



**AUSTRALIAN  
ZIRCONIA LTD**

(A wholly owned subsidiary of Alkane Resources Ltd)

ABN 51 091 489 511

# Dubbo Zirconia Project

## Air Quality Management Plan





**AUSTRALIAN  
ZIRCONIA LTD**

(A wholly owned subsidiary of Alkane Resources Ltd)

ABN 51 091 489 511

# Dubbo Zirconia Project

## Air Quality Management Plan

---

### TABLE OF REVISIONS

Revision Number	Revision Date	Prepared By	Approved by	Comments
1	3/9/2015	A. Irwin (RWC)	N. Earner (AZL)	For Stage 1 – Construction (EPL Application)
1.1	21/3/2016	A. Irwin (RWC)	M. Sutherland (AZL)	Submitted for Secretary's approval
1.2	25/8/2016	A. Irwin (RWC)	N. Earner (AZL)	Resubmitted for Secretary's approval
1.2	6/10/2016	A. Irwin (RWC)	C. Preshaw (DPE)	Approved following minor revisions - refer to Appendix 4



**AUSTRALIAN ZIRCONIA LTD**  
(A SUBSIDIARY OF ALKANE RESOURCES LTD)



**R.W. CORKERY & CO. PTY. LIMITED**

This page has intentionally been left blank

# CONTENTS

	Page
<b>FOREWORD .....</b>	<b>1</b>
<b>1. SCOPE .....</b>	<b>3</b>
<b>2. CONSULTATION .....</b>	<b>5</b>
2.1 GOVERNMENT CONSULTATION .....	5
2.2 COMMUNITY CONSULTATION .....	6
<b>3. LEGISLATIVE REQUIREMENTS .....</b>	<b>6</b>
3.1 DEVELOPMENT CONSENT SSD-5251 .....	6
3.2 ENVIRONMENT PROTECTION LICENCE (POEO ACT) .....	7
<b>4. OBJECTIVES AND OUTCOMES .....</b>	<b>9</b>
<b>5. LOCAL SETTING .....</b>	<b>10</b>
5.1 LOCAL METEOROLOGY .....	10
5.2 AMBIENT (BACKGROUND) CONDITIONS .....	10
5.3 NATIONAL GREENHOUSE AND ENERGY REPORTING SYSTEM .....	12
5.4 LOCAL LAND OWNERSHIP AND RESIDENCES .....	12
<b>6. AIR QUALITY CRITERIA .....</b>	<b>14</b>
6.1 PARTICULATE MATTER AND DUST DEPOSITION CRITERIA .....	14
6.2 GAS EMISSIONS CRITERIA .....	14
6.3 IN-STACK GAS CONCENTRATION CRITERIA .....	15
6.4 ODOUR .....	15
<b>7. AIR QUALITY MANAGEMENT MEASURES .....</b>	<b>15</b>
7.1 INTRODUCTION .....	15
7.2 OFF-SITE (LINEAR INFRASTRUCTURE) CONSTRUCTION .....	16
7.2.1 Introduction .....	16
7.2.2 Operating Hours and Conditions .....	16
7.2.3 Engineering Air Quality Controls .....	16
7.2.4 Procedural Air Quality Controls .....	17
7.3 ON-SITE CONSTRUCTION .....	18
7.3.1 Introduction .....	18
7.3.2 Operating Hours and Conditions .....	18
7.3.3 Engineering Air Quality Controls .....	19
7.3.4 Procedural Air Quality Controls .....	19
7.4 GREENHOUSE GAS .....	20
7.4.1 Introduction .....	20
7.4.2 Procedural Greenhouse Gas Controls .....	20
7.4.3 Engineering Greenhouse Gas Controls .....	21
7.5 MINING OPERATIONS .....	21

# CONTENTS

	Page
7.6 PROCESSING PLANT OPERATIONS .....	21
<b>8. AIR QUALITY MONITORING PROGRAM .....</b>	<b>21</b>
8.1 INTRODUCTION.....	21
8.2 METEOROLOGICAL MONITORING .....	21
8.3 MONITORING LOCATIONS .....	23
8.4 AIR EMISSIONS MONITORING .....	24
8.4.1 Deposited Dust.....	24
8.4.2 Particulate Matter (High Volume Air Sampler) .....	25
8.4.3 Particulate Matter (Beta Attenuating Monitor) .....	25
8.4.4 Processing Plant In-Stack Gas Concentration .....	26
8.4.5 Processing Plant Gas Emissions .....	26
8.4.6 Greenhouse Gas Emissions .....	26
8.4.7 Environmental Radiation .....	27
8.5 EVALUATION OF RESULTS .....	27
8.5.1 Air Quality Monitoring Report .....	27
8.5.2 National Greenhouse and Energy Reporting Scheme .....	27
<b>9. AIR QUALITY MANAGEMENT SYSTEM .....</b>	<b>27</b>
9.1 INTRODUCTION.....	27
9.2 PROACTIVE MANAGEMENT.....	28
9.2.1 Meteorological Forecasting .....	28
9.2.2 Proactive Mitigation Measures .....	28
9.3 REACTIVE MANAGEMENT .....	29
9.3.1 Triggers .....	29
9.3.2 Response and Corrective Action.....	30
<b>10. COMPLAINTS HANDLING AND RESPONSE.....</b>	<b>32</b>
<b>11. INCIDENT MANAGEMENT, NOTIFICATION AND REPORTING .....</b>	<b>32</b>
11.1 INCIDENT IDENTIFICATION.....	32
11.2 INCIDENT MANAGEMENT AND NOTIFICATION .....	33
11.2.1 Pollution Incident .....	33
11.2.2 Non-compliance Incident.....	33
11.3 INCIDENT REPORTING .....	33
<b>12. PUBLICATION OF MONITORING INFORMATION AND REPORTING .....</b>	<b>34</b>
<b>13. PLAN IMPLEMENTATION .....</b>	<b>34</b>
13.1 ROLES AND RESPONSIBILITY .....	34
13.2 COMPETENCE TRAINING AND AWARENESS.....	35
13.3 REVIEW (AND CONTINUAL IMPROVEMENT PROTOCOL).....	36
<b>14. REFERENCES .....</b>	<b>37</b>

# CONTENTS

## Page

### APPENDICES

Appendix 1	Air Quality-related Conditions of SSD-5251 .....	A1-1
Appendix 2	Air Quality-related Conditions of Environment Protection Licence .....	A2-1
Appendix 3	Radiation Monitoring Procedure .....	A3-1
Appendix 4	Confirmation of Approval .....	A4-1

### FIGURES

Figure 1	Dubbo Zirconia Project Activities – Stage 1 .....	4
Figure 2	Wind Roses for Toongi Locality .....	11
Figure 3	Land Ownership, DZP Site and Surrounds .....	13
Figure 4	Air Quality Monitoring Locations .....	22

### TABLES

Table 1	Conditional Requirements of SSD-5251 for an Air Quality Management Plan .....	6
Table 2	Weather Monitoring required by the EPA .....	9
Table 3	Objectives and Targets .....	9
Table 4	Background Air Quality .....	12
Table 5	Air Quality Criteria – Particulate Matter .....	14
Table 6	Air Quality Criteria – Deposited Dust .....	14
Table 7	Air Quality Criteria – Processing Plant (Gaseous) .....	14
Table 8	In-Stack Concentration Criteria under the Protection of the Environment Operations (Clean Air) Regulation 2010 .....	15
Table 9	Operating Hours of Off-Site Construction .....	16
Table 10	Meteorological Monitoring .....	21
Table 11	Greenhouse Gas Emission Monitoring Methodology and Frequency .....	26
Table 12	Roles and Responsibilities .....	34

This page has been intentionally left blank





# FOREWORD

*This Air Quality Management Plan (“the Plan”) for the Dubbo Zirconia Project (DZP) has been prepared by R.W. Corkery & Co. Pty. Limited (RWC) on behalf of Australian Zirconia Limited (AZL), a subsidiary of Alkane Resources Ltd (Alkane). The DZP, approved as SSD-5251 by the NSW Planning Assessment Commission (PAC) on 28 May 2015, comprises a small scale open cut mine supplying ore containing rare metals (zirconium, niobium, hafnium and tantalum) and rare earth elements (REEs) to a processing plant near the village of Toongi, approximately 25km south of Dubbo. Waste residues produced by the processing operations will be managed in residue storage facilities, designed to contained and encapsulate these residues.*

*The DZP also includes the construction of a water pipeline between the processing plant and the Macquarie River, a pipeline to carry natural gas between Dubbo and the DZP Site, and the upgrades of the following linear infrastructure;*

- *Toongi Road;*
- *Obley Road; and*
- *the Toongi-Dubbo section of the currently disused Dubbo-Molong Rail Line.*

*Collectively, these are referred to as the DZP linear infrastructure.*

*In accordance with Condition 14 of Schedule 2 of SSD-5251, the Plan is prepared in a staged fashion.*

- *Stage 1: provides for air quality management of construction activities on the DZP Site and linear infrastructure.*
- *Stage 2: provides for air quality management following the commencement of mining operations (as defined by SSD-5251 as “the removal and emplacement of overburden and extraction, processing, handling, storage and transport of mineral ore / ore concentrate / refined ore products”).*

*This document represents Stage 1 of the Plan.*

This page has been intentionally left blank



## 1. SCOPE

The Dubbo Zirconia Project (DZP) Air Quality Management Plan (“the Plan”) has been prepared as a tool to give consideration to and to manage air quality related issues during the construction and operation of the DZP. It will be used by Australian Zirconia Limited (AZL) personnel as the first point of reference for air quality related issues. The Plan forms part of the DZP Environmental Management System and sits under the overarching Environmental Management Strategy for the DZP.

This plan synthesises the recommendations made during the preparation of an Environmental Impact Statement (EIS) for the DZP (RWC, 2013), and subsequent assessment and approval of SSD-5251. It is a practical guide for management of air quality issues on site.

As noted in the **Foreword**, the Plan will be prepared in stages to reflect the initial construction activities on the DZP Site (as defined by Mining Lease 1724) and linear infrastructure (Stage 1), and ongoing construction and operations following commencement of mining operations (Stage 2). This document represents Stage 1 of the Plan and includes the following air quality generating activities (see **Figure 1**).

### DZP Site Construction

- Site Entrance and Access Road.
- Site Administration Area.
- Processing Plant Area.
- Laydown and Storage Area.
- Mine Haul Road.
- Residue Storage Facility (RSF).
- Salt Encapsulation Cell 1.
- Initial open cut development.
- Initial Waste Rock Emplacement (WRE) construction.
- Extraction of basalt from a small quarry (developed under separate development consent within the impact footprint of the WRE).

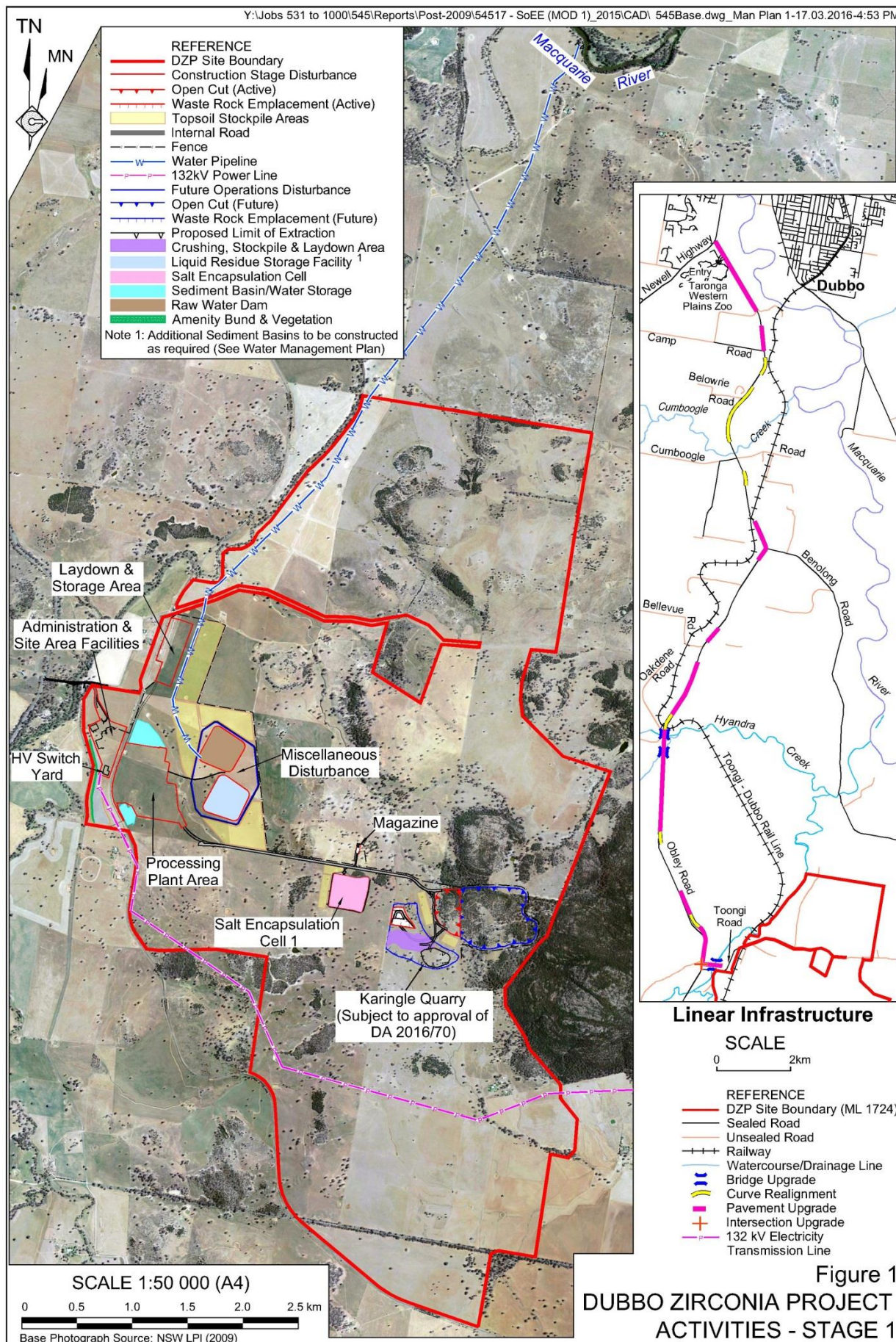
### Linear Infrastructure Construction

- Macquarie River Water Pipeline and pump station.
- Natural Gas Pipeline.
- Toongi Road Upgrade (including Wambangalang Creek Crossing).
- Obley Road Upgrade (including Hyandra and Twelve Mile Creek Crossings).

As this version of the Plan only considers the construction activities of Stage 1, some sections of the Plan remain to be completed and include the reference:

<b><i>To be included in Stage 2 of the Plan prior to commencement of mining operations</i></b>
--





Stage 2 of the Plan will be submitted prior to the commencement of mining operations (as defined by SSD-5251 as “the removal and emplacement of overburden and extraction, processing, handling, storage and transport of mineral ore / ore concentrate / refined ore products”).

## **2. CONSULTATION**

### **2.1 GOVERNMENT CONSULTATION**

#### **NSW Environment Protection Authority**

*Condition 23(a)* of Schedule 3 of SSD-5251 requires the NSW Environment Protection Authority (EPA) be consulted in the preparation of the Plan. Following from recommendations provided by the EPA to the NSW Department of Planning & Environment (DPE) on 21 November 2013 and 20 January 2014, which provided advice on air quality limits, air quality monitoring, compliance assessment and reporting (refer to Section 3.2), a meeting between AZL (Mr Mike Sutherland, General Manager) and the EPA (Mr Bradley Tanswell, Acting Head Far West Operations) was held on 29 May 2015. The objective of this meeting, also attended by RWC (Mr Alex Irwin, Senior Environmental Consultant), was to confirm the EPA’s requirements for an Air Quality Management Plan, discuss the staged preparation of the Plan and the application for Environmental Protection Licence (EPL) generally.

At the 29 May 2015 meeting, it was confirmed that:

- An Air Quality Management Plan, identifying air quality limits, air quality management measures, air quality monitoring, compliance assessment and contingency management, and reporting, was confirmed as being required to support an application for an EPL.
- The EPA would consider an Air Quality Management Plan restricted to the construction activities of the Mine Site and associated infrastructure as part of an application for a Scheduled Development Work EPL.

A copy of the Air Quality Management Plan was submitted to the EPA on 9 September 2015 for review. The EPA responded on 30 October 2015 declining to comment on the document.

#### **Dubbo City Council**

On 7 July 2015, AZL (Mr Mike Sutherland and Mr Nic Earner, Chief Operations Officer) met with representatives of Dubbo City Council (“Council”) to discuss progress and likely scheduling of tasks associated with the DZP. At this meeting, AZL sought feedback from Council with respect to the management of the linear infrastructure construction works to be undertaken on Council infrastructure, with the objective of ensuring that management effectively addressed issues both generally and with respect dust emissions.

Council requested that the Front End Engineering Design (FEED) drawings of road upgrades and infrastructure prepared by Hatch be forwarded to Steve Clayton at Council for consideration and comment.



