

Energy Resources of Australia Ltd

# Air Quality Control Management Plan

AMP001

Revision 1.14.0

Date: 3 July 2014

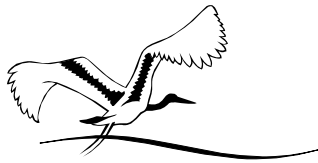
## Approvals

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Reviewed	Carmen Dyer	Specialist Environment	<a href="#">Carmen Dyer</a>	<a href="#">3/7/14</a>
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Checked & Approved	Todd Simms	Manager HSE	<a href="#">Todd Simms</a>	<a href="#">7/7/2014</a>

## Revisions

	Date	Description	By	Check	Approved
0.12.1	22 May 2012	Internal Distribution	C Vinatea	P Lander	T Simms
1.14.0	3 July 2014	Major Review	C Dyer	P Lander	T Simms



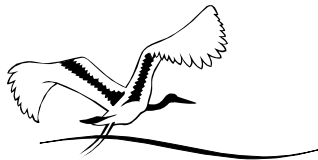


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## Definitions

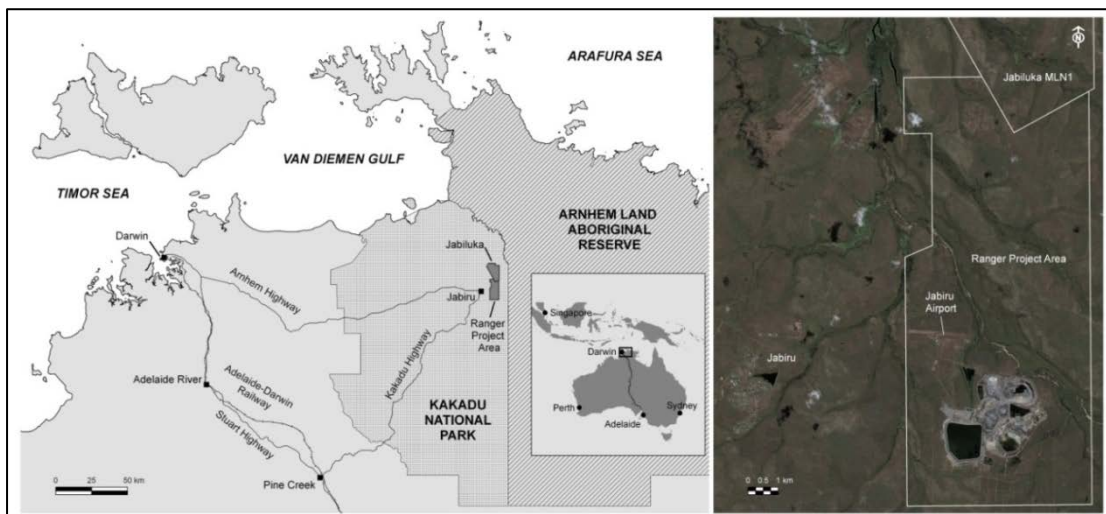
<b>Acronym</b>	<b>Description</b>
BOM	Bureau of meteorology
ERA	Energy Resources Australia
°C	Degrees Celsius
mm	Millimetres
NO <sub>2</sub>	Nitrogen dioxide
NPI	National pollution inventory
PM <sub>10</sub>	Particulate matter less than 10 µm diameter
ppb	Parts per billion
ppbv	Parts per billion by volume
RPA	Ranger Project Area
SO <sub>2</sub>	Sulfur dioxide
U <sub>3</sub> O <sub>8</sub>	Uranium oxide
µg/m <sup>3</sup>	Micrograms per cubic meter of air



## 1. Introduction

Energy Resources of Australia Ltd (ERA) is a subsidiary of Rio Tinto Limited that owns and operates the Ranger uranium mine. ERA mines uranium ore and produces drummed uranium oxide ( $U_3O_8$ ) at its Ranger mine in Australia's Northern Territory.

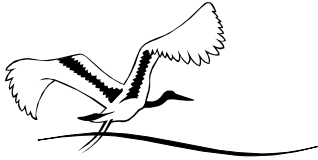
Located eight kilometres east of Jabiru and 260 kilometres east of Darwin, ERA's Ranger mine lies within the 79 square kilometre Ranger Project Area (RPA). The RPA is located on Aboriginal land, and surrounded by, but separate from; the World Heritage listed Kakadu National Park.



