leederville | 4.40                   |
| Lot 112               | 100 mm PVC Bore   | 403080      | 6401769     |              | na          | 8.62                   |
| Lot 114               | 1 x Bore          |             |             | 20.00        | Leederville |                        |
| Lot 115               | 1 x Bore          |             |             |              | na          |                        |
| Lot 500 Readhead Rd   | no access allowed | 401124      | 6403869     | ?            | ?           | ?                      |
| Lot 506               | 100 mm PVC Bore   | 401046      | 6405076     | 40.00        | Leederville | Capped                 |
| Peter                 | 100 mm PVC Bore   | 4021917     | 6402395     | 27.00        | Leederville |                        |
| SW H-Way              | 100 mm PVC Bore   | 403090      | 6399982     | ?            | na          | 8.80                   |
| <b>Soak</b>           |                   |             |             |              |             |                        |
| Brian Bowman          | Soak              | 404073      | 6400137     | 2.50         | Superficial | 1.50                   |
| Lot 1                 | Soak              | 399380      | 6404566     | ?            | Superficial | 1.50                   |
| Lot 1                 | Soak              | 399577      | 6405374     | ?            | Superficial | 1.80                   |
| Lot 1                 | Soak              | 399271      | 6404827     | ?            | Superficial | 1.40                   |
| Lot 12                | Soak              | 398624      | 6404575     | ?            | Superficial | 1.00                   |
| Lot 15                | Soak              | 400635      | 6403555     | ?            | Superficial | 1.50                   |
| Lot 3-6               | Soak              | 401546      | 6404049     | ?            | Superficial | 1.28                   |
| Lot 507-508, 63-65    | Soak              | 398812      | 6410703     | ?            | Superficial | 1.20                   |
| Lot 507-508, 63-65    | Soak              | 398839      | 6411336     | ?            | Superficial | 1.60                   |
| Lot 507-508, 63-65    | Soak              | 398610      | 6411055     | ?            | Superficial | 1.60                   |
| Lot 507-708, 63-65    | Soak              | 398024      | 6407681     | ?            | Superficial | 1.60                   |
| Lot 507-708, 63-65    | Soak              | 398311      | 6407749     | ?            | Superficial | 1.00                   |

| Lot No.             | Type Bore/Well | mE (MGA) | mN (MGA) | Depth (m) | Aquifer     | Water Level (m bgl) |
|---------------------|----------------|----------|----------|-----------|-------------|---------------------|
| Lot 507-708, 63-65  | Soak           | 398665   | 6410253  | ?         | Superficial | 2.00                |
| Lot 55              | Soak           | 398549   | 6403612  |           | Superficial | 1.44                |
| Lot 62              | Soak           | 397671   | 6406333  | ?         | Superficial | 1.73                |
| Lot 62              | Soak           | 398785   | 6405644  | ?         | Superficial | 1.10                |
| Lot 62              | Soak           | 397924   | 6406506  | ?         | Superficial | 1.64                |
| Lot 6-278           | Soak           | 401375   | 6404118  | ?         | Superficial | 1.40                |
| Lot 64              | Soak           | 398875   | 6409333  | ?         | Superficial | 1.70                |
| <b>Wells</b>        |                |          |          |           |             |                     |
| A40                 | Well           | 400021   | 6402977  | 6.69      | Superficial | 3.35                |
| A48                 | Well           | 403153   | 6403660  | ?         | ?           | ?                   |
| Lot 1               | Well           | 399285   | 6404132  | 2.90      | Superficial | 2.80                |
| Lot 4               | Well           | 401125   | 6412419  | 5.00      | Superficial | 2.77                |
| Lot 7 Hopeland Rd   | Well           | 397607   | 6405509  | ?         | ?           | ?                   |
| Lot 8               | Well           | 402837   | 6410611  | 7.00      | Superficial | 3.40                |
| Lot 15              | Well           | 400520   | 6403643  | ?         | Superficial | 3.40                |
| Lot 19              | Well           | 400376   | 6402714  | 6.00      | Superficial | 5.00                |
| Lot 41              | Well           | 399696   | 6401476  | 6.20      | Superficial | 4.50                |
| Lot 42              | Well           | 460410   | 6401784  | 6.00      | Superficial | 3.66                |
| Lot 56 Elliot Rd    | Well           | 400863   | 6410496  | 5.53      | Superficial | 3.38                |
| Lot 56 Elliot Rd    | Well           | 400835   | 6411642  | 2.96      | Superficial | 2.44                |
| Lot 56 Elliot Rd    | Well           | 400644   | 6410912  | 2.98      | Superficial | 2.22                |
| Lot 57              | Well           | 401262   | 6410027  | 6.70      | Superficial | 5.20                |
| Lot 57              | Well           | 400827   | 6409072  | 2.80      | Superficial | 2.45                |
| Lot 57              | Well           | 400083   | 6409229  | 4.40      | Superficial | 1.95                |
| Lot 57              | Well           | 398879   | 6403042  | 4.00      | Superficial | 3.20                |
| Lot 59              | Well           | 401857   | 6406381  | 3.50      | Superficial | 1.75                |
| Lot 59              | Well           | 400344   | 6406344  | 5.95      | Superficial | 2.10                |
| Lot 62              | Well           | 398149   | 6406559  | 3.70      | Superficial | 1.70                |
| Lot 62              | Well           | 398926   | 6406146  | 3.50      | Superficial | 1.70                |
| Lot 66              | Well           | 397924   | 6412284  | 6.60      | Superficial | 5.65                |
| Lot 66              | Well           | 327945   | 6412263  | 5.00      | Superficial | 4.00                |
| Lot 84              | Well           | 403514   | 6402107  | 6.00      | Superficial | 4.50                |
| Lot 101 Westcott Rd | Well           | 401112   | 6408267  | ?         | ?           | ?                   |
| Lot 507-508, 63-65  | Well           | 399162   | 6411046  | 5.40      | Superficial | 3.15                |
| Lot 507-508, 63-65  | Well           | 398141   | 6411039  | 6.00      | Superficial | 1.60                |
| Lot 507-708, 63-65  | Well           | 398272   | 6407397  | 4.50      | Superficial | 1.70                |
| Lot 507-708, 63-65  | Well           | 398188   | 6408596  | 5.80      | Superficial | 2.50                |
| SW H-Way            | Well           | 403947   | 6400136  | 6.00      | Superficial | 5.00                |
| <b>Dams</b>         |                |          |          |           |             |                     |
| 5 Readhead Rd       | Dam            | 400315   | 6403815  | ?         | Superficial | ~ 1.7 m             |
| 16 Readhead Rd      | Dam            | 400308   | 6403795  | ?         | Superficial | ~ 2.0 m             |
| A40                 | Dam            | 399996   | 6403354  | ?         | Superficial | -                   |
| Lot 50 Atkins Road  | Dam            | 403305   | 6402465  | 5.00      | Superficial | 3.00                |



**APPENDIX II**

**BORE COMPLETION AND  
TESTING REPORT**

**MAY 2007**

**REPORT FOR  
OLYMPIA RESOURCES LIMITED  
KEYSBROOK MINERAL SANDS PROJECT**

321.0/07/03



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## **1 INTRODUCTION**

Rockwater was commissioned by Olympia Resources Limited to supervise the construction and test pumping of bores into the Leederville Formation to investigate the supply of water at up to 2 GL/annum for the purposes of mineral processing at its Keysbrook mineral sand prospect, 55km south of Perth, Western Australia.

Additionally, the hydrogeological conditions adjacent to two wetlands were to be investigated by constructing shallow test holes and monitoring bores.

This Appendix presents the results of the drilling, construction and testing of deep production and observation bores and shallow monitoring bores.

## **2 DRILLING PROGRAMME**

The drilling and construction was carried out by Harrington Drilling using a proprietary rotary rig equipped with a 350psi/500cfm compressor. Bore construction data are given in Attachment AII-1 and summarised in Table AII-1.

Geophysical logs were run in each of the observation and production holes. Gamma-ray and resistivity logs were used in conjunction with lithological data to determine aquifer and formation boundaries. Geophysical logs are presented in the Composite Diagrams, Figures AII-2 to AII-6.

A production bore had initially been proposed for the KL1 site. However the abundance of granite boulders and siltstone encountered during drilling the observation bore, suggested it would be prudent to drill the second site, KL2, which is located 2.4km to the west. Based on the favourable results here, the third site, KL3, was chosen, 1.4km to the south of KL2. In all, three observation bores (KL1Obs, KL2Obs and KL3Obs) and two production bores (KL2P and KL3P) were constructed.

### **2.1 OBSERVATION BORES**

The surface holes for the observation bores were drilled at 251mm diameter to 12m depth using mud-rotary methods and lined with 155mm ID mild steel casings. Drill cuttings were collected at 1m intervals and lithological descriptions prepared. The annulus between the casing and the hole was cement grouted.

From 12m, 152mm diameter holes were drilled with blade or tricone roller bit using mud-rotary methods. Drill cuttings were collected at 2m intervals and lithological descriptions



prepared. The holes were drilled to 90m depth in KL1Obs, 144m in KL2Obs, and 156m in KL3Obs.

The bores are lined with 67mm ID, 76mm OD, class 12 uPVC blank and slotted casing. The slotted casing has 0.5mm aperture slots and is installed in KL1Obs from 47 to 83m, in KL2Obs from 42 to 48m, 54 to 60m and 66 to 96m, and in KL3Obs from 72 to 102m and 120 to 150m. The casings are fitted with uPVC end caps at the base.

Following the installation of casing, the annulus of each bore was filled with graded sand of 0.8–1.6mm grain size. The bores were developed using air-lifting and surging methods.

Bore construction details and lithological descriptions are shown in Figures AII-2 to AII-4, and summarised in the Schedule of Bores in Table AII-1.

## **2.2 PRODUCTION BORES**

The surface holes were drilled at 444mm diameter to 12m depth using mud-rotary methods and lined with 311mm ID mild steel casings. Drill cuttings were collected at 1m intervals and lithological descriptions prepared. The annulus between the casing and the hole was cement grouted.

From 12m, 305mm diameter holes were drilled with blade or tricone roller bits using mud-rotary methods. Drill cuttings were collected at 2m intervals and lithological descriptions prepared. The holes were drilled to 144m depth in KL2P and 150m in KL3P.

The bores are lined with 203 mm ID casing supported with centralisers at 12 m intervals. The blank casing is Class 12 203mm ID, 225mm OD uPVC and the screens are stainless steel with a 0.5mm aperture and 203mm ID. The casing and screens are joined using connectors 0.3m in length. Screened casing is installed in KL2P between 58-94m and 118-136m and in KL3P between 70.6-97.6m and 122.4-146.4m.

Basal cement plugs were installed in the bottom 1 m of each casing string.

Graded sand of 0.8–1.6mm grain size was installed in the annulus between casing and hole. The bores were then demudded and developed using air-lifting and surging methods. Both bores produced airlift yields of 40–45 L/s.

Bore construction details and lithological descriptions are shown in Figures AII-5 and AII-6 and summarised in the Schedule of Bores in Table AII-1.

## **2.3 SHALLOW WATER TABLE / WETLAND MONITORING BORES**

Two suites of five and six shallow monitoring bores are located at two sites adjacent to areas identified as wetlands. They are numbered KWT1A–1F and KWT2B–2F. Locations are





shown in Figure AII-1. The suites comprise three or four “shallow” bores between 2 and 4m in depth, and one “deep” bore 6m in depth.

An additional shallow monitoring bore, KWT3A, was sunk to a depth of 4m, within a few metres of the observation bore KL3Obs. Bore KWT3A is to be used to monitor the water table in the vicinity of the production bore KL3P. Another shallow monitoring bore, KL1S, of 3m depth, is located a few metres from KL1Obs and is also to be used to monitor the water table.

These monitoring bores were drilled using air-core methods and a 130mm air core vacuum bit. Lithological samples were collected every 0.5m (Attachment AII-2). The bores were lined with 50mm, Class 12 uPVC casing. This was slotted (1mm aperture) over the entire length of the shallow bores. The annulus was filled with graded sand of 0.8–1.6mm grain size. The deeper (6m) bores used blank casing to 5m, then the final metre was slotted. Graded sand was installed around the bottom 1m of the casing.

An additional shallow bore, KWT2A, located beside KL2Obs, was drilled to 1.5m depth using a hand auger. It was lined with 50mm, Class 12 uPVC slotted casing with a 0.5mm aperture.

The construction format of these bores is shown in Figures AII-7 and AII-8 and summarised in the Schedule of Bores in Table AII-1.

### **3 PUMPING TESTS**

#### **3.1 GENERAL**

At the completion of drilling, pumping tests were carried out on bores KL2P and KL3P to determine the potential sustainable yields and drawdown response in each, and to obtain values of aquifer transmissivity. The tests were conducted by Bennett Drilling using an electric submersible pump. Water levels were measured using an electric contact meter and discharge rates were monitored with an orifice weir assembly.

The tests comprised step rate tests of four hours' duration and constant rate tests of 44 hours for each bore. The step-rate tests were used to assess bore performance and to select rates for the 44 hour tests and are not reported on further.

Water produced from the test pumping was discharged onto surrounding farmland, and at KL3 also filled a nearby dam.



### 3.2 BORE KL2P

Bore KL2P was pumped at 20 L/s (1,700 m<sup>3</sup>/d) for 44 hours commencing 24 April 2007. The static level was 1.16m below the bore datum. Water levels were measured in the production bore and the observation bores KL1Obs and KL2Obs. Water level drawdowns are plotted on a semi-logarithmic scale and presented in Figure AII-9.

The water level drawdown was 5.7m after the first 15 minutes of pumping; it then followed a more or less linear trend and gradually drew down by almost another 2m by the end of the test. Using the Jacob analysis method (Kruseman and deRidder, 1994) the aquifer coefficients of transmissivity and storativity are calculated to be 346m<sup>2</sup>/d and 0.0006 respectively.

### 3.3 BORE KL3P

Bore KL3P was pumped at 20 L/s (1,700 m<sup>3</sup>/d) for 44 hours commencing 6 May 2007. The static water level was 0.1m below the bore datum. Water levels were measured in this production bore and bores KL2P, KL3Obs and KWT3A at distances of 1515m, 25m and 25m respectively. Semi-logarithmic drawdown plots for the test are presented in Figure AII-10.

In KL3P the water level drawdown was 6.7 m after 15 minutes of pumping, then followed a linear trend with minor fluctuations, gradually drawing down another 2m by the end of the test (Figure AII-10). From the Jacob straight-line method of analysis using the observation bore (KL3Obs) data, the transmissivity is calculated to be 394 m<sup>2</sup>/day, and the storage coefficient to be 0.0001.

Drawdowns in observation bores KL2P and KWT3A were 0.4m and 0.04m respectively at the end of the test.

### 3.4 SLUG TESTS

Falling-head tests were conducted on ten of the wetland shallow monitoring bores. Two bores, KWT1D and KWT2E, were also tested by the rising-head method. Analyses of the results to obtain permeability values for the Guildford Formation were made by the method of Bouwer and Rice (1989) (see Table 6 of the main report). The calculated values are taken to be approximate, but to indicate the range of values typical of the variable clayey and sandy material.

## 4 GROUNDWATER CHEMISTRY

Samples of groundwater collected from the bores at the end of the pumping tests were submitted to SGS Australia Pty Ltd for comprehensive chemical analyses. The results are given in Table AII-3.

The analytical results show the groundwater to be mildly alkaline and fresh, with Total Dissolved Solids ranging from 260mg/L in KL1Obs to 360mg/L in KL2Obs. It exceeds the drinking water guidelines for total iron content and manganese. The groundwater temperatures ranged from 20 to 21.5°C.

