

3 May 2010

Reference No. 107643126-002-L-Rev0

Colleen Murphy
Serpentine Jarrahdale Shire
6 Paterson Street
MUNDIJONG WA 6123

HEALTH IMPACT ASSESSMENT, KEYSBROOK MINERAL SANDS PROJECT

Dear Colleen

The Serpentine-Jarrahdale Shire (the Shire) engaged Golder Associates Pty Ltd (Golder) to undertake a review of various analyses and management plans submitted in support of the proposed Keysbrook Mineral Sands project (the project). The key objectives stated by the Shire were to undertake specific review and gap analysis of the health impact related content of key reports and management plans submitted in support of the mineral sands extraction proposal and to assist both local governments to decide whether to approve the applications, with or without conditions, or refuse the applications and provide reasons to the proponent.

1.0 SCOPE OF SERVICES

Golder's Scope of Services included:

- Define the relevant legislative requirements and standards regarding dust and radiation impacts relevant to the mineral sands extractive industries;
- Define the accepted practice and approach to dust and radiation management in the context of mineral sands extractive industry;
- Review background documentation relevant to the proposal, to be provided by the Shire;
- Review and critique specified documentation to determine the proposal's conformance with the reviewed legislation and industry practices;
- Review the proposal against the requirements of *Local Planning Policy 30: Mineral Sands Extraction*;
- Present the key findings in a short report format; and
- If required, provide a written response to feedback received from the mineral sands proposal applicant on the reported findings.

2.0 BACKGROUND

The Keysbrook Mineral Sands Extraction project was proposed by Olympia Resources Limited (Olympia) in July 2006. The proposed project had an expected life of eight years and covered a mine area of 1,366 hectares, which overlapped the Shires of Serpentine Jarrahdale and Murray (EPA, 2007). The project was assessed under Part IV of the WA Environment Protection Act 1986 (EP Act), and a Public Environmental Review (PER) was completed in July 2006. The project was designated to be a controlled action under the



Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The PER was assessed by the EPA in accordance with the bilateral agreement between Commonwealth and WA under the EPBC Act.

Based on the PER (2006), the Matilda Zircon Ltd development application (DA) was submitted in February 2010 to the Shire for approval under clause 5.1.1 of Town Planning Scheme 2 (TPS2). The application is for heavy mineral sand extraction and preliminary screening within the Shire. The DA applies to the Serpentine Jarrahdale Shire activities only, and refers to separate approval being sought from the Shire of Murray for primary processing (unless an amended planning approval is obtained from the Serpentine Jarrahdale Shire to locate the processing plant within the Shire). The proposed development (Olympia, 2006) was approved under the EP Act in October 2009 (Ministerial Statement 810). The determination under Part 9 of the EPBC Act will be made by EPA Bulletin 1269, relating to the Olympia application. The proponent will apply for an extractive industry licence under the Shire Extractive Industries Local Law.

The Matilda Zircon Ltd DA describes a project area of 942 hectares with an extraction area of 401 hectares, or 42% of the subject site. The expected project timeline is 10 years. The existing landscape is predominantly used for grazing and broad acre farming. Areas of significant vegetation within the landscape will be retained. Short-term impacts from mining operations are localised, with the majority of the subject site expected to appear as grazing pasture at any one time during operations, due to a prescribed 30 hectare limit for active mine excavation. The rehabilitation plan's intent is to return the entire site to agricultural land use, with a predicted landscape quality higher than currently exists. Mining operations will be visible from some locations during the project: South Western Highway; Escarpment; Internal road network; and Keysbrook Town Site (Matilda, 2010).

3.0 LEGISLATIVE STANDARDS AND REQUIREMENTS

The following sections outline the legislative standards and requirements for HIA and dust and radiation impacts relevant to the mineral sands extractive industries.

3.1 The HIA process

The HIA process is not currently integrated into existing State and Local Government approvals systems in Western Australia. The West Australian Department of Health (DoH) released a Discussion Paper and Summary Document on HIA for public comment in 2007. The documents "*outline the potential for HIA to be integrated into current developmental approvals processes for environmental assessments, state and regional planning, Local Government decision making and State Government policies and programmes*"¹.