**Figure 1: Location of Ranger mine operations**

Ranger commenced commercial production of drummed uranium oxide in 1981. Following completion of mining in the operating Pit 3 in November 2012, ERA has begun the transition from open cut mining to underground exploration of the Ranger 3 Deeps mineral resource and potential underground mining. ERA sells its product to power utilities in Asia, Europe and North America under strict international and Australian Government safeguards and non-proliferation conditions to ensure that Australian uranium is only used for peaceful purposes. It maintains long term relationships with customers and meets their energy needs by providing consistent and reliable supply of uranium oxide

Conditions for operating at Ranger and Jabiluka are set out in agreements entered into by the Northern Land Council on behalf of the Traditional owners.



## 2. Scope

This Air Quality Management Plan applies to all personnel and work activities conducted under the direction of Energy Resources Australia (ERA) with the exception of the R3D exploration decline. This Plan has been prepared to comply with and document the process for management of air quality at ERA in accordance with Rio Tinto Environmental Performance Standard (E2 Air Quality Control) and relevant legal and other requirements.

This document does not cover radiation hazards, particulate and gas/vapour exposures or greenhouse emissions as these are covered by other Management Plans and Procedures.

## 3. Purpose

The intent of this Plan is to identify and minimise potential impacts from significant air pollutant emissions from ERA operations. This Plan describes:

- legal and other requirements;
- description of site;
- air emission sources;
- controls and monitoring methods;
- reporting requirements;
- roles and responsibilities;
- non-conformance and corrective actions; and
- review and auditing.

## 4. Planning

### 4.1 Health Safety and Environment Policies

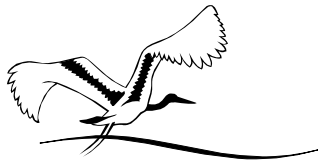
The ERA Health & Safety Policy and Environment Policies apply to all employees and contractors who work at ERA Ranger mine. The policies are communicated and made available to all employees and contractors.

The Environment Policy outlines the responsibilities of employees and contractors to ensure environmental harm is minimised and also summaries how ERA intends to achieve its Policy commitments. The ERA Health Safety and Environment Policies can be viewed online through the link below:

<http://www.energyres.com.au/ourapproach/2487.asp>

### 4.2 Legal and Other Requirements

Legal and other requirements with respect to air quality are provided in the Ranger Authorisation '0108' under the NT *Mining Management Act* and the Section 41 Authority

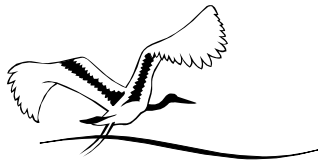


under the Commonwealth *Atomic Energy Act 1953*. In addition the Northern Territory is regulated by the *NT Waste Management and Pollution Control Act*.

A summary of conditions is provided in Table 1 and 2.

**Table 1: Summary of Air Quality Conditions in the Ranger Authorisation 0108**

Condition Number	Condition
3.2.2	Operations do not result in an adverse effect on the health of Aboriginals and other members of the regional community by ensuring that exposure to radiation and chemical pollutants is as low as reasonably achievable and conforms with relevant Australian law, and in particular, in relation to radiological exposure, complies with the most recently published and relevant Australian standards, codes of practice, and guidelines.
4.2.2	The interlocks in the uranium treatment plant are tested at intervals no greater than six months and the records of these tests are available for inspection by a Mining Officer.
4.2.4	Where a potential exists for dust generation, such as at crushing, screening, and transfer points within the mill, dust control devices shall be installed and their functioning in accordance with specifications checked annually and after maintenance.
4.2.5	The combined rate of emission of uranium and uranium compounds, expressed as uranium, from the uranium calciner stack and the product packaging dust control systems does not exceed 1.5 kg/day.
5.2.2	Minimise dusting from the surface of the tailings by ensuring that exposed surfaces of tailings are maintained in a coherent near-saturated condition.
6.5	Emissions of gaseous and particulate contaminants shall conform with Australian law, and, taking into account the most recently published and relevant Australian standards, codes of practice, and guidelines, be managed to minimise the effects of particulate and gaseous contaminants from the point of view of all possible radiological, physical and chemical hazards.
6.6	Air quality shall be managed in such a way that there is no physical or chemical detriment to any known sites of Aboriginal culture or heritage.