## 5 GRAIN SIZE ANALYSES

Grain size analyses were conducted on the uppermost 12m of samples collected from KL1Obs, KL2Obs and KL3Obs, and the samples from 3.5 to 6m in KWT1D and KWT2E. The results are presented in Figures AII-11 to AII-15.

In KL1Obs the samples are reasonably well sorted throughout and generally less than 20% of the samples by weight comprises grain sizes of fine sand/clay.

The samples from KL2Obs are poorly to well sorted. Fine sand to clay sized grains constitute over 42% of the sample weights in the samples at 4, 5 and 12m, and nearly all remaining samples have over 21% of the sample weight comprising grains in this size category.

In KL3Obs the samples at 9 and 10m have over 67% of their sample weight comprising grains of fine sand to clay size, and the sample at 7m is clearly bimodal, with over 36% of the weight being fine sand to clay and 40% being coarse grained sand. The remaining samples have between 5 and 15% by weight of fine sand to clay.

KWT1D exhibits poorly sorted samples, with fine sand to clay, medium sand, and coarse sand each making up approximately one third of the weight of each sample. There is little change in this grain size distribution with depth.

In KWT2E over 57% of the weight of each of the samples at 4, 5, 5.5 and 6m comprises fine sand to clay. These samples are all reasonably well sorted.



## 6 SUMMARY

Two production bores, KL2P and KL3P, were constructed at the proposed Olympia Resources Pty Ltd Keysbrook Mineral Sands mine site to allow testing of the Leederville aquifer with respect to providing water at up to 2GL/annum for proposed mineral processing.

In addition, three observation bores, KL1Obs, KL2Obs and KL3Obs, were constructed to allow monitoring of the drawdown in the Leederville aquifer, and another 12 bores were drilled to monitor the shallow water table in the superficial aquifer.

The groundwater is mildly alkaline and fresh but contains high levels of Total Iron at up to 19mg/L and Manganese at up to 0.75mg/L.

**Dated:** 22 May 2007

**Rockwater Pty Ltd**

**S Y McNaughtan**  
**Hydrogeologist**

**J R Passmore**  
**Principal Hydrogeologist**

## 7 REFERENCES

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## TABLES

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| AII-1 | Schedule of Bores             |
| AII-2 | Stratigraphic Tops            |
| AII-3 | Groundwater Chemical Analyses |



**Table AII-1: Schedule of Bores**

| BORE NO.                                                      | MGA* COORDS<br>mE <sup>1</sup> mN <sup>1</sup> | DATE OF<br>CONSTR. | TOTAL<br>DEPTH<br>(mBGL) | GROUND<br>LEVEL<br>(mAHD) | COLLAR<br>HEIGHT<br>(mAHD) | COLLAR<br>HEIGHT<br>(mAGL) | WATER<br>LEVEL<br>(mBTC) | WATER<br>LEVEL<br>(mAHD) | CASING DETAILS | SCREENED INTERVAL (m)                                                                                                             |                            |
|---------------------------------------------------------------|------------------------------------------------|--------------------|--------------------------|---------------------------|----------------------------|----------------------------|--------------------------|--------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| <b><u>Observation and Production Bores:</u></b>               |                                                |                    |                          |                           |                            |                            |                          |                          |                |                                                                                                                                   |                            |
| KL1 Obs                                                       | 401625                                         | 6406792            | March 2007               | 90                        | 33.426                     | 33.999                     | 0.573                    | 4.06                     | 29.941         | 0 - 83m 67mm ID, 76mm OD<br>uPVC                                                                                                  | 47 - 83                    |
| KL2 Obs                                                       | 399186                                         | 6406766            | Mar-Apr 2007             | 144                       | 27.198                     | 27.635                     | 0.437                    | 0.083                    | 27.552         | 0 - 108m 67mm ID, 76mm OD<br>uPVC                                                                                                 | 42 - 48, 54 - 60, 66 - 96  |
| KL3 Obs                                                       | 398778                                         | 6405465            | April 2007               | 156                       | 25.474                     | 26.099                     | 0.625                    | 0.071                    | 26.028         | 0 - 150m 67mm ID, 76mm OD<br>uPVC                                                                                                 | 72 - 102, 120 - 150        |
| KL2 P                                                         | 399190                                         | 6406893            | April 2007               | 144                       | 27.505                     | 28.103                     | 0.598                    | 1.02                     | 27.081         | 0 - 58m, 94 - 118m and 136 -<br>139m 203mm ID, 225mm OD<br>uPVC and 58 - 94m, 118 - 136m<br>203mm ID stainless steel<br>screens   | 58 - 94, 118 - 136         |
| KL3 P                                                         | 398779                                         | 6405436            | Apr-May 2007             | 150                       | 25.414                     | 25.966                     | 0.552                    | artesian                 | >26.0          | 0 - 70.6m and 97.6 - 122.4m<br>203mm ID, 225mm OD uPVC<br>and 70.6 - 97.6m, 122.4 - 146.4m<br>203mm ID stainless steel<br>screens | 70.6 - 97.6, 122.4 - 146.4 |
| <b><u>Shallow Water Table / Wetland Monitoring Bores:</u></b> |                                                |                    |                          |                           |                            |                            |                          |                          |                |                                                                                                                                   |                            |
| KL1S                                                          | 401628                                         | 6406792            | May 2007                 | 3                         | 33.426                     | 33.856                     | 0.43                     | 1.054                    | 32.802         | 0 - 3m 50mm ID uPVC                                                                                                               | 0 - 3                      |
| KWT1A                                                         | 400968                                         | 6405442            | May 2007                 | 2                         | 31.785                     | 32.222                     | 0.437                    | 1.627                    | 30.595         | 0 - 2m 50mm ID uPVC                                                                                                               | 0 - 2                      |
| KWT1B                                                         | 400956                                         | 6405464            | May 2007                 | 2                         | 32.049                     | 32.410                     | 0.361                    | 2.152                    | 30.258         | 0 - 2m 50mm ID uPVC                                                                                                               | 0 - 2                      |
| KWT1C                                                         | 400948                                         | 6405487            | May 2007                 | 2                         | 32.181                     | 32.569                     | 0.388                    | 2.284                    | 30.285         | 0 - 2m 50mm ID uPVC                                                                                                               | 0 - 2                      |
| KWT1D                                                         | 400948                                         | 6405488            | May 2007                 | 6                         | 32.116                     | 32.702                     | 0.586                    | 2.769                    | 29.933         | 0 - 6m 50mm ID uPVC                                                                                                               | 5 - 6                      |
| KWT1E                                                         | 400965                                         | 6405441            | May 2007                 | 4                         | 31.785                     | 32.365                     | 0.58                     | 1.096                    | 31.269         | 0 - 4m 50mm ID uPVC                                                                                                               | 0 - 4                      |
| KWT1F                                                         | 400920                                         | 6405579            | May 2007                 | 4                         | 31.78                      | 32.250                     | 0.47                     | 2.564                    | 29.686         | 0 - 4m 50mm ID uPVC                                                                                                               | 0 - 4                      |
| KWT2A                                                         | 399188                                         | 6406766            | May 2007                 | ~1.5                      | 27.089                     | 27.595                     | 0.506                    | 1.110                    | 26.485         | 0 - approx 1.5m 50mm ID uPVC                                                                                                      | 0 - approx 1.5             |
| KWT2B                                                         | 399380                                         | 6406810            | May 2007                 | 3.5                       | 27.522                     | 27.997                     | 0.475                    | 2.312                    | 25.685         | 0 - 3.5m 50mm ID uPVC                                                                                                             | 0 - 3.5                    |
| KWT2C                                                         | 399387                                         | 6406832            | May 2007                 | 3                         | 27.711                     | 28.099                     | 0.388                    | 1.640                    | 26.459         | 0 - 3m 50mm ID uPVC                                                                                                               | 0 - 3                      |
| KWT2D                                                         | 399395                                         | 6406854            | May 2007                 | 3                         | 27.754                     | 28.240                     | 0.486                    | 1.138                    | 27.102         | 0 - 3m 50mm ID uPVC                                                                                                               | 0 - 3                      |
| KWT2E                                                         | 399395                                         | 6406856            | May 2007                 | 6                         | 27.786                     | 28.277                     | 0.491                    | 1.020                    | 27.257         | 0 - 6m 50mm ID uPVC                                                                                                               | 5 - 6                      |
| KWT2F                                                         | 399404                                         | 6406883            | May 2007                 | 1.8                       | 28.13                      | 28.717                     | 0.587                    | 1.668                    | 27.049         | 0 - 1.8m 50mm ID uPVC                                                                                                             | 0 - 1.8                    |
| KWT3A                                                         | 398782                                         | 6405465            | May 2007                 | 4                         | 25.497                     | 25.975                     | 0.478                    | 1.230                    | 24.745         | 0 - 4m 50mm ID uPVC                                                                                                               | 0 - 4                      |
| <b><u>Department of Water Bores ** :</u></b>                  |                                                |                    |                          |                           |                            |                            |                          |                          |                |                                                                                                                                   |                            |
| AM63                                                          | 395613                                         | 6410199            | Feb 1980                 | 349                       | 21.765                     | 21.962                     | 0.197                    | 18.48                    | 3.487          | 0-350m x 80mm                                                                                                                     | 312 - 230                  |
| AM63A                                                         | 395593                                         | 6410199            | Aug 1983                 | 132                       | 21.862                     | 22.489                     | 0.627                    | 9.45                     | 13.044         | 0-126m x 114mm                                                                                                                    | 103 - 109                  |
| AM66                                                          | 397363                                         | 6403768            | Feb 1981                 | 384                       | 20.783                     | 21.320                     | 0.537                    | 16.87                    | 4.455          | 0-350m X 114mm                                                                                                                    | 341 - 347                  |
| AM66A                                                         | 397379                                         | 6403768            | Aug 1983                 | 103                       | 20.951                     | 21.487                     | 0.536                    | 16.97                    | 4.517          | 0-0103m x 114mm                                                                                                                   | 75 - 81                    |

\* MGA = Map Grid Australia

\*\* The date of construction and total depth are from the Dept of Water WIN database. Casing details and screened interval are from Davidson, 1995, Table 4.

**Table AII-2: Stratigraphic Tops (metres)**

| BORE NO.                                                      | Bassendean<br>Sand | Guildford<br>Fm | Pinjar<br>Mbr | Wanneroo<br>Mbr | Mariginiup<br>Mbr | South<br>Perth<br>Shale | Total<br>Depth |
|---------------------------------------------------------------|--------------------|-----------------|---------------|-----------------|-------------------|-------------------------|----------------|
| <b><u>Observation and Production Bores:</u></b>               |                    |                 |               |                 |                   |                         |                |
| KL1 Obs                                                       | 0                  | 3               | -             | -               | 12                | -                       | 90             |
| KL2 Obs                                                       | 0                  | 2               | -             | -               | 14                | 141                     | 144            |
| KL3 Obs                                                       | 0                  | 5               | -             | -               | 14                | 150                     | 156            |
| KL2 P                                                         | 0                  | 4               | -             | -               | 14                | 136                     | 144            |
| KL3 P                                                         | 0                  | 7               | -             | -               | 14                | -                       | 150            |
| <b><u>Shallow Water Table / Wetland Monitoring Bores:</u></b> |                    |                 |               |                 |                   |                         |                |
| KL1S                                                          | 0                  | -               | -             | -               | -                 | -                       | 3              |
| KWT1A                                                         | 0                  | 1               | -             | -               | -                 | -                       | 2              |
| KWT1B                                                         | 0                  | 1               | -             | -               | -                 | -                       | 2              |
| KWT1C                                                         | 0                  | 1               | -             | -               | -                 | -                       | 2              |
| KWT1D                                                         | 0                  | 1               | -             | -               | -                 | -                       | 6              |
| KWT1E                                                         | 0                  | 0.5             | -             | -               | -                 | -                       | 4              |
| KWT1F                                                         | 0                  | 0.5             | -             | -               | -                 | -                       | 4              |
| KWT2A **                                                      |                    |                 |               |                 |                   |                         | ~1.5           |
| KWT2B                                                         | 0                  | 1.5             | -             | -               | -                 | -                       | 3.5            |
| KWT2C                                                         | -                  | 0               | -             | -               | -                 | -                       | 3              |
| KWT2D                                                         | 0                  | 2               | -             | -               | -                 | -                       | 3              |
| KWT2E                                                         | -                  | 0               | -             | -               | -                 | -                       | 6              |
| KWT2F                                                         | 0                  | 1.4             | -             | -               | -                 | -                       | 1.8            |
| KWT3A                                                         | 0                  | 3.5             | -             | -               | -                 | -                       | 4              |
| <b><u>Department of Water Bores # :</u></b>                   |                    |                 |               |                 |                   |                         |                |
| AM63                                                          | ?                  | ?               | 15            | 25              | 99                | 216 *                   | 349            |
| AM66                                                          | ?                  | ?               | -             | 10              | 36                | 142 *                   | 384            |
| AM63A **                                                      |                    |                 |               |                 |                   |                         |                |
| AM66A **                                                      |                    |                 |               |                 |                   |                         |                |

- not present

# Stratigraphy from Davidson, 1995, Table 8.

? Possibly present as part of Davidson's (1995, Table 8) "Superficial Formations".

\* Other formations are present below South Perth Shale, but are not included here as the new bores did not extend below that fm.

\*\* Stratigraphic breakdown not available

Table AII-3: Groundwater Chemical Analyses  
(Conducted by SGS Australia Pty Ltd)

| SAMPLE                        | Units    | GUIDELINE       | KL1Obs | KL2Obs | KL2P | KL3Obs | KL3P |
|-------------------------------|----------|-----------------|--------|--------|------|--------|------|
|                               |          | LIMIT*          |        |        |      |        |      |
| pH                            | pH units | 6.5 to 8.5      | 7.4    | 7.8    | 6.9  | 7.4    | 7.7  |
| Conductivity @ 25°C           | µS/cm    |                 | 360    | 560    | 550  | 580    | 540  |
| TDS (Calculated)              | mg/L     | 500 (by evaptn) | 260    | 360    | 330  | 350    | 350  |
| Iron, Fe                      | mg/L     |                 | 0.14   | 0.05   | 1.1  | 1      | 0.65 |
| Total Iron, Fe                | mg/L     | 0.3             | n/a    | n/a    | 4.7  | n/a    | 19.0 |
| Sodium, Na                    | mg/L     | 180             | 50     | 83     | 83   | 90     | 74   |
| Potassium, K                  | mg/L     |                 | 8.2    | 7.2    | 7.0  | 8.1    | 6.0  |
| Calcium, Ca                   | mg/L     |                 | 0.8    | 4.5    | 2.8  | 8.0    | 3.8  |
| Magnesium, Mg                 | mg/L     |                 | 6.1    | 9.8    | 10.0 | 11.0   | 11.0 |
| Chloride, Cl                  | mg/L     | 250             | 79     | 130    | 120  | 120    | 110  |
| Carbonate, CO <sub>3</sub>    | mg/L     |                 | <1     | <1     | <1   | <1     | <1   |
| Bicarbonate, HCO <sub>3</sub> | mg/L     |                 | 55     | 80     | 100  | 95     | 85   |
| Sulphate, SO <sub>4</sub>     | mg/L     | 250             | 7      | 13     | 10   | 13     | 10   |
| Nitrate, NO <sub>3</sub>      | mg/L     | 50              | <0.2   | <0.2   | <0.2 | <0.2   | <0.2 |
| Fluoride, F                   | mg/L     |                 | <0.1   | 0.1    | n/a  | n/a    | 0.2  |
| Manganese, Mn                 | mg/L     | 0.1             | 0.20   | 0.59   | n/a  | n/a    | 0.75 |
| Silica, SiO <sub>2</sub>      | mg/L     |                 | 57     | 58     | n/a  | n/a    | 64   |
| Cation/Anion balance          | %        |                 | -5.7   | -4.6   | -4.6 | 1.0    | -4.1 |
| Sum of Ions (calculated)      | mg/L     |                 | 207    | 329    | 334  | 349    | 304  |

n/a not available

\* Australian Drinking Water Guidelines (1996)