## 2.2 COMMUNITY CONSULTATION

A Community Consultative Community (CCC) was established in November 2015 and provides a forum for open discussion between AZL, the community, Council and other stakeholders on issues directly relating to the mine's operations, environmental performance and community relations, and to keep the community informed on these matters.

The representatives of the CCC comprise an independent chair, AZL representative(s), community, Council and Aboriginal community representatives. The contact details of the CCC representatives are published (with the permission of each) on Alkane's website such that each may be contacted to present concerns of others in the community. The CCC meets quarterly and provides an opportunity for issues of concern related to management of air quality to be raised and solutions identified and discussed.

AZL will continue to publish a community newsletter that will inform the local community of relevant developments which may impact on the local air quality environment. AZL has and will continue to operate an open door policy to those wishing to raise and discuss issues of concern.

## 3. LEGISLATIVE REQUIREMENTS

### 3.1 DEVELOPMENT CONSENT SSD-5251

The DZP is State Significant Development and was assessed with an Environmental Impact Statement (RW Corkery 2013) in accordance with Schedule 2, Part 3 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Development Consent SSD-5251 was granted by the NSW Planning Assessment Commission (PAC) on 28 May 2015, with *Condition 23* (of Schedule 3) requiring the preparation of an Air Quality Management Plan. **Table 1** identifies the conditional requirements of both conditions and identified where in the Plan individual requirements have been addressed.

**Table 1**  
**Conditional Requirements of SSD-5251 for an Air Quality Management Plan**

Page 1 of 2

Condition	Section
<b>Schedule 3</b>	
23. The Applicant shall prepare and implement a detailed Air Quality Management Plan for the development to the satisfaction of the Secretary. This plan must:	
(a) be prepared in consultation with the EPA, and be submitted for approval prior to the commencement of construction activities under this consent, unless the Secretary agrees otherwise;	2
(b) describe the measures that would be implemented to ensure compliance with air quality criteria and operating conditions of this consent;	7
(c) describe the proposed air quality management system;	9
(d) include an air quality monitoring program that:	
• adequately supports the air quality management system;	8
• evaluates and reports on:	8.9
○ the effectiveness of the air quality management system; and	
○ compliance with the air quality operating conditions; and	

**Table 1 (Cont'd)**  
**Conditional Requirements of SSD-5251 for an Air Quality Management Plan**

Page 2 of 2

Condition	Section
<b>Schedule 3</b>	
<ul style="list-style-type: none"> <li>defines what constitutes an air quality incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any air quality incidents.</li> </ul>	8.10
(e) include procedures and a schedule for the preparation of emissions validation reports for the processing plant during the operation of the development.	8.4.5
<b>Schedule 5</b>	
3. The Applicant shall ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:	
(a) detailed baseline data;	5
(b) a description of:	
<ul style="list-style-type: none"> <li>the relevant statutory requirements (including any relevant approval, licence or lease conditions);</li> </ul>	3
<ul style="list-style-type: none"> <li>any relevant limits or performance measures/criteria;</li> </ul>	6
<ul style="list-style-type: none"> <li>the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;</li> </ul>	6
(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	7
(d) a program to monitor and report on the:	8
<ul style="list-style-type: none"> <li>impacts and environmental performance of the development;</li> <li>effectiveness of any management measures (see c above);</li> </ul>	
(e) a contingency plan to manage any unpredicted impacts and their consequences;	9
(f) a program to investigate and implement ways to improve the environmental performance of the development over time;	13.3
(g) a protocol for managing and reporting any:	
<ul style="list-style-type: none"> <li>incidents;</li> </ul>	8.6 & 9.3
<ul style="list-style-type: none"> <li>complaints;</li> </ul>	10
<ul style="list-style-type: none"> <li>non-compliances with statutory requirements; and</li> </ul>	8.6
<ul style="list-style-type: none"> <li>exceedances of the impact assessment criteria and/or performance criteria; and</li> </ul>	8.6
(h) a protocol for periodic review of the plan.	13.3

**Appendix 1** includes a copy of the 'relevant conditions' for which the Plan provides measures to ensure compliance, namely *Conditions 17 to 22 and 24* of Schedule 3, and *Condition 3* of Schedule 5, along with reference to the relevant section of the Plan.

### 3.2 ENVIRONMENT PROTECTION LICENCE (POEO ACT)

This version of the Plan supports an application for an Environment Protection Licence (EPL) under the *Protection of the Environment Operations Act 1997* (POEO Act). In lieu of conditional requirement of an EPL, the following recommendations of the NSW Environment

Protection Authority (EPA) to the DPE prior to the issue of SSD-5251, reflecting the requirements of the EPA in issuing a licence, have been considered and addressed in this Plan<sup>1</sup>.

### **Stack design**

*All emission points at the site must be designed and constructed to achieve the minimum stack height listed in the project Environmental Impact Statement:*

*Dubbo Zirconia Project Environmental Impact Statement Development Application SSD 5251, September 2013.*

*All emission points must be designed to be TM-1 compliant, as defined in the Approved Methods for the Sampling and Analysis of Air Pollutants in NSW, 2006 (or its later version).*

### **Odour**

*No condition of this licence identifies a potentially offensive odour for the purposes of section 129 of the Protection of the Environment Operations Act 1997.*

*Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environment protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.*

### **General Dust Conditions**

*The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.*

*Activities occurring in or on the premises must be carried out in a manner that will minimise the generation, or emission of dust from the premises.*

### **Air Quality Management Plan**

*For all emission sources (point and fugitive) at the site the proponent must prepare an Air Quality Management Plan that includes, but is not limited to:*

- *Benchmark site operations against best management practice and emission control;*
- *Benchmark site operations against regulatory emission limit(s), as set out in the Protection of the Environment Operations (Clean Air) Regulation, 2010;*
- *Key performance indicator(s);*
- *Monitoring method(s);*
- *Location, frequency and duration of monitoring;*
- *Record keeping;*
- *Response mechanisms; and*
- *Compliance reporting.*

<sup>1</sup> The recommendations identified in italics reflect management of DZP operations to be addressed in future versions of this Plan.



The air quality management plan must be submitted to the Environment Protection Authority (EPA) in conjunction with the application for an Environment Protection Licence under the Protection of the Environment Operations Act 1997 for the project.

The air quality management plan must be implemented prior to the commencement of any dust generating activities at the site.

#### Requirement to Monitor Weather

The licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of **Table 2**. The licensee must use the sampling method, units of measure, averaging period and sample at the frequency, specified opposite in the other columns.

**Table 2**  
**Weather Monitoring required by the EPA**

Parameter	Units of Measure	Frequency	Averaging Period	Sampling Method
Rainfall	Mm/hr	Continuous	1 hour	AM-4
Sigma theta	°C	Continuous	10 minute	AM-2 and AM-4
Siting				AM-1
Temperature at 2m	Kelvin	Continuous	10 minute	AM-4
Temperature at 10m	Kelvin	Continuous	10 minute	AM-4
Total solar radiation	W/m <sup>2</sup>	Continuous	10 minute	AM-4
Wind Direction at 10m	°C	Continuous	10 minute	AM-2 and AM-4
Wind Speed at 10m	m/s	Continuous	10 minute	AM-2 and AM-4

Monitoring of all parameters listed in Column 1 of **Table 2** must commence prior to earth moving activities being undertaken at the site.

## 4. OBJECTIVES AND OUTCOMES

**Table 3** details the objectives and outcomes with respect to air quality management of the DZP.

**Table 3**  
**Objectives and Targets**

Page 1 of 2

Objectives	Outcomes
(a) To ensure compliance with the criteria of SSD-5251, Environmental Protection Licence and reasonable community expectations.	(i) Compliance with all relevant criteria and reasonable community expectations, as determined in consultation with the relevant government agencies. <ul style="list-style-type: none"> <li>– Maintain recorded annual average Depositional Dust levels below the nuisance level of 4g/m<sup>2</sup>/month.</li> <li>– Meet in-stack and air quality limits for SO<sub>2</sub>, NO<sub>x</sub>, HCl &amp; other gaseous emissions.</li> <li>– Prevent odour nuisance to surrounding residents.</li> </ul>



**Table 3 (Cont'd)**  
**Objectives and Targets**

Page 2 of 2

Objectives	Outcomes
(b) To implement appropriate air quality management and mitigation measures during all stages of the DZP.	(ii) All identified air quality management and mitigation measures implemented.
(c) To implement a monitoring program to establish compliance or otherwise with relevant criteria during all stages of the Project.	(iii) All identified monitoring undertaken in accordance with the Plan.
(d) To implement an appropriate complaints handling and response protocol	(iv) Complaints (if any) handled and responded to in an appropriate manner.
(e) To implement appropriate corrective and preventative actions, if required.	(v) Corrective and preventative actions implemented, if required.
(f) To implement an appropriate incident reporting program, if required.	(vi) Incidents (if any) reported in an appropriate manner.

## 5. LOCAL SETTING

### 5.1 LOCAL METEOROLOGY

The climatic conditions of the local setting are presented in *Section 4.1.3* of RWC (2013). A summary of the climatic conditions is presented in this subsection.

#### Temperature and Humidity

January is typically the warmest month of the year with a mean daily maximum temperature of 33.4°C and mean daily minimum temperature of 18.2°C. The coolest month of the year is typically July with the lowest mean daily maximum temperature of 15.4°C and minimum mean minimum temperature of 3.1°C.

The highest humidity is experienced in June, and the least humid month is December.

#### Rainfall

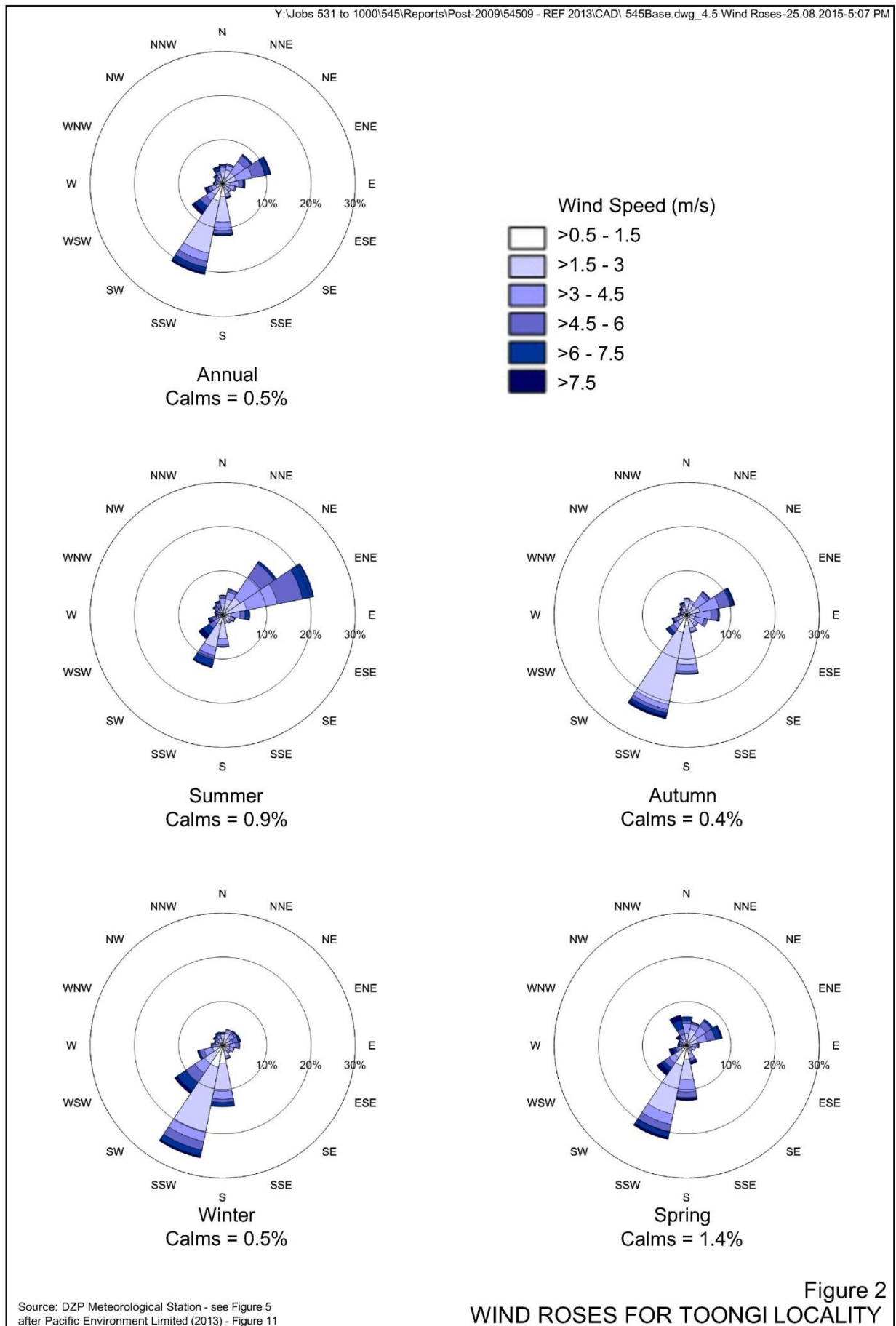
On average, 647.3mm of rain is recorded each year, with that rainfall spread relatively evenly throughout the year. January is typically the wettest month (66.4mm) and September is the driest month (42.7mm).

#### Wind Speed and Direction

Wind distribution patterns at the DZP Site are dominated by winds from the south-southwest in autumn, winter and spring, with northeasterly winds dominating in summer. **Figure 2** presents the wind roses from 2008, selected as a year representative of the prevailing annual conditions of the local setting.

### 5.2 AMBIENT (BACKGROUND) CONDITIONS

Ambient (background) air quality of the local setting is described in detail in *Section 4.3.3* of the EIS (RWC, 2013). The air quality of the Toongi area is influenced primarily by seasonal (meteorological), land use (agricultural) and event based (bush fire, drought) factors typical of the predominantly rural setting within western NSW.



Based on a review of air quality monitoring established for the DZP Site and data collected from established EPA monitoring stations conducted by Pacific Environmental Limited (PEL, 2013), **Table 4** presents the adopted background concentrations in comparison to the relevant EPA criteria for air quality.

**Table 4**  
**Background Air Quality**

Air Quality Parameter	Averaging period	Adopted Background Concentration
Dust deposition	Annual	2g/m <sup>2</sup> /month
TSP annual	Annual	19µg/m <sup>3</sup>
PM <sub>10</sub>	Annual	16µg/m <sup>3</sup>
	24 hour	Daily varying
PM <sub>2.5</sub>	Annual	7µg/m <sup>3</sup> <sup>B</sup>
	24 hour	n/a
SO <sub>2</sub>	Annual <sup>A</sup>	3µg/m <sup>3</sup>
	24 hour <sup>A</sup>	11µg/m <sup>3</sup>
	1 hour	27µg/m <sup>3</sup>
	10 minute <sup>A</sup>	34µg/m <sup>3</sup>
NO <sub>2</sub>	Annual	Daily varying
	1 hour	Daily varying
HCl	<b>Averaging period</b>	Insignificant
Note A: Pro-rated in accordance with the 1-hour monitoring data for SO <sub>2</sub>		
Note B: In consideration of the relatively higher PM <sub>10</sub> concentrations measured at Wagga Wagga and Wagga Wagga North, the annual average PM <sub>2.5</sub> background contribution has been assumed		
Source: Modified after PEL (2013) - Table 17		

### 5.3 NATIONAL GREENHOUSE AND ENERGY REPORTING SYSTEM

A greenhouse gas assessment was conducted using the *National Greenhouse Accounts Factors 2012* published by the Department of Climate Change and Energy Efficiency. This assessment determined that the DZP will emit greater than 25kt per annum of greenhouse emissions and therefore requires reporting under the National Greenhouse and Energy Reporting (NGER) system.