Annex A	Environmental Monitoring Program A.4 Atmospheric monitoring		
		<b>Measurement</b>	<b>Frequency</b>
	<b>Calciner stack emissions</b>	Uranium	Quarterly
	<b>Product packing area stack emissions</b>	Uranium	Quarterly
	<b>Powerhouse stack emissions</b>	SO <sub>2</sub>	Quarterly
Annex B	Meteorology Monitoring		
	Wind speed and direction ~ hourly average wind direction and wind speed in 10 sectors		

**Table 2: Summary of Air Quality Conditions in the Section 41 Authority**

Condition Number	Condition
4.1	Emissions of gaseous and particulate contaminants must conform with Australian law, and, taking into account the most recently published and relevant Australian standards, codes of practice, and guidelines, be managed to minimise the effects of particulate and gaseous contaminants from the point of view of all possible radiological, physical and chemical hazards.
4.2	Air quality must be managed in such a way that there is no physical or chemical detriment to any known sites of Aboriginal culture or heritage.

### 4.3 Rio Tinto Requirements

Rio Tinto provides guidance for air quality control in the Rio Tinto Environmental Performance Standard E2 – Air Quality Control.

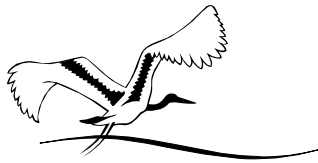
## 5. Site Characteristics

### 5.1 Background Ambient Air Quality

Ambient air quality monitoring is undertaken in the Northern Territory in accordance with the National Environmental Protection (Ambient Air Quality) Measure. A study was undertaken by the Commonwealth Scientific and Industrial Research Organisation in Darwin in 2000 which describes gaseous and particulate concentrations.

The study was concluded that PM<sub>10</sub> concentrations were generally low during the wet season, typically less than 10 µg/m<sup>3</sup>. PM<sub>10</sub> concentrations increased during the dry season





to around 20  $\mu\text{g}/\text{m}^3$ . Elevated  $\text{PM}_{10}$  concentrations in the dry season were associated with seasonal burning and increased night time atmospheric stability.

$\text{NO}_2$  concentrations averaged 4.3 ppb with a range of 1 to 8 ppb.  $\text{NO}_2$  concentrations increases in the dry season may be due to regional bushfire events.  $\text{SO}_2$  concentrations were generally low, with an average of 0.5 ppbv. Similarly Ozone concentrations were low with a 4 hour average of 8 ppb.

Air quality in the rural and unpopulated areas in the Northern Territory is primarily influenced by natural events such as bush fires and wind erosion.

## 5.2 Meteorology

The climate of the Alligator Rivers Region within which the Ranger mine is located, is dominated by a seasonal wet-dry monsoon cycle. The frequency and timing of rainfall in the Northern Territory has a strong correlation to contaminant dispersal in the regional air shed.

The wet season is marked by monsoonal depressions bringing heavy rain and occasional tropical cyclones. When cyclones and tropical lows are present, the Ranger mine can experience elevated winds and rainfall.

The wet season generally extends from late October to early April. The dry season extends from May to September with little or no rain falling. The long term average rainfall for Jabiru airport is approximately 1586 mm over approximately 105 rain days (Bureau of Meteorology 1971 - 2011). Evaporation exceeds rainfall by approximately 1,000mm per year, with average pan evaporation of 2,570mm (BOM 1971 - 2011).

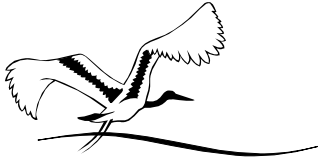
Temperatures are high throughout the year with a lowest mean daily maximum of 31.3°C in June and a highest of 37.6°C in October. The dry season has cooler temperatures and lower humidity compared with the wet season.

A summary of average temperatures, evaporation and rainfall is provided in Table 3.

**Table 3: Historical Weather Data, Jabiru Airport (BOM 2013)**

Parameter (32 Yr. average)	Value	Month
Mean Maximum Temperature (°C)	37.6	October
Mean Minimum Temperature (°C)	18.5	July
Maximum Average Daily Evaporation (mm)	9.5	October
Minimum Average Daily Evaporation (mm)	5.6	March
Annual Average Daily Evaporation (mm)	7.2	
Annual Rainfall (mm)	1,565	
Annual Evaporation (mm)	2,594	

Prevailing winds can affect contaminant dispersal and hence it is important to understand local wind patterns and the potential impact they may have. Winds during the wet season



are light west to north westerly. In the dry season, the prevailing winds are the south easterly trade winds (Bureau of Meteorology, 2011).

