

# Chapter 12 Transport



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## 12 TRANSPORTATION

### 12.1 INTRODUCTION

This chapter is based on the findings of the traffic impact assessment undertaken by GHD Pty Ltd (**Appendix 16**) and discusses the traffic risk assessment method, relevant transportation routes and traffic volumes. The chapter also discusses the outcomes of the traffic risk assessment and the contribution of the Project to ERA's current transport risk profile. These risks are discussed in consideration of potential impacts to the public and receiving environment inclusive of listed threatened species and other Matters of National Environmental Significance (MNES). The effectiveness of existing controls to mitigate potential impacts on these values is discussed. In addition, the chapter discusses the capacity of the road network to accommodate ERA traffic, inclusive of the Project.

The methods used to assess risks to the environment; public safety and the capacity of the road network to accommodate the Project were selected in consideration of the EIS guidelines. The chapter discusses the following:

- study scope (**Section 12.2**);
- transport routes (**Section 12.3**);
- existing environment (**Section 12.4**);
- assessment approach (**Section 12.5**);
- route capacity impact assessment (**Sections 12.6**);
- assessment of risk (**Section 12.7**); and
- mitigation (**Section 12.8**).

### 12.2 STUDY SCOPE

The transport impact assessment (**Appendix 16**):

- Identified proposed routes for transport to and from the Project of construction materials, consumables, product and personnel;
- Identified the type, size and number of vehicles required during all Project phases;
- Identified the quantity of materials to be transported in support of the Project;
- Compared existing traffic on the road network and compare this with a future project traffic scenario to establish the potential impacts to the existing road network;
- Considered projected traffic volumes associated with the project in the context of the relative likelihood of incidents;
- Undertook a risk assessment of the maximum reasonable consequence to (a) public safety, and (b) the receiving environment, should an incident occur. This was based on

quantitative analysis of incidents occurring along the identified haulage routes and assessment of the credible worst case consequence of the risk;

- Identified levels of uncertainty in estimating the level of risk;
- Undertook an assessment of the safeguards and mitigation measures adopted by ERA and its suppliers. This assessment sought to understand the effectiveness of the current controls to reduce the likelihood of an incident occurring. This analysis took into consideration the ability of the safeguards and measures to take account of seasonality (wet/dry), nature of the consignment, truck/trailer configuration and design, and the biophysical nature of the local environment. These controls and their effectiveness were considered in the risk assessment process.

## **12.3 TRANSPORT ROUTES**

### **12.3.1 Existing Road Network**

The main haulage routes associated with ERA's current operations and the Project are Berrimah Road, Tiger Brennan Drive, and the Stuart, Arnhem and Kakadu Highways; these therefore constituted the study area (refer to **Figure 12-1**). Both Berrimah Road and Tiger Brennan Drive are located within Darwin. For further information on these road sections, refer to **Section 2.2.5**.

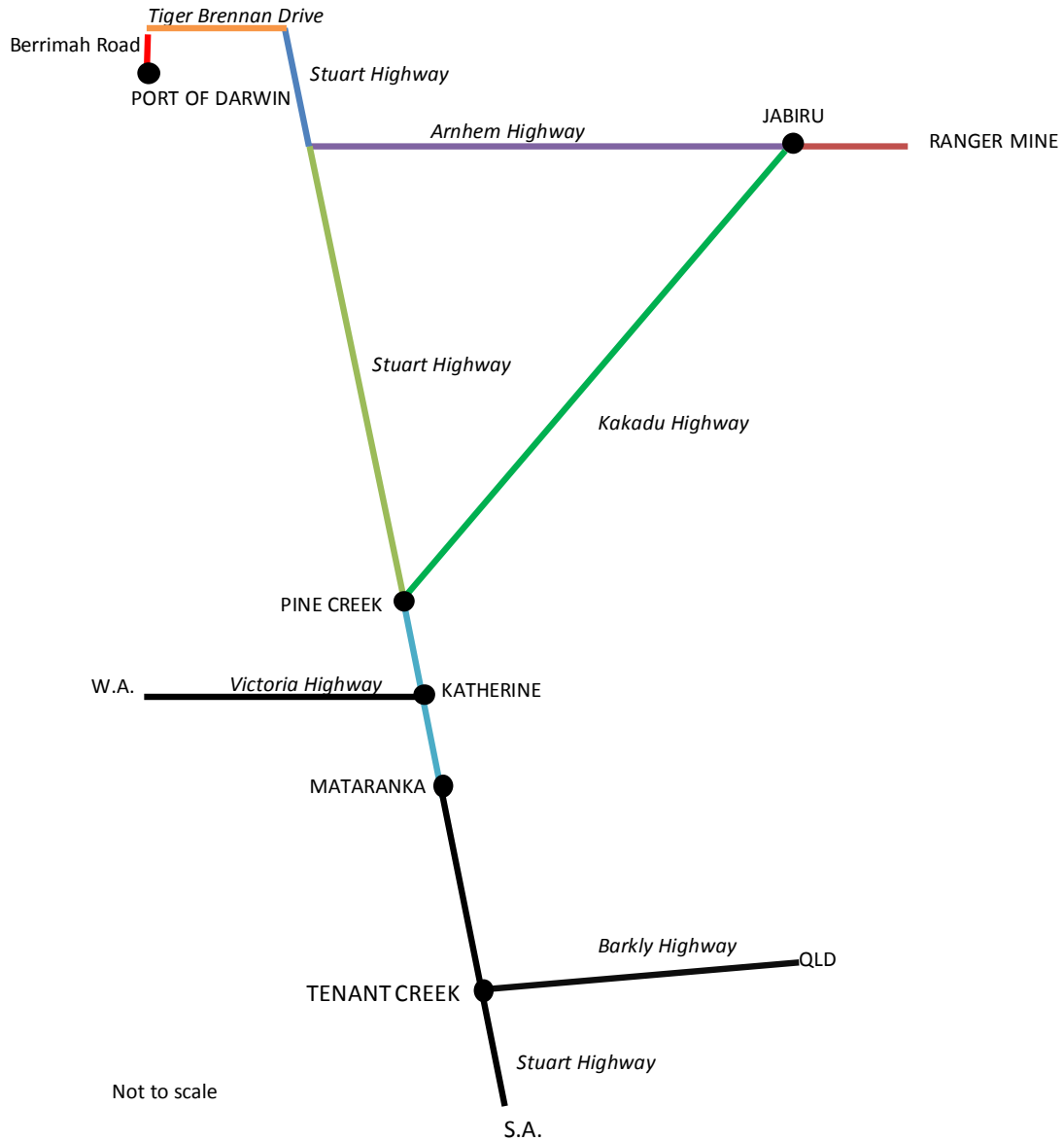


Figure 12-1: Study area road sections

The broader regional transport route setting is presented in **Figure 12-2**.