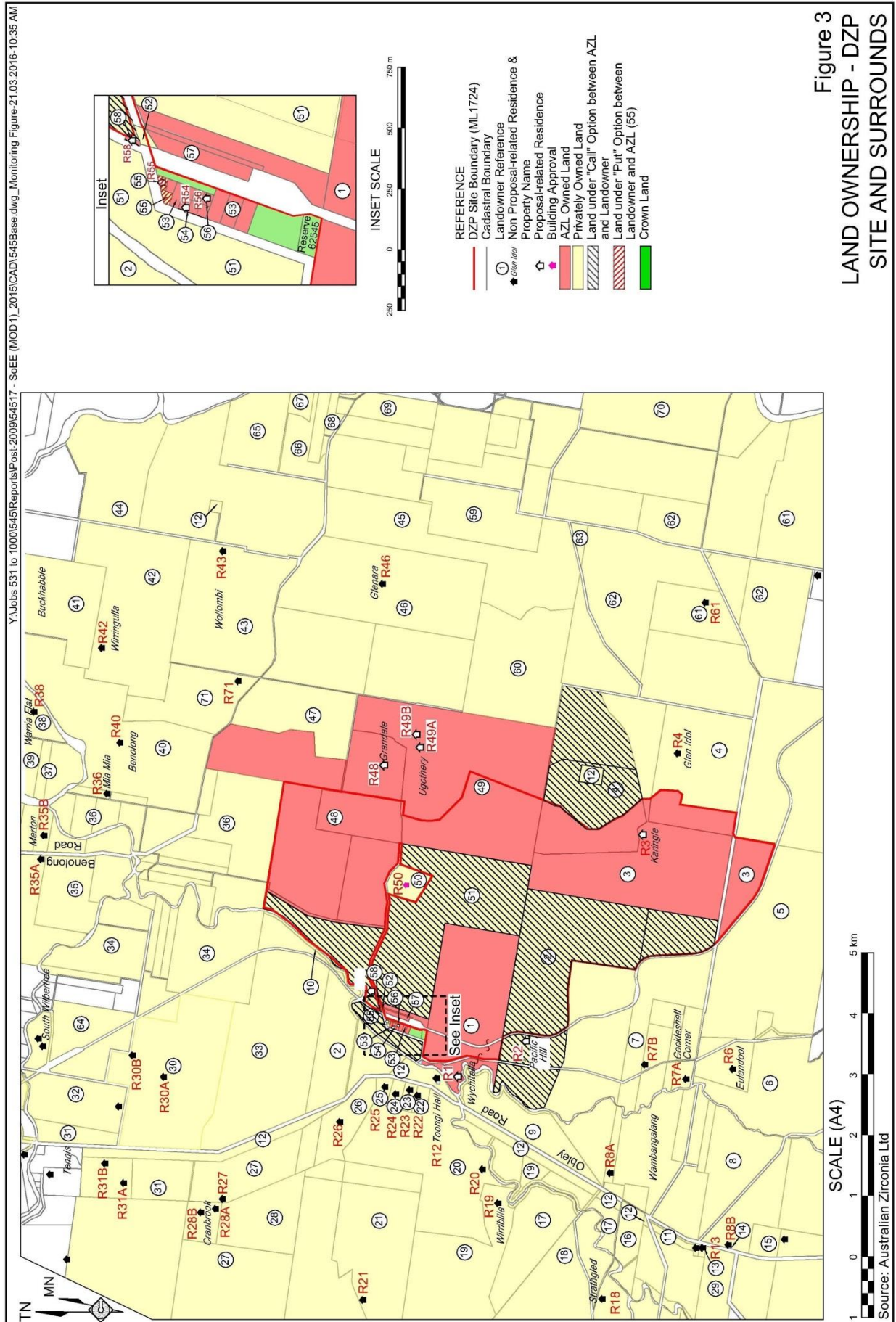
### 5.4 LOCAL LAND OWNERSHIP AND RESIDENCES

The land ownership within and surrounding the DZP Site is presented in **Figure 3**.

Five residences are located on the DZP Site (R3, R48, R49A, R49B and R51), all of which are either owned by AZL or are the subject of an agreement to purchase. All residences within the village of Toongi are either owned, or under contract to purchase by AZL, as are Residences R1 and R2 to the immediate west of the DZP Site.

The closest residential receivers to the DZP Site, not owned by or under contract to AZL, are the four houses on smaller lifestyle blocks to the west of Obley Road (approximately 600m to 1000m from the entrance to the DZP Site). Other notable receivers surrounding the DZP Site include the Toongi Hall (R12), approximately 600m to the southwest of the site entrance and 800m west of the processing plant, and the Wambangalang Environmental Education Centre (R13), approximately 4.8km to the southwest of the processing plant.





## 6. AIR QUALITY CRITERIA

### 6.1 PARTICULATE MATTER AND DUST DEPOSITION CRITERIA

In accordance with *Condition 18* of Schedule 3 of SSD-5251, the particulate matter and deposited dust air quality criteria at any residence on privately-owned land for all activities undertaken during the construction stage of the DZP are presented in **Tables 5** and **6**.

**Table 5**  
**Air Quality Criteria – Particulate Matter**

Pollutant	Averaging period	Criterion <sup>1</sup>
<b>Long-term criteria</b>		
Total suspended particulate (TSP) matter	Annual	90 µg/m <sup>3</sup> <sup>(2)</sup>
Particulate matter < 10 µm (PM <sub>10</sub> )	Annual	30 µg/m <sup>3</sup> <sup>(2)</sup>
<b>Short-term Criteria</b>		
Particulate matter < 10 µm (PM <sub>10</sub> )	24 hour	50 µg/m <sup>3</sup> <sup>(2)</sup>
Note 1: Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agreed to by the Secretary		
Note 2: Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to other sources)		

**Table 6**  
**Air Quality Criteria – Deposited Dust**

Pollutant	Averaging period	Maximum increase	Maximum total
Deposited dust <sup>1</sup>	Annual	2 g/m <sup>2</sup> /month <sup>2</sup>	4 g/m <sup>2</sup> /month <sup>3</sup>
Note 1: Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method			
Note 2: Incremental impact (i.e. incremental increase in concentrations due to the development on its own)			
Note 3: Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to other sources)			

### 6.2 GAS EMISSIONS CRITERIA

The air quality criteria at any residence on privately-owned land for processing plant emissions are presented in **Table 7**. In accordance with *Condition 18* of Schedule 3 of SSD-5251, these criteria will be followed in addition to the particulate matter and deposited dust air quality criteria presented in **Tables 5** and **6**.

**Table 7**  
**Air Quality Criteria – Processing Plant (Gaseous)**

Pollutant	Averaging Period	Criteria
Sulphur Dioxide	10-minute	712 µg/m <sup>3</sup>
	1-Hour	570 µg/m <sup>3</sup>
	24-Hour	228 µg/m <sup>3</sup>
	Annual	60 µg/m <sup>3</sup>
Nitrogen Dioxide	1-Hour	246 µg/m <sup>3</sup>
	Annual	62 µg/m <sup>3</sup>
Hydrogen Chloride	1 hour	0.14 mg/m <sup>3</sup>

### 6.3 IN-STACK GAS CONCENTRATION CRITERIA

**Table 8** summarises the in-stack concentration limits for particulate matter and other air quality parameters specified by the *Protection of the Environment Operations (Clean Air) Regulation 2010*.

**Table 8**  
**In-Stack Concentration Criteria under the Protection of the Environment Operations (Clean Air) Regulation 2010**

Air quality parameter	Source	Limit (mg/m <sup>3</sup> )
Solid Particles (Total)	Clean Air Regulation – Schedule 4 “Any plant used for heating metals”	50
	Clean Air Regulation – Schedule 4 “Any crushing, grinding, separating or materials handling activity”	20
NO <sub>2</sub> or NO or both as NO <sub>2</sub> equivalent	Clean Air Regulation – Schedule 4 “Any boiler operating on gas”	350
SO <sub>2</sub>	Clean Air Regulation – Schedule 4 “Sulphuric acid manufacture using elemental sulphur”	1,000
SO <sub>3</sub>	Clean Air Regulation – Schedule 4 “Any activity or plant”	100
HCl	Clean Air Regulation – Schedule 4 “Any activity, other than the manufacture of glazed terracotta roofing tiles”	100
Note: mg/m <sup>3</sup> – milligrams per cubic metre		
Source: <i>Protection of the Environment Operations (Clean Air) Regulation 2010</i>		

### 6.4 ODOUR

*Condition 17* of Schedule 3 requires that no offensive odours, as defined under the POEO Act, are to be emitted from the DZP. An 'offensive odour' is defined under the POEO Act as:

*“... an odour which is harmful to a person who is outside the premises from which it is emitted or which interferes unreasonably with the comfort or repose of a person outside the premises from which it is emitted.”*

On the basis that the predicted odour would not exceed 1 Odour Unit at the closest receivers to the DZP Site, effectively imperceptible, no quantified criteria will be applied. Rather the criteria for assessment of impact will be complaint from surrounding receivers.

## 7. AIR QUALITY MANAGEMENT MEASURES

### 7.1 INTRODUCTION

*Condition 23(b)* of Schedule 3 identifies that this Plan describes the air quality mitigation measures that will be implemented to ensure compliance with *Conditions 17 to 24*. Reflecting the staged approach to the preparation and implementation of the Plan, this section considers the various components of the development and operation of the DZP separately.

## 7.2 OFF-SITE (LINEAR INFRASTRUCTURE) CONSTRUCTION

### 7.2.1 Introduction

The off-site linear infrastructure construction activities to be managed in accordance with the Plan include the following (**Figure 2**).

- Obley Road upgrade (100% off site).
- Toongi Road bridge over Wambangalang Creek (100% off site).
- Gas pipeline from Dubbo to Toongi ( 99% off site).
- 132kV ETL power line from Geurie to Toongi (80% off site).
- Macquarie River Water Pipeline and associated infrastructure (50% off site).

Sections 7.2.2 to 7.2.4 describe the air quality management measures that would be implemented during the construction of this infrastructure.

### 7.2.2 Operating Hours and Conditions

The hours of operation presented in **Table 9** will be adhered to.

**Table 9**  
**Operating Hours of Off-Site Construction**

Activity	Operating Hours
Construction of linear infrastructure	6:00am to 6:00pm, Monday to Friday. 8:00am to 1:00pm, Saturday. No construction to be undertaken on Sundays or Public Holidays.

In order to reduce the impact of road works on local residents and commuters, linear infrastructure construction works, e.g. public road upgrades, may be planned to include Saturdays between 1:00pm and 6:00pm, as well as Sundays. These extended hours of operation will only be undertaken on approval of an *Out of Hours Work Protocol* by the Secretary of the DPE. A copy of the *Out of Hours Work Protocol* template, to be completed prior to any construction programs requiring an extension of the working hours beyond those nominated in **Table 9**, is appended to the *Noise Management Plan* (RWC, 2016b).

### 7.2.3 Engineering Air Quality Controls

During construction the following design and engineering controls will be undertaken in order to minimise air quality impact from the DZP.

- The extent of clearing of vegetation and topsoil stripping will be limited to the designated footprint required for construction. Maps identifying the extent of approved clearing will be provided to supervisors or managers who will provide instruction to operators on extent. Where natural features cannot be used to delineate extents, in field markers such as survey pegs, star pickets or equivalent will be used for delineation.



- Stockpiled material will be located where existing vegetation or topographic features provide a barrier from prevailing winds. Stockpiles, if not be immediately reused, will be revegetated to achieve a cover factor of 70% within 60 days of construction.
- Access roads and laydown areas will be restricted and delineated prior to construction. Movements via these access roads will be minimised wherever practicable.
- Major access roads and laydown areas will be sheeted with gravel and compacted.

#### **7.2.4 Procedural Air Quality Controls**

During construction the following procedural controls will be undertaken in order to minimise air quality impacts from the DZP.

- Weather forecasts will be closely monitored prior to construction activities taking place to limit excavation during periods of high winds (see also Section 9.2.1).
- All Project-related personnel, including contractors and their employees, will be made aware of their obligations and responsibilities with regard to minimising emissions. These will include, but not be limited to:
  - confining all vehicle movement to designated routes;
  - notifying supervisors if wind-blown dust is observed;
  - conservative driving methods, including restricting driving to designated haul roads and implementation of appropriate speed limits;
  - undertaking of regular maintenance of machinery to minimise emissions;
  - minimising drop heights from buckets;
  - controlling and reducing trips and trip distances where possible, for example by coordinating delivery and removal of materials to avoid unnecessary trips;
  - promoting awareness and consideration of the expectation of landowners; and surrounding residents.
- Supervisors of specific works programs will undertake regular visual inspections of dust emissions and modify, relocate or cease works where dust emissions are excessive or impacting at receivers away from the work area (see also Section 9.2.2).
- Speed limits (20km/hr) will be applied to access roads of the construction zone to reduce the potential for dust lift-off.
- A water cart will be operated when construction involves disturbance which removes groundcover. The rate of water application will vary depending on prevailing weather conditions, however, will aim to prevent visible dust lift-off during periods of activity. Additional proactive management measures are discussed in Section 9.2.2.

- Specific measures for minimising dust emissions from scraper operation are discussed in Section 9.2.2.
- Occupants of residences adjoining construction activities will be provided with details ahead of time regarding the type of activities, their duration and the specific measures to minimise dust and other emissions during the period. Occupants will also be provided with contact details for personnel managing the construction activities.

In addition to the above, the Air Quality Management System (Section 9) includes specific proactive and reactive procedures, controls and actions designed to reduce the potential for air quality incidents.

## 7.3 ON-SITE CONSTRUCTION

### 7.3.1 Introduction

As identified in Section 1, the Stage 1 construction activities to which the management measures presented in Section 7.3.2 to 7.3.4 apply include the site preparation and construction of the following features depicted on **Figure 1**.

- Site Entrance and Access Road.
- Site Administration Area (incorporating lay down areas).
- Processing Plant Area (incorporating lay down areas).
- Laydown and Storage Area.
- Mine Haul Road.
- Residue Storage Facility (RSF).
- Salt Encapsulation Cell 1.
- Initial open cut development.
- Initial Waste Rock Emplacement (WRE) construction.
- Extraction of basalt from a small quarry (developed under separate development consent within the impact footprint of the WRE).
- Linear infrastructure associated with the on-site components of the Macquarie River Water Pipeline and 22kV power line and the 132kV power line.

### 7.3.2 Operating Hours and Conditions

The hours of operation presented in **Table 9** will be adhered to.

### 7.3.3 Engineering Air Quality Controls

During construction the following design and engineering controls will be undertaken in order to minimise air quality impact from the DZP.

- The extent of clearing of vegetation and topsoil stripping will be limited to the designated footprint required for construction. Maps identifying the extent of approved clearing will be provided to supervisors or managers who will provide instruction to operators on extent. Where natural features cannot be used to delineate extents, in field markers such as survey pegs, star pickets or equivalent will be used for delineation.
- Stockpiled material will be located where existing vegetation or topographic features provide a barrier from prevailing winds. Stockpiles, if not be immediately reused, will be revegetated to achieve a cover factor of 70% within 60 days of construction.
- Where drill and blast is required to complete land preparation ahead of construction, dust aprons, dust extraction and water injection technology will be used. *Section 8.6 of the DZP Blast Management Plan* provides additional controls for management of dust and fumes from blasting.
- Access roads and laydown areas will be restricted and delineated using in-field markers prior to construction. Movements via these access roads will be minimised wherever practicable.
- Major access roads and laydown areas will be sheeted with gravel and compacted.

### 7.3.4 Procedural Air Quality Controls

During construction the following procedural controls will be undertaken in order to minimise air quality impacts from the DZP.

- Weather forecasts will be closely monitored prior to commencement of activities.
  - Earthworks will be reviewed and restricted as necessary (in accordance with the Air Quality Management System – see Section 9) during periods of hot temperatures and/or high winds.
  - Blasting operations will not be undertaken during periods when the prevailing winds are towards the nearest receptors (to the west and southwest).
- All Project-related personnel, including contractors and their employees, will be made aware of their obligations and responsibilities with regard to minimising emissions. These will include, but not be limited to:
  - confining all vehicle movement to designated routes;
  - notifying supervisors if wind-blown dust is observed;
  - conservative driving methods, including restricting driving to designated haul roads and implementation of appropriate speed limits;
  - undertaking of regular maintenance of machinery to minimise emissions;
  - minimising drop heights from buckets;

- controlling and reducing trips and trip distances where possible, for example by coordinating delivery and removal of materials to avoid unnecessary trips; and
- promoting awareness and consideration of the expectation of landowners; and surrounding residents.
- Supervisors of specific works programs will undertake regular visual inspections of dust emissions and modify, relocate or cease works where dust emissions are excessive or impacting at receivers away from the work area (see also Section 9.2.2).
- Speed limits (20km/hr) will be applied to access roads of the construction zone to reduce the potential for dust lift-off.
- Water carts will be used to water roads, laydown areas, stockpiles and other trafficked areas to minimise wind-blown dust from traffic and exposed surfaces. The rate of water application will vary depending on prevailing weather conditions, however, will aim to prevent visible dust lift-off during periods of activity. Additional proactive management measures are discussed in Section 9.2.2.
- Specific measures for minimising dust emissions from scraper operation are discussed in Section 9.2.2.
- Occupants of residences adjoining construction activities will be provided with details ahead of time regarding the type of activities, their duration and the specific measures to minimise dust and other emissions during the period. Occupants will also be provided with contact details for personnel managing the construction activities.

As noted in Section 7.2.4, specific proactive and reactive procedures, controls and actions of an Air Quality Management System (Section 9) will also be implemented as required.

## **7.4 GREENHOUSE GAS**

### **7.4.1 Introduction**

Greenhouse gas emissions will be produced by the DZP through the combustion of fuel from hydrocarbon-powered equipment and vehicles, the combustion of natural gas for heating purposes, on-site electricity consumption and the movement of vehicles to and from the DZP Site. The following subsections describe the air quality management measures that will be implemented to minimise greenhouse gas emissions.

### **7.4.2 Procedural Greenhouse Gas Controls**

During construction the following procedural controls will be undertaken in order to minimise greenhouse gas emissions from the DZP.