### 5.3 Receptors

The Ranger mine lies within the 79 square kilometres of the RPA, which is surrounded by Kakadu National Park.

The nearest major populated centre is Jabiru, located approximately 9km to the west of the Ranger mine and some 250km east of Darwin. Gunbalanya is located 40km north-north east of the Ranger mine.

Other potential receptors that are located in closer proximity to the Ranger mine are:

- ERA Ranger Mine Village (or Contractor Camp) (approximately 2km west of the mine);
- The airport and other businesses (2-3km north west of the mine);
- Mudginberri (approximately 9km to the north west); and
- “009 Camps”, a transient local camp (approximately 4km north of the mine).

In addition, a cultural heritage site containing aboriginal artwork is also located at Mount Brockman (approximately 3km south of the mine). Figure 2 shows nearest potential receptors.

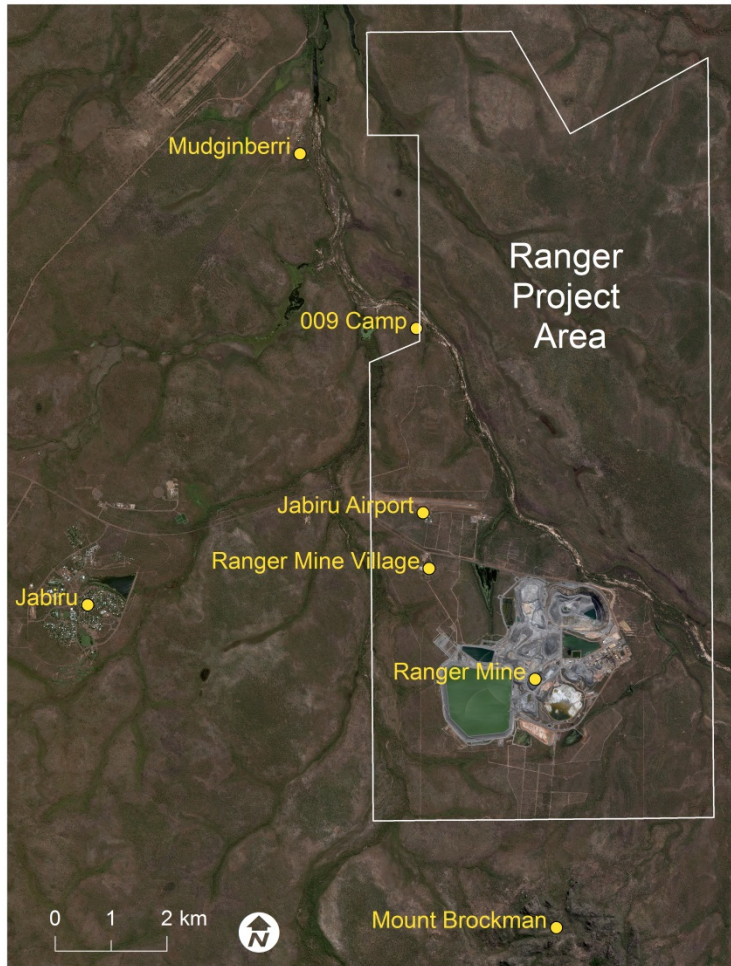
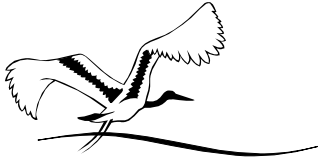


Figure 2: Nearest potential receptors to Ranger Mine

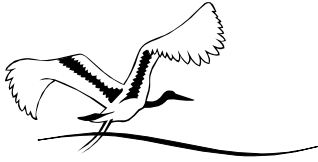
## 6. Hazard identification and risk management

### 6.1 Hazard Assessment

Risks and control measures associated with air emissions have been identified and documented in ERAs Risk Register in accordance with ERS003 HSEQ Hazard Identification and Risk Management. Air quality controls are described in Section 7 of this Plan.

### 6.2 Emission Identification

The Ranger mine operations are surrounded by Kakadu National Park. The Jabiru Airport and the town of Jabiru operate within the vicinity the RPA. Emission sources from these activities are considered insignificant and are not discussed further in the Plan, however



particulate emissions from landscape fires undertaken as part of the management of Kakadu National Park are also present in the region.