The process for undertaking a HIA in Australia comprises three major stages, adapted from enHealth (2001)². For simplicity, the descriptor *activity* is used to refer to proposals, projects, policy, developments or existing activities to which HIA might be applied.

Preliminary Stage

<i>Screening</i>	Does this <i>activity</i> need HIA? Is there the potential for cumulative effects from successive proposals?
<i>Scoping</i>	What issues need to be addressed in the HIA? It is important that the proponent, consultant, communities and regulatory agencies work closely together to identify/define the target population and subgroups to be considered and what impacts should be explicitly considered and ensure that all impacts are included even if they become apparent during the process (e.g. physical health, well-being, health care services).
<i>Profiling</i>	What is the current health status of the affected population and the quality of the local environment? This process establishes the baseline information to be used to assess the difference the development will make. For HIA, data on human health and well-being are needed.

¹ http://www.public.health.wa.gov.au/2/987/2/health_impact_assessment_.pm

² Health Impact Assessment Guidelines, Department of Health and Ageing enHealth Council, September 2001

Risk Analysis Stage

<i>Risk assessment</i>	What are the risks and/or benefits? Who will be affected, how and to what extent?
<i>Risk communication</i>	Has there been adequate consultation on the risks and have public concerns been taken into account?
<i>Risk management</i>	How can the risks be eliminated or reduced? What are the options (including consideration of costs and benefits) for controlling the risks? Are contingency/emergency plans adequate? How can differing perceptions of risk be mediated? Can future health risks be predicted?

Implementation Stage

<i>Decision-making</i>	Is there adequate information for decision-making? Is there a conflict to be resolved? How will conditions be enforced and by whom? How and by whom will effects be monitored? How will post- <i>activity</i> management be resourced?
<i>Monitoring, auditing, evaluation</i>	Is the activity complying with its conditions? Are the conditions achieving the required and expected outcomes? How well is the HIA process achieving its aim?

The *Preliminary Stage* requires that the proposal or activity be thoroughly examined to determine whether there is health risk involved, whether or not an assessment is needed, and at what level. The issues to be covered are identified by a health risk assessment and baseline data are collected and documented.

The next stage is the *Risk Analysis* stage where risks are analysed and a report produced.

The last stage is the *Implementation Stage* where decisions are made and implemented, and the progress of the *activity* is monitored to ensure compliance with the approval process and to evaluate the effectiveness of the HIA.

3.2 Radiation and Dust Impacts

The main legislative responsibility for radiation management of mineral sand mining operations in Western Australia lies with the Radiological Council, which administers the *Radiation Safety Act 1975* and the *Radiation Safety (General) Regulation 1983*. The following list details the relevant legislative requirements with respect to radiation and dust impacts in the mineral sands extraction industry; further details are included in Attachment Legislative Standards and Requirements:

- *Radiation Safety Act 1975* (the 'RS Act');
- *Radiation Safety (General) Regulation 1983* (the 'RSG Regulations');
- *Occupational Safety and Health Act 1984* (the 'OSH Act');
- *Environmental Protection Act 1986* (the 'EP Act');
- *Mines Safety and Inspection Act 1994* (the 'MSI Act');
- *Mines Safety and Inspection Regulations 1995* (the 'MSI Regulations');
- *Australian Radiation Protection and Nuclear Safety Act 1998* (the 'ARPNS Act');
- *Radiation Safety (Transport of Radioactive Substances) Regulations 2002* (the 'TRS Regulations');
- *Managing naturally occurring radioactive material (NORM) in mining and mineral processing* (the 'NORM guidelines'); and

- *Commonwealth Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing 2005* (the 'Code').

3.2.1 Shire Planning Policy No. 30

The Shire Planning Policy No. 30³ (the 'Policy') which came into effect on 22 February 2010 establishes the policy framework for assessment of mineral sands extraction processes under Town Planning Scheme No. 2 (TPS2) and/or the Metropolitan Region Scheme. The application of the Policy to mineral sands projects is new and Shire assessment requirements or pro forma against the Policy were not provided to Golder as part of this review.