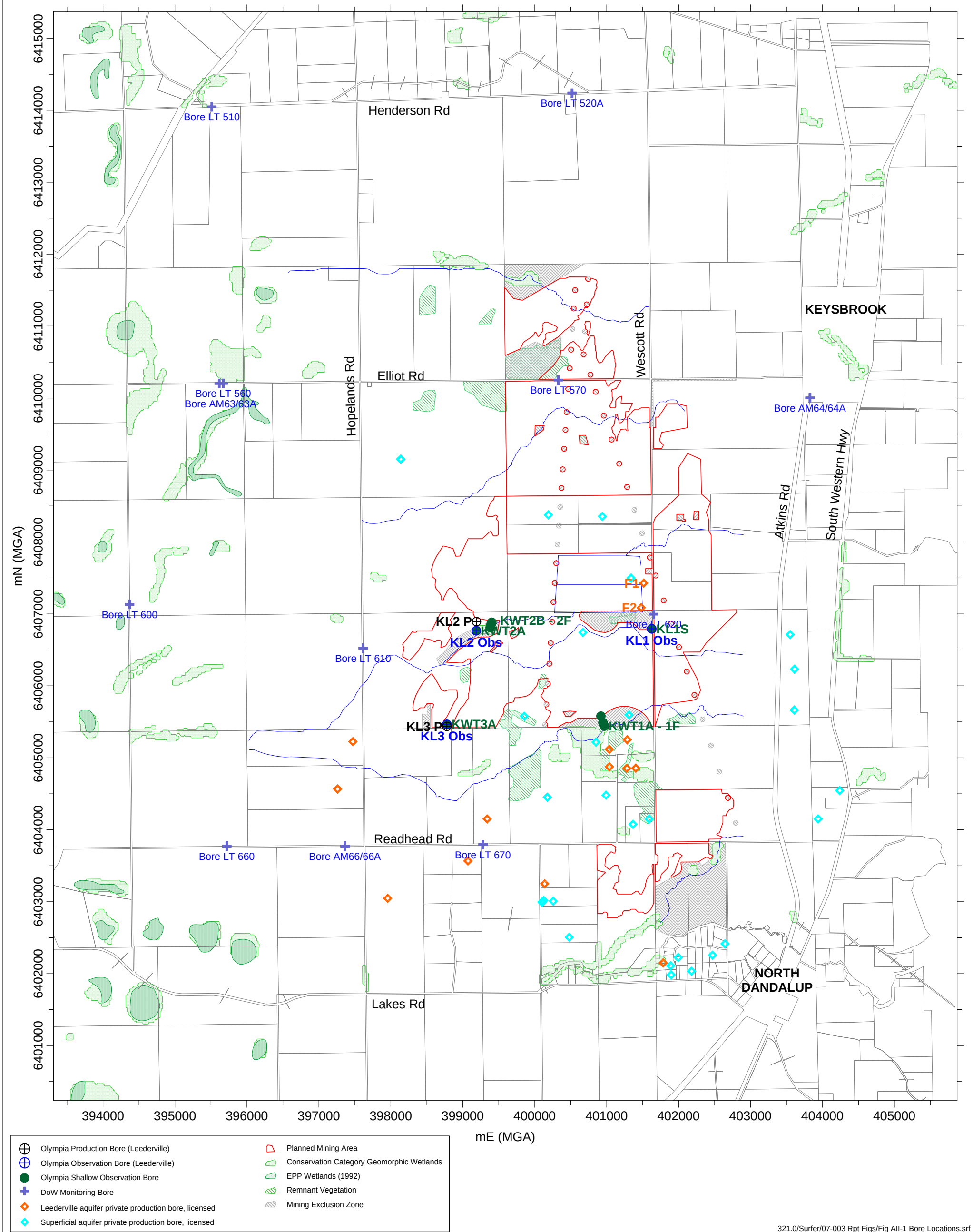


## **FIGURES**

- AII-1 Locality Map
- AII-2 Observation Bore KL1Obs Composite Diagram
- AII-3 Observation Bore KL2Obs Composite Diagram
- AII-4 Observation Bore KL3Obs Composite Diagram
- AII-5 Production Bore KL2P Composite Diagram
- AII-6 Production Bore KL3P Composite Diagram
- AII-7 Construction of a Typical KWT 2 to 4m-deep BORE
- AII-8 Construction of a Typical KWT 6m-deep BORE
- AII-9 Constant Rate Pumping Test, Production Bore KL2P Drawdown
- AII-10 Constant Rate Pumping Test, Production Bore KL3P Drawdown
- AII-11 Grain Size Curves KL1Obs
- AII-12 Grain Size Curves KL2Obs
- AII-13 Grain Size Curves KL3Obs
- AII-14 Grain Size Curves KWT1D
- AII-15 Grain Size Curves KWT2E



Figure AII-1



321.0/Surfer/07-003 Rpt Figs/Fig AII-1 Bore Locations.srf

CLIENT: Olympia Resources Pty Ltd

PROJECT: Keysbrook Mineral Sands Project

DATE: May 2007

Dwg No: 321.0/07/AII-1

LOCALITY MAP

Figure AII-2

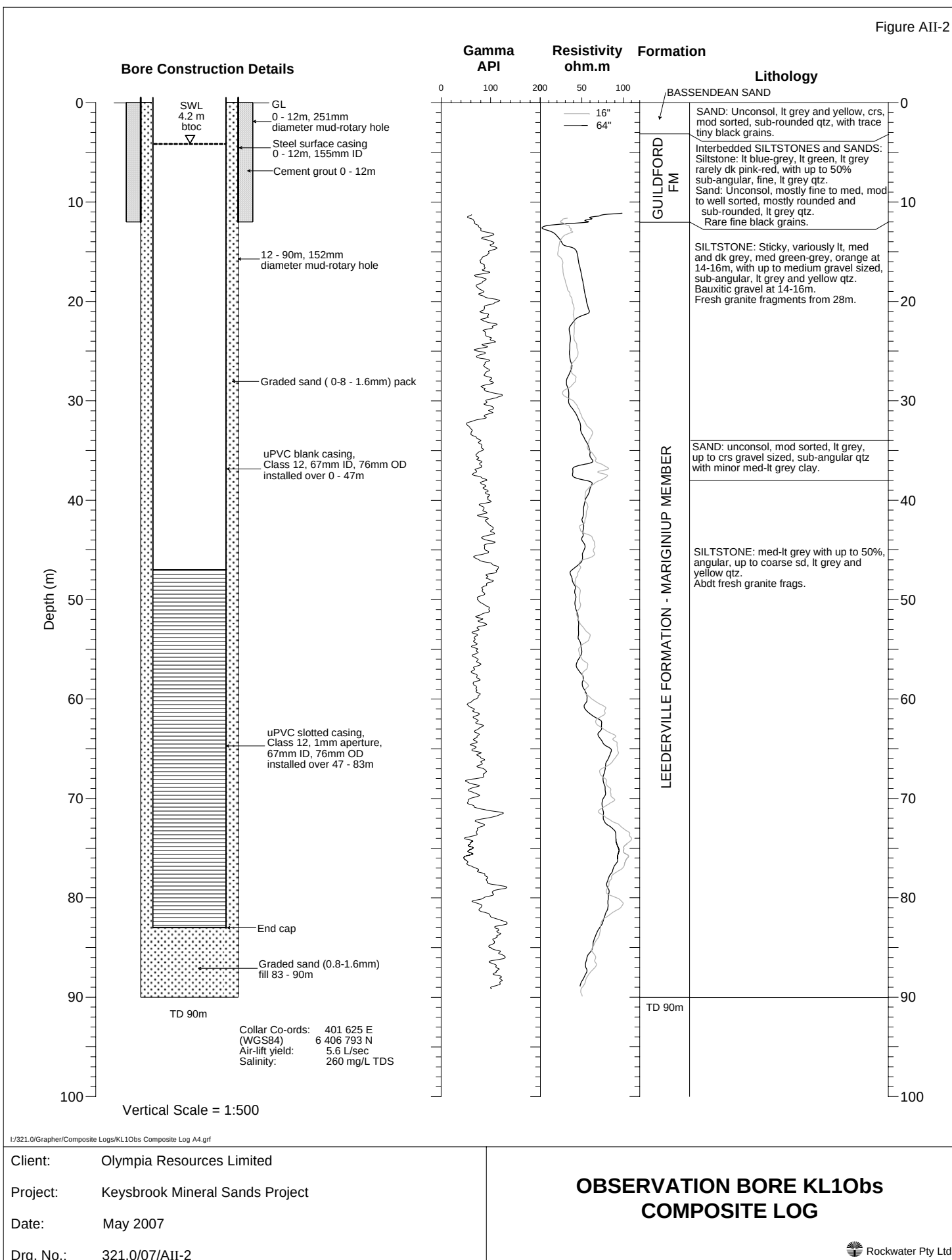


Figure AII-3

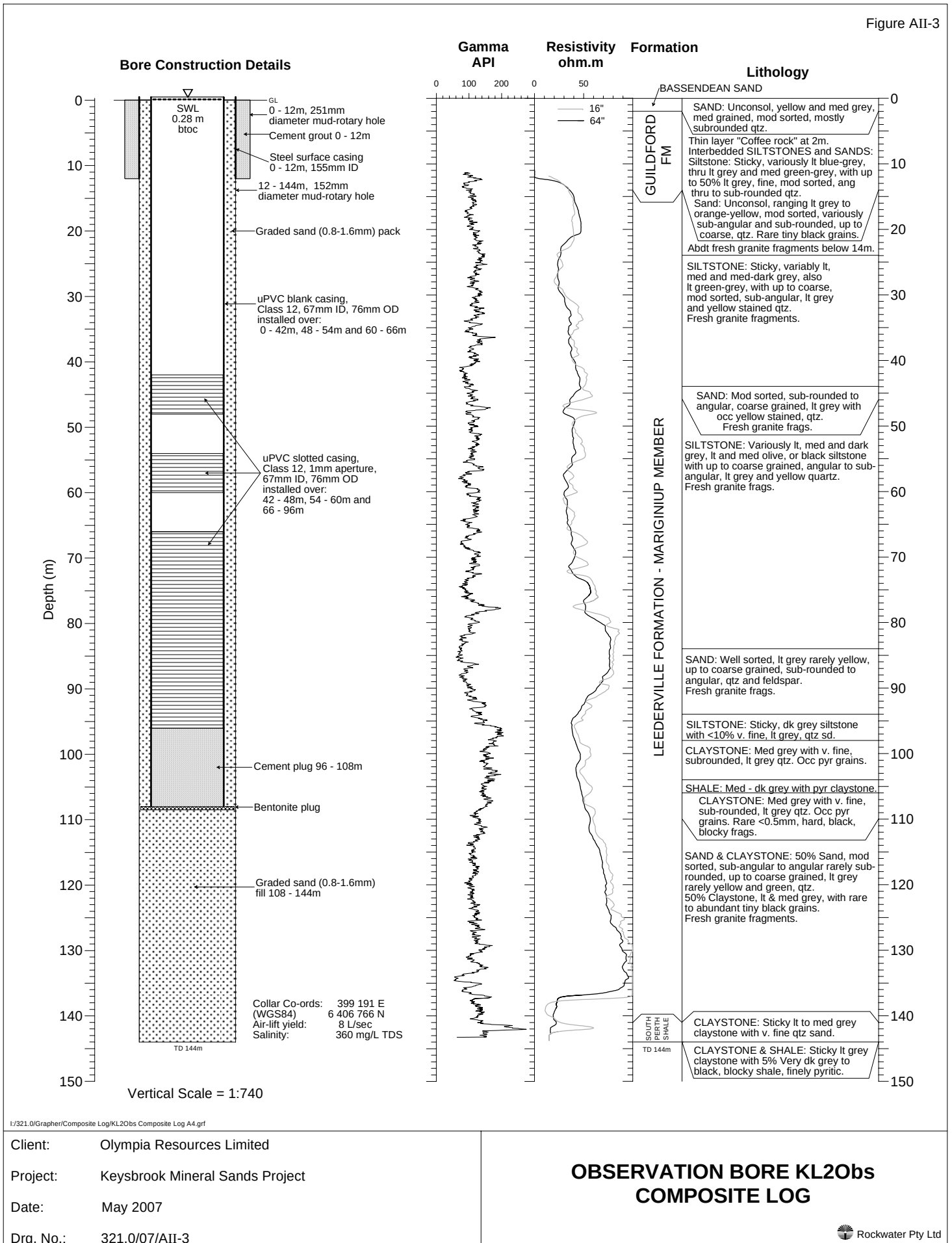
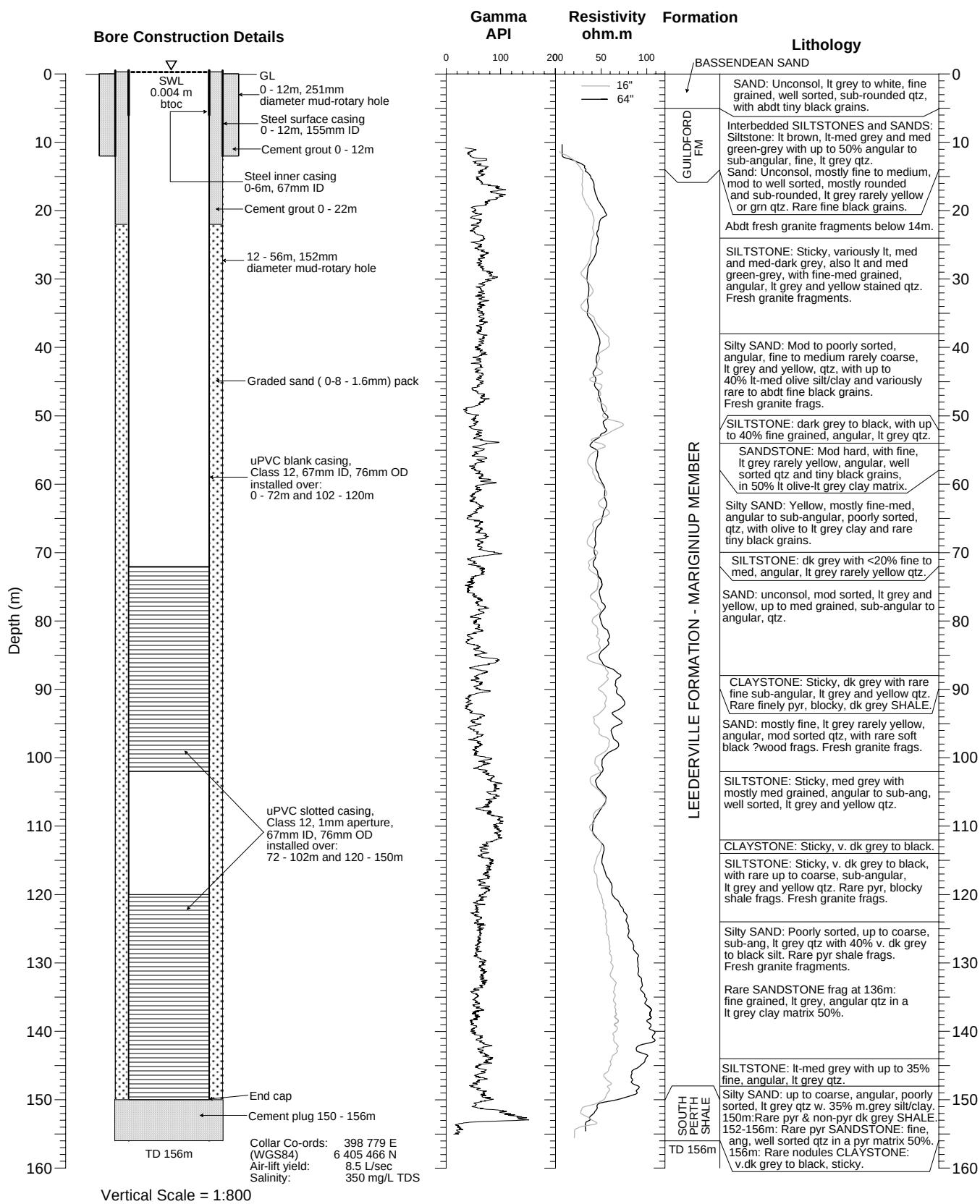