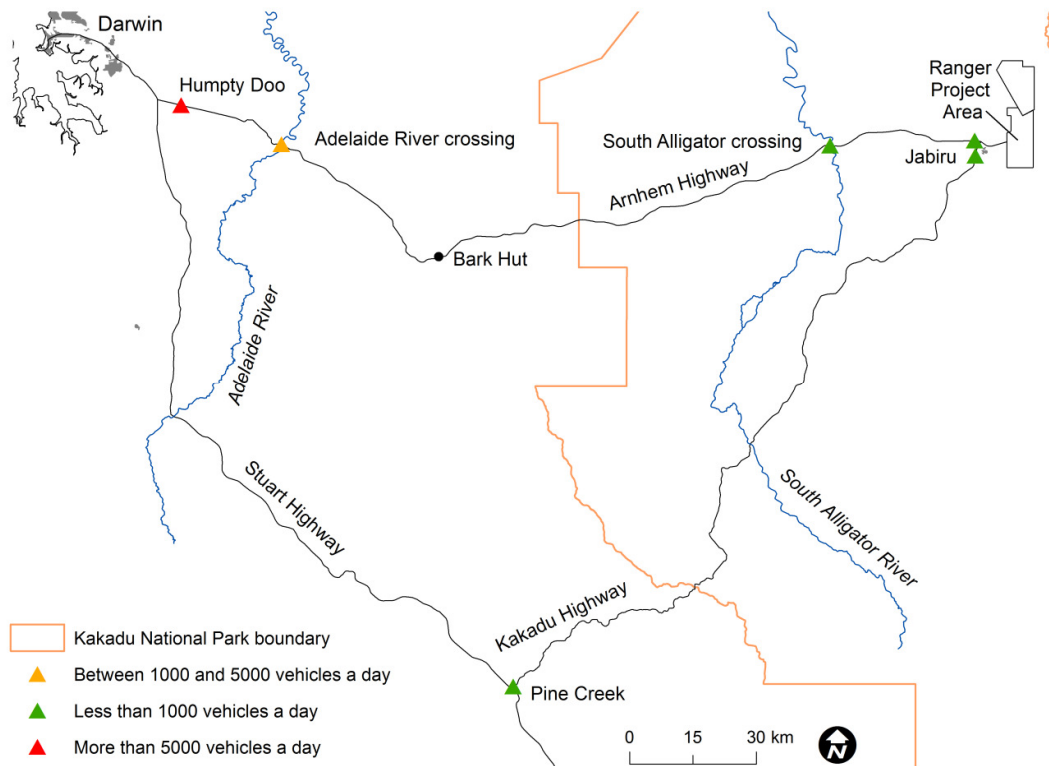


Figure 12-2: Predominant transport routes to the Ranger mine

Site inspections were undertaken along the Arnhem, Kakadu and Stuart Highways in order to:

- Identify areas of high ecological importance comparative to the desktop analysis;
- Familiarise the study team with the existing road conditions and vehicle types utilising these roads; and
- Identify any major road condition or road design issues including very steep roads or tight alignments.

For further discussion on the characteristics of these routes refer to **Appendix 16**.

## 12.4 EXISTING ENVIRONMENT

### 12.4.1 Existing Land Use

Existing land use along the proposed transport routes includes residential land, land under agriculture and horticulture, grazing, a military training area and a quarry on the Arnhem Highway. Large tracts of land have been set aside for conservation and tourism within NT and Commonwealth National Parks.

### 12.4.2 Physical Environment

The study area transport corridors occur within three northern Australian bio-geographic regions (**Figure 12-3**). Most of the transport corridor occurs within the Pine Creek bioregion. To a lesser extent, the north western and north eastern ends of the Arnhem Highway lie within the southern extent of the Darwin Coastal bioregion. Also of limited extent, the Kakadu Highway intercepts the south western portion of the Arnhem Plateau bioregion while the Stuart Highway partially traverses the north eastern edge of the Daly Basin. Additional information on these bioregions is provided in **Appendix 16**.

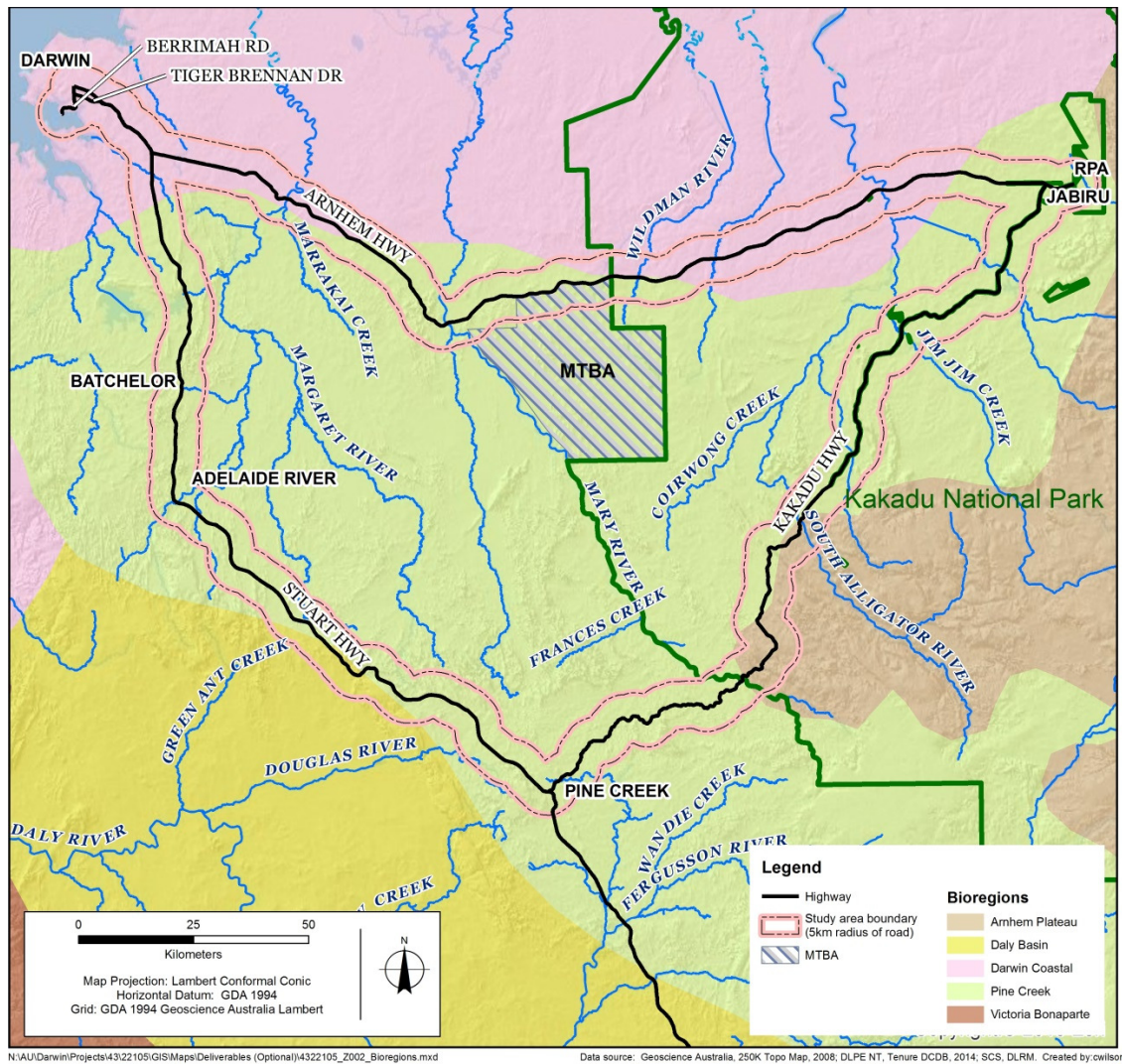


Figure 12-3: Study area bioregions

## 12.5 ASSESSMENT APPROACH

This section outlines the traffic impact assessment method conducted to address the following EIS guideline requirement:

*" potential risks relating to the environment and public safety from the transportation of uranium, explosives (bulk emulsion) and consumables, including dangerous goods, on public roads ..."* (refer **Appendix 2**; p.1)

ERA engaged independent consultants GHD Pty Ltd to conduct the traffic assessment and consider risks to a) public health and safety, b) Northern Territory (NT) conservation significant species and communities, and c) MNES as outlined in the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The traffic risk assessment was semi-quantitative in consideration of the EIS guideline requirement:

*"Sufficient quantitative analysis should be provided to indicate whether risks are likely to be acceptable or tolerable."*

The outcomes of the transportation impact assessment are discussed in **Section 12.7** and **Appendix 16**.

### 12.5.1 Environmental Assessment

The environmental assessment was conducted for all road transport routes to the Ranger mine; these pass along the Stuart Highway and either the Kakadu or Arnhem highways. The transport study area was defined as a 10 km wide corridor along each route (i.e. 5 km each side of the highway).

#### 12.5.1.1 Desktop Assessment

A desktop assessment was undertaken to identify species of conservation significance (including threatened ecological communities and threatened and migratory species) within the study corridor (**Section 12.5.1.2**) along with ecologically sensitive areas (**Section 12.5.1.3**).