The Jabiluka Mineral Lease is located immediately to the north of the Ranger Project Area. ERA has entered into a Long Term Care and Maintenance Agreement with the Mirarr Traditional Owners in relation to Jabiluka. No major activities are carried out on the Jabiluka lease with the exception of ongoing revegetation works. There are no significant emissions sources from the management of Jabiluka.

An assessment of the potential impacts from activities at Ranger Uranium Mine was conducted as part of the *Ranger Uranium Mine Environmental Impact Statement (1974)*. The assessment identified the following emission:

- Dust (particulate matter);
- Radon and airborne radionuclides (uranium); *dealt with in RAP001 Radiation Management Plan.*
- Anhydrous ammonia used in the processing plant and transported to site; and
- Sulfur Dioxide as a point emission from stacks in the processing plant and power station.

A 2011 assessment identified gaseous and particulate emission sources from Ranger mine operations.

- Particulate emissions are generated by mining related activities including active mining, area emissions from stockpiles, material transfer points, and vehicle movements along haul roads.
- Gaseous emissions are generated from mobile plant, processing operations and powerstation operations.

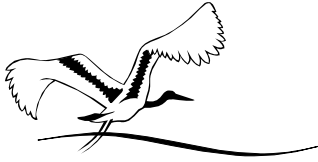
## **6.3 Emission Sources**

Emissions are generated from both point and fugitive emissions. The following section of this Plan provides a summary of emission sources from Ranger activities. This summary includes significant and minor emission sources.

### **6.3.1 Point source emissions**

Point source emissions are generated from the facilities at the Ranger mine:

- Crushing Circuit;
- Product Packing Stacks;
- Calciner Stacks;
- Brine Concentrator Stacks;
- Turbo Burning Stacks; and
- Diesel Fired Power Station Stacks.



### 6.3.2 Fugitive emissions

Fugitive emissions are generated from the following activities at the Ranger mine:

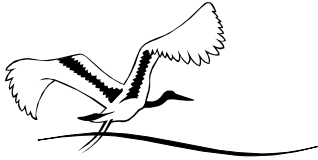
- Combustion of diesel from mobile/stationary equipment;
- Vehicle movements – on unsealed roads;
- Wind blown erosion;
- Material movements – mining operations (including drilling) and transfer points/conveyors;
- Vehicle movements – on unsealed roads;
- Chemical storage and use;
- Waste disposal facilities; and
- Landscape burning for asset protection/fuel reduction.

## 7. Implementation and Operation

### 7.1 Emission Controls

Air quality controls are implemented at Ranger to minimise significant air emissions and potential impacts and to comply with legal and other requirements. The following section describes key emission control equipment and processes.

- Wash down equipment in processing plant to minimise dust generation;
- Dust extraction equipment installed in dust generating areas of the processing plant, including:
  - ore sorters, crushers and screens;
  - transfer points on conveyors;
  - surge bins;
  - Grinding mills;
  - Calciner; and
  - Product filling station
- Negative pressure in the calciner;
- Interlocks are placed in the processing plant so that it cannot be operated unless the dust extraction systems are working. Interlocks are located in the:
  - Crushing plant dust extraction;
  - Calciner dust extraction; and
  - Product packing dust extraction.
- Six monthly tests of interlocks in the processing plant in accordance with *PPC019 Test Scrubber Interlocks*;



- Water sprays on conveyors and transfer points;
- Visual inspection and maintenance of dust control equipment in the processing plant;
- Low sulphur diesel used in the powerstation and mobile/stationery equipment;
- Dust suppression by water trucks on mine haul roads;
- Sub-aqueous deposition of tailings within the Tailings Storage Facility;
- Exposed tailings are kept moist within the Tailings Storage Facility;
- Capping (with weathered rock) of dewatered tailings held Pit #1 in preparation for pit closure; and
- Ammonia gas detection system and alarms.

### 7.1.1 Turbo burning controls

Ranger mine operates turbo burner devices for the incineration of potentially radioactive contaminated hydrocarbons. Approximately 10,000 L of waste oil is incinerated annually in accordance with *PDS025 Treatment and Disposal of Hydrocarbon waste (Turbo Burning)*. Controls in place to manage turbo burning air emissions include:

- Favourable wind direction (wind directions that have a westerly aspect and blow to the north east to south east);
- Restriction of burning times (burns permitted from 8.30 am to 3.30 pm);
- Burning of suitable waste products only;
- Drum contents inspected for water and other foreign contaminants prior to burns;
- No burning of painted drums.