- Vehicles that produce greenhouse gas emissions, including but not limited to light vehicles, dump trucks, excavators, drills, dozers, scrapers and graders will undergo regular maintenance.
- Equipment that generates unusual emissions will be serviced as soon as practicable.

- All Project-related personnel, including contractors and their employees, will be made aware of their obligations and responsibilities with regard to minimising emissions.
- Regular maintenance will be undertaken on the power plant to ensure efficient operation.

### 7.4.3 Engineering Greenhouse Gas Controls

During construction the following engineering controls will be undertaken in order to minimise greenhouse gas emissions from the DZP.

- Heat waste from the processing plant will be used to partially generate electricity and steam products.
- Continuous improvements will be sought in process flow sheet efficiency, including the reduction of water consumption through recycling.
- Waste rock emplacements will be located as close as practicable to the open cut to reduce haulage distances.

## 7.5 MINING OPERATIONS

*To be included in Stage 2 of the Plan prior to commencement of mining operations*

## 7.6 PROCESSING PLANT OPERATIONS

*To be included in Stage 2 of the Plan prior to commencement of mining operations*

# 8. AIR QUALITY MONITORING PROGRAM

## 8.1 INTRODUCTION

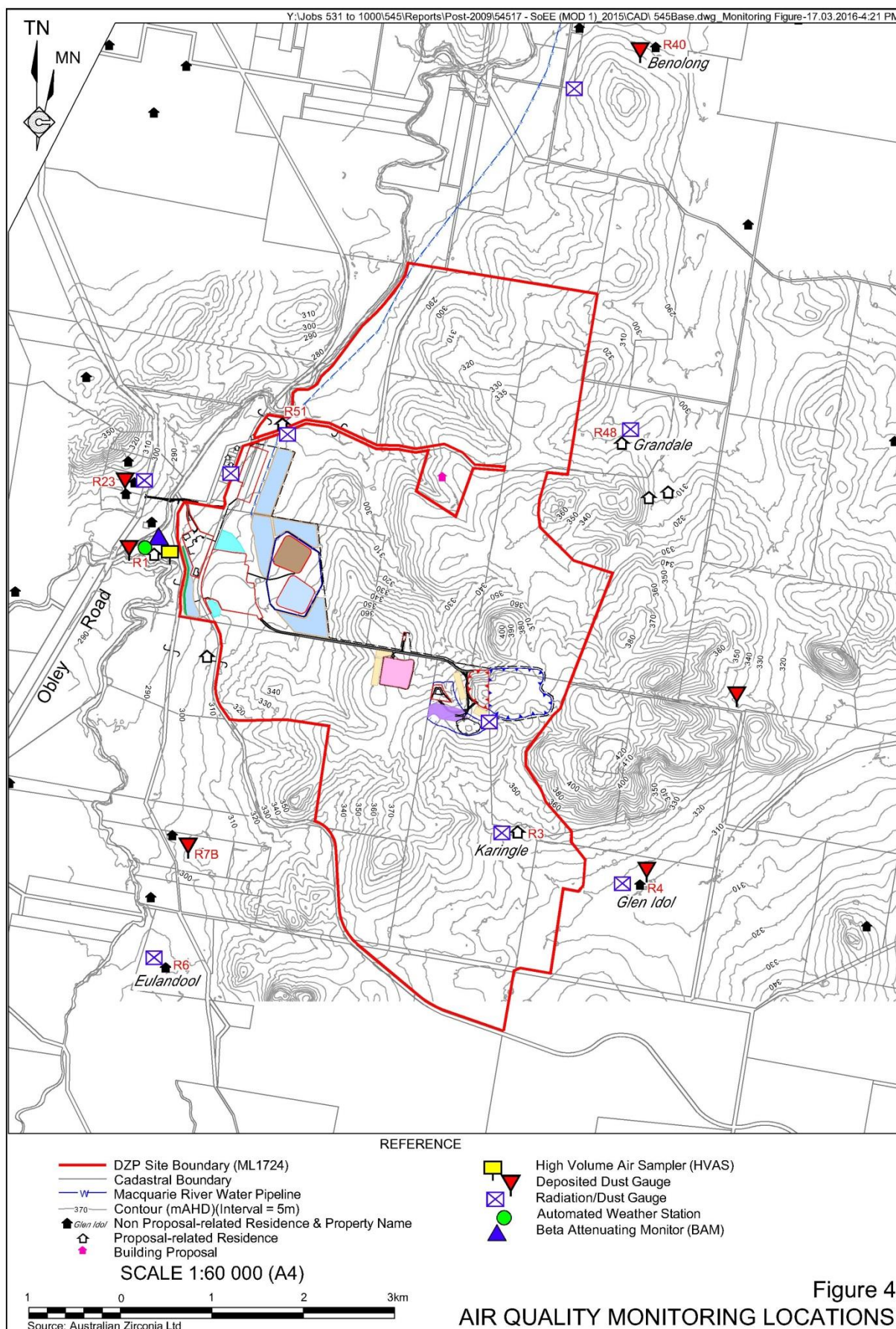
Condition 23 of Schedule 3 requires that the Plan include an air quality monitoring program that uses attended monitoring to evaluate the effectiveness of the project against the criteria identified in Conditions 18 and 19 and include a protocol for determining exceedances of the relevant conditions of the approval. This sub-section has been prepared in part satisfaction of that requirement.

## 8.2 METEOROLOGICAL MONITORING

A meteorological station is operated adjacent to the DZP Site (see **Figure 4**). The weather data collected, units of measure, frequency, averaging period and method is include in **Table 10**.







**Table 10**  
**Meteorological Monitoring**

Parameter	Units of Measure	Frequency	Averaging Period	Approved (Sampling) Method (AM)
Rainfall	Mm/hr	Continuous	1 hour	AM-4
Sigma theta	°C	Continuous	10 minute	AM-2 and AM-4
Siting				AM-1
Temperature at 2m	Kelvin	Continuous	10 minute	AM-4
Temperature at 10m	Kelvin	Continuous	10 minute	AM-4
Total solar radiation	W/m <sup>2</sup>	Continuous	10 minute	AM-4
Wind Direction at 10m	°C	Continuous	10 minute	AM-2 and AM-4
Wind Speed at 10m	m/s	Continuous	10 minute	AM-2 and AM-4

The meteorological station will be operated, as far as practicable, in accordance with the following guidelines.

- NSW OEH Approved methods for the sampling and analysis of air pollutants in NSW (DECC, 2005);
- Australian Standard and New Zealand Standard (AS/NZS) 3580.1.1:2007 Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment;
- AS 2922:1987 Ambient Air – Guide for the Siting of Sampling Units (AM-1);
- AS 2923:1987 Ambient air – Guide for measurement of horizontal wind for Air Quality Applications (AM-2); and
- USEPA (2000) EPA 454/R-99-005 Meteorological monitoring guidance for regulatory modelling applications (AM-4).

All air quality monitoring will be accompanied by a quantitative record of weather conditions during the monitoring period together with a qualitative description of weather conditions, including cloud cover, fog etc. This data will be used to correlate environmental conditions with emission levels and derive a relationship between the two factors.

### 8.3 MONITORING LOCATIONS

Air quality monitoring will be undertaken at the locations presented in **Figure 4**. Monitoring equipment used includes the following.

- 10 dust deposition gauges equipped for environmental radiation monitoring of gamma radiation, radon concentration, thoron concentration and radionuclide concentration (denoted by R- on **Figure 4**).
- Two additional dust deposition gauges (denoted by D- on **Figure 4**).

- One Beta Attenuating Monitor (BAM) for the measurement of PM<sub>10</sub> (denoted by BAM on **Figure 4**).
- One High Volume Air Sampler (HVAS) measuring Total Suspended Particulates (TSP)<sup>2</sup> (denoted by HVAS on **Figure 4**).

The BAM will be upgraded following construction of the Processing Plant to monitor PM<sub>2.5</sub>, NO<sub>x</sub>, SO<sub>2</sub>, and other gaseous emissions. Details of this monitoring, as well as in-stack monitoring of gas emissions will be documented in future version of Air Quality Management Plan.

## 8.4 AIR EMISSIONS MONITORING

### 8.4.1 Deposited Dust

#### 8.4.1.1 Purpose

The purpose of the deposited dust monitoring will be to confirm compliance with the criteria identified in *Condition 3(18)* of SSD-5251 and the conditions of the Environment Protection Licence (refer to Section 3.2).

#### 8.4.1.2 Methodology

Deposited dust monitoring will be undertaken using ten dust deposition gauges placed at private receptors surrounding the DZP Site. The dust gauges were installed in September 2012 to provide background deposited dust levels prior to construction and operation.

Deposited dust monitoring will be undertaken in accordance with the following documents.

- AS 2922:1987 Ambient Air – Guide for the Siting of Sampling Units (AM-1).
- NSW DEC Approved methods for the sampling and analysis of air pollutants in NSW (DEC, 2005).
- AS/NZS 3580.10.1:2003 Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter - Deposited Matter – Gravimetric Method (AM-19).

#### 8.4.1.3 Frequency

Deposited dust will be measured and reported on a monthly basis. Exposed gauges will be replaced on a three monthly basis with analysis conducted at a National Association of Testing Authorities (NATA) accredited laboratory for insoluble solids.

---

<sup>2</sup> The HVAS collects data on a campaign basis. From the data collected, a ratio of PM<sub>10</sub> to TSP can be determined and then used in conjunction with the BAM PM<sub>10</sub> data to assess future TSP compliance.



## 8.4.2 Particulate Matter (High Volume Air Sampler)

### 8.4.2.1 Purpose

The HVAS will measure total suspended particulate matter to confirm compliance with the criteria identified in *Condition 18* of Schedule 3 and the conditions of the Environment Protection Licence (refer to Section 3.2).

### 8.4.2.2 Methodology

Monitoring will be undertaken using a HVAS installed at the closest sensitive receiver, Toongi Hall (R12 – see **Figure 4**), located 280m west of the DZP Site.

HVAS monitoring will be undertaken in accordance with the following documents.

- AS 29221987 Ambient Air – Guide for the Siting of Sampling Units (NSW DECCW Method AM-1).
- NSW DECCW Approved methods for the sampling and analysis of air pollutants in NSW (DECC, 2005).
- AS/NZS 3580.9.3:2003 Methods for Sampling and Analysis of Ambient Air – Determination of Suspended Particulate Matter – Total Suspended Particulate Matter (TSP) – High Volume Sampler Gravimetric Method (AM-15).

### 8.4.2.3 Frequency

HVAS will be monitored on a 24-hour, one-day-in-six frequency.

## 8.4.3 Particulate Matter (Beta Attenuating Monitor)

### 8.4.3.1 Purpose

The Beta Attenuating Monitor (BAM) will measure concentrations  $PM_{10}$  to confirm compliance with the criteria identified in *Condition 18* of Schedule 3 and the conditions of Environment Protection Licence (refer to Section 3.2).

### 8.4.3.2 Methodology

Monitoring will be undertaken using a BAM unit installed at the closest sensitive receiver, Toongi Hall, located 700m west of the DZP Site.

BAM monitoring will be undertaken in accordance with the following documents.

- AS 29221987 Ambient Air - Guide for the Siting of Sampling Units (NSW DECCW Method AM-1).
- NSW DECCW Approved methods for the sampling and analysis of air pollutants in NSW (DECC, 2005).

- AS/NZS 3580.9.11:2008 Methods for sampling and analysis of ambient air  
Method 9.11: Determination of suspended particulate matter PM10 beta attenuation monitors.

#### 8.4.3.3 Frequency

BAM will be measured on a continuous basis. Results can be accessed remotely at any time.

#### 8.4.4 Processing Plant In-Stack Gas Concentration

*To be included in Stage 2 of the Plan prior to commencement of mining operations*

#### 8.4.5 Processing Plant Gas Emissions

*To be included in Stage 2 of the Plan prior to commencement of mining operations*

#### 8.4.6 Greenhouse Gas Emissions

##### 8.4.6.1 Purpose

The National Greenhouse and Energy Reporting Scheme (NGERS) requires mandatory reporting for facilities or corporations who trigger relevant greenhouse gas thresholds of 25 kilotons of CO<sub>2</sub>-e. As the DZP is anticipated to exceed this threshold, greenhouse gas emissions, including electricity and diesel usage, will be monitored to confirm compliance with NGERS.

##### 8.4.6.2 Methodology and Frequency

The methodology and frequency of greenhouse gas emission monitoring is presented in Table 11.

**Table 11**  
**Greenhouse Gas Emission Monitoring Methodology and Frequency**

Parameter Monitored	Frequency	Person Responsible
Electricity usage	Collated Quarterly	Environment and Community Manager
Diesel usage from mining and generators (including offsite transport task)	Collated Quarterly	Environment and Community Manager
LPG usage	Collated Quarterly	Environment and Community Manager
CNG usage	Collated quarterly	Environment and Community Manager
Limestone consumption	Collated Quarterly	Environment and Community Manager

#### **8.4.7 Environmental Radiation**

This monitoring is undertaken in accordance with an Environmental Radiation Monitoring Procedure prepared by JRHC (2014) (see **Appendix 3**).

### **8.5 EVALUATION OF RESULTS**

#### **8.5.1 Air Quality Monitoring Report**

AZL will aim to obtain an air quality monitoring report from the person or company responsible for the monitoring within 14 days of each monthly, quarterly or annual monitoring period. That report will include an assessment of the monitoring results against the criteria identified in *Condition 18* of Schedule 3. The monitoring report will be reviewed by the Environmental Superintendent and a copy included within the Annual Environmental Management Report.

In the event that the air quality monitoring report identifies an exceedance of the relevant criteria, the procedures identified in Section 9.3.2 will be implemented.

#### **8.5.2 National Greenhouse and Energy Reporting Scheme**

AZL will report annually and publicly to the NGERs. The reports will contain but not be limited to the following information:

- Energy usage;
- Greenhouse gas emissions;
- Greenhouse gas reduction measures;
- Review of previous energy/greenhouse gas reduction measures;
- Investigation of future energy/ greenhouse gas reduction measures; and
- Any other information required for reporting, including contextual information.

## **9. AIR QUALITY MANAGEMENT SYSTEM**

### **9.1 INTRODUCTION**

As nominated in Section 3, an objective of AZL with respect to air quality management is to maintain emissions levels received at sensitive receivers below air quality criteria.

The following identifies the proactive and reactive measures that will be implemented as part of an Air Quality Management System to reduce the potential for exceedances of air quality criteria.



## 9.2 PROACTIVE MANAGEMENT

### 9.2.1 Meteorological Forecasting

Local weather forecasts will be considered when programming works, in particular earthworks and blasting.

Three day forecasts are available for the Dubbo Airport Weather Station (AWS) operated by the Bureau of Meteorology (BoM). These data will be reviewed daily by the managing AZL personnel (refer to Section 12) who will check weather conditions for coming days and plan, relocate or postpone works accordingly.

Adverse weather in terms of dust impacts relates to hot, dry and gusty / windy conditions and specifically to either:

- Hot dry conditions where the temperature is in excess of 35°C (at temperatures exceeding 35° it is difficult to maintain adequate surface moisture to control dust generation); or
- High wind conditions (>30km/hr) towards nearest sensitive receptors.

### 9.2.2 Proactive Mitigation Measures

Preparatory measures that can be put in place for adverse weather include:

#### Scheduling of Activities

- Short-term modification of dust generating activities in response to forecasting of hot, dry and gusty / windy conditions (based on 3-day forecasts from the Dubbo AWS). Modifications could include the following.
  - Surface moistening of areas where dust-generating construction will occur prior to the on-set of windy conditions.
  - Preparation for the use of the water cart or sprinkler systems during periods of high winds.
  - Reduced intensity of activities.

#### Water Application

- During the hotter months, areas to be trafficked or otherwise disturbed as part of planned activities, e.g. access road, go-line, laydown areas and work areas, will be watered prior to the commencement of activities.
- To assist in maintaining the moisture content of areas to be trafficked or disturbed, access roads, laydown and work areas will be watered at the end of the outgoing shift.
- If a water cart is not available due to unplanned maintenance, water supply issues or the like, all activities that may generate dust are to be suspended immediately. The nominated works program supervisor is to notify the Mine Superintendent immediately. Works that generate dust will not re-commence until dust control measures are reinstated.

### **Monitoring**

- The supervisor of any nominated works program (construction or operation) is to monitor dust on regular basis during dry conditions.
- Depending on the work area and prevailing wind conditions, visual monitoring is to include Obley Road, residential and other community receivers in the proximity of the activities.
- Where the supervisor observes excessive dust from an area or activity, the Mine Superintendent (or delegate) is to be notified and additional measures implemented (in accordance with Section 9.3.2.4) to reduce dust generation.

### **Scraper Operations**

- Whilst stripping topsoil and subsoil the scraper bowl will not be filled to a point where spillage causes dust generation.
- The closure mechanism on the scraper bowl will be maintained to the specified standard to minimise soil leakage that may create dust during tramming.
- During scraper operations in dry conditions, water carts are to be run at a ratio of one pass on the stockpile or access road per two scraper movements (unless conditions become slippery and unsafe).