Identifying areas of greater sensitivity to disturbance allowed the risk assessment to focus on locations of comparatively greater vulnerability to a particular event. Background information and data for the desktop assessment was sourced from the following:

- The Department of the Environment protected matters search tool to identify MNES potentially occurring in the study area;
- The Department of Land and Resource Management;
- Fauna atlas database records from the study area;
- Land systems and soil mapping;
- Vegetation mapping;

- Mapping of surface water features based on Bureau of Meteorology data; and
- Geology mapping based on Geoscience Australia data.

#### **12.5.1.2 Species of Conservation Significance (Commonwealth and NT)**

The desktop assessment included a review of the Commonwealth EPBC Act protected matters search database, to identify any threatened species and ecological communities likely to occur within the study area. The database search returned the Arnhem Plateau Sandstone Shrubland as an endangered ecological community impacted by altered fire regimes along with invasive weed species. Given available information regarding habitat preferences and likely distribution of this ecological community (SEWPAC 2012), it is unlikely to occur within the study area; therefore, this community was not included in the assessment.

In addition to the protected matters search, the desktop assessment also reviewed the Department of Land and Resource Management database for threatened NT flora and fauna. In total, the Commonwealth and NT databases identified 13 threatened flora species and 43 threatened fauna species predicted or known to occur in the study area. This includes 11 mammals, 14 birds, 12 reptiles, 1 amphibian and 5 fish. These are threatened under both the EPBC Act and the Territory Parks and Wildlife Conservation Act. The protected matters search tool and the Department of Land and Resource Management database also identified 56 migratory species that are predicted or known to occur in the study area as listed under the EPBC Act. This includes 3 mammals, 46 birds and 7 reptiles. For a full discussion on the threatened and migratory species identified by the desktop assessment refer **Appendix 16**.

The likelihood of occurrence of species of conservation significance, within the 10 km wide traffic corridor, was assessed using a three-tier scale:

- Possible – suitable habitat occurs within the study area;
- Unlikely – suitable habitat is unlikely to occur within the study; or suitable habitat substantially modified; or suitable habitat present, but species have not been recorded for over 50 years; and
- Highly unlikely – no suitable habitat is present within the study area and individuals have not been recorded within the study area.

#### **12.5.1.3 Ecologically Sensitive Areas**

A site inspection was undertaken at each ecologically sensitive area to validate the outcomes of the desktop assessment described above and confirm that the habitat characteristics are consistent with known areas of high species abundance and/or diversity. These locations predominantly comprise of wetlands, floodplains and rivers that have the potential to be significantly impacted in the event that a spill occurs during the transport of materials to/from Ranger mine. A total of 14 locations were identified as areas high in species richness, recording the highest abundance and diversity of threatened flora/fauna and migratory species. Each of these locations is provided in **Table 12-1** and presented in **Appendix 16; Figures 4 to 6**.

Table 12-1: Ecologically sensitive areas

| Highway        | Ecologically sensitive area  |
|----------------|--|
| Arnhem Highway | Adelaide River crossing and surrounding floodplain   |
| Arnhem Highway | Mary River crossing and surrounding floodplains  |
| Arnhem Highway | South Alligator River crossing and surrounding floodplains   |
| Arnhem Highway | Wetland areas between Jabiru and Ranger mine   |
| Kakadu Highway | Nourlangie Creek crossing and surrounding floodplain   |
| Kakadu Highway | Jim Jim Creek/ Jim Jim Billabong crossing and surrounding floodplain *                                   |
| Kakadu Highway | South Alligator River crossing and surrounding floodplain  |
| Kakadu Highway | Mary River crossing and surrounding floodplain   |
| Kakadu Highway | 7 km east of the Mary River crossing   |
| Stuart Highway | Pine Creek township at the intersection of Stuart Highway and Kakadu Highway                             |
| Stuart Highway | Eastern roadside area, approximately 60 km north of Pine Creek   |
| Stuart Highway | Adelaide River crossing and surrounding floodplain   |
| Stuart Highway | 134 km Bridge crossing over creek line and adjoining riparian woodland                                   |
| Stuart Highway | Greater Darwin region and broader area surrounding the intersection of Arnhem Highway and Stuart Highway |

\* Yellow Waters wetland is also in the vicinity of this floodplain.

For further information on ecologically sensitive areas refer to **Appendix 16**.

### 12.5.2 Risk Assessment Process

The risk assessment considered potential risks to both public health and safety and the environment. The scope of the risk assessment included transport requirements associated with construction and operational phases of the Project and comprised both incremental (Project) and cumulative (Project and continuation of existing operations) impacts.

During Project decommissioning, equipment and material requirements in support of closure activity are anticipated to be sourced from existing operations. Therefore, transport movements for this Project phase have not formed part of the risk assessment scope. Further information regarding the decommissioning phase of the Project is discussed in **Chapter 3** and **Chapter 13**.

### 12.5.2.1 Risk Identification

Risk identification was undertaken in an independently facilitated workshop held on 5 December 2013. The workshop participants included ERA, NT Department of Transport, and GHD ecologists, together with ERA key suppliers and transport contractors (represented by chemical product and logistics specialists). Further details concerning the participants are provided in **Appendix 16**.

The risk identification process used a Bow Tie diagram method for each consumable listed in **Table 12-2**. Using their industry knowledge and expertise, workshop participants systematically identified causal factors, preventative controls and causal pathways that may result in a potential impact to public health and safety and the environment.

Underlying causal factors that may give rise to an incident included vehicle condition, driver impairment, environment, third parties, and load configuration. For further information on the risk identification process and its application in the assessment for each consignment, refer to **Appendix 16**.

Table 12-2: Key consumables and product

| Consumable/product           | Hazardous <sup>(b)</sup> | Dangerous good <sup>(c)</sup> | Consumable/product                                       | Hazardous | Dangerous good    |
|------------------------------|--------------------------|-------------------------------|--|-----------|-------------------|
| Sulfuric acid                | Yes                      | Yes                           | Quicklime  | Yes       | No <sup>(d)</sup> |
| Diesel                       | Yes                      | No                            | Anhydrous ammonia  | Yes       | Yes               |
| Sodium hydroxide             | Yes                      | Yes                           | Cement   | No        | No                |
| Shellsol 2046 (kerosene)     | Yes                      | No                            | Explosives (ammonium nitrate, ammonium nitrate emulsion) | Yes       | Yes               |
| Alamine 336                  | Yes                      | Yes                           | Pyrolusite (manganese oxide (IV) powder)                 | Yes       | Yes               |
| Flocculant (Magnafloc 139)   | No                       | No                            | Sand/aggregate   | No        | No                |
| Uranium oxide <sup>(a)</sup> | Yes                      | Yes                           | Construction material                                    | No        | No                |

<sup>(a)</sup> Transport of uranium oxide is back freighted and therefore the actual product movement between Ranger mine and destination would be undertaken by a vehicle that would otherwise have returned empty

<sup>(b)</sup> Classified according to Work safe Australia criteria

<sup>(c)</sup> Classified by the Australian Dangerous Goods Code

<sup>(d)</sup> Classified as a dangerous good when transported by air

## 12.5.3 Risk Analysis

### 12.5.3.1 Consequence Assessment

Consequence descriptors ranging in magnitude from minor to catastrophic were developed for species of conservation significance, environmental values, and public health and safety (refer **Table 12-3**).

For each ecologically sensitive location listed in **Table 12-1**, and the environmental values<sup>1</sup> they contain, the risk assessment considered a loss of containment scenario for each consumable/product and the expected recovery time of the ecological system. The maximum reasonable consequence level associated with each scenario considered a) the range of controls currently in place for each consumable/product, and b) the "credible release"<sup>2</sup> quantity in the event of a containment loss.

The consequence to public health and safety has been determined on the basis of whether the incident is associated with direct vehicle to vehicle interaction or subsequent fire and/or explosion, in addition to contact with the contents of the consignment.

The likelihood of a crash involving a light or heavy vehicle at a particular location (or road length) was calculated as the product of two components:

- Probability of a crash at a specific location; and
- Frequency<sup>3</sup> of trips and, therefore, the exposure of a light or heavy vehicle to that location.