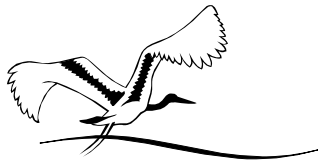
Turbo Burning Operations are conducted in accordance with *PDS025 Treatment and Disposal of Hydrocarbon waste (Turbo Burning)*.

### 7.1.2 Ammonia yard

The release of Anhydrous Ammonia is managed in accordance with the *ERW012.2 Ammonia Gas Release Emergency Response Plan*. Anhydrous ammonia is stored on site in four fully contained high pressure tanks and release is determined via ammonia detection monitoring and sirens. In the event of an ammonia release a “release perimeter” of around 450 m has been established around the storage facility. No potential receptors (Figure 2) fall within the vicinity of the 450 m release perimeter.

## 8. Performance Criteria

The Ranger Authorisation provides criteria for air emissions. As stated in the Ranger Authorisation Section 4.2.5 the combined rate of emission of uranium and uranium compounds, expressed as uranium, from the uranium calciner stack and the product packaging dust control systems must not exceed 1.5 kg/day (Table 1).



## 9. Measuring and Monitoring

### 9.1 Atmospheric Monitoring

Annex A of the Ranger Authorisation provides a schedule for air quality monitoring (Table 1).

Stack emission sampling is conducted on a quarterly basis by an external consultant in accordance with Standard Operating Procedure *EVP064 Stack Sampling* (Table 4). The flow rate, velocity, moisture, dry gas density, molecular weight and temperature are determined for each stack.

**Table 4: Stationary Emission Sources, Emissions and associated Sampling Method**

Stationary Emission Source	Emissions	Sampling method
Product Packing Stack	Particulate matter, uranium	Isokinetic sampling
Calciner Stack	Particulate matter, uranium, sulfur dioxide	Isokinetic sampling
Powerhouse Stack	Particulate matter, sulfur dioxide	Isokinetic sampling

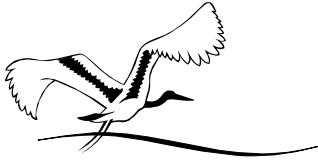
All equipment used by the consultant in the stack sampling process is as stated by United States *Environmental Protection Agency Code of Federal Regulations 40 Part 60 requirements for stack monitoring* and adheres to the methodology as set out in the Standard Operating Procedure *EVP064 Stack Sampling*.

### 9.2 Meteorology Monitoring

A meteorological station is operated by the Bureau of Meteorology at the Jabiru Airport. The BOM meteorology station has the longest record and is used for statistical purposes. The monitoring data provided by BOM at the Jabiru Airport is approved as per the Ranger Authorisation (Annex B).

### 9.3 National Pollutant Inventory

Australian, State and Territory governments have agreed to legislation called National Environment Protection Measures which includes provision for measurement of emissions to land, water & air. ERA completes an annual measurement of emissions to land, water and air generated by the Ranger mine operations. This measurement is completed in accordance with the National Pollutant Inventory emission estimation techniques and in accordance with the objectives of the NT *Waste Management and Pollution Control Act*.



## 10. Reporting

### 10.1 Air Quality Reporting

Reporting of stack emission sampling is prepared on a quarterly basis in the Radiation Data Report. An annual summary of provided in the Radiation Protection and Atmospheric Monitoring Program Report. These reports are prepared by ERA and submitted to fulfil the requirements of the Ranger Authorisation.

Emissions to air are reported via the National Pollutant Inventory on an annual basis. The emission estimates are made publicly available via the NPI website as managed by the Department of the Environment. Emissions data can be sourced from the NPI website located at <http://www.npi.gov.au/>.

### 10.2 Data and Records Management

All records relating to air quality are managed in accordance with *ERS008 Documentation and Document Control Standard* for the use and filing of documents and records on network drives, and retained in accordance with the Rio Tinto retention schedule.

## 11. Non-conformance and incident management

### 11.1 Incident Reporting

Environmental incidents are reported to regulatory authorities in accordance with Section 29 of the Mining Management Act and via the monthly Environmental Incident Report.

Health, Safety and Environment incidents are managed through the Rio Tinto Business Solution in accordance with *ERS014 Non-Conformance Incident and Action Management Standard*.