Figure AII-4



I:\321.0\Grapher\Composite Logs\KL30bs Composite Log A4.grf

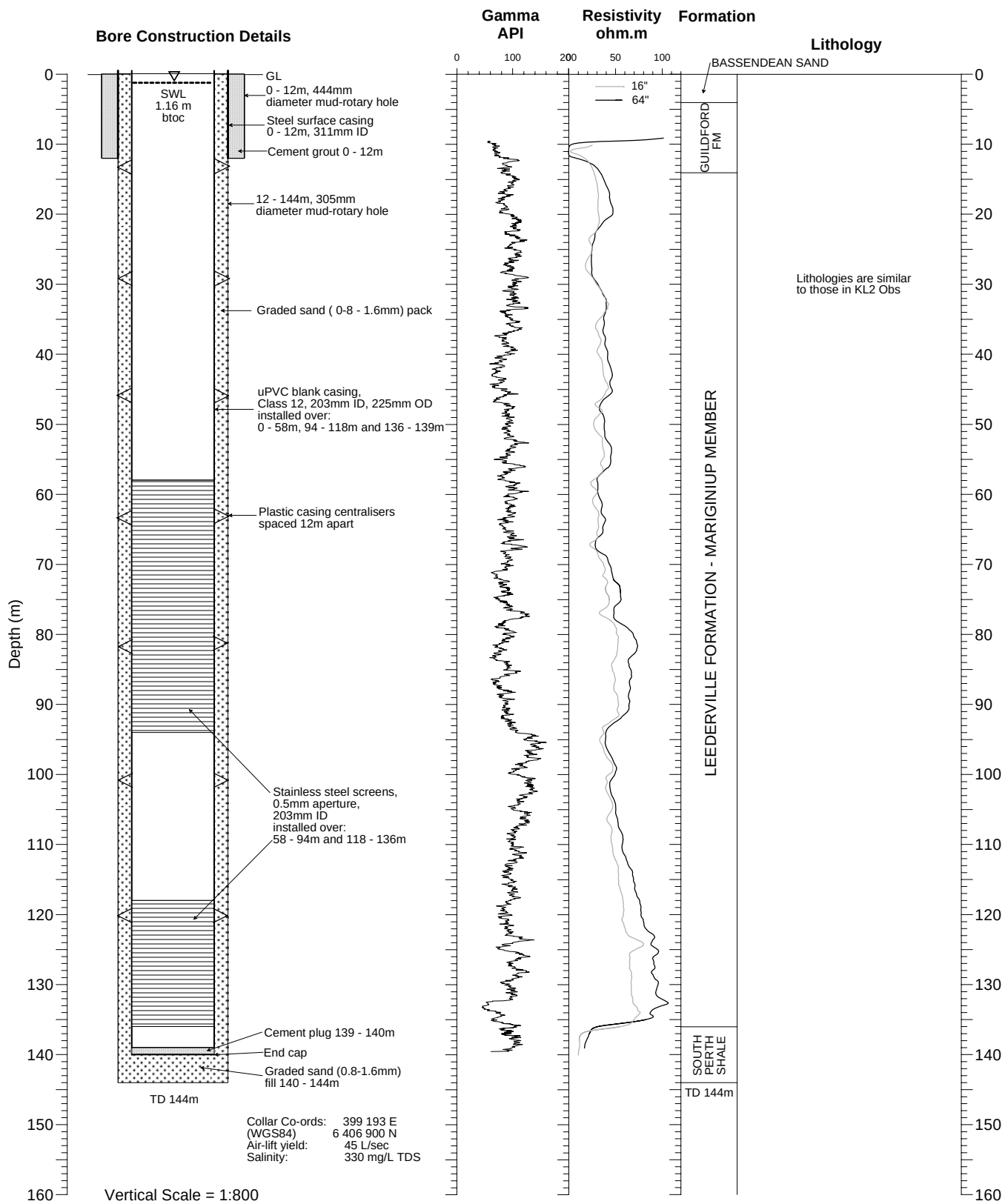
Client: Olympia Resources Limited

Project: Keysbrook Mineral Sands Project

Date: May 2007

Drg. No.: 321.0/07/AII-4

## OBSERVATION BORE KL30bs COMPOSITE LOG

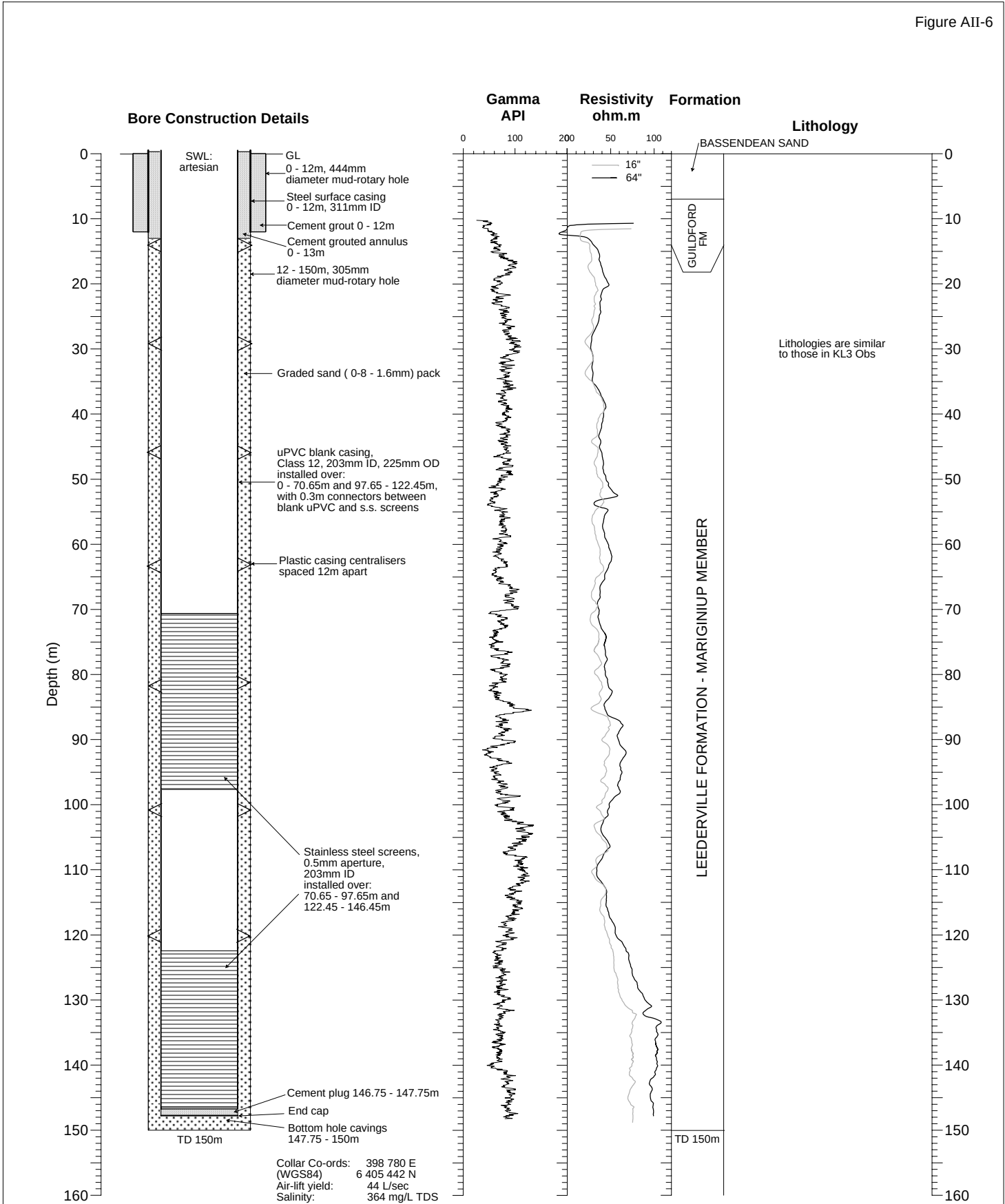


I:\321.0\Grapher\Composite Logs\KL2Prod Composite Log A4.grf

Client: Olympia Resources Limited  
Project: Keysbrook Mineral Sands Project  
Date: May 2007  
Drg. No.: 321.0/07/AII-5

**PRODUCTION BORE KL2P  
COMPOSITE LOG**

Figure AII-6



I:\321.0\Grapher\Composite Logs\KL3Prod Composite Log A4.grf

Client: Olympia Resources Limited

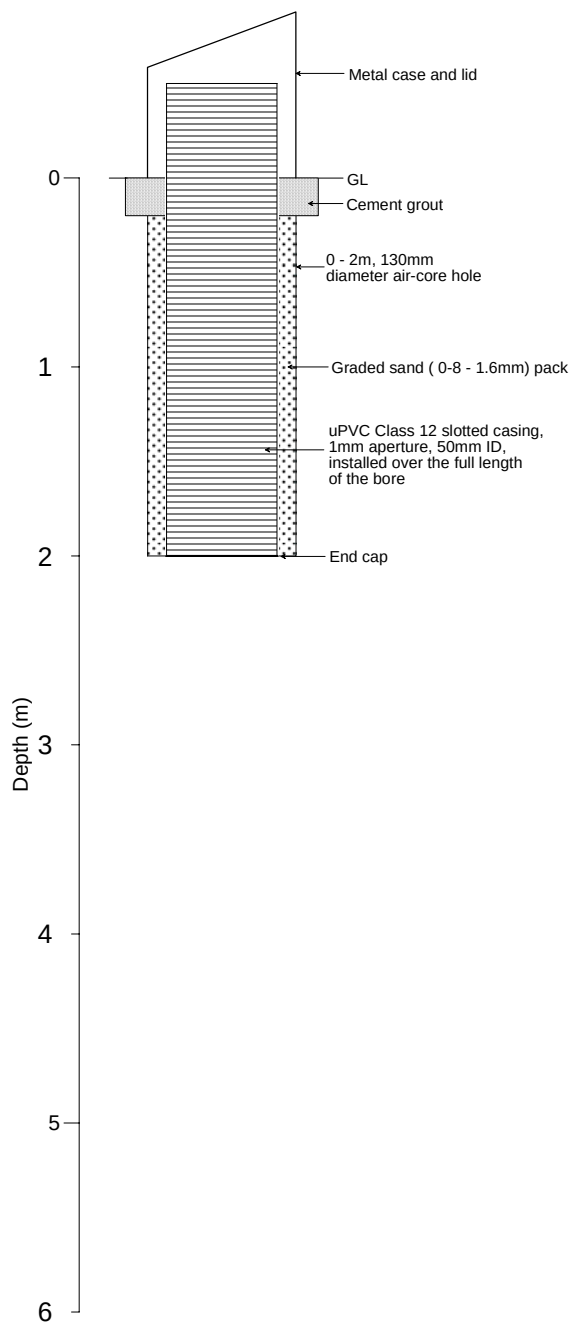
Project: Keysbrook Mineral Sands Project