For example, if a consumable has three times the number of deliveries as another consumable along the same route, then its exposure (and the likelihood of a crash at a particular location) is three times as high.

Average crash rates along each 1 km road section were established using traffic data sourced from the NT annual traffic report 2012 and NT vehicle accident data. Crash rate calculations encompassed all vehicle classifications. Heavy vehicles comprise a smaller component of this vehicle profile and, therefore, the use of all vehicle classifications provided a larger data set from which to derive crash rates.

The leading measure of crash rates along the transport route is 'crashes per million vehicle kilometres travelled'. For example, a crash rate of 1.0 crash per million vehicle kilometres travelled means that if one million vehicles traversed a 1 km section of road, the probability would be for one crash to occur.

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<sup>1</sup> The consequence criteria used for environmental values applies to multiple biotic and abiotic elements including impacts to flora, fauna, soils and surface water.

<sup>2</sup> The term "credible release" is the maximum reasonable loss of a substance to ground based on tanker design and industry statistics.

<sup>3</sup> The year of 2017 has been selected to establish frequency as this is the year that represents the greatest number of round trips and therefore exposure.

Once the crash rate is established, it is multiplied by the number of ERA vehicles and the length of a specific road section to calculate the crash likelihood. A worked example is provided in **Appendix 16**.

The likelihood value is then aligned to the corresponding likelihood level described in **Table 12-4**. For example, a risk scenario with a quantified likelihood of 5% corresponds to a likelihood level of 'possible'.

Despite the impossibility of eliminating all conceivable traffic risks, the controls identified as an outcome of the Bow Tie process reduce the likelihood associated with a number of risks within ERA's control. Further information on risk mitigation and controls is provided in **Section 12.8** and **Appendix 16**.

### **12.5.3.2 Likelihood of an Escalating Event**

An escalating event is a vehicle incident where there are additional circumstances or conditions that may result in a secondary impact event, e.g. flammable liquid plus fire causes an explosion. In other words, the potential for an escalating event depends on both a containment loss (release) and the physical and chemical properties of the substance. The conditional probability that this scenario may occur was determined using loss of containment escalation factors sourced from the United States Federal Motor Carrier Safety Administration (Battelle 2001).

The likelihood of a release event is quantified by multiplying the previously established crash rate by the consignment load along with the escalation factor relevant to the consumable. Similarly, the likelihood that this release event may result in a fire and explosion is further quantified using an appropriate escalation factor. A worked example is provided in **Appendix 16**.

With the exception of product which is outbound from Ranger mine, the likelihood of release events is comparatively greater from inbound deliveries carrying full loads. Therefore, the release exposure exists for half the time that the vehicle and its load are in transit.

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Table 12-3: Consequence descriptors

| Consequence type     | Consequences   |  |  |   |   |
|----------------------|--|--|--|---|---|
|                      | Minor  | Medium   | Serious  | Major   | Catastrophic  |
| Environmental values | Impact* will be very limited and have no discernible effect on environmental values, including sensitive populations, communities and assets.  | Impact* will be limited and affect only minor environmental values. Recovery periods are relatively short.   | Impact* will affect environmental values, disrupting some aspects of environmental structures or functions, but recovery periods are relatively short.   | Impact* will seriously affect environmental values, disrupting many environmental structures or functions. Long periods of recovery.  | Impact* will seriously affect environmental values, disrupting major environmental structures or functions. Potentially irreversible.   |
|                      | Negligible soil impact; chemical concentrations are above background but below ecological investigation levels as defined in the National Environmental Protection Measure.  | Localised soil impact; low level (< 2 times) exceedance of ecological investigation levels defined in the National Environmental Protection Measure.   | Localised long term or widespread short term soil impact; chemical concentrations (2 to 5 times) exceedance of ecological investigation level defined in the National Environmental Protection Measure.                        | Widespread and/or long term impact; chemical concentrations (5 to 10 times) exceedance of ecological investigation level defined in the National Environmental Protection Measure.  | Irreversible and/or extensive impact; chemical concentrations are (> 10 times) the ecological investigation level defined in the National Environmental Protection Measure.                               |
|                      | No detectable change to background water quality; no exceedance of background and applicable Australian and New Zealand Environment and Conservation Council/ Agriculture and Resources Management Council of Australia and New Zealand. | Local, short term, minor exceedance of background and applicable Australian and New Zealand Environment and Conservation Council/ Agriculture and Resources Management Council of Australia and New Zealand. | Local, long term or widespread, short term exceedance of background and applicable Australian and New Zealand Environment and Conservation Council/ Agriculture and Resources Management Council of Australia and New Zealand. | Local, permanent or widespread, long term exceedance of background and applicable Australian and New Zealand Environment and Conservation Council/ Agriculture and Resources Management Council of Australia and New Zealand. | Widespread, permanent exceedance of background and applicable Australian and New Zealand Environment and Conservation Council/ Agriculture and Resources Management Council of Australia and New Zealand. |
| Public health and    | No injuries or first aid required  | Basic first aid treatment required   | Medical attention required   | Permanent injury or illness   | Loss of life  |

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| Consequence type | Consequences                     |  |   |  |   |
|------------------|----------------------------------|--|---|--|---|
|                  | Minor                            | Medium   | Serious   | Major  | Catastrophic  |
| safety           | No increase in vehicle accidents | Increase of < 2 annual non fatal vehicle accidents | Increase of 2 to 5 annual non fatal vehicle accidents | Increase of 5 to 10 annual non fatal vehicle accidents | Increase of > 10 annual non fatal vehicle accidents |

\* Includes an impact that would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that a species is likely to decline and/or an impact to a world heritage and/or national heritage place (not excluding declared Ramsar wetland); and/or impact to common flora and fauna such as an impact that would modify habitat and/or disrupt the lifecycle of common species.

Table 12-4: Likelihood classification

| Likelihood |                |   |
|------------|----------------|---|
| A          | Almost certain | Common repeating occurrence that is ongoing. Frequency interval (multiple events): more than twice per year; probability (single events): more than 25%.                                  |
| B          | Likely         | Known to occur or will probably occur at some time and in most circumstances. Frequency interval (multiple events): from once per year; probability (single events): from 10% to 25%.     |
| C          | Possible       | Could occur at some time but not often. Frequency interval (multiple events): from once in 10 years to once per year; probability (single events): from 1% to 10%.                        |
| D          | Unlikely       | Could potentially occur at some time but highly unlikely. Frequency interval (multiple events): from once in 100 years to once in 10 years; probability (single events): from 0.1% to 1%. |
| E          | Rare           | Practically impossible, will only occur in very rare circumstances. Frequency interval (multiple events): less than once in 100 years; probability (single events): less than 0.1%.       |

### 12.5.4 Risk Evaluation

Risk evaluation was undertaken using the consequence and likelihood descriptors discussed previously in combination with the risk matrix similar to that provided in **Section 5.4.3 (Figure 5-3)**. This risk matrix works in the same way as the risk matrix used in the traffic risk assessment. The only differences between the two relate to the terms assigned to the consequence descriptor and the risk ranking. For example, **Table 12-5** indicates the comparison between the risk matrix used in the environmental risk assessment and the traffic risk assessment. For consistency, the risk ranking system used in this chapter will be described as a risk class.

Table 12-5: Consequence and risk ranking comparison

| Consequence name (environmental risk assessment) | Consequence name (traffic risk assessment) | Risk ranking name (environmental risk assessment) | Risk ranking name (traffic risk assessment) |
|--|--|---|---|
| Very low   | Minor                                      | Class I   | Low   |
| Low  | Medium                                     | Class II  | Moderate                                    |
| Moderate   | Serious                                    | Class III   | High  |
| High   | Major                                      | Class IV  | Critical                                    |
| Very high  | Catastrophic                               |   |   |

The outcome of this process identified a total of 246 risks. Of these, 147 risks were associated with listed threatened and migratory species; 68 were associated with environmental values; and 31 were associated with public health and safety.