Appendix B of the Policy outlines the matters required to be addressed by proponents in making development planning applications, and where mineral sands applications will not be determined by the Shire, it will serve as a statutory reference document to guide Shire decision making processes. The Policy's intent is to ensure mineral sands applications demonstrate a commitment to achieving social, economic and environmental benefits in the short, medium and long term. The Policy includes the following key HIA-related matters:

- Water Resources (Items 6-10): potential impacts on ground water levels and drinking water supplies, salinity and acidity of surrounding water and soils;
- Health Impacts (Items 46-53): potential exposure of residents / visitors / employees to airborne contaminants, dust, and radiation including cumulative health impacts; impacts to domestic and commercial food production; potential mental health impacts on residents; and
- Sensory Receptors (Items 54-56): potential exposure of residents / visitors / employees to dust, noise impacts or potential impacts on future amenity and lifestyle opportunities.

4.0 ACCEPTED APPROACH TO DUST AND RADIATION MANAGEMENT IN MINERAL SANDS INDUSTRY

The accepted approach to dust and radiation management in the mineral sands extractive industry is outlined in the NORM guidelines (see Attachment Legislative Standards and Requirements), which were jointly prepared by Resources Safety and the Radiation Industry Group of Chamber of Minerals and Energy of Western Australia to describe acceptable methods for addressing radiation safety requirements under Part 16 of the MSI Regulations. While this guideline is not mandatory it is generally accepted within the industry that the guideline is followed to the extent practicable.

5.0 DOCUMENTATION REVIEW

5.1 Key findings – Dust Impacts

The following key findings outline conformance of the reviewed documents with respect to dust impacts and the legislation outlined in Section 3.0:

- The Ministerial Approval approving the DA under the EP Act required an Air Quality and Dust Management Plan, which has been provided (Olympia, 2007a).
- The Air Quality and Dust Management Plan (Olympia, 2007a) included detailed management actions for minimizing dust and air monitoring strategies, which is in accordance with the NORM guidelines and MSI Regulations.
- While Olympia (2007a) states that "*the effectiveness of the Dust Management Programme will be reviewed against... compliance with licence criteria and guideline values for ambient air quality... and ...compliance with internal target values for ambient air quality*" these criteria are not stated in the document. The DA includes a Total Suspended Particulate and a PM₁₀ (particles smaller than 10 microns aerodynamic diameter) limit as required under the Ministerial Approval but it would be useful to define these criteria in the Air Quality and Dust Management Plan.

³ Shire Local Planning Policy No. 30 (file: A1646, Trim: E09/7379): Mineral Sands Extraction (22 February 2010)

- The DA states that “*There will be no health or mental health impacts (e.g. respiratory disease, depression and lowered immunity) on local residents, visitors to the subject site or surrounding area or those involved in undertaking the Proposal, including exposure to airborne contaminants, radiation and dust*”. Golder had difficulty finding evidence supporting this statement. The SKM report on Dust Modelling (Appendix 1, Olympia 2007a) concluded that “*worst case scenario modelling demonstrates the potential to impact upon some residences located close to the mine operation area at different stages of the mining operations*”. The EPA (2007) project assessment report identified that “*Dust generated from the proposal has the potential to impact on the health, welfare and amenity of local residents*”.

Matilda Zircon Ltd needs to provide the evidence that supports their statement above.

5.2 Key findings – Radiation Impacts

The following key findings outline conformance of the reviewed documents with respect to radiation impacts and the legislation outlined in Section 3.0:

- Both the DA and Olympia (2007b) state that an application for a licence will be submitted under the *Radiation Safety Act 1975*.
- The Radiation Management Plan (Olympia 2007b) provided results of a pre-operational baseline radiation survey in accordance with the Code and the NORM guidelines. Potential pathways of radiation exposure and estimated radiation dose were reported in Olympia 2007b, complying with the requirements of the RSG Regulations. Estimated radiation dose for workers was calculated based on measured radiation levels of test samples of the heavy mineral concentrate (HMC). It was stated in the Radiation Management Plan that “*very minor amounts of monazite (were) recorded in samples of HMC product*” but no supportive evidence was included in the plan.
- Radiation dose limits and a radiation monitoring plan encompassing personal and area radiation monitoring specified in Olympia (2007b) comply with the RSG Regulations.
- Olympia (2007b) included information on transport and disposal of radioactive waste, as specified by the Code, the NORM guidelines and the TRS Regulations.
- Olympia (2007b) proposed to review the Radiation Management Plan within six months of commencement of mining operations which complies with MSI Regulations.