Date: May 2007

Drg. No.: 321.0/07/AII-6

**PRODUCTION BORE KL3P  
COMPOSITE LOG**

Figure AII-7



I:/321.0/Grapher/Composite Logs/KWT 2m Construction A4.grf

Client: Olympia Resources Limited

Project: Keysbrook Mineral Sands Project

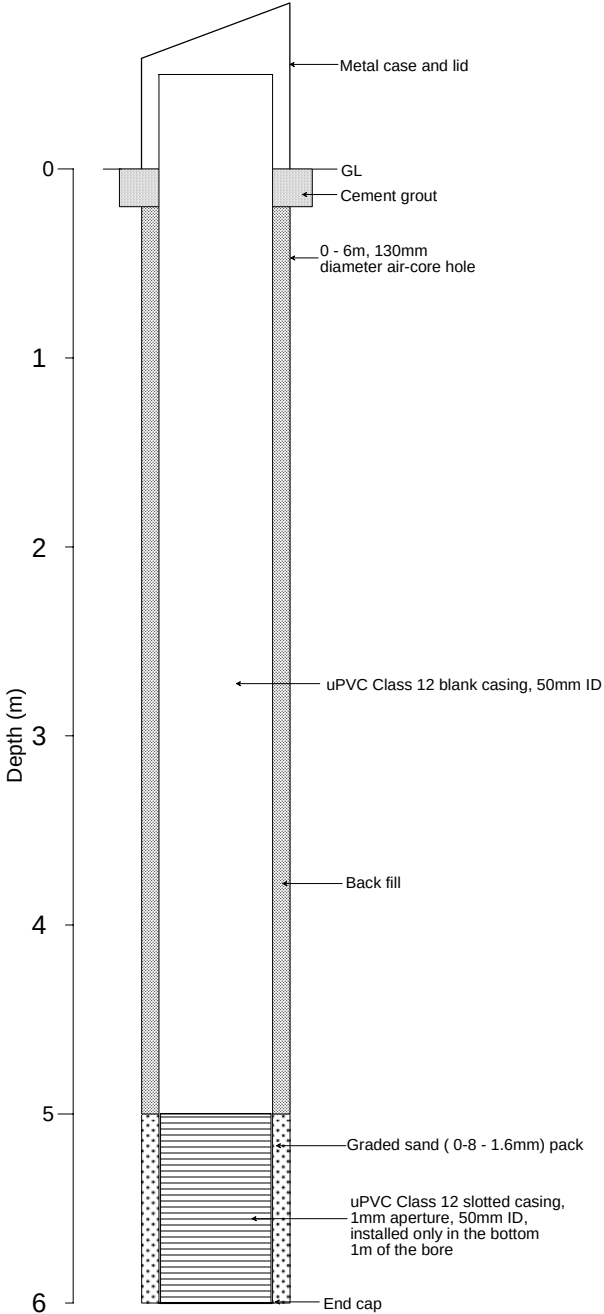
Date: May 2007

Drg. No.: 321.0/07/AII-7

## CONSTRUCTION OF A TYPICAL KWT 2 to 4m-DEEP BORE



Figure AII-8

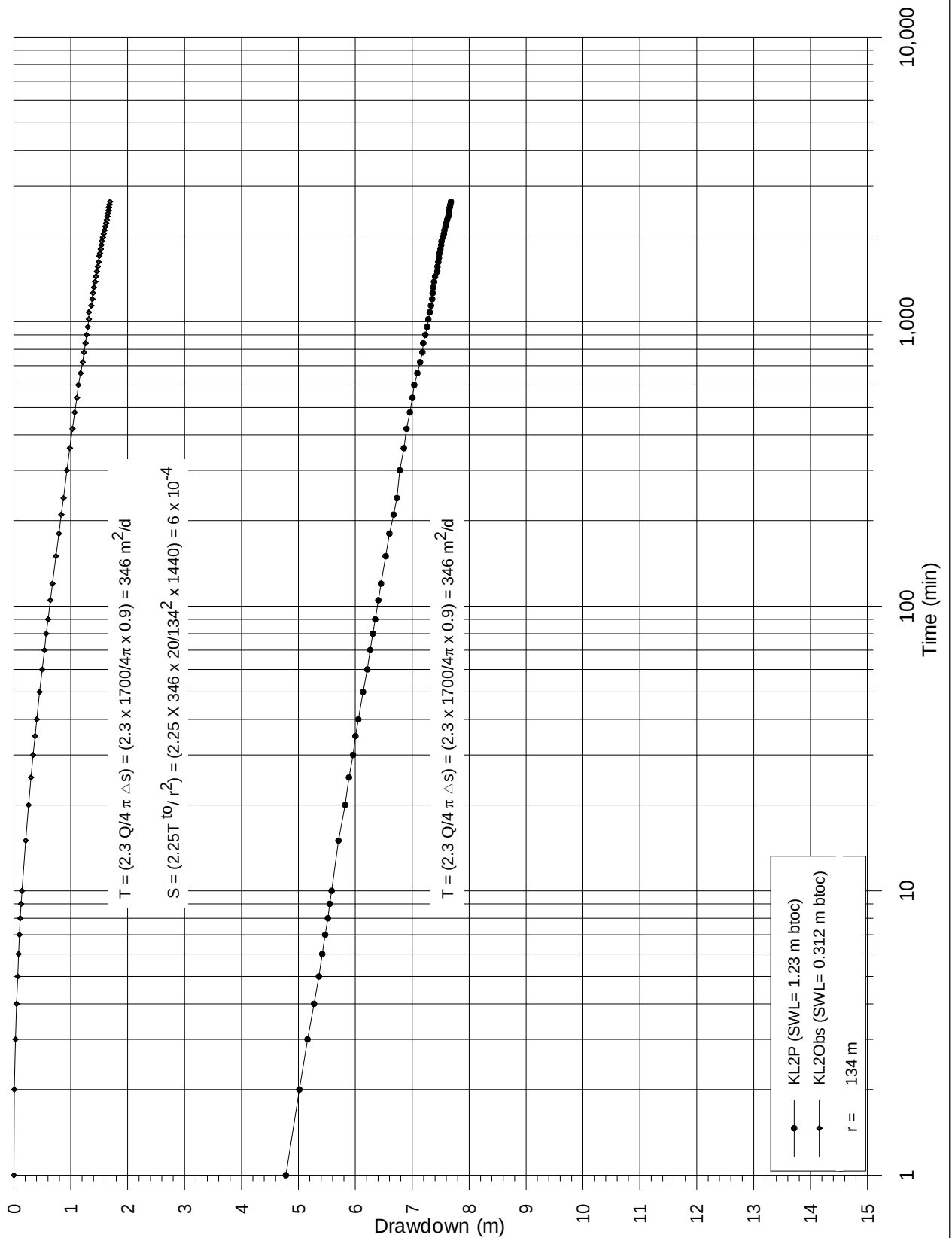


I:/321.0/Grapher/Composite Logs/KWT 6m Construction A4.grf

Client: Olympia Resources Limited  
Project: Keysbrook Mineral Sands Project  
Date: May 2007  
Drg. No.: 321.0/07/AII-8

**CONSTRUCTION OF A TYPICAL  
KWT 6m-DEEP BORE**

Figure AII-9



321-0/Grapher/KL2 Prod Constant rate.xls/KL2Prod Constant Rate.grf

Client: Olympia Resources Limited

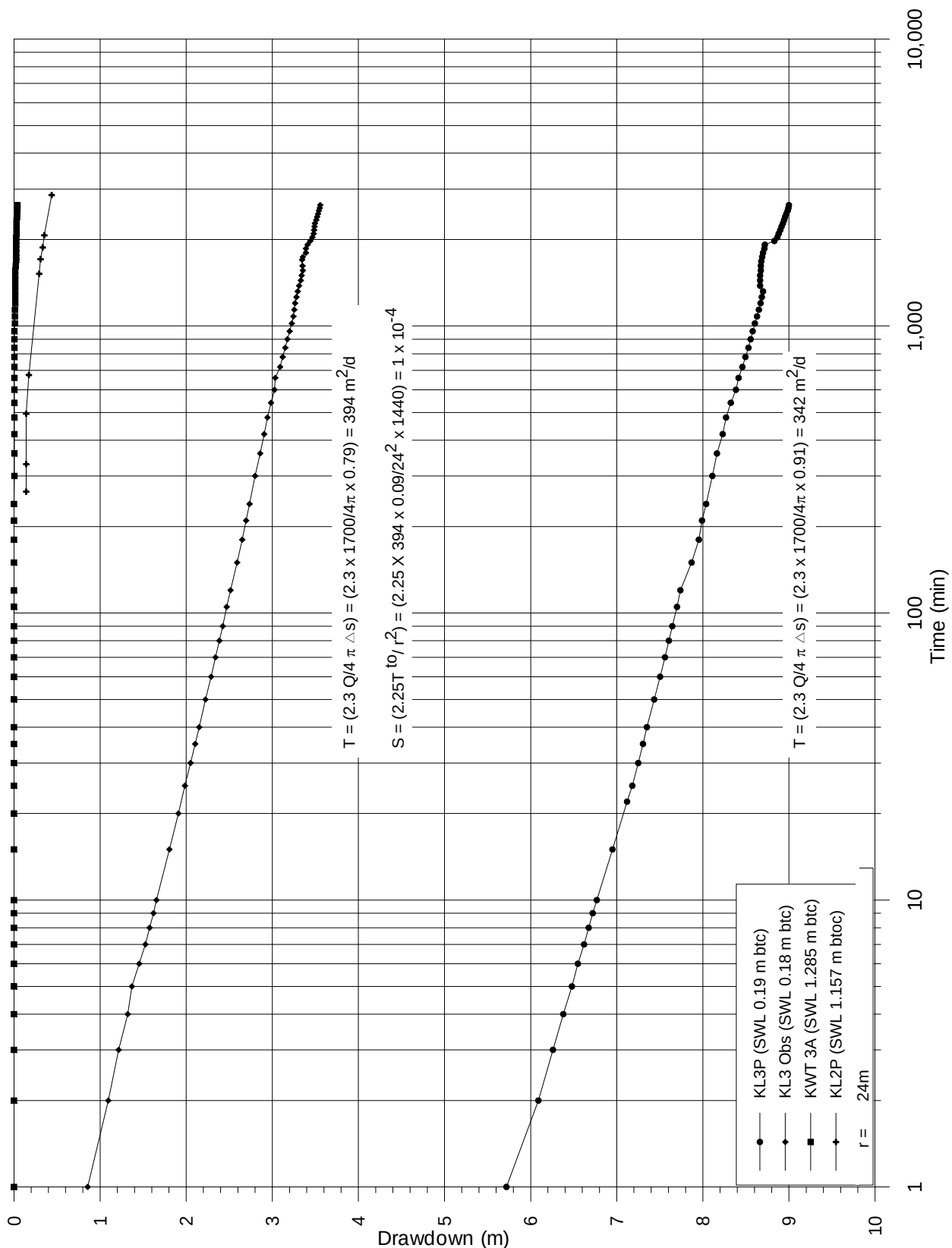
Project : Keysbrook

Date : May 2007

Dwg. No: 321.0/07/AII-9

Bore KL2P 44 Hour Pumping Test.  
 Drawdown in the Pumped Bore & Bore KL2Obs  
 Test Started 7:30am 24/4/2007  
 Pumping Rate = 1700 m<sup>3</sup>/day

Figure AII-10



321-0/Grapher/KL3 Prod Constant rate.xls/KL2Prod Constant Rate.grf

Client: Olympia Resources Limited

Project : Keysbrook

Date : May 2007

Dwg. No: 321.0/07/AII-10

Bore KL3P 44 Hour Pumping Test.

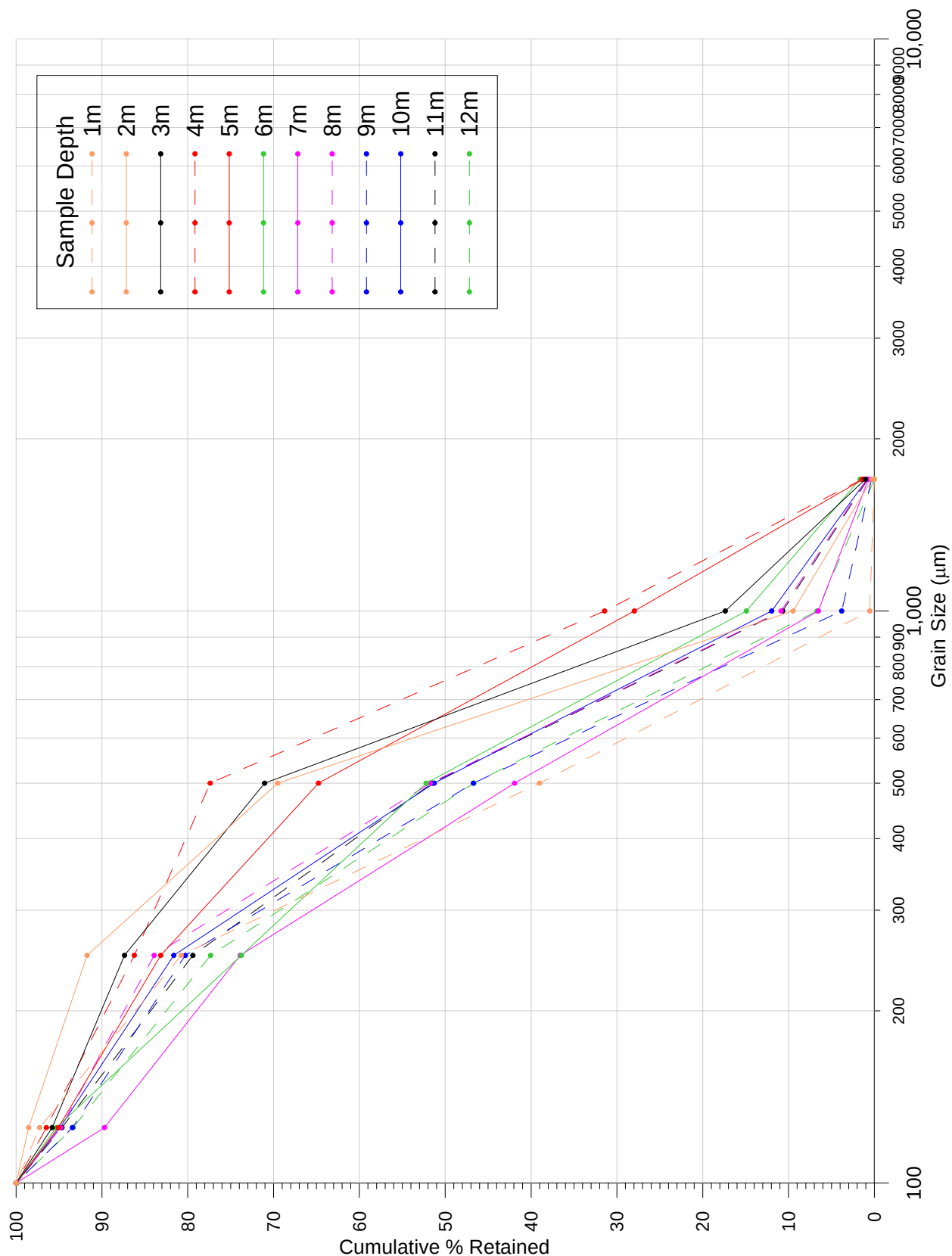
Drawdown in the Pumped Bore &

Bore KL3Obs and KWT 3A

Test Started 7:30am 6/5/2007

Pumping Rate = 1700 m<sup>3</sup>/day

Figure AII-11



321.0/Grapher/Grain Size Analyses/grain size curves KL1 Obs.grf

Client: Olympia Resources Pty Ltd

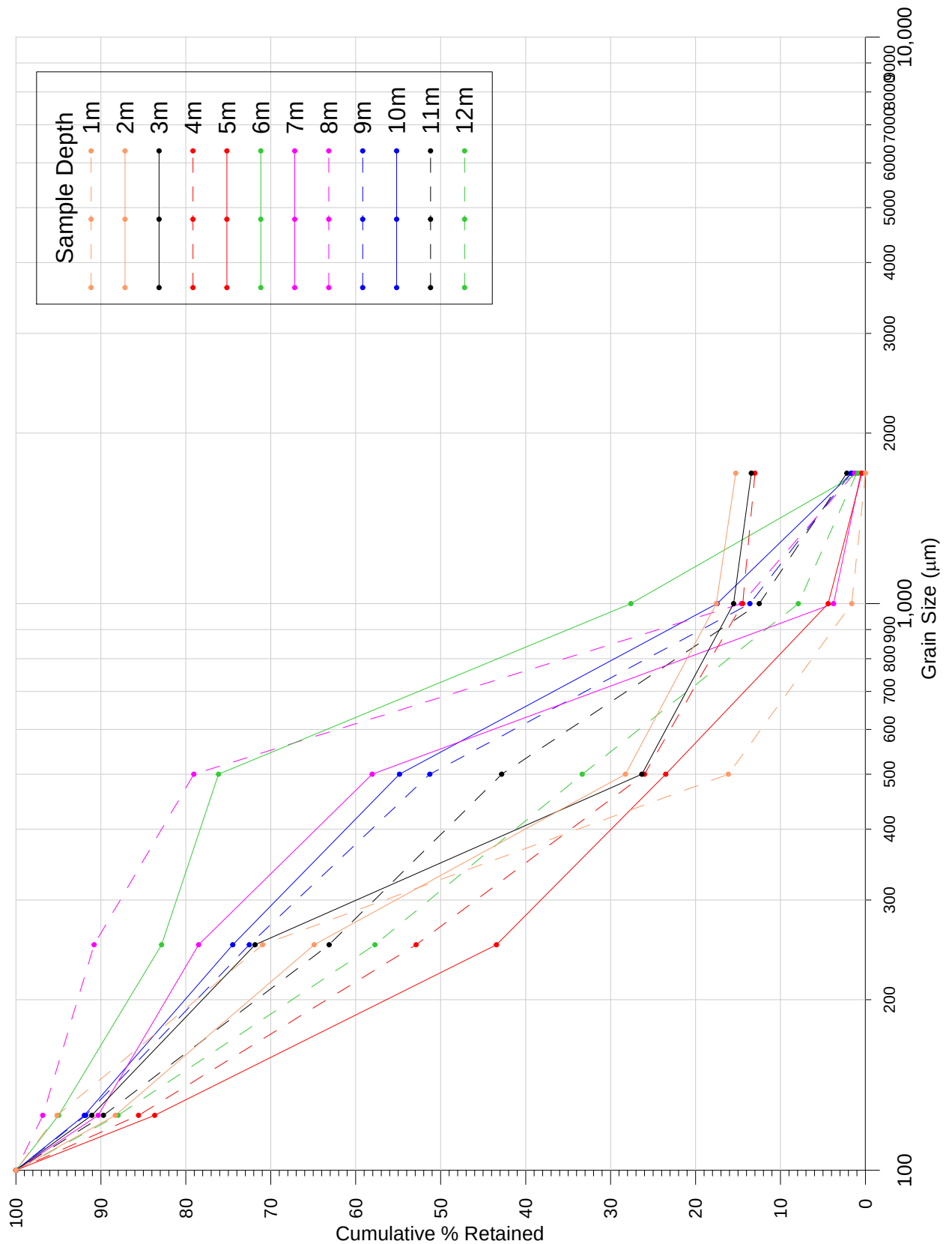
Project : Keysbrook Mineral Sands Project