In terms of risk class, the residual risk profile indicates 47 Class III risks and 4 Class IV risks. The remainder of the residual risk rankings were either Class I or Class II. A full discussion of all risks and treatments is provided in **Section 12.7** and **Section 12.8**, respectively. For further information refer to **Appendix 16**.

### 12.5.5 Level of Uncertainty

The extent of available data and information, along with the suite of controls currently in place, informed the risk ranking process and provided a basis upon which to assess a level of uncertainty. The effectiveness of ERA's existing controls to mitigate transport risks are discussed in **Section 12.8.2**.

ERA and its supplier network have a thorough understanding of the risks associated with transport logistics. Therefore, a high degree of certainty is associated with each of the respective risk rankings. The certainty descriptors used to evaluate the level of confidence in the available information are provided **Section 5.4.3 (Table 5-4)**.

### **12.5.6 Cumulative Impacts**

The traffic impact assessment is a cumulative assessment that considered all traffic volumes (including other user traffic and Ranger mine traffic with and without the Project). The cumulative impact to route capacity and road intersections was also assessed to determine whether the Project could be accommodated within the existing road transport network.

### **12.5.7 Monitoring and Review**

The continued effectiveness of ERA's management of traffic and transport-related risks are assessed systematically through its established light vehicle committee, light vehicle travel statistics and contractor management system. This ensures that those who travel on ERA business or transport materials on the company's behalf do so in a manner that minimises the potential for an incident that may result in an impact to public health and safety and/or the environment.

In addition, ERA meets quarterly with its transport providers and the NT Department of Transport. This collaborative forum is an opportunity to discuss current road conditions and identify opportunities to improve existing transport management practices.

## **12.6 ROUTE CAPACITY IMPACT ASSESSMENT**

### **12.6.1 Background Traffic Volume**

Traffic volumes were obtained from the NT Department of Transport 2012 Annual Traffic Report (TAMS 2012) and daily traffic volumes for each road section are summarised in **Table 12-6** which includes both heavy and light vehicles travelling to and from the Ranger uranium mine. The geographical distribution of traffic volumes including ERA's contribution is presented in **Figure 12-4**. Other user traffic consists of both light and heavy vehicles which are for private, commercial or military use.

Tourists travelling along the study area transport corridors predominantly occur in the dry season months of May through to November. Of these, a significant proportion visit Kakadu National Park.

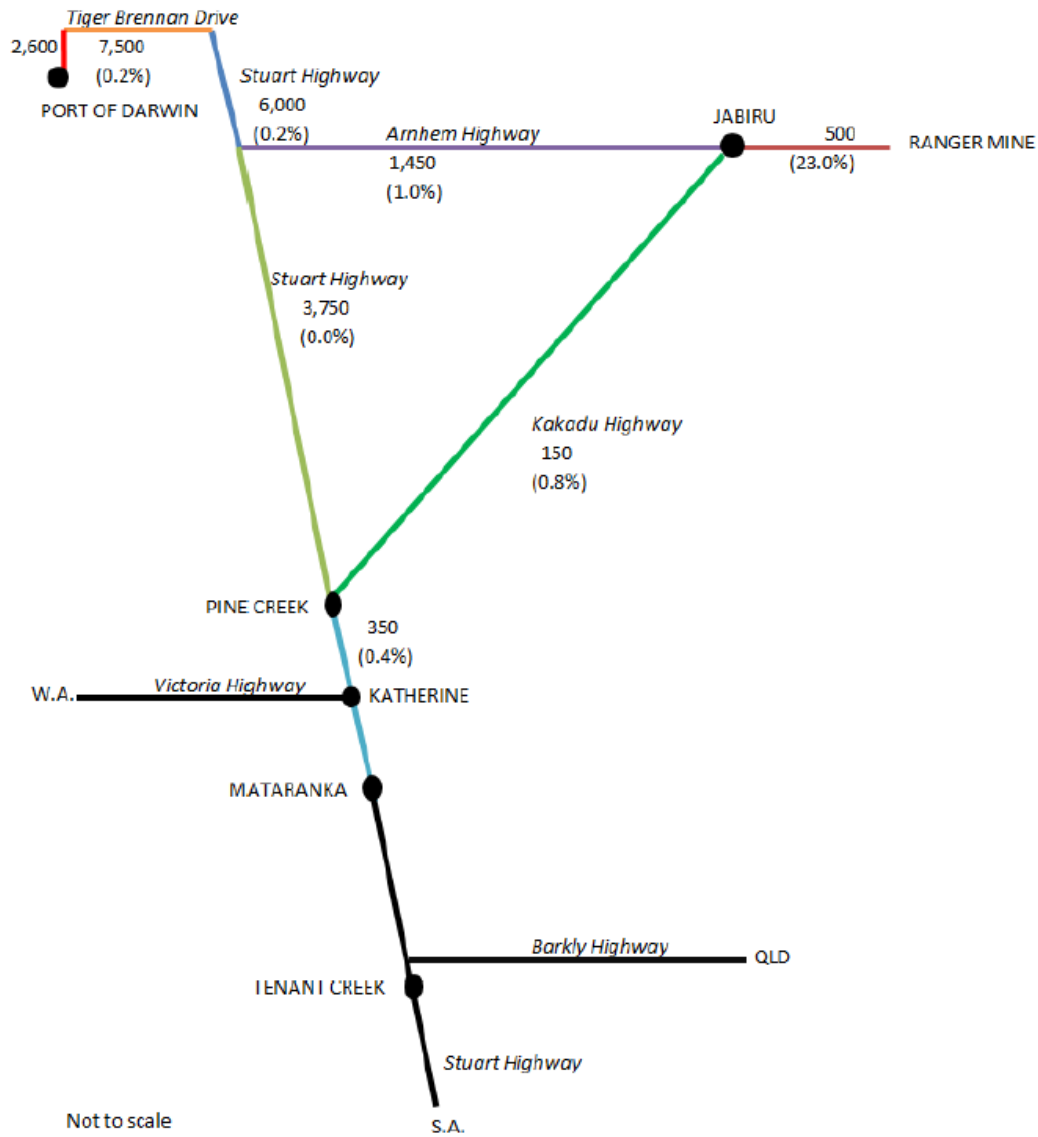


Figure 12-4: 2012 average daily traffic volumes and Ranger mine contribution (%)

Table 12-6: 2012 average daily traffic volumes along each road section (round trips)

| Road section   | Daily traffic volume  | Round trip equivalent volume |
|--|-----------------------|------------------------------|
| Berrimah road  | 5,200                 | 2,600                        |
| Tiger Brennan Drive  | 15,000 <sup>(a)</sup> | 7,500                        |
| Stuart Highway, between Tiger Brennan Drive and Arnhem Highway | 12,000                | 6,000                        |
| Stuart Highway, between Arnhem Highway and Pine Creek          | 7,500                 | 3,750                        |

| Road section                                      | Daily traffic volume | Round trip equivalent volume |
|---|----------------------|------------------------------|
| Stuart Highway, between Pine Creek and Mataranka  | 700                  | 350                          |
| Arnhem Highway, between Stuart Highway and Jabiru | 2,900                | 1,450                        |
| Arnhem Highway, between Jabiru and Ranger mine    | 1,000                | 500                          |
| Kakadu Highway from Jabiru to Pine Creek          | 300                  | 150                          |

<sup>(a)</sup> Traffic volume data was not available for Tiger Brennan Drive. This has been estimated based on the assessment of traffic impacts attributed to the duplication of Tiger Brennan Drive from Berrimah Road to Woolner Road.

## 12.6.2 Existing ERA Vehicle Traffic Volumes

With respect to ERA vehicles, light vehicle travel predominantly occurs between Darwin and the Ranger mine. These trips are limited in number, with a daily average of eight round trips<sup>4</sup> recorded at the Bark Hut rest stop (refer **Figure 12-2**).

Light vehicle travel has been recognised as the greatest safety risk to ERA personnel. As a mitigation measure, most personnel fly between Darwin and Jabiru. Various consumables are transported by heavy vehicles to the Ranger mine. Consumables originate from both within the NT and interstate, where the latter involves mainly South Australia and Queensland. These deliveries utilise the Stuart, Arnhem or Kakadu Highways and therefore these have formed the focus of the traffic impact assessment study area.