### **Blasting**

- Blasting in windy conditions, or conditions likely to result in emissions dispersing towards residential or other community receptors, will be avoided.
- In hot dry conditions, the blast area will be pre-treated by watering to reduce the dust lift-off potential.

### **Stockpile Management**

- Stockpiles will be placed in the lee of natural features such as remnant vegetation and topographic features when practicable.
- Stockpiles will be stabilised with a cover of grass or artificial stabilising agent.

### **Area Specific Controls**

- As the activities most likely to result in dust emissions and the controls most effective in reducing these emissions are identified for specific works or component area of the DZP, 'Area Specific Controls' will be developed, implemented and added to the Plan.

## **9.3 REACTIVE MANAGEMENT**

### **9.3.1 Triggers**

The following triggers for reactive management will be applied.

- a) Air Quality Complaint.
- b) Unavailability of water cart or equivalent water application mechanism.

- c) Dust observed to be dispersing towards residential or other community receptors.
- d) Exceedance of air quality emissions criteria established through air quality monitoring.

Once triggered, the response and corrective action measures described in Section 9.3.2 will be initiated.

## **9.3.2 Response and Corrective Action**

### **9.3.2.1 Air Quality Complaint**

In the event of a complaint referencing air quality being received, the following response and action plan will be implemented.

1. The complaint will be logged with the person attending the “Duty Phone”.
2. The person attending the “Duty Phone” will log the details of the complaint and immediately notify the manager or supervisor responsible for the specific activity (this could be an AZL manager or manager of contracted construction company) and the Environment and Community Manager, of the complaint.
3. The manager, supervisor and/or Environment and Community Manager will immediately investigate the complaint, the source of the emissions, review the activities and procedures and make arrangements to either suspend, relocate or modify the activities to reduce emissions.
4. The Manager will inform the Environment and Community Manager on implementation of modified arrangements.
5. The Environment and Community Manager will review operations and emissions before contacting the complainant.
6. If AZL is unable to acceptably reduce the emissions, AZL will advise the affected resident(s) of measures being undertaken to limit air quality emissions levels, provide an indication as to the longevity of activities generating the air quality emissions, and continue to provide the affected residents with regular monitoring results until construction activities are either completed or operating within acceptable criteria.

### **9.3.2.2 Water Cart Unavailability**

In the event the water cart becomes unavailable, the following response and action plan will be implemented.

1. Activities likely to generate dust, i.e. earthworks and those involving significant movement over disturbed ground, will be suspended temporarily.
2. The location of these activities relevant to off-site receivers will be reviewed, with consideration given to wind conditions, will be reviewed by the Manager and Environmental Superintendent.

3. Recommencement of activities in areas unlikely to result in dispersal of dust towards off-site receptors will be approved.
4. Monitoring of dust emission dispersal will be undertaken with increased frequency and actions taken as relevant if dust observed to be affecting surrounding receptors.

### **9.3.2.3 Air Quality Monitoring Exceedance**

If air quality monitoring indicates that emissions exceed criteria (either annual, monthly deposited dust monitoring, 24-hour exceedance or other short term measure [for gas emission]), the following response and action plan will be implemented.

1. Immediately after obtaining exceedance information, the Environmental Superintendent (or delegated representative) will phone the relevant AZL manager or manager of contracted construction company and inform them of the air quality emissions levels and location of the exceedance.
2. Notification procedures (of community and government agencies) will be commenced in accordance with Section 11.
3. The Manager will immediately investigate the source of the air quality emissions, review the construction activities and if necessary make arrangements to alter or postpone the construction activities so that the air quality emissions are reduced.
4. The Manager will inform the Environment Superintendent (or delegated representative) when construction activities have been altered.
5. A Non-Conformance and Corrective Action Report will be produced for the exceedance.
6. Within two weeks of obtaining any data showing an exceedance of air quality criteria, AZL will notify in writing any affected landowners or tenants. If AZL is unable to reduce the emissions level to within the air quality criteria then AZL will advise the affected resident(s) of measures being undertaken to limit emissions, provide an indication as to the longevity of construction activities generating the emissions, and continue to provide the affected residents with regular monitoring results until construction activities are either completed or operating within the air quality criteria.

### **9.3.2.4 Observed Dust Emissions**

If during regular visual inspections, the Mine Manager or Environmental Superintendent observe, or are made aware by other personnel of, excessive dust emissions dispersing from the DZP Site or linear infrastructure areas (see Section 9.2.2), the following response and action plan will be implemented.

1. The activities observed to be the primary cause of dust emissions will be suspended temporarily.
2. If available, the water cart will be allocated to the area to increase moisture content of the ground.



3. If the water cart is unavailable or ineffective, the activities will either be reduced intensity, relocated or postponed until meteorological conditions improve.
4. Where the dust generation is a result of dust lift-off from stockpiles or large areas of disturbance, these will be stabilised either by sowing a temporary cover crop or applying an artificial stabilising (binding) agent.

## **10. COMPLAINTS HANDLING AND RESPONSE**

In order to receive, record and respond to any complaints in a timely manner, the Company has established the following.

- Telephone via a 24-hour, 7 day per week Community Information Line.
- A dedicated email address ([dzp@alkane.com.au](mailto:dzp@alkane.com.au)).
- Registration of complaint portal on the Company web site ([www.alkane.com.au](http://www.alkane.com.au)).

Section 10.1 of the DZP *Environmental Management Strategy* describes the complaints handling procedure and Section 10.2 of the DZP *Environmental Management Strategy* the approach to dispute resolution.

Response to the receipt of a complaint is described in Section 9.3.2.1. Notification of a complaint will be based on whether it classifies as an incident or not (see Section 11).

## **11. INCIDENT MANAGEMENT, NOTIFICATION AND REPORTING**

### **11.1 INCIDENT IDENTIFICATION**

SSD-5251 defines an incident as “a set of circumstances that:

- *causes or threatens to cause material harm to the environment; and/or*
- *breaches or exceeds the limits or performance measures/criteria.”*

In accordance with the definition provided by Section 147 of the POEO Act, harm to the environment is deemed to be material if:

- i) it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial; or
- ii) it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$10,000 (or such other amount as is prescribed by the regulations); and
- iii) loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.

No definition as to what constitutes trivial is provide by the POEO Act, therefore it is taken as the literal definition being “of little value or importance”. For the purpose of assessing whether an event related to the emission of particulate matter, gas or odour, the following two questions will be considered.

- a) Are the emissions of a type which could impact on human (or biota) health, e.g. SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub>?



b) Will specific clean-up actions be required?

If the answer to either question is YES, then the actual or potential harm is NOT trivial.

An incident which causes or threatens to cause material harm to the environment (and may or may not result in an exceedance of air quality criteria) is referred to as a **Pollution Incident**.

An incident which is only as a result of an exceedance of air quality criterion, is referred to as a **Non-compliance Incident**.

## 11.2 INCIDENT MANAGEMENT AND NOTIFICATION

### 11.2.1 Pollution Incident

Management (including notification) of a pollution incident is to be undertaken in accordance with Section 6 of the DZP *Pollution Incident Response Management Plan*.

### 11.2.2 Non-compliance Incident

On identification of a non-compliance against air quality criteria, or in response to a complaint related to nuisance emissions (dust deposition), the relevant Manager will be notified and an investigation into the source of the non-compliant or complaint causing emissions commenced.

On identification of the source of emissions resulting in the incident, the Manager, Environment and Community Manager or delegate will implement one or more of the corrective measures identified in the Air Quality Management System (see Section 9).

An investigation into the cause of the non-compliant air emissions will be undertaken involving the personnel involved, supervisory personnel, relevant Manager and/or Environment Manager. The investigation will review all reasonable and feasible steps which may be taken to:

- correct the activity resulting in elevated air emissions; and
- prevent recurrence.

At the earliest opportunity<sup>3</sup> following the completion of the investigation, a report will be prepared and submitted to the DPE and EPA summarising the investigation and proposed corrective and preventative measures.

If the incident was identified following receipt of complaint, the complainant will be provided with a report confirming the incident, source or cause of the incident, actions taken and ongoing management to prevent subsequent incident at the earliest opportunity (see also Section 10).

## 11.3 INCIDENT REPORTING

Pollution incidents will be reported in accordance with the Section 6.5 of the DZP *Pollution Incident Response Management Plan*.

<sup>3</sup> Unless justification is provided at the time, earliest opportunity refers to the end of the next business day (from completion of investigation) and within 7 days of the incident.



In addition to the reports prepared for notification purposes (see Section 11.2.2), a short report documenting any non-compliance incident, actions taken and results of the corrective actions will be compiled by the Environment Manager, Environmental Superintendent or equivalent position. This report will be provided to the regulatory authorities and/or complainant at the earliest opportunity.

A summary of all non-compliance incidents (and pollution incidents), including dates of occurrence, corrective measures taken and success of these measures will be compiled and reported in the Annual Environmental Management Report to the DPE and Annual Return to the EPA.

## 12. PUBLICATION OF MONITORING INFORMATION AND REPORTING

AZL will include all air quality monitoring reports as appendices to the Annual Environmental Management Report. That document, once approved by the relevant government agencies, would be published on the Company's website.

In accordance with the requirements of Section 66(6) of the *Protection of the Environment Operations Act 1997*, AZL will make any of the monitoring data that relates to pollution available on AZL's website within 14 days of obtaining the data. In addition, AZL will provide a copy of obtained data (the value of each individual monitoring sample) free of charge to a member of the public when requested. The data will be published in a format that includes raw data values, is comprehensible by the general public and also includes all accompanying necessary information. NGER data is not required to be published. These requirements are presented in detail in *Requirements for Publishing Pollution Monitoring Data* (EPA, 2013).

## 13. PLAN IMPLEMENTATION

### 13.1 ROLES AND RESPONSIBILITIES

**Table 12** outlines the roles and responsibilities of personnel with reference to management of air quality.

**Table 12**  
**Roles and Responsibilities**

Page 1 of 2

Role	Responsibilities
Chief Operations Officer	Ensure adequate resources are available to enable implementation of the Plan.
General Manager NSW	Ensure community notifications and negotiations are undertaken as nominated in the Plan and in a timely manner.
The Manager (Construction or Mining Operations)	<p>Ensure reviews of meteorological forecasts are completed prior to the commencement of noisy linear infrastructure construction activities.</p> <p>Implementation of the Air Quality Management System (refer to Section 9).</p> <p>Relocate or postpone dust emitting activities in the event of adverse (dust enhancing) winds.</p> <p>Initiate investigations of complaints as received from public or regulator.</p> <p>Inform the Environment and Community Manager of identified causes of elevated air emission levels and any alterations to site operations.</p>

**Table 12 (Cont'd)**  
**Roles and Responsibilities**

Page 2 of 2

<b>Role</b>	<b>Responsibilities</b>
Environment and Community Manager	<p>Ensure the implementation of the Plan.</p> <p>Review and advise on implementation of the Air Quality Management System (refer to Section 9).</p> <p>Ensure air quality monitoring is undertaken.</p> <p>Review air quality monitoring results and enter into the environmental database.</p> <p>Assist the Manager in investigations of a recorded incident.</p> <p>Provide primary contact for complaints and supply follow-up information to the complainant.</p> <p>Prepare a report to regulatory authorities or neighbours following a recorded incident.</p> <p>Ensure employees are competent through training and awareness programs.</p>
Maintenance Manager	Supervision of scheduled maintenance of plant and equipment on site.
Mobile Equipment / Processing Operators	<p>Safe, efficient and compliant operation of plant and equipment.</p> <p>Ensure areas of disturbance strictly adhere to instructions provided by the Manager, Environment and Community Manager or the Plan.</p> <p>Operate equipment in accordance with design and operational specifications and with consideration of those in close proximity.</p> <p>Report any anomalous air emissions or unaccounted for events to the Manager, or Environment and Community Manager.</p>
All Personnel	<p>Operate in manner that minimises risks of incidents to themselves, fellow workers or the surrounding environment.</p> <p>Follow any instructions provided by the Environment and Community Manager or Manager.</p>

## 13.2 COMPETENCE TRAINING AND AWARENESS

Prior to commencement of work on the DZP Site or specific off-site construction sites, personnel and subcontractors will undertake a DZP Induction. The induction will address occupational health and safety, quality, and environmental issues. *Section 6.3.2* of the DZP *Environmental Management Strategy* describes the overall content of induction to be undertaken. After completing the induction workers will sign a statement of attendance and records of this are kept in the site office.

AZL and contract personnel will also be provided with environmental awareness training. As discussed in *Section 6.3.3* of the DZP *Environmental Management Strategy*, training will be targeted to specific to activities or locations depending on the potential for environmental impact. The training will be prepared and delivered by the Environment Manager (or equivalent position) or delegate, with specific training relevant to air quality management to include the following.

- Pollution Incident Response Management Plan obligations and requirements.
- Air Quality Management Plan obligations and requirements.



- Vegetation Clearing and Soil Stripping.
- Engineering and Procedural Air Quality Controls (Dust Minimisation).

### **13.3 REVIEW (AND CONTINUAL IMPROVEMENT PROTOCOL)**

In accordance with *Condition 5*, of Schedule 5, of SSD-5251, the Plan will be reviewed and if necessary advised within 3 months of:

- a) the submission of an Annual Review of operations in accordance with Condition 4, of Schedule 5, of SSD-5251 (to be completed by 30 September each year);
- b) any notifiable incident related to air emissions;
- c) any internal or external audits undertaken of the DZP; and/or
- d) any significant modifications to operations that may influence air quality management.

These reviews will consider monitoring data, complaints and management measures to ensure air emission levels are reduced as far as reasonably possible. This will ensure the adequacy of the Plan and allow for opportunities of adaptive management and continual improvement.

## 14. REFERENCES

Australian Standard (AS) 2922-1987. *Ambient air - Guide for the siting of sampling units.*

Australian Standard / New Zealand Standard (AS/NZS) 3580.10.1:2003. *Methods for Sampling and Analysis of Ambient Air – Determination of Particulate Matter – Deposited Matter - Gravimetric Method.*

Australian Standard / New Zealand Standard (AS/NZS) 3580.9.11:2008 Methods for sampling and analysis of ambient air Method 9.11: Determination of suspended particulate matter PM<sub>10</sub> beta attenuation monitors.

Department of Environment and Conservation (DEC) (2005). *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW.*

Environment Protection Authority (EPA) (2013). *Requirements for publishing pollution monitoring data.*

Pacific Environment Limited (PEL) (2013). *Air Quality Assessment for the Dubbo Zirconia Project.* Volume 1, Part 2 of the Specialist Consultant Studies Compendium.

R.W. Corkery & Co. Pty Limited (RWC) (2013). *Environmental Impact Statement for the Dubbo Zirconia Project, September 2013.* Prepared on behalf of Australian Zirconia Limited.

R.W. Corkery & Co. Pty Limited (RWC) (2016a). *Environmental Management Strategy for the Dubbo Zirconia Project, July 2016.* Prepared on behalf of Australian Zirconia Limited.

R.W. Corkery & Co. Pty Limited (RWC) (2016b). *Noise Management Plan for the Dubbo Zirconia Project, July 2016.* Prepared on behalf of Australian Zirconia Limited.

This page has intentionally been left blank





# Appendix 1

## Air Quality-related Conditions of SSD-5251

Schedule 3, Conditions 17 to 24  
Schedule 5, Condition 3

(Total No. of pages including blank pages = 6)



This page has intentionally been left blank



#### Property Investigations

13. If the owner of any privately-owned land claims that buildings and/or structures on his/her land have been damaged as a result of blasting on the site, then within 2 months of receiving this claim the Applicant shall:
- commission a suitably qualified, experienced and independent person, whose appointment is acceptable to both parties to investigate the claim; and
  - give the landowner a copy of the property investigation report.

If this independent property investigation confirms the landowner's claim, and both parties agree with these findings, then the Applicant shall repair the damage to the satisfaction of the Secretary.

If there is a dispute over the selection of the suitably qualified, experienced and independent person, or the Applicant or the landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Secretary for resolution.

#### Operating Conditions

14. During mining operations on site, the Applicant shall:
- implement best management practice to:
    - protect the safety of people and livestock in the surrounding area;
    - protect public or private infrastructure/property in the surrounding area from any damage; and
    - minimise the dust and fume emissions of any blasting;
  - operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule on site and any road closures; and
  - monitor and report on compliance with the relevant blasting conditions in this consent, to the satisfaction of the Secretary.
15. The Applicant shall not undertake blasting on site within 500 metres of:
- any public road; or
  - any land outside the site that is not owned by the Applicant, unless:
    - the Applicant has a written agreement with the applicable roads authority or landowner to allow blasting to be carried out closer to the public road or land, and the Applicant has advised the Department in writing of the terms of this agreement; or
    - the Applicant has:
      - demonstrated to the satisfaction of the Secretary that the blasting can be carried out closer to the road or land without compromising the safety of people or livestock, or damaging buildings and/or structures; and
      - updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the road or land.