Date : May 2007

Dwg. No: 321.0/07/AII-11

## Grain Size Curves KL1 Obs

Figure AII-12

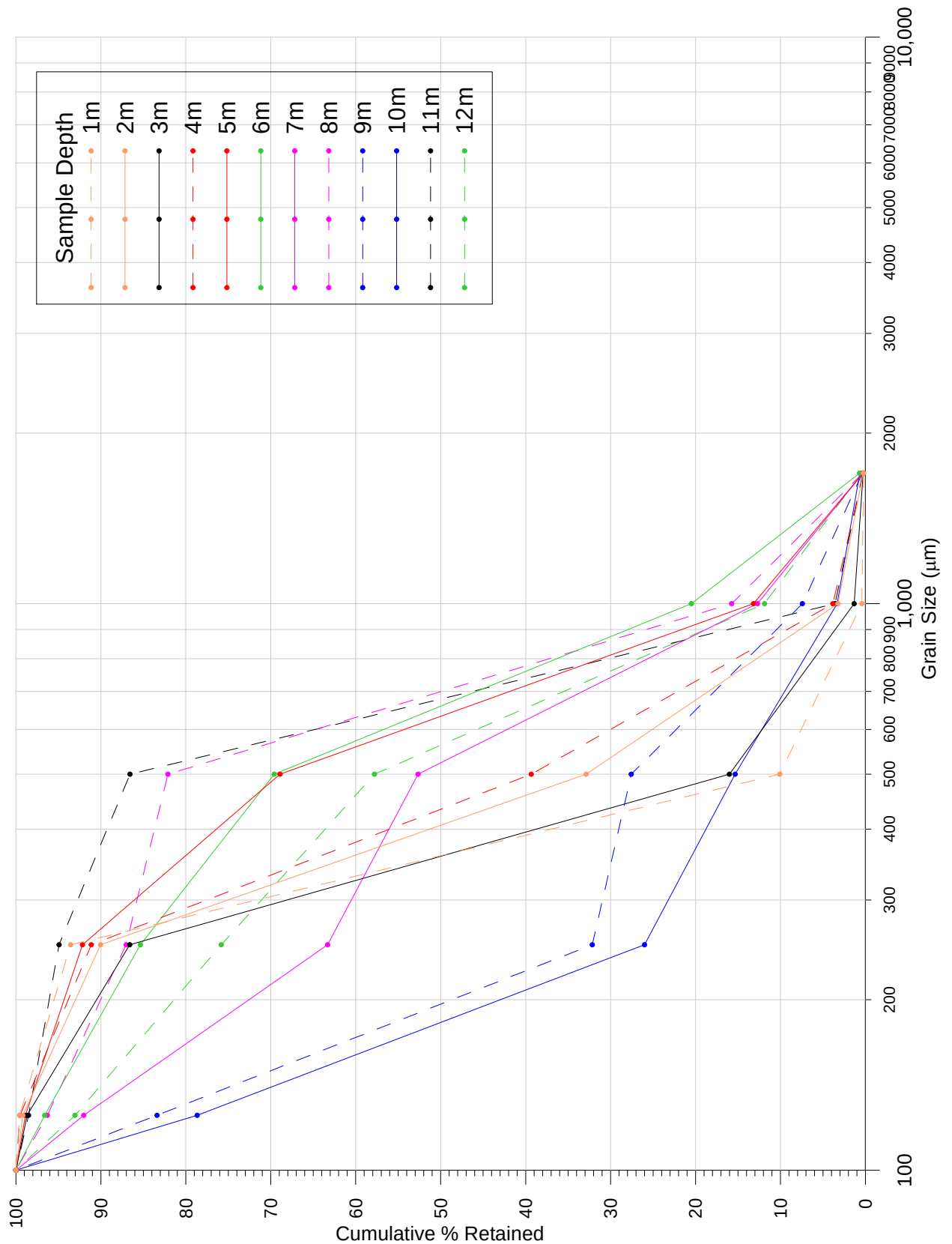


321.0/Grapher/Grain Size Analyses/grain size curves KL2 Obs.grf

Client: Olympia Resources Pty Ltd  
 Project : Keysbrook Mineral Sands Project  
 Date : May 2007  
 Dwg. No: 321.0/07/AII-12

## Grain Size Curves KL2 Obs

Figure AII-13

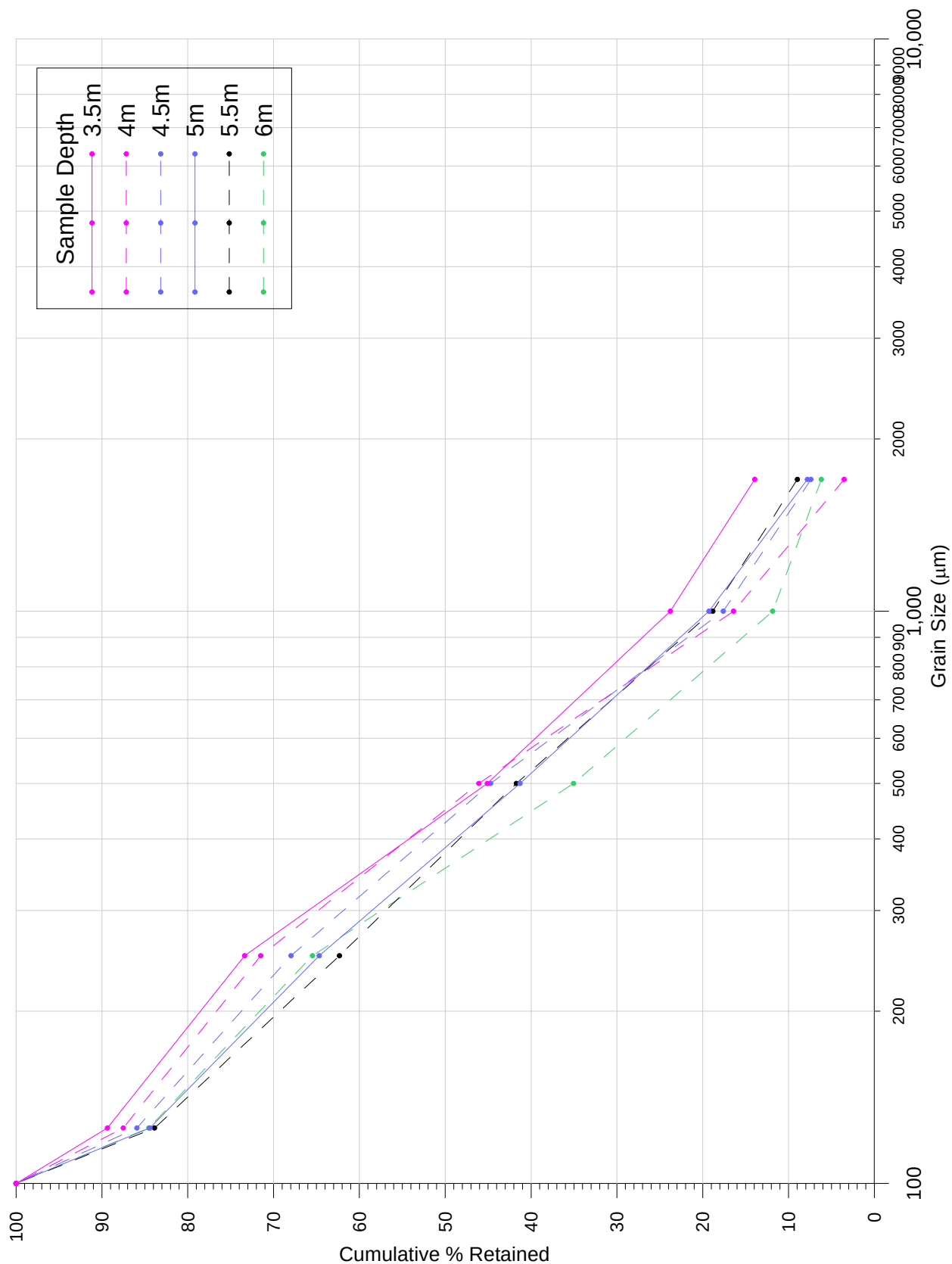


321.0/Grapher/Grain Size Analyses/grain size curves KL3Obs.grf

Client: Olympia Resources Pty Ltd  
 Project : Keysbrook Mineral Sands Project  
 Date : May 2007  
 Dwg. No: 321.0/07/AII-13

## Grain Size Curves KL3Obs

Figure AII-14

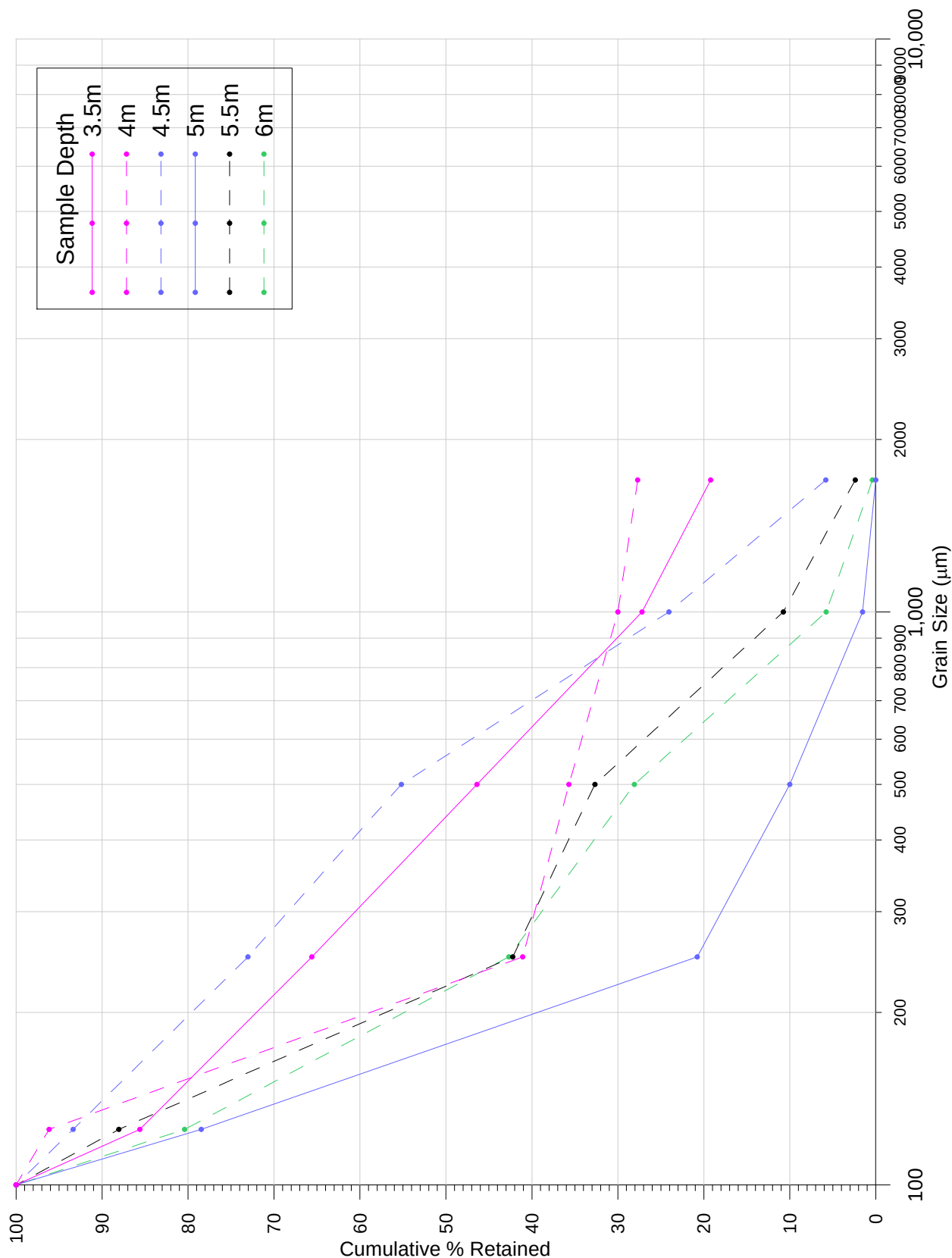


321.0/Grapher/Grain Size Analyses/grain size curves KWT1D.grf

Client: Olympia Resources Pty Ltd  
 Project : Keysbrook Mineral Sands Project  
 Date : May 2007  
 Dwg. No: 321.0/07/AII-14

## Grain Size Curves KWT1D

Figure AII-15



321.0/Grapher/Grain Size Analyses/grain size curves KWT2E.grf

Client: Olympia Resources Pty Ltd  
 Project : Keysbrook Mineral Sands Project  
 Date : May 2007  
 Dwg. No: 321.0/07/AII-15

## Grain Size Curves KWT2E



## **ATTACHMENTS**

AII-1 Bore Construction Data

AII-2 Lithological Descriptions for KWT bores



**PRODUCTION BORE COMPLETION DATA**

|                                |                                                                                                                                                                                                                                        |                        |          |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------|
| <b>Project:</b>                | Olympia Resources, Keysbrook Mineral Sands Project                                                                                                                                                                                     |                        |          |
| <b>Bore No:</b>                | KL2P, Wattle Vale Farm, Hopelands Rd, Keysbrook                                                                                                                                                                                        |                        |          |
| <b>MGA Coordinates:</b>        | 399190 mE, 6 406 893 mN                                                                                                                                                                                                                |                        |          |
| <b>Status:</b>                 | Production Bore                                                                                                                                                                                                                        |                        |          |
| <b>Date Commenced:</b>         | 3/04/07                                                                                                                                                                                                                                | <b>Date Completed:</b> | 17/04/07 |
| <b>Drilling Contractor:</b>    | Harrington Drilling Ltd                                                                                                                                                                                                                |                        |          |
| <b>Drilling Rig:</b>           | HD#1                                                                                                                                                                                                                                   |                        |          |
| <b>Depth Reamed:</b>           | 144 m                                                                                                                                                                                                                                  |                        |          |
| <b>Reaming Details:</b>        | 0 – 12.0m, 251mm mud-rotary<br>12.0 – 144m, 152mm, mud-rotary                                                                                                                                                                          |                        |          |
| <b>Casing Details:</b>         | 0 – 12m, 311mm ID steel surface casing.<br>0 – 58m, 94 – 118m and 136 – 139m, 203mm ID, 225mm OD, uPVC blank casing.<br>58 – 94m and 118 – 136m, 203mm ID, stainless steel screens (0.5mm aperture).<br>139 – 140m, basal cement plug. |                        |          |
| <b>Ground Elevation:</b>       | 27.5mAHD                                                                                                                                                                                                                               |                        |          |
| <b>Collar Elevation:</b>       | 28.1mAHD                                                                                                                                                                                                                               |                        |          |
| <b>Static Water Level:</b>     | 26.9mAHD                                                                                                                                                                                                                               |                        |          |
| <b>Final Airlift Salinity:</b> | 573 µS/cm                                                                                                                                                                                                                              |                        |          |
| <b>Airlift Yields:</b>         | 42 L/s from completed bore                                                                                                                                                                                                             |                        |          |
| <b>Lithology:</b>              | similar to KL2Obs                                                                                                                                                                                                                      |                        |          |