5.3 Key findings – Shire Planning Policy No. 30

The Policy was in draft form at the time of the Matilda Zircon Ltd (2010) DA submission to the Shire. The following summarises the key findings in Golder’s review of the supplied documents against the health impact requirements of the Policy.

- Items 6-10: Water Resources
 - The DA includes a description of the aquifers expected to be impacted by the proposal. The PER includes discussion on anticipated impacts on salinity or acidity of surrounding water and soils. Golder understands an Acid Sulfate Soils Management Plan for the proposal has been prepared⁴, although this document was not supplied to Golder for review as part of this report. While a proposed water level monitoring programme of the Superficial Aquifer and Leederville Aquifer is briefly outlined in the DA, a more comprehensive plan including monitoring locations and frequency may be of value for the Shire when assessing this matter;
- Items 46-53: Health Impacts
 - Potential exposure to dust and radiation and management options are outlined in Olympia (2007a) and (2007b), including detailed dust mitigation procedures (see Sections 5.1 and 5.2);

⁴ Olympia Resources Limited (2007) *Keysbrook Mineral Sand Project. Acid Sulfate Soils Management Plan*. (Unpub) Prepared by MBS Environmental. May 2007.

- The DA states the proposal will not “*adversely affect end product food production*” but no justification of this statement could be found;
- The DA states “*there will be no health or mental health impacts*” from the proposal but minimal justification of this statement is provided. Further rationalization, possibly with the consideration of inclusion of a method for assessment of worker and/or local residents health and mental health during the undertaking of the proposal, such as a health surveillance program, may be of value for the Shire;
- Items 54-56: Sensory Receptors
 - The DA outlines the requirements of an Air Quality and Dust Management Plan for the proposal, as necessary under the Ministerial Approval. These requirements are included in Olympia (2007a) (see Section 5.1) and are also discussed in the PER;
 - Some discussion of potential impacts of the proposal on future amenity and lifestyle opportunities is included in the DA and PER, with impacts predicted to be minimal when combined with management procedures such as dust mitigation and landscaping.

5.4 Key findings – Health Impact Assessment

As outlined in Section 3.1, HIA is not currently a legislative requirement in Western Australia. However, the integration of a formalised HIA process into developmental approvals procedures is supported by the DoH.

While there are some elements of a HIA within the PER (Olympia 2006), the DA (Matilda Zircon Ltd, 2010), and Air Quality and Dust and Radiation Management Plans (Olympia, 2007a and 2007b), none of these documents contain a specific HIA section. There are components of a HIA that have not been included in these documents. The form and extent of a HIA document depends upon the preliminary screening, scoping and profiling step (see Section 3.1). From Golder’s review of these documents it is not clear whether this step was undertaken and whether the community was involved in the decision making process.

It is important that a HIA meets the relevant legislative requirements as well as the concerns and needs of the community. While the PER reported on a “*Consultation Programme*”, the information provided was mainly about “*Environmental issues raised during stakeholder consultations*” and did not include information on the inclusion of the community in the preliminary stages (screening, scoping and profiling) that would inform the development of the HIA. It is noted in Golder report No. 107643126-001-L-RevB that detail relating to ongoing consultation and community development programmes was lacking.

Other elements of a HIA not specifically included in the PER or the DA include:

- Discussion of whether a human health risk assessment is needed and if so at what level; and
- Collection of baseline human health data.

The Shire may find the provision of a HIA document valuable when assessing the proposal.