#### Blast Management Plan

16. The Applicant shall prepare and implement a Blast Management Plan for the development to the satisfaction of the Secretary. This plan must:
- be prepared in consultation with the EPA, and submitted to the Secretary for approval prior to undertaking any blasting under this consent;
  - describe the measures that would be implemented to ensure compliance with the blasting criteria and operating conditions of this consent;
  - propose and justify any alternative ground vibration limits for any public infrastructure or other structures in the vicinity of the site (if relevant); and
  - include a monitoring program for evaluating the performance of the development, including:
    - compliance with the applicable criteria; and
    - minimising the fume emissions from the site.

#### AIR QUALITY

##### Odour

17. The Applicant shall ensure that no offensive odours, as defined under the POEO Act, are emitted from the site.

#### Air Quality Criteria

18. The Applicant shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the particulate emissions generated by the development do not exceed the criteria listed in Tables 4 to 6 at any residence on privately-owned land.

Table 4: Long term criteria for particulate matter

Pollutant	Averaging period	<sup>d</sup> Criterion
Total suspended particulate (TSP) matter	Annual	<sup>a</sup> 90 µg/m <sup>3</sup>
Particulate matter < 10 µm (PM <sub>10</sub> )	Annual	<sup>a</sup> 30 µg/m <sup>3</sup>

Table 5: Short term criterion for particulate matter

Pollutant	Averaging period	<sup>d</sup> Criterion
Particulate matter < 10 µm (PM <sub>10</sub> )	24 hour	<sup>a</sup> 50 µg/m <sup>3</sup>

Table 6: Long term criteria for deposited dust

Pollutant	Averaging period	Maximum increase in deposited dust level	Maximum total deposited dust level
<sup>c</sup> Deposited dust	Annual	<sup>b</sup> 2 g/m <sup>2</sup> /month	<sup>a</sup> 4 g/m <sup>2</sup> /month

Notes to Tables 4 to 6:

- <sup>a</sup> Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to other sources);
- <sup>b</sup> Incremental impact (i.e. incremental increase in concentrations due to the development on its own);
- <sup>c</sup> Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and
- <sup>d</sup> Excludes extraordinary events such as bushfires, prescribed burning, dust storms, fire incidents, illegal activities or any other activity agreed to by the Secretary.

19. The Applicant shall ensure that all reasonable and feasible design, avoidance and mitigation measures are employed so that the gaseous emissions generated by the development do not exceed the criteria listed in Table 7 at any residence on privately-owned land.

Table 7: Criteria for Processing Plant Emissions

Pollutant	Averaging Period	Criteria
Sulphur Dioxide	10-minute	712 µg/m <sup>3</sup>
	1-Hour	570 µg/m <sup>3</sup>
	24-Hour	228 µg/m <sup>3</sup>
	Annual	60 µg/m <sup>3</sup>
Nitrogen Dioxide	1-Hour	246 µg/m <sup>3</sup>
	Annual	62 µg/m <sup>3</sup>
Hydrogen Chloride	1 hour	0.14 mg/m <sup>3</sup>

#### Operating Conditions

20. The Applicant shall:
- implement all reasonable and feasible measures to minimise the:
    - odour, fume, dust and radon emissions of the development;
    - gaseous emissions from the ore processing facility; and
    - greenhouse gas emissions from the site;
  - minimise the surface disturbance of the site;
  - operate a comprehensive air quality management system that uses a combination of predictive meteorological forecasting and real-time air quality monitoring data to guide the day-to-day planning of mining operations and implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions of this consent;
  - minimise the air quality impacts of the development during adverse meteorological conditions and extraordinary events (see note d to Tables 4 to 6 above), to the satisfaction of the Secretary.

#### Processing Plant Design and Validation

21. Prior to commissioning the ore processing facility on the site, the Applicant shall:
- finalise the detailed design of the emission control measures at the ore processing facility to ensure:
    - it has TM-1 compliant sample ports so sampling of emissions will comply with the EPA's *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW 2006* (or its latest version); and
    - compliance with the minimum stack height detailed in the EIS, unless otherwise agreed with the EPA; and
  - prepare a revised air quality impact assessment to predict the emissions from the development at surrounding sensitive receivers based on the final design of the ore processing facility, in consultation with the EPA and to the satisfaction of the Secretary.
- Note: The revised air quality impact assessment must be undertaken in accordance with the relevant methods and guidelines, including EPA's Approved Methods for the Modelling and Assessment of Air Pollutants in NSW 2005 (or latest version).*
22. Within 1 month of commissioning the ore processing facility, unless the Secretary agrees otherwise, the Applicant shall prepare an emissions validation report, which includes monitoring to compare the actual emissions with:
- the predicted emissions in the revised air quality impact assessment in condition 21 (b) above; and
  - the criteria in Table 7,
- in consultation with the EPA and to the satisfaction of the Secretary.

#### Air Quality Management Plan

23. The Applicant shall prepare and implement a detailed Air Quality Management Plan for the development to the satisfaction of the Secretary. This plan must:
- be prepared in consultation with the EPA, and be submitted for approval prior to the commencement of construction activities under this consent, unless the Secretary agrees otherwise;
  - describe the measures that would be implemented to ensure compliance with air quality criteria and operating conditions of this consent;
  - describe the proposed air quality management system;
  - include an air quality monitoring program that:
    - adequately supports the proactive and reactive air quality management system;
    - evaluates and reports on:
      - the effectiveness of the air quality management system; and
      - compliance with the air quality operating conditions; and
    - defines what constitutes an air quality incident, and includes a protocol for identifying and notifying the Department and relevant stakeholders of any air quality incidents; and
  - include procedures and a schedule for the preparation of emissions validation reports for the processing plant during the operation of the development.

#### METEOROLOGICAL MONITORING

24. Prior to undertaking any development on the site, the Applicant shall ensure that there is a suitable meteorological station operating in the vicinity of the site that:
- complies with the requirements in the *Approved Methods for Sampling of Air Pollutants in New South Wales* guideline; and
  - is capable of measuring temperature inversion conditions (stability category) determined by the sigma-theta method in accordance with the *NSW Industrial Noise Policy*, unless a suitable alternative is approved by the Secretary following consultation with the EPA.

#### RADIATION MANAGEMENT

##### Radiation Management Plan

25. The Applicant shall prepare and implement a Radiation Management Plan for the development to the satisfaction of the Secretary. This plan must:
- be prepared in consultation with EPA and DRE by a suitably qualified expert/s whose appointment has been approved by the Secretary;
  - be submitted for approval prior to commencing mining operations on the site, unless the Secretary agrees otherwise;
  - be consistent with the *Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* (ARPANSA, 2005);
  - describe:
    - the measures that would be implemented to ensure compliance with the ARPANSA Public Dose Limit;

## SCHEDULE 5 ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING

### ENVIRONMENTAL MANAGEMENT

#### Environmental Management Strategy

1. The Applicant shall prepare and implement an Environmental Management Strategy for the development to the satisfaction of the Secretary. This strategy must:
  - (a) be submitted to the Secretary for approval prior to the commencement of an activity associated with the development;
  - (b) provide the strategic framework for environmental management of the development;
  - (c) identify the statutory approvals that apply to the development;
  - (d) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development;
  - (e) describe the procedures that would be implemented to:
    - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
    - receive, handle, respond to, and record complaints;
    - resolve any disputes that may arise during the course of the development;
    - respond to any non-compliance;
    - respond to emergencies; and
  - (f) include:
    - copies of any strategies, plans and programs approved under the conditions of this consent; and
    - a clear plan depicting all the monitoring required to be carried out under the conditions of this consent.

#### Adaptive Management

2. The Applicant shall assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in schedule 3. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation.

Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity:

- (a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and
- (c) implement remediation measures as directed by the Secretary, to the satisfaction of the Secretary.

#### Management Plan Requirements

3. The Applicant shall ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:
  - (a) detailed baseline data;
  - (b) a description of:
    - the relevant statutory requirements (including any relevant approval, licence or lease conditions);
    - any relevant limits or performance measures/criteria;
    - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;
  - (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;
  - (d) a program to monitor and report on the:
    - impacts and environmental performance of the development;
    - effectiveness of any management measures (see c above);
  - (e) a contingency plan to manage any unpredicted impacts and their consequences;
  - (f) a program to investigate and implement ways to improve the environmental performance of the development over time;
  - (g) a protocol for managing and reporting any:
    - incidents;
    - complaints;
    - non-compliances with statutory requirements; and
    - exceedances of the impact assessment criteria and/or performance criteria; and
  - (h) a protocol for periodic review of the plan.



# Appendix 2

## Air Quality-related Conditions of Environment Protection Licence

(Total No. of pages including blank pages = 6)



This page has intentionally been left blank



**L6 Potentially offensive odour**

- L6.1 The licensee must not cause or permit the emission of offensive odour beyond the boundary of the premises.

Note: Section 129 of the Protection of the Environment Operations Act 1997, provides that the licensee must not cause or permit the emission of any offensive odour from the premises but provides a defence if the emission is identified in the relevant environmental protection licence as a potentially offensive odour and the odour was emitted in accordance with the conditions of a licence directed at minimising odour.

- L6.2 No condition of this licence identifies a potentially offensive odour for the purposes of Section 129 of the Protection of the Environment Operations Act 1997.

**4 Operating Conditions**

**O1 Activities must be carried out in a competent manner**

- O1.1 Licensed activities must be carried out in a competent manner.

This includes:

- a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and
- b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

**O2 Maintenance of plant and equipment**

- O2.1 All plant and equipment installed at the premises or used in connection with the licensed activity:
- a) must be maintained in a proper and efficient condition; and
  - b) must be operated in a proper and efficient manner.

**O3 Dust**

- O3.1 All operations and activities occurring at the premises must be carried out in a manner that will minimise the emission of dust from the premises.
- O3.2 All dust control equipment must be operable at all times with the exception of shutdowns required for maintenance.
- O3.3 Trucks entering and leaving the premises that are carrying loads must be covered at all times, except during loading and unloading.

## 5 Monitoring and Recording Conditions

### M1 Monitoring records

- M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.
- M1.2 All records required to be kept by this licence must be:
- a) in a legible form, or in a form that can readily be reduced to a legible form;
  - b) kept for at least 4 years after the monitoring or event to which they relate took place; and
  - c) produced in a legible form to any authorised officer of the EPA who asks to see them.
- M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
- a) the date(s) on which the sample was taken;
  - b) the time(s) at which the sample was collected;
  - c) the point at which the sample was taken; and
  - d) the name of the person who collected the sample.

### M2 Weather monitoring

- M2.1 At the point(s) identified below, the licensee must monitor (by sampling and obtaining results by analysis) the parameters specified in Column 1 of the table below, using the corresponding sampling method, units of measure, averaging period and sampling frequency, specified opposite in the Columns 2, 3, 4 and 5 respectively.

#### POINT 9

Parameter	Sampling method	Units of measure	Averaging period	Frequency
Rainfall	AM-4	millimetres	1 hour	Continuous
Wind Direction at 10 metres	AM-2 & AM-4	Degrees	15 minutes	Continuous
Siting	AM-1 & AM-4	-	-	-
Sigma theta	AM-2 & AM-4	Degrees	-	Continuous
Wind Speed at 10 metres	AM-2 & AM-4	metres per second	15 minutes	Continuous

### **M3 Recording of pollution complaints**

- M3.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.
- M3.2 The record must include details of the following:
- a) the date and time of the complaint;
  - b) the method by which the complaint was made;
  - c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
  - d) the nature of the complaint;
  - e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and
  - f) if no action was taken by the licensee, the reasons why no action was taken.
- M3.3 The record of a complaint must be kept for at least 4 years after the complaint was made.
- M3.4 The record must be produced to any authorised officer of the EPA who asks to see them.

### **M4 Telephone complaints line**

- M4.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.
- M4.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.
- M4.3 The preceding two conditions do not apply until - the date of the issue of this licence.

### **R2 Notification of environmental harm**

- R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.

Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.

- R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

### **G2 Signage**

- G2.1 The location of each Monitoring and Discharge point must be clearly marked by signs that indicate the point identification number used in this licence and be located as close as practical to the point.

This page has intentionally been left blank



# Appendix 3

## Radiation Monitoring Procedure

(Total No. of pages including blank pages = 24)



This page has intentionally been left blank





PROCEDURE			
DOCUMENT TITLE	ENVIRONMENTAL RADIATION MONITORING		
AUTHOR	JRHC ENTERPRISES PTY LTD	ISSUE DATE	2/2/2015
AUTHORISED BY	R. SECEN-HONDROS	VERSION	2.0

## 1. PURPOSE

Environmental radiation monitoring is undertaken to determine the pre-existing background radiation level at various monitoring sites prior to the commencement of mining development and operational works. Once works commence, it is usual to continue monitoring to identify and to quantify any radiological impact of the works.

This procedure details the establishment of and on-going monitoring at environmental radiation monitoring locations for radionuclides in dust, environmental gamma and isotopic radon levels.

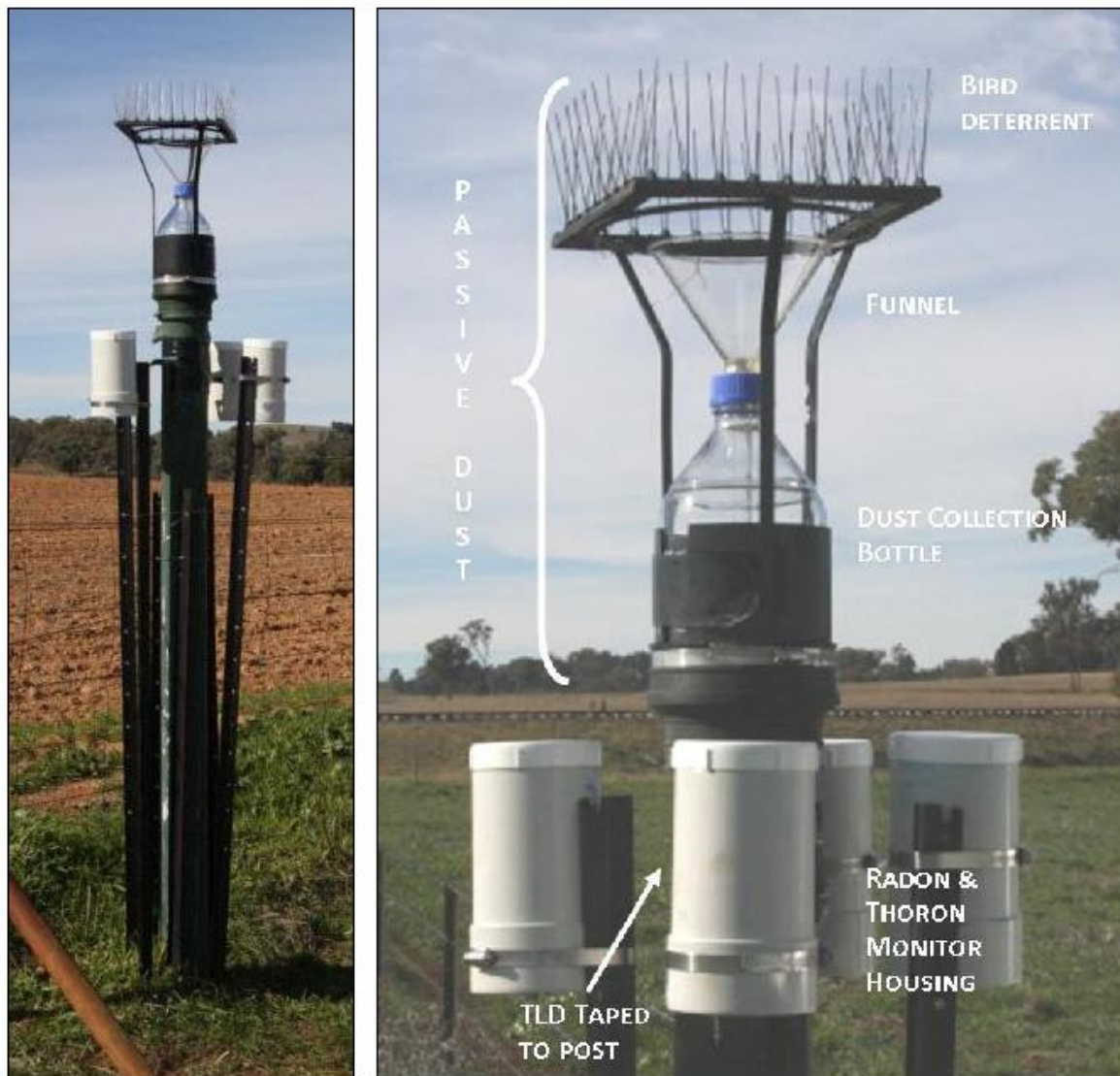
## 2. PRINCIPLE

Environmental radiation monitoring locations (ERMLs) are established at sites, in and around the proposed development, which have been selected based on factors including proximity to the development and to sensitive receptors. At each ERML, equipment which collects dust settling from the air (passive dust) is installed. Environmental TLD badges and Long-term Radon Monitors are attached to the dust collecting equipment; see Figure 1.

On a three monthly basis, samples and monitors are collected and replacements set out in the field. Collected samples and monitors are sent to external laboratories for preparation and analysis. Due to the small quantity of dust collected via this methodology, annual site composites are prepared and analysed at the end of a one year of sampling period.