Regionally based heavy vehicles transporting consumables typically travel towards the Ranger mine from Darwin. Interstate heavy vehicles pass through Mataranka, which is situated on the Stuart Highway 200 km south of the Kakadu Highway intersection at Pine Creek. Consequently, Darwin and Mataranka have been adopted as points of origin for assessing traffic capacity.

Flooding on sections of the Arnhem Highway may prevent access via this route during the wet season. This occurs for an average of 1.5 weeks each wet season. During this period, heavy vehicles that would ordinarily use the Arnhem Highway may be re-routed along the Stuart and Kakadu Highways to the Ranger mine. Alternatively, buffer storage capacity at Ranger is available such that not all deliveries need to be re-routed.

Heavy vehicle deliveries to Ranger mine typically return to their point of origin empty. An exception to this is the transportation of uranium oxide product, which is back freighted on heavy vehicles that would otherwise have returned empty.

Consumables, their origin and round trip movements associated with existing operations are identified in **Table 12-7**.

<sup>4</sup> A 'round trip' consists of an out and back journey, e.g. a single round trip is made up of the journey from point of origin to destination and the return journey back to the point of origin.

Table 12-7: 2012 existing ERA heavy vehicle traffic volumes

| Consumable / product                     | Actual origin    | Effective origin | Transport quantity | Annual round trips | Average daily round trips |
|--|------------------|------------------|--------------------|--------------------|---------------------------|
| Sulfuric acid                            | Darwin           | Darwin           | 162 kt             | 1,686              | 5                         |
| Quicklime                                | Mataranka        | Mataranka        | 24 kt              | 393                | 1                         |
| Flocculant (Magnafloc 139)               | Darwin           | Darwin           | 340 t              | 93                 | <1                        |
| Diesel                                   | Darwin           | Darwin           | 44,000 kL          | 338                | 1                         |
| Pyrolusite (Manganese oxide (IV) powder) | Darwin           | Darwin           | 11 kt              | 126                | <1                        |
| Alamine 336                              | Perth / Adelaide | Mataranka        | 68 kL              | 4                  | <1                        |
| ShellSol 2046 (kerosene)                 | Adelaide         | Mataranka        | 1,716 kL           | 26                 | <1                        |
| Anhydrous ammonia                        | Queensland       | Mataranka        | 1.8 kt             | 44                 | <1                        |
| Sodium hydroxide                         | Darwin           | Darwin           | 120 kL             | 7                  | <1                        |
| Miscellaneous                            | Darwin           | Darwin           | -                  | 24                 | <1                        |
| Uranium oxide <sup>(a)</sup>             | Ranger mine      | Ranger mine      | 3.7 kt             | -                  | -                         |

<sup>(a)</sup> The transport of uranium oxide is back freighted and is undertaken by a previous delivery that would ordinarily have returned empty. This involves around 102 trips.

The transport of consumables by transport providers is undertaken using a variety of heavy vehicle configurations as detailed in **Table 12-8**. There are no specific restrictions on when materials and product can be transported. This activity predominantly occurs during daylight hours. Depending on transport provider scheduling and the needs of Ranger mine, travel may occur outside daylight hours. This arrangement will not change as a result of the Project. The Project will require similar vehicle types and configurations for transporting these same consumables and product along current haulage routes.

Table 12-8: Consumables transported, heavy vehicle type, capacity and current haulage routes

| Consumable / product                                     | Vehicle type / capacity  | Current haulage route  |
|--|--|--|
| Sulfuric acid  | Quad road train (104 t capacity)   | Berrimah Road, Tiger Brennan Drive, Stuart Highway, Arnhem Highway |
| Quicklime  | B-double road train (60 t capacity)                                      | Stuart Highway, Kakadu Highway, Arnhem Highway                     |
| Magnafloc 139<br>(flocculation agent)                    | Rigid truck (4.2 t bags or 750 kg immediate bulk container)              | Berrimah Road, Tiger Brennan Drive, Stuart Highway, Arnhem Highway |
| Diesel   | Quad road train (130 kL capacity)  | Berrimah Road, Tiger Brennan Drive, Stuart Highway, Arnhem Highway |
| Pyrolusite (manganese oxide (IV) powder)                 | Quad road train, side tipping (90 t capacity)                            | Berrimah Road, Tiger Brennan Drive, Stuart Highway, Arnhem Highway |
| Alamine 336  | Single trailer (18 kL capacity using immediate bulk container)           | Stuart Highway, Arnhem Highway                                     |
| Kerosene (ShellSol 2046)                                 | Triple road train (90 kL capacity)                                       | Stuart Highway, Arnhem Highway                                     |
| Ammonia - anhydrous                                      | B-double road train (60 t capacity)                                      | Stuart Highway, Kakadu Highway, Arnhem Highway                     |
| Sodium hydroxide   | Single trailer (18 kL capacity using immediate bulk container)           | Berrimah Road, Tiger Brennan Drive, Stuart Highway, Arnhem Highway |
| Explosives (ammonium nitrate, ammonium nitrate emulsion) | B-double road train (60 t capacity)                                      | Stuart Highway, Kakadu Highway, Arnhem Highway                     |
| Cement   | B-double road train (60 t capacity)                                      | Stuart Highway, Kakadu Highway, Arnhem Highway                     |
| Sand / aggregate   | Quad road train, side tipping (90 t capacity)                            | Stuart Highway, Kakadu Highway, Arnhem Highway                     |
| Construction materials                                   | Various  | Berrimah Road, Tiger Brennan Drive, Stuart Highway, Arnhem Highway |
| Miscellaneous  | Rigid truck (60 t capacity)  | Berrimah Road, Tiger Brennan Drive, Stuart Highway, Arnhem Highway |
| Uranium oxide  | Single trailer (2 containers each carrying 18 tonnes of drummed product) | Arnhem Highway, Stuart Highway, Tiger Brennan Drive, Berrimah Road |

### 12.6.3 Historical and Projected ERA Traffic

Over the life of the Project, the highest number of round trips will occur in 2017 (**Figure 12-5**). This together with projected background traffic associated with other road users provides a conservative basis to undertake both the route capacity impact assessment and the environmental risk assessment.