6.0 CONCLUSION

In general, the proposal complies with the health-related requirements of the Policy. The DA does not provide complete justification for predicting no health or mental health impacts or impacts on food production from the proposal. The Shire may wish to consider requesting a more comprehensive summary on the justification for these statements. The inclusion of comprehensive groundwater monitoring plans may also be useful for the Shire.

Based on this review, the PER (Olympia 2006), DA (Matilda Zircon Ltd, 2010), and Air Quality and Dust and Radiation Management Plans (Olympia, 2007a and 2007b), in the main, meet the requirements of legislation, guidelines and industry practices with regard to dust and radiation management as outlined in Section 3.0. The Shire may consider requesting additional information on the following in order to better inform their decision on the proposal:

- A specific HIA document;

- Laboratory data confirming concentrations of monazite in the HMC samples; and
- Justification of the statement that no health or mental health impacts from exposure to dust, radiation or airborne contaminants will be incurred by residents or visitors to the area.

7.0 CLOSURE

Thank you for the opportunity to review these documents.

Please contact the undersigned if you have any queries.

GOLDER ASSOCIATES PTY LTD



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CJP/PDM/ajm



Peter Di Marco
Principal Toxicologist

Attachments: Legislative Standards and Requirements

Golder Associates Pty Ltd Limitations GAP Form No. LEG 04 RL 1

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The legislative standards and requirements for dust and radiation impacts relevant to the mineral sands extractive industries in Western Australia are outlined below.

Radiation Safety Act 1975

The *Radiation Safety Act 1975* (the 'RS Act') came into effect on 18 September 1975 and the current version, 03-a0-00, has been in effect since 6 November 2009. The RS Act regulates the keeping and use of radioactive substances, irradiating apparatus and certain electronic products through a process of licensing and registration.

Radiation Safety (General) Regulation 1983

The *Radiation Safety (General) Regulations 1983* (the 'RSG Regulations') came into effect on 21 February 1983 and the current version, 03-00-01, has been in effect since 19 December 2008. The RSG Regulations outline general precautions and requirements relating to radiation safety and include dose limits and maximum permissible exposure levels for radiation workers.

Occupational Safety and Health Act 1984

The *Occupational Safety and Health Act 1984* (the 'OSH Act') came into effect on 19 December 1984 and is administered by WorkSafe, within the division of Commerce in the Western Australian State Government. The current version of the OSH Act, 06-e0-00, has been in effect since 31 December 2009. Sections of the OSH Act relevant to radiation and dust impacts include provision by an employer of a workplace in which employees are not exposed to hazards.

Environmental Protection Act 1986

The *Environmental Protection Act 1986* (the 'EP Act') came into effect on 10 December 1986 and is defined as "*an Act to provide for an Environmental Protection Authority, for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment and for matters incidental to or connected with the foregoing*"¹.

A Ministerial Approval for was granted by the Minister for Environment; Youth in Statement No. 810 on 19 October 2009, approving the DA under the EP Act. The management plans required by the Ministerial Approval include an Air Quality and Dust Management Plan.

Mines Safety and Inspection Act 1994

The *Mines Safety and Inspection Act 1994*² (the 'MSI Act') came into effect on 7 November 1994, and the current version, 04-d-00, has been in effect since 4 December 2009. It is defined as "*An Act to consolidate and amend the law relating to the safety of mines and mining operations and the inspection and regulation of mines, mining operations and plant and substances supplied to or used at mines; to promote and improve the safety and health of persons at mines and for connected purposes*".

The objectives of the MSI Act include to "*protect employees against the risks associated with mines, mining operations, work systems at mines, and plant and hazardous substances at mines by eliminating those risks, or imposing effective controls in order to minimize them*".

Mines Safety and Inspection Regulations 1995

The *Mines Safety and Inspection Regulations 1995*³ (the 'MSI Regulations') came into effect on 8 December 1995 and the current version, 05-a0-00, came into effect on 16 October 2009. The MSI Regulations contains guidance on ventilation and control of dust and atmospheric contaminants, and the mining and processing of radioactive materials.