This procedure is based on AS/NZS 3580.10.1:2003 in relation to the sampling methodology for passive dust collection.

Figure 1: ERML with Dust, TLD and Radon monitors



### 3. DEFINITIONS

<b>ERML</b>	Environmental radiation monitoring location
<b>Radionuclide</b>	Radioactive isotope. Relevant isotopes of the Uranium and Thorium decay chains are: $U^{238}$ , $Th^{230}$ , $Ra^{226}$ , $Pb^{210}$ , $Po^{210}$ , $Th^{232}$ , $Ra^{228}$ , $Th^{228}$ and $Ra^{224}$ .
<b>Radon</b>	Term used for the $Rn^{222}$ isotope
<b>Thoron</b>	Term used for the $Rn^{220}$ isotope
<b>Water</b>	Distilled water

## **4. EQUIPMENT**

### **4.1 Monitoring Site Installation – per site**

- a. Support stand for air deposition sampling
- b. Bird deterrent
- c. 1500mm star pickets – 5 (if 1500mm not available, 1350 or 1650mm will suffice)
- d. Picket hammer
- e. Leather gloves
- f. Roll heavy gauge wire
- g. Pliers
- h. Wire cutters
- i. Medium sized flat head screwdriver
- j. Metal clamp rings -2
- k. Radon monitor housing - 2
- l. GPS to record monitoring site locations

### **4.2 Three-monthly changeover – per site**

- a. DZP ERML Log-book
- b. Dust deposition gauge bottle (2.5L) with copper sulphate
- c. Funnel (glass 150mm diameter) with bottle lid attached (once established, these remain at each location however a spare should be taken when doing changeover in case of breakage)
- d. Squeeze wash bottle – plastic 500mL
- e. Step ladder (this will be required if personnel are short)
- f. Permanent marker
- g. Duct tape approx. 50mm wide, approx. 3m
- h. Scissors to cut tape
- i. Large zip-lock bags – one per ERML
- j. TLD badge (supplied by SGS-ARS)
- k. Rad Trak monitors –2 (1 x Radon & 1 x Thoron) -supplied by Landauer
- l. Foil seal – 2 (for infield Radon & Thoron monitorS) -supplied by Landauer

## 5. INSTALLATION OF MONITORING STATIONS

### 5.1 Monitoring Station Locations

Ten sites have been selected as the Dubbo Zirconia Project (DZP) Environmental Monitoring Locations (ERMLs) and are listed below in Table 1 and shown in Figure 2.

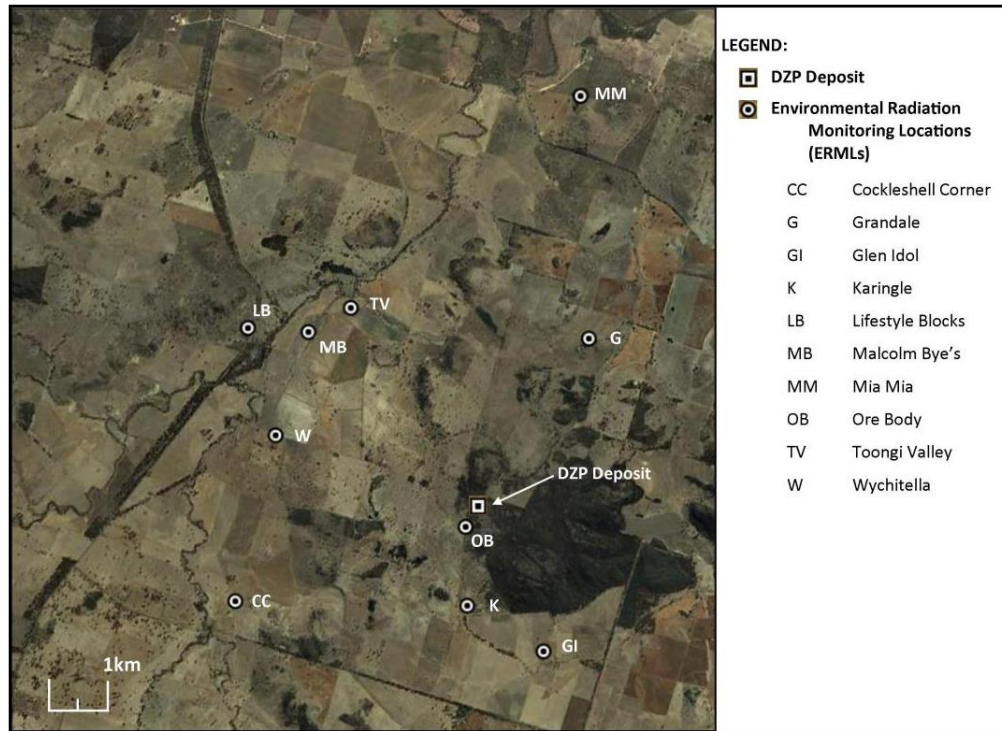
**Table 1:** List of Environmental Monitoring Locations

Site ID	Site Name	GPS Location (Zone 55)		Site Comments
ERML-LB	Lifestyle Blocks	648836 E	6409281 N	2km NW of ROM Pad
ERML-MB	Malcolm Bye's	649785 E	6409341 N	1.9km NNW of ROM Pad
ERML-TV	Toongi Valley	650383 E	6409799 N	2.3km NNE of ROM Pad
ERML-W	Wychitella	649483 E	6407671 N	370m west of ROM Pad
ERML-CC	Cockleshell Corner	649188 E	6405018 N	2.5km SE of ROM pad
ERML-K	Karingle	652794 E	6405411 N	1.4km SSE of Open Cut
ERML-OB	Ore Body	652610 E	6406629 N	125m S of Open Cut
ERML-GI	Glen Idol	654075 E	6404853 N	2.6km SE of Open Cut
ERML-G	Grandale	654153 E	6409793 N	2.9km NNE of Open Cut
ERML-MM	Mia Mia	653539 E	6413550 N	7km NE of ROM Pad
ERML-EU <sup>1</sup>	Eulandool	648590 E	6404437 N	3.4km SE of ROM Pad

NB 1: ERML-CC moved to Eulandool (ERML-EU) Sep 2015



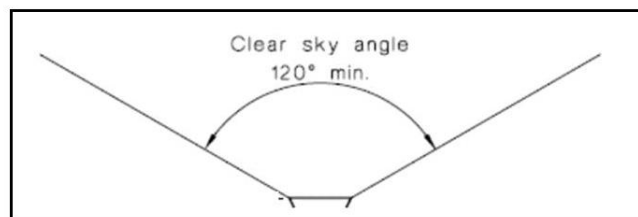
Figure 2: Map of DZP ERMLs



## 5.2 Monitoring Station Installation

- a. Each ERML must be sited with no overhead obstruction such as trees or building eaves, and with a clear sky angle of at least 120° as shown below in Figure 3.

Figure 3: Minimum clearance required for funnel at 2m above ground



- b. A 30cm<sup>2</sup> area needs to be level and clear of rocks.
- c. Knowing that the PVC ERML support stand will be central in the clear level area and be held in place by three star pickets wired together, use the picket hammer to drive first star picket 30-50cm into the ground ensuring that it is 'plumb' vertical and that the holes in the picket are facing toward the outside of the cleared area.
- d. Position the PVC support stand and determine the position of the next start picket.
- e. Remove PVC support stand and drive second start picket in ground as per instruction in step c. above.

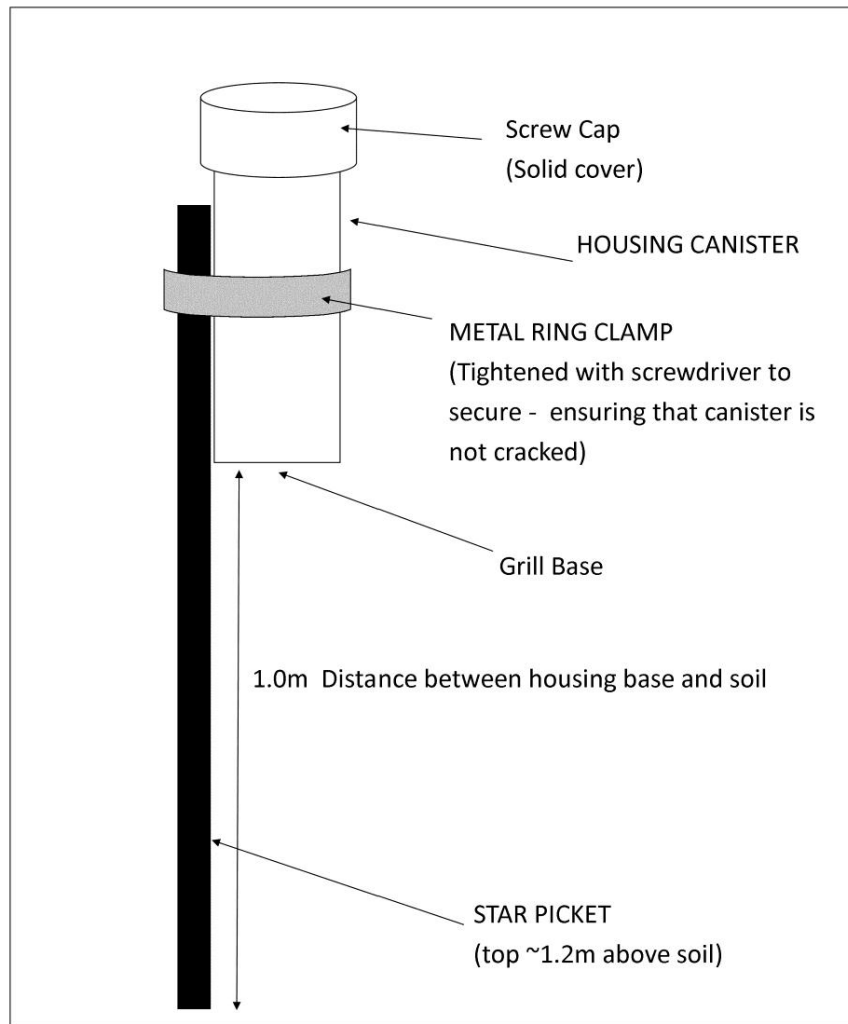
- f. Repeat steps d. and e. for third star picket.
- g. Slide PVC support stand down between star pickets and thread wire through holes in star pickets and use pliers to twist tighten as secure star pickets as shown below in Figure 4. The PVC stand should sit on the surface, not be dug into the ground.

**Figure 4: Detail of support stand, star pickets and wire**



- h. Hammer star picket into ground and attach radon housing canister with wire band. Note it is important that the base of the canister is 1.0m above ground surface, as shown below in Figure 5.

Figure 5: Radon and Thoron monitor housing.



## 6. QUARTERLY MONITORING – 2-4 WEEKS BEFORE CHANGEOVER

Changeover of the sampling and monitoring equipment should be scheduled to occur every 3 months and should be aligned to the seasons, ie 1<sup>st</sup> March, June, September and December. A few days either side is fine as this allows for weekends, public holidays and extreme weather conditions.

To ensure that equipment is available to proceed with changeover, orders for changeover equipment should be placed 2-4 weeks prior to scheduled change over with supplied informed that equipment is required by the 27<sup>th</sup> of the month or thereabouts. Annual quotes for equipment supply and analysis should be obtained and purchase orders raised to cover annual costs. Pro-forma letters are contained in Appendix A.

## 7. QUARTERLY MONITORING – EQUIPMENT RECEIPT & FIELD PREPARATION

Prepare the site zip-log bags by labelling large bags the ERML id – one bag per site. These bags will contain all the TLD and passive radon/thoron monitors and equipment needed for changeover.

### 7.1 Passive Dust Equipment

This equipment is supplied by Regional Enviroscience Pty Ltd, Dubbo.

Upon receipt of replacement bottles, visually check to ensure no breakages.

Also check that approximately 10mL of a pale blue solution (copper-sulphate) is present in each bottle.

### 7.2 TLD Badges

These badges are supplied by SGS-ARS, Melbourne.

- a. Upon receipt of the badges open the envelope and **return the ‘transit control’ badges** as per the enclosed SGS-ARS instructions.
- b. Check the badge labels against the enclosed log sheets and complete the log sheet with ERML ids (a sample TLD log-sheet is shown in Appendix C).
- c. Place the correct TLD for each site in the appropriate labelled zip-lock bag.
- d. The ‘CONTROL’ TLD should be kept with the ERML zip-lock bags until monitors are being placed in the field.

### 7.3 Passive Radon and Thoron Monitors

These monitors are supplied by Landauer, Sydney.

Radon monitors are labelled DRNM and thoron +radon monitors are labelled DRNF on the Landauer supply sheet (sample attached in Appendix D). JRHC Enterprises will email through the log-sheet for each quarter’s monitors.

- a. Upon receipt of the monitors open the box and confirm that the detectors numbers on the supply sheet match the barcodes on the monitor packaging.
- b. Complete the log sheet with ERML ids (a sample of the JRHC supplied radon/thoron log-sheet is shown in Appendix D).
- c. Place the correct monitors for each site in the appropriate labelled zip-lock bag.

- d. Add two foil seal stickers to each ERML zip-lock bag.
- e. Store ERML zip-lock bags and "CONTROL TLD" in a secure place **away from any gamma sources** (this includes ore samples).

Store the ARS log-sheets and foil stickers with passive dust "control" solution for later use when monitors are collected and returned to ARS.

## 8. QUARTERLY MONITORING – IN THE FIELD

Ensure all the equipment in section 4.2 packed into vehicle for ERML sampling changeover – note items **Error! Reference source not found.** to I. should be included in the ERML zip-lock bags.

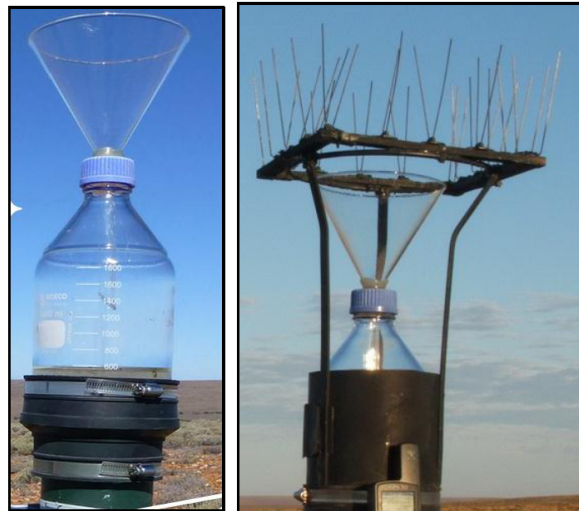
**Remove the 'old' CONTROL TLD and replace with the 'new' CONTROL TLD in the 'gamma-free' location** (ie: office with no ore present).

### 8.1 Passive Dust Monitoring

**As the procedure for passive dust monitoring is based on AS/NZS 3580.10.1:2003, the size and configuration of the equipment is important. If part of the apparatus is damaged, it must be replaced with identical parts. This includes the PVC support stand (equipment height is critical) and the funnel (height and diameter are critical).**

The Passive Dust Monitoring equipment consists of a support stand, glass bottle and funnel. A lid, fitted with a glass funnel is screwed onto a glass bottle which contains a known quality of copper sulphate (algaecide), and this bottle/funnel configuration is attached by means of a rubber sleeve and metal tensioning band to the PVC support stand, as shown below in Figure 6. A bird deterrent device is fitted to prevent birds landing on the funnel.

**Figure 6: Passive Dust sample bottle and funnel and Sampling bottle with bird deterrent fitted**



- a. Carefully remove the bird deterrent device by lifting it off the stand
- b. Using the flat-head screwdriver, loosen the upper tensioning band and carefully remove bottle and funnel from stand.
- c. Record any observations (unusual collected matter,...) on the log sheet.
- d. Using the squeeze wash-bottle, rinse the funnel with water to wash any dust and collected matter into the bottle.
- e. Unscrew lid from the new sample bottle.
- f. Carefully unscrew lid and funnel from collected sample bottle and screw onto new bottle.
- g. Screw lid onto collected sample bottle and clearly label bottle and lid with ERML id.
- h. Place new sampling bottle and funnel in rubber sleeve and secure tensioning band.
- i. Refit bird deterrent device.

## **8.2 TLD Badges**

TLD badges are sealed in plastic pouches to prevent contact between the film and water. **The badges have front and a back. It is important that the front faces out into the environment.** As the TLDs are gamma monitors the duct tape will not affect measurements.

- a. Using scissors, cut duct tape and remove TLD badge from passive dust support stand.
- b. Record date in monitoring log and check to confirm that TLD barcode number matches that recorded on log sheet.
- c. Confirm that the barcode number on the new tld badge matches the log sheet and place a small loop of duct tape on the back of the TLD and firmly press it onto the stand, below the rubber sleeve.