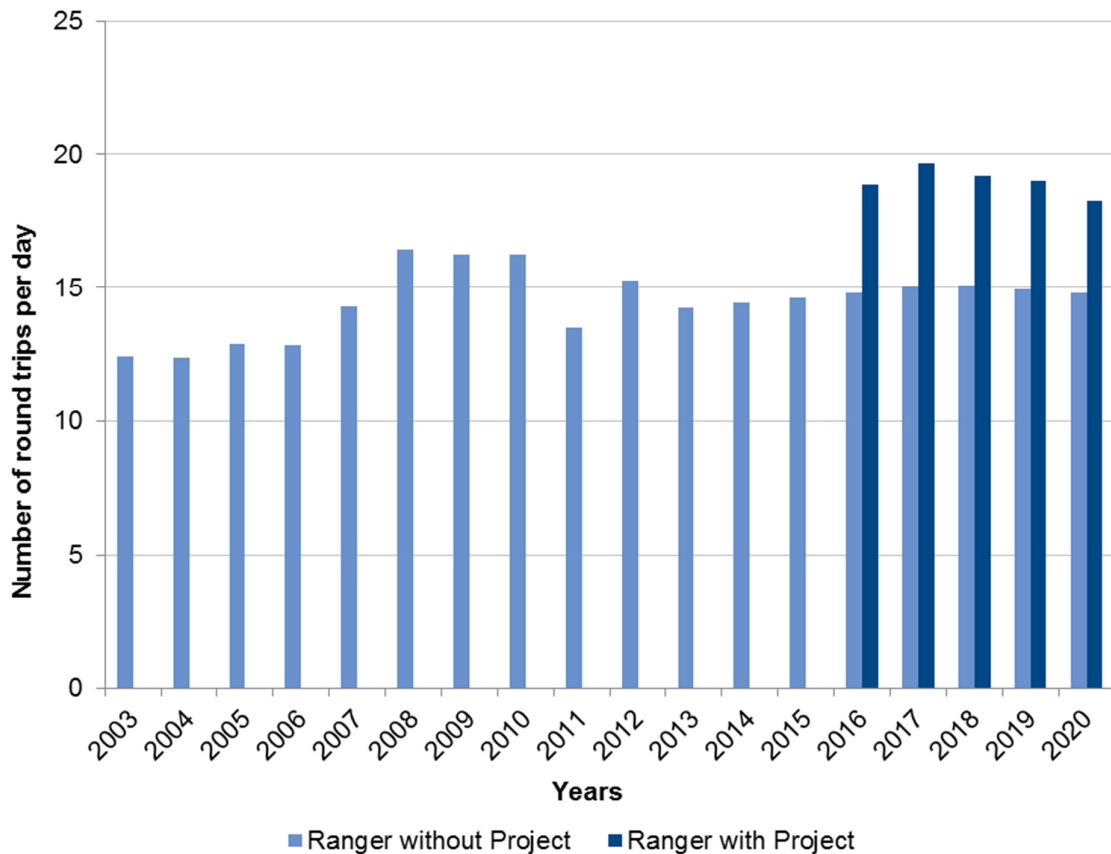


Figure 12-5: Historical and projected heavy and light vehicle trips to the Ranger mine

#### 12.6.3.1 Change to Consignment Quantities

The average inventory of consignments between 2016 – 2020 that are required for both the Project and cumulatively for the existing Ranger operations and the Project are shown in **Table 12-9**.

Table 12-9: Forecast consignments, transport quantities and annual movement frequency

| Consignment                                     | Project only<br>(average) | Cumulative<br>(average) | Project only<br>round trip<br>(average) | Cumulative<br>round trip<br>(average) |
|---|---------------------------|-------------------------|---|---------------------------------------|
| Sulfuric acid                                   | 38 kt                     | 154 kt                  | 365                                     | 1,481                                 |
| Quicklime                                       | 14 kt                     | 50 kt                   | 237                                     | 813                                   |
| Flocculant (Magnafloc 139)                      | -                         | 370 t                   | -                                       | 74                                    |
| Diesel <sup>(a)</sup>                           | 24,400 kL                 | 68,800 kL               | 188                                     | 529                                   |
| Pyrolusite (Manganese oxide (IV) powder)        | -                         | 10 kt                   | -                                       | 114                                   |
| Alamine 336                                     | 29 kL                     | 51 kL                   | 2                                       | 3                                     |
| ShellSol 2046 (kerosene)                        | 400 kL                    | 1,500 kL                | 4                                       | 17                                    |
| Anhydrous ammonia                               | 1 kt                      | 2 kt                    | 32                                      | 56                                    |
| Cement  | 48 kt                     | 48 kt                   | 796                                     | 796                                   |
| Sand/aggregate                                  | 6 kt                      | 6 kt                    | 68                                      | 68                                    |
| Sodium hydroxide                                | 23 kL                     | 41 kL                   | 2                                       | 2                                     |
| Explosives <sup>(b)</sup>                       | 770 t                     | 770 t                   | 13                                      | 13                                    |
| Uranium oxide <sup>(c)</sup>                    | 2 kt                      | 4 kt                    | -                                       | -                                     |
| Miscellaneous                                   | -                         | -                       | 25                                      | 25                                    |
| Construction materials (various) <sup>(d)</sup> | -                         | -                       | 77                                      | 77                                    |
| Personnel (land) <sup>(e)</sup>                 | -                         | 5,800                   | -                                       | 2,900                                 |
| Personnel (air) <sup>(f)</sup>                  | 5,000                     | 22,000                  | -                                       | -                                     |

<sup>(a)</sup> Based on full capacity power demand without distributing electrical load across existing power generating infrastructure (i.e. very conservative)

<sup>(b)</sup> Includes bulk and packaged explosives

<sup>(c)</sup> Transport of uranium oxide is back freighted and is undertaken by a previous delivery that would ordinarily have returned empty. This involves around 106 trips.

<sup>(d)</sup> Transport of construction equipment will predominantly occur in 2016 with smaller consignments for later years.

<sup>(e)</sup> Based on two occupants per light vehicle.

<sup>(f)</sup> Based on the total number of scheduled flights in 2013 between Darwin and Jabiru airports.

### 12.6.3.2 Change to Background Traffic

The average daily traffic volumes for 2012 presented previously in **Table 12-6**, were increased by 2.5%<sup>5</sup> annually to generate a forecast for background traffic volumes in 2017. This projected growth is considered to be conservative and therefore provides an adequate basis to assess the impact of the Project on transport route capacity.

<sup>5</sup> Information provided by B. O'Donnell, Project Manager Design, Engineering and Environmental Services, (NT Department of Infrastructure) (personal communication to GHD, 29 Oct 2013).

Combining this information with cumulative Ranger mine traffic, the relative contribution of ERA traffic to total road use was determined and is shown in **Table 12-10**.

Table 12-10: Projected daily averages in 2017 and expected cumulative contribution from Ranger (round trip)

| Road section  | Other road user average daily traffic | Project average daily traffic | Ranger mine average daily traffic (including the Project) | Combined average daily traffic | Contribution of the Ranger mine to average daily traffic % |
|---|---------------------------------------|-------------------------------|---|--------------------------------|--|
| Berrimah Road   | 3,000                                 | 2                             | 14  | 3,014                          | 0.5  |
| Tiger Brennan Drive   | 8,500                                 | 2                             | 14  | 8,514                          | 0.2  |
| Stuart Highway (between Tiger Brennan Drive and Arnhem Highway) | 6,800                                 | 2                             | 14  | 6,814                          | 0.2  |
| Stuart Highway, (between Arnhem Highway and Pine Creek)         | 4,300                                 | <1                            | <1  | 4,300                          | 0.0  |
| Stuart Highway, (between Pine Creek and Mataranka)              | 400                                   | 3                             | 5   | 405                            | 1.3  |
| Arnhem Highway, (between Stuart Highway and Jabiru)             | 1,700                                 | 2                             | 15  | 1,715                          | 0.9  |
| Arnhem Highway, (between Jabiru and Ranger mine)                | 600 <sup>1</sup>                      | 6                             | 20  | 620                            | 19.4   |
| Kakadu Highway from Jabiru to Pine Creek                        | 200                                   | 3                             | 5   | 205                            | 2.6  |

<sup>1</sup> This includes vehicles heading from Jabiru to Ranger mine (estimated to be 100).

## 12.6.4 Potential Impact to Route Capacity

### 12.6.4.1 Construction Traffic Volume

As the Project requires a limited amount of new infrastructure, construction related deliveries will be small in number. These are predominantly associated with surface infrastructure that will arrive at the Ranger mine as either single units or as modular components to be assembled on site. The anticipated consignment inventory will consist of, but is not limited to:

- Ventilation stack/fan assemblies;
- Refrigeration units;
- Backfill plant modular components;
- Dewatering plant modular components; and
- Diesel generators.

Construction activity will predominantly occur in 2016. Traffic volumes associated with this activity are small and therefore will not impact road capacity. Note that construction personnel will travel to the Project by air in most instances.

#### 12.6.4.2 Operational Traffic Volume

As shown in **Table 12-10**, cumulative Ranger mine traffic during the Project's peak assessment year (2017) is less than 4% of the projected road use.

In total, the Ranger mine currently generates approximately 14 round trips per day, comprising 6 heavy vehicle trips and 8 light vehicle trips. Based on ERA projections (with and without the Project) to 2020, 2017 generates the highest number of round trips to the Ranger mine with the Project, equal to around 20 round trips per day. The Project accounts for approximately five of these round trips.

It is not anticipated that the Project would contribute any additional light vehicles to the road network in 2017, and so these additional vehicles are all heavy vehicles. This additional heavy vehicle traffic on the road network represents a comparatively small contribution to traffic volumes in the study area in 2017.