¹ <http://www.epa.wa.gov.au/article.asp?ID=1835&area=Profile&CID=10&Category=Legislation>

² Mines Safety and Inspection Act 1994, version 04-d0-00. Department of Mines and Petroleum

³ Mines Safety and Inspection Regulations 1995, version 05-a0-00. Department of Mines and Petroleum



Australian Radiation Protection and Nuclear Safety Act 1998

The *Australian Radiation Protection and Nuclear Safety Act 1998* (the 'ARPNS Act') aims to protect the health and safety of people, and to protect the environment, from the harmful effects of radiation. The ARPNS Act includes requirements for regulation of "controlled material", i.e. "any natural or artificial material, whether in solid or liquid form, or in the form of a gas or vapour, which emits ionizing radiation spontaneously".

Radiation Safety (Transport of Radioactive Substances) Regulations 2002

The *Radiation Safety (Transport of Radioactive Substances) Regulations 2002*⁴ (the 'TRS Regulations') came into effect on 26 March 2002 (version 00-a7-07) and apply to the transport of radioactive materials in Western Australia and the storing, packing and stowing of radioactive materials for transport in Western Australia, if the radioactive materials are "radioactive substances" within the meaning of that term in the ARPNS Act.

Managing naturally occurring radioactive material (NORM) in mining and mineral processing

The Department of Mines and Petroleum guideline *Managing naturally occurring radioactive material (NORM) in mining and mineral processing*⁵ (the 'NORM guidelines') should be used by anyone engaged in mining operations in Western Australia that involve or have the potential to involve naturally occurring radioactive material. This includes exploration, mining and mineral processing. Although compliance is not mandatory, the industry is encouraged to follow this publication to "ensure uniformity in radiation safety management".

The NORM guidelines include consideration of the following: preparation of a radiation management plan, pre-operational and operational monitoring requirements, air monitoring strategies, airborne radioactivity sampling, particle size measurement, dust control strategies, management of radioactive waste and transport of NORM.

Commonwealth Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing 2005

The Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing 2005⁶ (the 'Code') establishes requirements for radiation protection in mining and mineral processing industries and for protection of human health and the environment from the effects of radioactive waste from mining and mineral processing. The Code was approved by the Radiation Health Committee on 22 July 2005 and on 5 August 2005 the Radiation Health & Safety Advisory Council advised the Chief Executive Officer of the Australian Radiation Protection and Nuclear Safety Agency to adopt the Code.

The provisions of the Code apply to the separation of heavy minerals from mineral sands ore, and to the control of occupational and public radiation exposures, and the management of radioactive waste generated, at all stages of mining and mineral processing from exploration to final site rehabilitation.

The Code includes requirements for a radiation management plan and radioactive waste management plan, with subsequent approval of these two plans by a relevant regulatory authority prior to commencement of operation. The Code specifies that the radiation management plan includes sufficient information to allow all significant exposure sources and pathways to be identified, and identifies the measures that will be implemented to control radiation exposures. Other aspects of a radiation management plan specified by the Code include details of the arrangements to monitor radiation in order to demonstrate compliance with regulatory limits, determine doses received by individuals or groups and provide information on the effectiveness of engineering and procedural control measures. The Code also

⁴ Radiation Safety (Transport of Radioactive Substances) Regulations 2002, version 00-a7-00, Department of Mines and Petroleum

⁵ Managing naturally occurring radioactive material (NORM) in mining and mineral processing — guideline (2nd edition): Resources Safety, 2010, Department of Mines and Petroleum, Western Australia <www.dmp.wa.gov.au/ResourcesSafety>

⁶ Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (2005) Radiation Protection Series Publication No. 9 August 2005 Australian Radiation Protection and Nuclear Safety Agency.



Legislative standards and requirements

specifies inclusion in the radiation management plan of estimates of the exposures or doses that will arise from the operation, which may be derived from empirical data, from modeling or from experience in similar operations.

The Code specifies the following inclusions in a radioactive waste management plan: a description of the facilities and resources, establishment of baseline conditions, procedures such as operating instructions, monitoring to assess compliance with discharge limits and procedures, conceptual decommissioning and rehabilitation plan, and the proposed final deposition of waste.

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