**PRODUCTION BORE COMPLETION DATA**

|                                |                                                                                                                                                                                                                                                                                                |                        |         |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>                | Olympia Resources, Keysbrook Mineral Sands Project                                                                                                                                                                                                                                             |                        |         |
| <b>Bore No:</b>                | KL3P, Wattle Vale Farm, Hopelands Rd, Keysbrook                                                                                                                                                                                                                                                |                        |         |
| <b>MGA Coordinates:</b>        | 398 779 mE, 6 405 436 mN                                                                                                                                                                                                                                                                       |                        |         |
| <b>Status:</b>                 | Production Bore                                                                                                                                                                                                                                                                                |                        |         |
| <b>Date Commenced:</b>         | 26/04/07                                                                                                                                                                                                                                                                                       | <b>Date Completed:</b> | 3/05/07 |
| <b>Drilling Contractor:</b>    | Harrington Drilling Ltd                                                                                                                                                                                                                                                                        |                        |         |
| <b>Drilling Rig:</b>           | HD#1                                                                                                                                                                                                                                                                                           |                        |         |
| <b>Depth Reamed:</b>           | 150 m                                                                                                                                                                                                                                                                                          |                        |         |
| <b>Reaming Details:</b>        | 0 – 12.0m, 251mm mud-rotary<br>12.0 – 144m, 152mm, mud-rotary                                                                                                                                                                                                                                  |                        |         |
| <b>Casing Details:</b>         | 0 – 12m, 311mm ID steel surface casing.<br>0 – 70.6m and 97.6 – 122.5m, 203mm ID, 225mm OD, uPVC blank casing.<br>0.3m connectors between uPVC and steel casing.<br>70.6 – 97.6m and 122.4 – 146.4m, 203mm ID, stainless steel screens (0.5mm aperture).<br>146.7 – 147.7m, basal cement plug. |                        |         |
| <b>Ground Elevation:</b>       | 25.4mAHD                                                                                                                                                                                                                                                                                       |                        |         |
| <b>Collar Elevation:</b>       | 26.0mAHD                                                                                                                                                                                                                                                                                       |                        |         |
| <b>Static Water Level:</b>     | >26.0mAHD                                                                                                                                                                                                                                                                                      |                        |         |
| <b>Final Airlift Salinity:</b> | n/a                                                                                                                                                                                                                                                                                            |                        |         |
| <b>Airlift Yields:</b>         | 40L/s from completed bore                                                                                                                                                                                                                                                                      |                        |         |
| <b>Lithology:</b>              | similar to KL3Obs                                                                                                                                                                                                                                                                              |                        |         |



## EXPLORATION HOLE COMPLETION DATA

|                             |                                                             |                        |          |
|-----------------------------|-------------------------------------------------------------|------------------------|----------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project          |                        |          |
| <b>Bore No:</b>             | KL1S                                                        |                        |          |
| <b>MGA Coordinates:</b>     | 401 628 mE, 6 406 792 mN                                    |                        |          |
| <b>Status:</b>              | Superficial aquifer monitoring hole                         |                        |          |
| <b>Date Commenced:</b>      | 30/05/07                                                    | <b>Date Completed:</b> | 30/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                     |                        |          |
| <b>Drilling Rig:</b>        | HD#1                                                        |                        |          |
| <b>Depth Drilled:</b>       | 3m                                                          |                        |          |
| <b>Drilling Details:</b>    | 0 – 3m, 130mm air-core                                      |                        |          |
| <b>Casing Details:</b>      | 0 – 3m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |          |
| <b>Ground Elevation:</b>    | 33.43mAHD                                                   |                        |          |
| <b>Collar Elevation:</b>    | 33.86mAHD                                                   |                        |          |
| <b>Static Water Level:</b>  | 32.80mAHD                                                   |                        |          |
| <b>Water Salinity:</b>      | n/a                                                         |                        |          |
| <b>Lithology:</b>           | See Attachment AII-2                                        |                        |          |



**EXPLORATION HOLE COMPLETION DATA**

|                             |                                                                                                                                                                               |                        |          |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project                                                                                                                            |                        |          |
| <b>Bore No:</b>             | <b>KL1Obs</b>                                                                                                                                                                 |                        |          |
| <b>MGA Coordinates:</b>     | 401 625 mE, 6 406 792 mN                                                                                                                                                      |                        |          |
| <b>Status:</b>              | Observation Hole                                                                                                                                                              |                        |          |
| <b>Date Commenced:</b>      | 22/03/07                                                                                                                                                                      | <b>Date Completed:</b> | 26/03/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                                                                                                                                       |                        |          |
| <b>Drilling Rig:</b>        | HD#1                                                                                                                                                                          |                        |          |
| <b>Depth Drilled:</b>       | 90 m                                                                                                                                                                          |                        |          |
| <b>Drilling Details:</b>    | 0 – 12m, 251mm mud-rotary<br>12 – 90m, 152mm, mud-rotary                                                                                                                      |                        |          |
| <b>Casing Details:</b>      | 0 – 12m, 155mm ID steel surface casing.<br>0 – 47m, 67mm ID, 76mm OD, Class 12 uPVC blank casing.<br>47 – 83m, 67mm ID, 76mm OD, Class 12 uPVC slotted casing (1mm aperture). |                        |          |
| <b>Ground Elevation:</b>    | 33.4mAHD                                                                                                                                                                      |                        |          |
| <b>Collar Elevation:</b>    | 34.0mAHD                                                                                                                                                                      |                        |          |
| <b>Static Water Level:</b>  | 29.8mAHD                                                                                                                                                                      |                        |          |
| <b>Water Salinity:</b>      | 346µS/cm                                                                                                                                                                      |                        |          |
| <b>Airlift Yields:</b>      | 5.6L/s from completed bore                                                                                                                                                    |                        |          |
| <b>Lithology:</b>           | see Figure AII-2                                                                                                                                                              |                        |          |



**EXPLORATION HOLE COMPLETION DATA**

|                             |                                                                                                                                                                                                                             |                        |         |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project                                                                                                                                                                          |                        |         |
| <b>Bore No:</b>             | <b>KL2Obs</b>                                                                                                                                                                                                               |                        |         |
| <b>MGA Coordinates:</b>     | 399 186 mE, 6 406 766 mN                                                                                                                                                                                                    |                        |         |
| <b>Status:</b>              | Observation Hole                                                                                                                                                                                                            |                        |         |
| <b>Date Commenced:</b>      | 27/03/07                                                                                                                                                                                                                    | <b>Date Completed:</b> | 2/04/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                                                                                                                                                                                     |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                                                                                                                                                                                        |                        |         |
| <b>Depth Drilled:</b>       | 144 m                                                                                                                                                                                                                       |                        |         |
| <b>Drilling Details:</b>    | 0 – 12 m, 251 mm mud-rotary<br>12 – 144 m, 152 mm, mud-rotary                                                                                                                                                               |                        |         |
| <b>Casing Details:</b>      | 0 – 12m, 155mm ID steel surface casing.<br>0 – 42m, 48 – 54m and 60 – 66m, 67mm ID, 76mm OD, Class 12 uPVC blank casing.<br>42 – 48m, 54 – 60m and 66 – 96m, 67mm ID, 76mm OD, Class 12 uPVC slotted casing (1mm aperture). |                        |         |
| <b>Ground Elevation:</b>    | 27.2mAHD                                                                                                                                                                                                                    |                        |         |
| <b>Collar Elevation:</b>    | 27.6mAHD                                                                                                                                                                                                                    |                        |         |
| <b>Static Water Level:</b>  | 27.4mAHD                                                                                                                                                                                                                    |                        |         |
| <b>Water Salinity:</b>      | 360mg/L TDS (calc.)                                                                                                                                                                                                         |                        |         |
| <b>Airlift Yields:</b>      | 8.0L/s from completed bore                                                                                                                                                                                                  |                        |         |
| <b>Lithology:</b>           | see Figure AII-3                                                                                                                                                                                                            |                        |         |



**EXPLORATION HOLE COMPLETION DATA**

|                             |                                                                                                                                                                                                             |                        |          |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project                                                                                                                                                          |                        |          |
| <b>Bore No:</b>             | <b>KL3Obs</b>                                                                                                                                                                                               |                        |          |
| <b>MGA Coordinates:</b>     | 398 778 mE, 6 405 465 mN                                                                                                                                                                                    |                        |          |
| <b>Status:</b>              | Observation Hole                                                                                                                                                                                            |                        |          |
| <b>Date Commenced:</b>      | 19/04/07                                                                                                                                                                                                    | <b>Date Completed:</b> | 25/04/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                                                                                                                                                                     |                        |          |
| <b>Drilling Rig:</b>        | HD#1                                                                                                                                                                                                        |                        |          |
| <b>Depth Drilled:</b>       | 156 m                                                                                                                                                                                                       |                        |          |
| <b>Drilling Details:</b>    | 0 – 12m, 251mm mud-rotary<br>12 – 156m, 152mm, mud-rotary                                                                                                                                                   |                        |          |
| <b>Casing Details:</b>      | 0 – 12m, 155mm ID steel surface casing.<br>0 – 72m and 102 – 120m, 67mm ID, 76mm OD, Class 12 uPVC blank casing.<br>72 – 102m and 120 – 150m, 67mmID, 76mm OD, Class 12 uPVC slotted casing (1mm aperture). |                        |          |
| <b>Ground Elevation:</b>    | 25.5mAHD                                                                                                                                                                                                    |                        |          |
| <b>Collar Elevation:</b>    | 26.099mAHD                                                                                                                                                                                                  |                        |          |
| <b>Static Water Level:</b>  | 26.095mAHD                                                                                                                                                                                                  |                        |          |
| <b>Water Salinity:</b>      | 350mg/L TDS (calc.)                                                                                                                                                                                         |                        |          |
| <b>Airlift Yields:</b>      | 8.5L/s from completed bore                                                                                                                                                                                  |                        |          |
| <b>Lithology:</b>           | see Figure AII-4                                                                                                                                                                                            |                        |          |



## EXPLORATION HOLE COMPLETION DATA

|                             |                                                             |                        |         |
|-----------------------------|-------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project          |                        |         |
| <b>Bore No:</b>             | KWT1A                                                       |                        |         |
| <b>MGA Coordinates:</b>     | 400 968 mE, 6 405 442 mN                                    |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                         |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                     | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                     |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                        |                        |         |
| <b>Depth Drilled:</b>       | 2m                                                          |                        |         |
| <b>Drilling Details:</b>    | 0 – 2m, 130mm air-core                                      |                        |         |
| <b>Casing Details:</b>      | 0 – 2m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |         |
| <b>Ground Elevation:</b>    | 31.8mAHD                                                    |                        |         |
| <b>Collar Elevation:</b>    | 32.2mAHD                                                    |                        |         |
| <b>Static Water Level:</b>  | dry                                                         |                        |         |
| <b>Water Salinity:</b>      | n/a                                                         |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                        |                        |         |



## EXPLORATION HOLE COMPLETION DATA

|                             |                                                             |                        |         |
|-----------------------------|-------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project          |                        |         |
| <b>Bore No:</b>             | <b>KWT1B</b>                                                |                        |         |
| <b>MGA Coordinates:</b>     | 400 956 mE, 6 405 464 mN                                    |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                         |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                     | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                     |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                        |                        |         |
| <b>Depth Drilled:</b>       | 2m                                                          |                        |         |
| <b>Drilling Details:</b>    | 0 – 2m, 130mm air-core                                      |                        |         |
| <b>Casing Details:</b>      | 0 – 2m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |         |
| <b>Ground Elevation:</b>    | 32.05mAHD                                                   |                        |         |
| <b>Collar Elevation:</b>    | 32.4mAHD                                                    |                        |         |
| <b>Static Water Level:</b>  | 31.1mAHD                                                    |                        |         |
| <b>Water Salinity:</b>      | n/a                                                         |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                        |                        |         |



## EXPLORATION HOLE COMPLETION DATA

|                             |                                                             |                        |         |
|-----------------------------|-------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project          |                        |         |
| <b>Bore No:</b>             | KWT1C                                                       |                        |         |
| <b>MGA Coordinates:</b>     | 400 948 mE, 6 405 487 mN                                    |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                         |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                     | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                     |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                        |                        |         |
| <b>Depth Drilled:</b>       | 2m                                                          |                        |         |
| <b>Drilling Details:</b>    | 0 – 2m, 130mm air-core                                      |                        |         |
| <b>Casing Details:</b>      | 0 – 2m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |         |
| <b>Ground Elevation:</b>    | 32.2mAHD                                                    |                        |         |
| <b>Collar Elevation:</b>    | 32.6mAHD                                                    |                        |         |
| <b>Static Water Level:</b>  | dry                                                         |                        |         |
| <b>Water Salinity:</b>      | n/a                                                         |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                        |                        |         |

**EXPLORATION HOLE COMPLETION DATA**

|                             |                                                                                                             |                        |         |
|-----------------------------|-------------------------------------------------------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project                                                          |                        |         |
| <b>Bore No:</b>             | <b>KWT1D</b>                                                                                                |                        |         |
| <b>MGA Coordinates:</b>     | 400 948 mE, 6 405 488 mN                                                                                    |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                                                                         |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                                                                     | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                                                                     |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                                                                        |                        |         |
| <b>Depth Drilled:</b>       | 6m                                                                                                          |                        |         |
| <b>Drilling Details:</b>    | 0 – 6m, 130mm air-core                                                                                      |                        |         |
| <b>Casing Details:</b>      | 0 – 5m, 50mm ID, class 12 uPVC blank casing,<br>5 – 6m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |         |
| <b>Ground Elevation:</b>    | 32.1mAHD                                                                                                    |                        |         |
| <b>Collar Elevation:</b>    | 32.7mAHD                                                                                                    |                        |         |
| <b>Static Water Level:</b>  | 29.9mAHD                                                                                                    |                        |         |
| <b>Water Salinity:</b>      | n/a                                                                                                         |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                                                                        |                        |         |

## EXPLORATION HOLE COMPLETION DATA

|                             |                                                             |                        |          |
|-----------------------------|-------------------------------------------------------------|------------------------|----------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project          |                        |          |
| <b>Bore No:</b>             | KWT1E                                                       |                        |          |
| <b>MGA Coordinates:</b>     | 400 965 mE, 6 405 441 mN                                    |                        |          |
| <b>Status:</b>              | Superficial aquifer monitoring hole                         |                        |          |
| <b>Date Commenced:</b>      | 30/05/07                                                    | <b>Date Completed:</b> | 30/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                     |                        |          |
| <b>Drilling Rig:</b>        | HD#1                                                        |                        |          |
| <b>Depth Drilled:</b>       | 4m                                                          |                        |          |
| <b>Drilling Details:</b>    | 0 – 4m, 130mm air-core                                      |                        |          |
| <b>Casing Details:</b>      | 0 – 4m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |          |
| <b>Ground Elevation:</b>    | 31.79mAHD                                                   |                        |          |
| <b>Collar Elevation:</b>    | 32.37mAHD                                                   |                        |          |
| <b>Static Water Level:</b>  | 31.27mAHD                                                   |                        |          |
| <b>Water Salinity:</b>      | n/a                                                         |                        |          |
| <b>Lithology:</b>           | See Attachment AII-2                                        |                        |          |

## EXPLORATION HOLE COMPLETION DATA

|                             |                                                             |                        |          |
|-----------------------------|-------------------------------------------------------------|------------------------|----------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project          |                        |          |
| <b>Bore No:</b>             | KWT1F                                                       |                        |          |
| <b>MGA Coordinates:</b>     | 400 920 mE, 6 405 579 mN                                    |                        |          |
| <b>Status:</b>              | Superficial aquifer monitoring hole                         |                        |          |
| <b>Date Commenced:</b>      | 30/05/07                                                    | <b>Date Completed:</b> | 30/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                     |                        |          |
| <b>Drilling Rig:</b>        | HD#1                                                        |                        |          |
| <b>Depth Drilled:</b>       | 4m                                                          |                        |          |
| <b>Drilling Details:</b>    | 0 – 4m, 130mm air-core                                      |                        |          |
| <b>Casing Details:</b>      | 0 – 4m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |          |
| <b>Ground Elevation:</b>    | 31.78mAHD                                                   |                        |          |
| <b>Collar Elevation:</b>    | 32.25mAHD                                                   |                        |          |
| <b>Static Water Level:</b>  | 29.69mAHD                                                   |                        |          |
| <b>Water Salinity:</b>      | n/a                                                         |                        |          |
| <b>Lithology:</b>           | See Attachment AII-2                                        |                        |          |