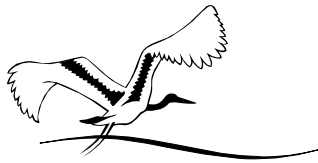
### 11.2 Emergency Preparedness and Response

ERA standard operating procedure *SFP030 Responding to Emergencies* is followed in the event of an emergency involving a hazardous material. The procedure provides clear and concise guidelines for incidents with a serious threat to people, the environment or property.

*BRP002 Emergency Response Plan* documents the resources and strategies to address the immediate response to an incident. It is primarily concerned with the protection and preservation of life, the environment and property. The ERP is supported by *BRP001 Business Resilience Management Plan*.

The release of Anhydrous Ammonia is managed in accordance with the *ERW012.2 Ammonia Gas Release Emergency Response Plan*.

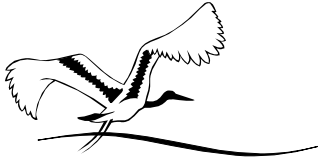




## 12. Roles and Responsibilities

**Table 5: ERA Roles and Responsibilities for Air Quality**

<b>Role / Title</b>	<b>Responsibility</b>
General Manager Operations	Ensure adequate resources are allocated to departments to facilitate compliance with the Air Quality Control Management Plan.
Department Managers	<p>Maintain the requirements of this Plan.</p> <p>Implement and maintain control equipment and procedures to minimise air emissions from point and fugitive sources.</p> <p>Develop and maintain systems for ensuring air emissions control equipment is maintained, calibrated and effective.</p> <p>Ensure the selection of all new or replacement equipment and plant is designed and constructed to ensure air emissions are minimised.</p>
Superintendent Radiation & Hygiene	<p>Provide technical input into any issues with respect to the air emission control equipment.</p> <p>Report on stack emission sampling as per the requirement of the Ranger Authorisation.</p>
Manager HSE	<p>Maintain awareness of the legal and other requirements relevant to air quality control (eg. Ranger Authorisation).</p> <p>Promote and support compliance with this Air Quality Control Management Plan.</p>
Environmental Superintendent	<p>Report of emission to air in accordance with the National Pollutant Inventory.</p> <p>Provide advice to site on risks and controls relevant to air quality relevant to exiting, planned and proposed activities.</p> <p>Co-ordinate the review and update of the Air Quality Control Management Plan at 2 yearly intervals (or sooner in response to significant change in legal requirements or site activities).</p> <p>Co-ordinate the quarterly stack sampling programme.</p> <p>Maintain procedures associated with stack sampling programme.</p>
Water Management Superintendent	Maintain and calibrate meteorological monitoring equipment on the Ranger lease (excludes the BOM station).
Emergency Response Supervisor	Maintain emergency preparedness and response for emergency scenario's relating to air quality control (ammonia release).
Document Controller	To ensure that all air quality records are managed in accordance with the appropriate procedures
All ERA Employees and Contractors	<p>Adhere to the controls specified in this <i>Air Quality Management Plan</i> and all associated plans and procedures.</p> <p>Follow incident reporting and emergency procedures.</p>



## **13. Review and Audit**

### **13.1 Management of Change**

Risks to ambient air quality arising from new developments or substantive changes to existing facilities must be assessed for environmental hazards through change management procedures. *ERS011 Management of Change Standard* and *ERW0011 Change Management Procedure* are used to enable ERA employees and contractors to effectively manage change. It is noted that major projects, for example, may be subject to alternative change management processes (eg EIS or Rio Tinto project evaluation guidelines).

### **13.2 Audit**

This Plan will be audited against the Rio Tinto Environment Performance Standard E2 (Air Quality Control) as part of the Health Safety Environment Quality business conformance audit process. In addition, environmental aspects that impact on air quality and associated management are also audited against the Ranger Environmental Management System to maintain ISO 14001 certification. Actions arising from these audits form part of continual improvement to the environmental management systems.

The Ranger Authorisation and Jabiluka Authorisation are subject to periodic audit undertaken by regulatory authorities, led by the Office of Supervising Scientist. The audits are undertaken conjointly with the Department of Mines and Energy to assess levels of environmental risk and compliance with the Authorisation and management systems under Section 61 of the *Mining Management Act*.

### **13.3 Review**

The Air Quality Management Plan will be reviewed and updated no later than two years from the last date of review. A review may occur sooner consequent to a material change in risk, legal requirements or an incident relevant to air quality.