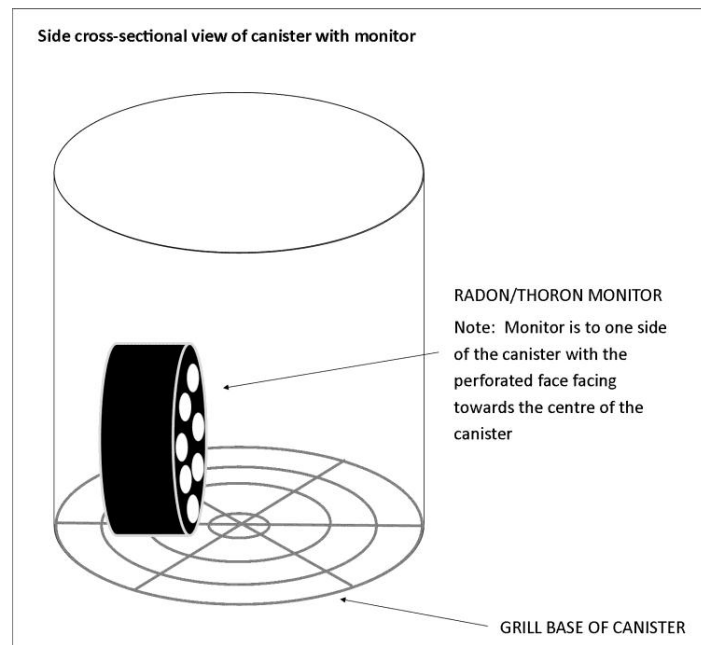
- d. Using a length of duct tape, secure the TLD to the stand by wrapping tape twice around the TLD and stand. A double wrap is necessary to ensure that the monitor remains attached, given environmental conditions, for the sampling period.
- e. Complete logbook for TLD changeover and place TLD badge in site zip-lock bag.

### 8.3 Passive Radon & Thoron Monitors

Passive radon and passive thoron monitors are sensitive to rain and consequently they are placed in PVC housing. **The passive radon and passive thoron monitors are supplied in sealed foil bags. These bags must only be opened in the field and immediately prior to placement in housing. At the end of the sampling period, foil stickers (provided by Landauer) must be placed on the monitors to seal the perforations in the monitor.**

- a. Unscrew the housing canister lid and check there are no spiders.
- b. Carefully remove monitors from housing and seal perforation side with foil stickers.
- c. Check that barcode id's on monitors match those in logbook.
- d. Open foil pouch containing new passive radon/thoron detector and check barcodes match log book.
- e. Place monitor on grill as shown in Figure 7 and screw lid back on.

**Figure 7: Monitor placement in housing**



- f. Repeat steps a. to e. for the remaining passive radon/thoron monitors.
- g. Complete logbook for passive radon and thoron changeover and place sealed used passive radon/thoron monitors in the site zip-lock bag.



## 9. QUARTERLY MONITORING – SAMPLE DISPATCH

### 9.1 Passive Dust Samples

- a. Complete chain of custody (COC) form, as in Appendix B and save copy of form as pdf file labelled ERMLDustCOC\_Date.pdf where the date the last sample was collected ie ERMLDustCOC\_20121201.pdf.
- b. Enclose COC with samples and arrange delivery Regional Enviroscience Pty Ltd.

### 9.2 TLD

- a. Complete SGS-ARS log form (from Section 7.2) and save copy of form as pdf file labelled ERML\_G\_COC\_Date.pdf where the date the last sample was collected ie ERML\_G\_COC\_20111201.pdf.
- b. Place ERML badges, control badge and log form in a box, and label for dispatch to SGS- ARS at the delivery address on the log-forms.
- c. **Clearly mark package with “DO NOT XRAY”** on a couple of faces and send to SGS-ARS using Australia post.
- d. Email copy of log form to SGS-ARS and notify them of dispatch date. Include Radiation Consultant and other relevant personal on distribution list.

### 9.3 Passive Radon and Thoron

- a. Complete Landauer log form (from Section 7.2) and save copy of form as pdf file labelled ERML\_RT\_COC\_Date.pdf where the date the last sample was collected ie ERML\_RT\_COC\_20111201.pdf.
- b. Place monitors and log forms in a box, and label for dispatch to Landauer at the delivery address on the log-forms.
- c. Send to Landauer using Australia post.
- d. Email copy of log forms to Radiation Consultant.

## 10. RESULTS

At this stage, analysis results will be sent to the Radiation Consultants who will produce annual reports that analyse and contextualise the data.

## **11. CONTACTS**

### **11.1 Radiation Consultants**

**JRHC Enterprises Pty Ltd** PO Box 372, Stirling SA 5152

Contact: Rose Secen-Hondros  
rose@jrhc.com.au  
0402 987 191

### **11.2 Equipment Providers and Analysis Laboratory**

#### **11.2.1 Passive Dust Monitoring**

**Regional Enviroscience Pty Ltd** Unit 2 No 7 Energy Place, Dubbo, NSW, 2830

Contact: Juliet Duffy  
juliet@enviroscience.com.au  
02 6884 8820

#### **11.2.2 TLD Gamma Monitoring**

**SGS-ARS Australian Radiation Services Pty Ltd**  
7/25-37 Chapman Street, Blackburn North VIC 3130

Contact: Rose Secen-Hondros  
**JRHC Enterprises Pty Ltd**  
rose@jrhc.com.au  
0402 987 191

#### **11.2.3 Radon and Thoron Monitoring**

**Landauer Australasia** Locked Bag 7002, Paramatta NSW 2124

Contact: Rose Secen-Hondros  
**JRHC Enterprises Pty Ltd**  
rose@jrhc.com.au  
0402 987 191

**Appendix A**

**Annual Quotation Request Pro-forma Letters**

**Passive Dust Sampling Equipment, Gravimetric mass determination and annual composite preparation.**

Regional Enviroscience is the preferred supplier for passive dust deposition equipment.

In the case of equipment breakage, replacement supplied should be ordered through Regional Enviroscience.

Quotation requests should be sent via email in August of each year – this corresponds to the annual monitoring cycle of September to August.

*Juliet Duffy juliet@enviroscience.com.au*

*Hi Juliet,*

*Could you please quote for:*

- the supply of 10 dust deposition monitoring bottles on a quarterly basis.*
- Gravimetric mass determination of collected sample at the end of each monitoring quarter and ERML site composite preparation.*

*Bottles will require copper-sulphate addition, and as per the existing arrangement, a 'control' copper sulphate aliquot will be kept by you for gravimetric determination when bottles are returned..*

- At the end of the sampling year and after liason with the Radiation Consultant the samples will be sent to an external laboratory, as advised, for analysis.*

Upon receipt of the quotation and approval to proceed, a purchase orders should be raised for the following year.

For budgeting purposes, expenditure can be expected in March, June, September and December

### TLD and Passive Dust Analysis

SGS-ARS is the preferred laboratory supplier for TLD and for the radionuclide analysis of passive dust samples.

Quotation requests will be sent by the Radiation Consultant, via email, in August of each year – this corresponds to the annual monitoring cycle of September to August.

*Please provide 2 quotes as detailed below.*

*Quote 1:*

- *10 Area TLD monitors (plus necessary controls and transit monitors) – sealed for outdoor environmental monitoring/quarter (ie 40 total per year)*

*Quote 2:*

*Analysis of Passive Dust Samples*

- *Analysis of 10 samples for:*
  - *High Res Gamma,*
  - *Po<sup>210</sup> alpha*
  - *U & Th alpha*
  - *ICP-MS Elemental – Alkane DZP Suite - Dy, Gd, La, Nb, Nd, Pb, Rb, Ta, Th, U, Zr*

Upon receipt of the quotations and approval to proceed, purchase orders should be raised for the following year. Quote 1 is a quarterly cost and so the prices should be multiplied by 4. Quote 2 is an annual cost.

For budgeting purposes, expenditure can be broken down as follows:

Passive Dust - January

TLDs - March, June, September and December

### **Passive Radon and Passive Thoron Monitors**

Landauer is the preferred laboratory supplier for passive radon and passive thoron monitors.

Quotation requests will be sent by the Radiation Consultant, via email, in August of each year – this corresponds to the annual monitoring cycle of September to August.

*Could you please quote for supply and analysis of:*

- *10 Passive Radon monitors – DRNM / quarter*
  - *10 Passive Radon + Thoron monitors – DRNF / quarter*
- ie 40 of each monitor type / year*

Upon receipt of the quotations and approval to proceed, purchase orders should be raised for the following year. The quote is a quarterly cost and so the prices should be multiplied by 4.

For budgeting purposes, expenditure can be broken down as follows:

Radon & Thoron Monitors – March, June, September and December

Appendix B


ENVIROSCIENCE Log-sheet – Passive Dusts

Regional		EnvirosScience		Hazardous Materials Laboratory and Consultancy		Laboratory Chain of Custody		
Client:		Australian Zirconia Ltd						
Client Address:		Level 2, 21 Church Street						
Email:		ms@therland@alstom.com.au		Phone:		02 6882 2866		
Job No:		Analysis Required:		Copper Sulphate as per AS/NZS 3582.10.1.2003 & Rain Water				
Site Address:		Phone:		Email:				
Sampled By:		Phone:		Email:				
Sample ID	Date & Time Collected	Sample Description	Sample Location	Sample Preservation				
ENL-MB	18.12.14	Sampling 26.9.2014 to 18.12.14						
ENL-OB	"							
ENL-LB	"							
ENL-MBP	"							
ENL-G1	"							
ENL-K	"							
ENL-G	"							
ENL-TC	"							
ENL-W	"							
ENL-TV	"							
Relinquished by:	Nicole Widdison	Signature:	B. Vidan		Date:	18.12.14	Time:	4.5pm
Received by:	Penny Hargreaves	Signature:	Penny Hargreaves		Date:	18/12/14	Time:	5.12pm

REGIONAL ENVIROSCIENCE | PO BOX 1645 DUBBO NSW 2830 | PH 02 6884 8820 | [www.envirosience.com.au](http://www.envirosience.com.au)



## Appendix C SGS-ARS Log-sheet – TLD Gamma badges



**AUSTRALIAN RADIATION SERVICES**  
*Keeping people safe.*

PO Box 3103 Nunawading VIC 3101 Australia  
22 King Street Blackburn VIC 3130 Australia  
T +61 3 9877 4898 F +61 3 9877 8272  
E info@radiation.net.au W www.radiation.net.au  
ARS is ISO 9001:2007

### TLD AREA MONITORING ISSUE FORM

Page 1 of 1

Client: DZP	Client ID: 10809	Deployment Period: 3 Months
Job Number: 13-0443		Date Sent: 10 September 2012
Contact Person: Ms. Rose Secen-Hondros		Expected removal date: 10 December 2012

**Instructions:**


- 1) All transit badges must be returned to ARS in a package labelled "Do Not X-Ray" (included) as soon as they are received.
- 2) The CONTROL area monitors should be kept away from all sources of ionising radiation and referenced with the deployed monitor.
- 3) The locations and date of deployment for each area monitor should be recorded in the space provided below.
- 4) All area monitors and this form should be returned to ARS in a package labelled "Do Not X-Ray" at the end of the deployment period.

Type	ID No.	Badge colour	Badge Label	Location	Date Placed	Date Removed	Comments
TRANSIT	001	ORANGE	13-0443-O-021	PLEASE RETURN THE TRANSIT MONITORS TO ARS THE SAME DAY THE MONITORS ARE RECEIVED.			
	002	ORANGE	13-0443-O-022				
CONTROL	003	ORANGE	13-0443-O-024				
AREA MONITORS	004	ORANGE	13-0443-O-025	EML - MB	19		
	005	ORANGE	13-0443-O-028	" - OB	19		
	006	ORANGE	13-0443-O-029	" - LB	19		
	007	ORANGE	13-0443-O-030	" - MM	19		
	008	ORANGE	13-0443-O-031	" - GI	19		
	009	ORANGE	13-0443-O-032	" - K	19		
	010	ORANGE	13-0443-O-035	" - G	19		
	011	ORANGE	13-0443-O-036	" -	19		
	012	ORANGE	13-0443-O-037	" - CC	19		
	013	ORANGE	13-0443-O-038	" - TV	19		

S:\TLD AREA MONITORING\2013\TLD Area Monitoring Jobs\DZP\13-0443\TLD Area Monitoring Issue Form 13-0443 7  
September Page 1

## Appendix D LANDAUER Supply & Log-Sheets – Radon & Thoron

### Supply Sheet


**LANDAUER AUSTRALASIA**

Australian Zirconia  
 P/O 200125  
 Mike Sutherland  
 Alliant Resources,  
 2nd Floor, 21 Church Street,  
 Sydney NSW 2000

TNT-9801 0075 2608

Dubbo NSW 2830.

**10 x 3409-DRNF  
Outdoor Radon Monitor**


1	4982154
2	4982155
3	4982150
4	4982151
5	4982152
6	4982153
7	4982156
8	4982159
9	4982157
10	4982158

**10 x 3411-DRNM  
Outdoor Radon Monitors  
With Thoron Filter**

1	4970187
2	4970188
3	4970190
4	4970189
5	4970178
6	4970180
7	4970177
8	4970176
9	4970179
10	4970175

Log Sheet

# LANDAUER®



**At completion of monitoring,  
send detectors to:**  
Landauer Australasia Pty. Ltd.  
Locked Bag 2001  
Drummoyle NSW 1470  
attn: David Rundell

## RADTRAK® RADON TEST DATA SHEET

Company: Alkane Resources - DZP  
 Asst. Number: \_\_\_\_\_  
 Contact: Rose Secan-Hondros  
 Phone: 0402987191  
 Email: rose@jrhc.com.au

**Send Radon Report To:**  
(Different from monitoring site)

Company: JRHC Enterprises  
 Attn: Rose Secan-Hondros  
 Address: \_\_\_\_\_  
**NO POSTAL CORRESPONDANCE**  
**- EMAIL ONLY**  
 City: \_\_\_\_\_  
 ST/Prov: \_\_\_\_\_ Post Code: \_\_\_\_\_  
 Country: Australia  
 Phone: +61402987191  
 Email: rose@jrhc.com.au

**Site Information:**  
(Please provide information on detector location and being deployed. Reports will be altered and dated by value provided in "Site Name" below.)

Site Name: ALKANL DZP  
 Site Type: outdoors  
 Additional Information: \_\_\_\_\_

**If Applicable:**

Technician Name: \_\_\_\_\_  
 Technician Number: \_\_\_\_\_  
 Technician Signature: \_\_\_\_\_

**DRNM - Radon**

Please include all detector numbers, exposure periods and location information to appear on report

Detector Number	Site Building ID Name / Nbr	Unit Nbr	Floor	Comment / Note	Start Date mm/dd/yyyy	End Date mm/dd/yyyy
4969909		NA	NA			
4969900						
4969901						
4969902						
4969903						
4969904						
4969920						
4969929						
4969930						
4969931						

Landauer Use Only: Processed By: \_\_\_\_\_ Date: \_\_\_\_\_ Page \_\_\_\_ of \_\_\_\_

Landauer, Inc. 2 Science Road Glenwood, Illinois 60425-1586 T: (708) 755-7000 F: (708) 755-7048 E: radon@landauer.com

R 10/01/14

LANDAUER Radtrak radon test data Sheet
Page 2/2

Alkane Resources - DZP

Rose Secen-Hondros  
+614007987191  
rose@jrh.com.au

DRN- Radon + Thoron

Detector Number	Site ID	Comment	Start Date	End Date
4969538				
4969539				
4969540				
4969541				
4969542				
4969543				
4969545				
4969546				
4969547				
4969548				

# Appendix 4

## Confirmation of Approval

(Total No. of pages including blank pages = 2)

This page has intentionally been left blank





Planning Services  
Resource Assessments  
Contact: Phillipa Duncan  
Tel: 9274 6451  
Email: [phillipa.duncan@planning.nsw.gov.au](mailto:phillipa.duncan@planning.nsw.gov.au)

Mr Mike Sutherland  
General Manager NSW  
Alkane Resources  
PO Box 910  
DUBBO NSW 2830

Dear Mr Sutherland

**Dubbo Zirconia Project (SSD-5251)  
Environmental Management Plan**

I refer to an email dated 20 August 2016 sent by Alex Irwin of RW Corkery & Co Pty Limited on your behalf, seeking approval of the management plans required by conditions 8, 16, 23 and 30 of Schedule 3 and condition 1 of Schedule 5 of the project approval for the Dubbo Zirconia Project.

The Department has reviewed the final versions of the management plans and considers that they meet the requirements of the relevant conditions of approval.

Accordingly, please be advised that the Secretary has approved the following management plans:

- Environmental Management Strategy (Version 2.1 dated 6 October 2016);
- Air Quality Management Plan (Version 1.2 dated 6 October 2016);
- Noise Management Plan (Version 2.1 dated 6 October 2016);
- Water Management Plan (Version 2.1 dated 6 October 2016); and
- Blast Management Plan (Version 2.1 dated 6 October 2016).

I would appreciate if you could make the approved plans available on your website as soon as possible.

If you have any further enquiries about this matter, please contact Phillipa Duncan on the above contact details.

Yours sincerely

 12/10/16

Clay Preshaw  
A/Director  
Resource Assessments  
as nominee of the Secretary

cc: Alex Irwin of RW Corkery & Co Pty Limited



This page has intentionally been left blank