## EXPLORATION HOLE COMPLETION DATA

|                             |                                                               |                        |           |
|-----------------------------|---------------------------------------------------------------|------------------------|-----------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project            |                        |           |
| <b>Bore No:</b>             | <b>KWT2A</b>                                                  |                        |           |
| <b>MGA Coordinates:</b>     | 399 188 mE, 6 406 766 mN, 3m E of KL2Obs                      |                        |           |
| <b>Status:</b>              | Superficial aquifer monitoring hole                           |                        |           |
| <b>Date Commenced:</b>      | ~11/05/07                                                     | <b>Date Completed:</b> | ~11/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                       |                        |           |
| <b>Drilling Rig:</b>        | Hand auger                                                    |                        |           |
| <b>Depth Drilled:</b>       | 1.5m                                                          |                        |           |
| <b>Drilling Details:</b>    | 0 – 1.5m, hand auger                                          |                        |           |
| <b>Casing Details:</b>      | 0 – 1.5m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |           |
| <b>Ground Elevation:</b>    | 27.1mAHD                                                      |                        |           |
| <b>Collar Elevation:</b>    | 27.6mAHD                                                      |                        |           |
| <b>Static Water Level:</b>  | 26.5mAHD                                                      |                        |           |
| <b>Water Salinity:</b>      | n/a                                                           |                        |           |
| <b>Lithology:</b>           | See Attachment AII-2                                          |                        |           |

## EXPLORATION HOLE COMPLETION DATA

|                             |                                                                 |                        |         |
|-----------------------------|-----------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project              |                        |         |
| <b>Bore No:</b>             | <b>KWT2B</b>                                                    |                        |         |
| <b>MGA Coordinates:</b>     | 399 380 mE, 6 406 810 mN                                        |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                             |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                         | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                         |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                            |                        |         |
| <b>Depth Drilled:</b>       | 3.5m                                                            |                        |         |
| <b>Drilling Details:</b>    | 0 – 3.5.0m, 130mm air-core                                      |                        |         |
| <b>Casing Details:</b>      | 0 – 3.5.0m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |         |
| <b>Ground Elevation:</b>    | 27.5mAHD                                                        |                        |         |
| <b>Collar Elevation:</b>    | 28.0mAHD                                                        |                        |         |
| <b>Static Water Level:</b>  | 25.2mAHD                                                        |                        |         |
| <b>Water Salinity:</b>      | n/a                                                             |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                            |                        |         |



## EXPLORATION HOLE COMPLETION DATA

|                             |                                                               |                        |         |
|-----------------------------|---------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project            |                        |         |
| <b>Bore No:</b>             | KWT2C                                                         |                        |         |
| <b>MGA Coordinates:</b>     | 399 387 mE, 6 406 832 mN                                      |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                           |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                       | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                       |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                          |                        |         |
| <b>Depth Drilled:</b>       | 3m                                                            |                        |         |
| <b>Drilling Details:</b>    | 0 – 3.0m, 130mm air-core                                      |                        |         |
| <b>Casing Details:</b>      | 0 – 3.0m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |         |
| <b>Ground Elevation:</b>    | 27.7mAHD                                                      |                        |         |
| <b>Collar Elevation:</b>    | 28.1mAHD                                                      |                        |         |
| <b>Static Water Level:</b>  | 26.2mAHD                                                      |                        |         |
| <b>Water Salinity:</b>      | n/a                                                           |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                          |                        |         |



## EXPLORATION HOLE COMPLETION DATA

|                             |                                                               |                        |         |
|-----------------------------|---------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project            |                        |         |
| <b>Bore No:</b>             | <b>KWT2D</b>                                                  |                        |         |
| <b>MGA Coordinates:</b>     | 399 395 mE, 6 406 854 mN                                      |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                           |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                       | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                       |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                          |                        |         |
| <b>Depth Drilled:</b>       | 3m                                                            |                        |         |
| <b>Drilling Details:</b>    | 0 – 3.0m, 130mm air-core                                      |                        |         |
| <b>Casing Details:</b>      | 0 – 3.0m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |         |
| <b>Ground Elevation:</b>    | 27.7mAHD                                                      |                        |         |
| <b>Collar Elevation:</b>    | 28.2mAHD                                                      |                        |         |
| <b>Static Water Level:</b>  | 27.0mAHD                                                      |                        |         |
| <b>Water Salinity:</b>      | n/a                                                           |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                          |                        |         |

**EXPLORATION HOLE COMPLETION DATA**

|                             |                                                                                                                      |                        |         |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project                                                                   |                        |         |
| <b>Bore No:</b>             | <b>KWT2E</b>                                                                                                         |                        |         |
| <b>MGA Coordinates:</b>     | 399 395 mE, 6 406 856 mN                                                                                             |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                                                                                  |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                                                                              | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                                                                              |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                                                                                 |                        |         |
| <b>Depth Drilled:</b>       | 6m                                                                                                                   |                        |         |
| <b>Drilling Details:</b>    | 0 – 6.0m, 130mm air-core                                                                                             |                        |         |
| <b>Casing Details:</b>      | 0 – 5.0m, 50mm ID, class 12 uPVC blank casing,<br>5.0 – 6.0m, 50mm ID, class 12 uPVC slotted casing, 1mm<br>aperture |                        |         |
| <b>Ground Elevation:</b>    | 27.8mAHD                                                                                                             |                        |         |
| <b>Collar Elevation:</b>    | 28.3mAHD                                                                                                             |                        |         |
| <b>Static Water Level:</b>  | 27.0mAHD                                                                                                             |                        |         |
| <b>Water Salinity:</b>      | n/a                                                                                                                  |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                                                                                 |                        |         |



## EXPLORATION HOLE COMPLETION DATA

|                             |                                                               |                        |         |
|-----------------------------|---------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project            |                        |         |
| <b>Bore No:</b>             | KWT2F                                                         |                        |         |
| <b>MGA Coordinates:</b>     | 399 404 mE, 6 406 883 mN                                      |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                           |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                       | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> |                                                               |                        |         |
| <b>Drilling Rig:</b>        | Hand auger                                                    |                        |         |
| <b>Depth Drilled:</b>       | 1.8m                                                          |                        |         |
| <b>Drilling Details:</b>    | 0 – 1.8m, 130mm air-core                                      |                        |         |
| <b>Casing Details:</b>      | 0 – 1.8m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |         |
| <b>Ground Elevation:</b>    | 28.1mAHD                                                      |                        |         |
| <b>Collar Elevation:</b>    | 28.7mAHD                                                      |                        |         |
| <b>Static Water Level:</b>  | n/a                                                           |                        |         |
| <b>Water Salinity:</b>      | n/a                                                           |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                          |                        |         |



## EXPLORATION HOLE COMPLETION DATA

|                             |                                                               |                        |         |
|-----------------------------|---------------------------------------------------------------|------------------------|---------|
| <b>Project:</b>             | Olympia Resources, Keysbrook Mineral Sands Project            |                        |         |
| <b>Bore No:</b>             | KWT3A                                                         |                        |         |
| <b>MGA Coordinates:</b>     | 398 782 mE, 6 405 465 mN, 3m E of KL3Obs                      |                        |         |
| <b>Status:</b>              | Superficial aquifer monitoring hole                           |                        |         |
| <b>Date Commenced:</b>      | 4/05/07                                                       | <b>Date Completed:</b> | 4/05/07 |
| <b>Drilling Contractor:</b> | Harrington Drilling Ltd                                       |                        |         |
| <b>Drilling Rig:</b>        | HD#1                                                          |                        |         |
| <b>Depth Drilled:</b>       | 4m                                                            |                        |         |
| <b>Drilling Details:</b>    | 0 – 4.0m, 130mm air-core                                      |                        |         |
| <b>Casing Details:</b>      | 0 – 4.0m, 50mm ID, class 12 uPVC slotted casing, 1mm aperture |                        |         |
| <b>Ground Elevation:</b>    | 25.5mAHD                                                      |                        |         |
| <b>Collar Elevation:</b>    | 26.0mAHD                                                      |                        |         |
| <b>Static Water Level:</b>  | 24.6mAHD                                                      |                        |         |
| <b>Water Salinity:</b>      | n/a                                                           |                        |         |
| <b>Lithology:</b>           | See Attachment AII-2                                          |                        |         |

**BORE KL1S  
LITHOLOGY**

| Depth (m) | Formation       | Description                                                                                                                                                                |
|-----------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 3     | Bassendean Sand | SAND: cream to yellow/grey, mod sorted, sub-rounded, fine to very coarse grained qtz, unconsolidated. Tiny black grains in top 0.75m. Ferruginous sandstone chips at 2.5m. |

**BORE KWT1A  
LITHOLOGY**

| Depth (m) | Formation       | Description                                                                                                                              |
|-----------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 1     | Bassendean Sand | SAND: lt brown, well sorted, sub-angular, fine grained qtz, unconsolidated, with freq tiny black grains.                                 |
| 1 – 2     | Guildford Fm    | CLAYEY SAND: Sand 80% as above, with small nodules of clay, lt brown at 1m but becoming increasingly lt blue-grey and crimson down hole. |

**BORE KWT1B  
LITHOLOGY**

| Depth (m) | Formation       | Description                                                                                                   |
|-----------|-----------------|---------------------------------------------------------------------------------------------------------------|
| 0 – 1     | Bassendean Sand | SAND: lt brown, well sorted, sub-angular, fine grained qtz, unconsolidated, with freq tiny black grains.      |
| 1 – 2     | Guildford Fm    | CLAYEY SAND: Sand 80% as above, with small nodules of clay, lt blue to white. Rare ferruginous pebbles at 2m. |

**BORE KWT1C  
LITHOLOGY**

| Depth (m) | Formation       | Description                                                                                                                         |
|-----------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 1     | Bassendean Sand | SAND: lt brown, well sorted, sub-angular, fine grained qtz, unconsolidated, with freq tiny black grains.                            |
| 1 – 2     | Guildford Fm    | CLAYEY SAND: Nodules of mostly lt blue – lt grey, tan and yellow siltstone with fine grained, well sorted, sub-angular lt grey qtz. |



### BORE KWT1D LITHOLOGY

| Depth (m) | Formation       | Description                                                                                                                                                                     |
|-----------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 1     | Bassendean Sand | SAND: lt brown, well sorted, sub-angular, fine grained qtz, unconsolidated, with freq tiny black grains.                                                                        |
| 1 – 3     | Guildford Fm    | CLAYEY SAND: Nodules of mostly lt grey, lt brown and orange siltstone with fine grained, well sorted, sub-angular to sub-rounded, lt grey qtz. Rare ferruginous pebbles.        |
| 3 - 6     |                 | SILTSTONE: Nodules of cream thru to crimson, olive and lt blue siltstone with mostly fine grained but up to coarse grained, poorly sorted, sub-angular and angular lt grey qtz. |

### BORE KWT1E LITHOLOGY

| Depth (m) | Formation       | Description                                                                                                                                              |
|-----------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 0.5   | Bassendean Sand | SAND: cream to dk grey, mod sorted, sub-ang to sub-rounded, med grained qtz, v. sl. cemented.                                                            |
| 0.5 – 4   | Guildford Fm    | CLAYEY SAND: Fine to v. coarse gr, ang to sub-rounded, cream to dk grey to red, mod and poorly sorted Sand, with up to 2cm pieces ferruginous sandstone. |

### BORE KWT1F LITHOLOGY

| Depth (m) | Formation       | Description                                                                                                                                                             |
|-----------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 0.5   | Bassendean Sand | SAND: cream to dk grey, mod sorted, sub-ang to sub-rounded, v fine to med grained qtz, traces tiny black grains.                                                        |
| 0.5 – 4   | Guildford Fm    | CLAYEY SAND: Fine to v. coarse gr, ang to sub-rounded, cream to salmon pink, mod and poorly sorted Sand, with traces tiny black grains and chips ferruginous sandstone. |

### BORE KWT2A LITHOLOGY

| Depth (m) | Formation | Description |
|-----------|-----------|-------------|
|           |           |             |



**BORE KWT2B  
LITHOLOGY**

| Depth (m) | Formation       | Description                                                                                                                                                          |
|-----------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 1.5   | Bassendean Sand | SAND: yellow to brown, mod sorted, sub-rounded, fine grained qtz, unconsolidated.                                                                                    |
| 1.5 – 3.5 | Guildford Fm    | CLAYEY SAND: Yellow and orange, fine grained, sub-rounded, poorly to mod sorted, unconsolidated qtz with 25% sticky, yellow to brown clay increasing to 40% at 3.5m. |

**BORE KWT2C  
LITHOLOGY**

| Depth (m) | Formation    | Description                                                                                                                                                                                                                                                                                        |
|-----------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 3     | Guildford Fm | CLAYEY SAND: Orange to med brown, fine grained, sub-rounded, mod sorted, unconsolidated qtz with up to 40% orange to brown clay. At 2 and 2.5m there are occasional med gravel sized pieces of SANDSTONE comprising mod sorted, yellow, sub-rounded, coarse grained qtz 70% in a siliceous matrix. |

**BORE KWT2D  
LITHOLOGY**

| Depth (m) | Formation       | Description                                                                                                               |
|-----------|-----------------|---------------------------------------------------------------------------------------------------------------------------|
| 0 – 2     | Bassendean Sand | SAND: yellow to red brown, mod to well sorted, sub-rounded, fine grained qtz, unconsolidated. Ferruginous gravel at 1.5m. |
| 2 – 3     | Guildford Fm    | CLAYEY SAND: Sand as above with 40% orange-brown clay. Frequent to abundant ferruginous gravel.                           |

**BORE KWT2E  
LITHOLOGY**

| Depth (m) | Formation    | Description                                                                                                                                                                |
|-----------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 – 3     | Guildford Fm | FERRUGINOUS CLAY: Orange, mod sorted, sub-rounded, fine grained qtz, in sticky orange clay approx 50:50 increasing to 70% clay from 2m, with frequent ferruginous pebbles. |
| 3 – 4.5   |              | CLAYEY LATERITE: Ferruginous gravel with sticky, yellow-orange clay.                                                                                                       |
| 3 – 6     |              | SILTSTONE: Nodules of lt blue siltstone with up to med grained, poorly sorted, sub-angular lt grey qtz, all covered in yellow clay.                                        |



**BORE KWT2F  
LITHOLOGY**

| <b>Depth<br/>(m)</b> | <b>Formation</b> | <b>Description</b>                                                                                     |
|----------------------|------------------|--------------------------------------------------------------------------------------------------------|
| 0 – 1.4              | Bassendean Sand  | SAND: lt brown, mod well sorted, fine-med grained qtz.                                                 |
| 1.4 – 1.6            | Guildford Fm     | CLAYEY SAND: Sand as above, slightly clayey with nodules of material cemented with ferruginous matrix. |
| 1.6 – 1.8            |                  | CLAYEY SAND: as above with more cemented material.                                                     |

**BORE KWT3A  
LITHOLOGY**

| <b>Depth<br/>(m)</b> | <b>Formation</b> | <b>Description</b>                                                                                                              |
|----------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 0 – 3.5              | Bassendean Sand  | SAND: lt grey to white, well sorted, sub-rounded, fine grained qtz, unconsolidated. Rare to abdt tiny black grains.             |
| 3.5 – 4              | Guildford Fm     | SILTSTONE: lt grey to white clay 10% at 3.5m and 50% at 4m, with lt grey, up to med grained, poorly sorted, unconsolidated qtz. |