Using established guidelines published by Austroads, a road capacity assessment was undertaken **Appendix 16**. The capacity of a traffic lane is expressed as a number of vehicles per hour. The road capacity assessment indicates that there is significant spare capacity to accommodate Ranger mine traffic (with and without the Project) (**Table 12-11**).

Table 12-11: 2017 estimated hourly volumes and comparison to Austroads capacity guidelines

| Road section  | Lanes each way | Capacity of one lane (vehicles per hour) | Total volume (vehicles per hour) | Spare capacity (vehicles per hour) |
|---|----------------|--|----------------------------------|------------------------------------|
| Berrimah Road   | 1              | 900                                      | 301                              | 599                                |
| Tiger Brennan Drive   | 2              | 1,800                                    | 851                              | 949                                |
| Stuart Highway (between Tiger Brennan Drive and Arnhem Highway) | 2              | 1,800                                    | 681                              | 1,119                              |
| Stuart Highway, (between Arnhem Highway and Pine Creek)         | 1              | 1,800                                    | 430                              | 1,370                              |
| Stuart Highway, (between Pine Creek and Mataranka)              | 1              | 1,800                                    | 41                               | 1,759                              |
| Arnhem Highway, (between Stuart Highway and Jabiru)             | 1              | 1,800                                    | 171                              | 1,629                              |
| Arnhem Highway, (between Jabiru and Ranger mine)                | 1              | 1,800                                    | 62                               | 1,738                              |
| Kakadu Highway from Jabiru to Pine Creek                        | 1              | 900                                      | 21                               | 879                                |

## 12.7 ASSESSMENT OF RISK

The risk assessment process discussed previously in **Section 12.5** considered a range of consumables and/or materials (14), at a number of locations with possible impacts to the environment and or public health and safety. This process generated 246 risks, however, given the repetition of equivalent risks multiplied by up to 14 locations, that number should not be directly compared to the previously discussed risks arising from the environmental risk workshop.<sup>6</sup>

The assessment considered risks to the following receptors:

- Listed threatened and migratory species;
- Environmental values; and
- Public health and safety.

The risk profile includes the following:

- There were 147 risk scenarios that address risks to listed threatened and migratory species at 14 environmentally sensitive locations, concerning the transport of 14 separate consumables and/or materials;
- There were 68 risk scenarios that address risks to environmental values at 6 environmentally sensitive locations, concerning the transport of 14 separate consumables and/or materials; and
- There were 31 risk scenarios that address risks to public safety in the study area concerning the transport of 14 separate consumables and/or materials.

A summary of the cumulative risk profile for each of the environmental receptors is provided in **Table 12-12**.

Table 12-12: Summary risk profile

| Risk profile        | Listed threatened and migratory species | Environmental values | Public health and safety | Total |
|---------------------|---|----------------------|--------------------------|-------|
| Critical (Class IV) | 0                                       | 0                    | 4                        | 4     |
| High (Class III)    | 21                                      | 11                   | 15                       | 47    |
| Moderate (Class II) | 14                                      | 6                    | 5                        | 25    |
| Low (Class I)       | 112                                     | 51                   | 7                        | 170   |
| Total               | 147                                     | 68                   | 31                       | 246   |

The cumulative risk rankings for all of the environmental receptors are shown in **Figure 12-6**.

<sup>6</sup> By analogy, if the transport risk assessment approach had been applied to the environmental risk areas, instead of one risk of fauna falling into a vent shaft during construction, there would be up to eight risks; i.e. one for each shaft under construction.

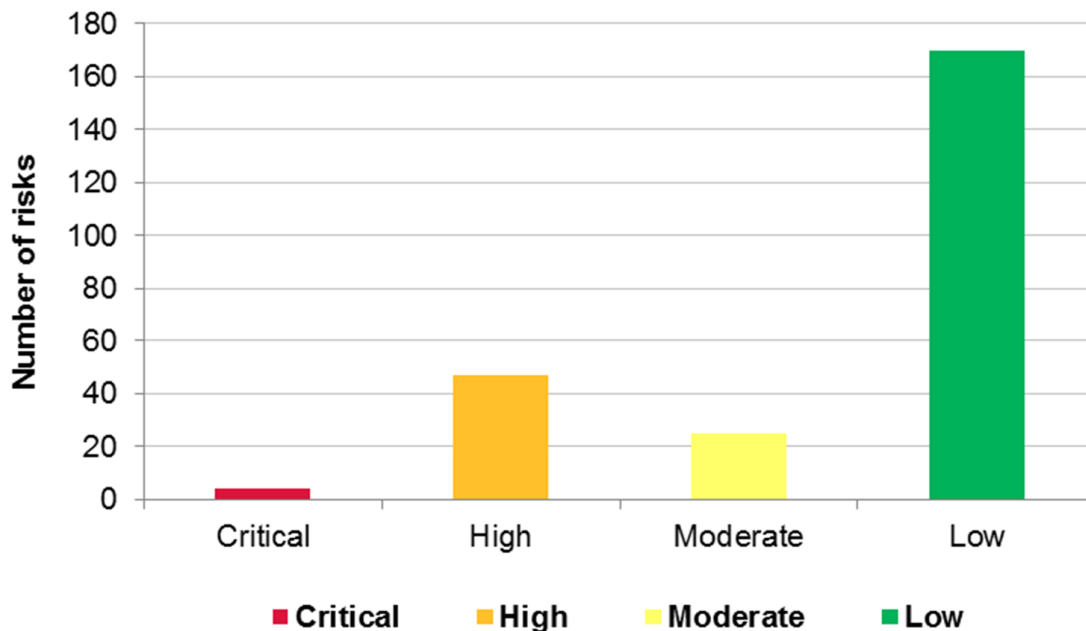


Figure 12-6: Cumulative risk rankings

### ***Public safety***

Impact scenarios that were considered for public health and safety included a vehicle incident resulting in an injury or fatality, either from a direct vehicle interaction or indirectly due to a loss of containment or a resultant fire and/or explosion.

For all public health and safety risks that may involve a direct vehicle to vehicle interaction, the maximum reasonable consequence was assessed to be catastrophic (loss of life). In combination with the relevant consequence descriptor and likelihood classification, the risk assessment process identified four critical risk (Class IV) consumables. These consumables were sulfuric acid, quicklime, cement and diesel. Due to the higher frequency of cumulative traffic movements and probability of incident likelihood, there is potential for injury/loss of life. This potential remains the same whether the Project proceeds or not. The remaining consumables were assessed to be of high risk, but lower likelihood, due to a lower frequency of traffic movement.

There were four consumables that have potential to escalate into impacts involving thermal radiation or blast injury due to their inherent flammable or explosive characteristics. These included diesel, ShellSol (2046), anhydrous ammonia and explosives (e.g. ammonium nitrate, ammonium nitrate emulsion). Consequently, each of these was assigned a high risk ranking (Class III). Of the 47 Class III risks, there were 15 Class III risks to public health and safety.

The low incremental increase in traffic volumes associated with the Project will not materially influence the existing likelihood of an incident occurring. Therefore, as the consequences associated with a particular event remain the same regardless of whether the Project proceeds, the Project does not alter the existing risk profile to public health and safety.

The complete risk register is provided in **Appendix 16**.

***Environmental values, listed threatened and migratory species***

An assessment of potential impacts to the environment, the biophysical sensitivity of the receiving environment in which the transport corridors are located has been considered. In determining biophysical sensitivity, soils, surface water, conservation significant species<sup>7</sup> and habitat have been considered. This includes potential impacts to Ramsar wetlands, migratory species and Kakadu National Park. In combination with consignment characteristics, credible loss of containment (release) scenarios and the extent of current controls, the consequence descriptors outlined in **Chapter 5** have been applied. These descriptors are appropriate in assessing impacts to environmental values, listed threatened and migratory species.

Therefore, the "maximum reasonable consequence"<sup>8</sup> derived in the risk assessment process is an outcome of these fore mentioned aspects. In addition, the maximum reasonable consequence remains the same whether the Project proceeds or not, as the chemical and release scenarios are identical in either instance.

Due to the extent of current controls in place in combination with a low frequency of travel, for the majority of release scenarios considered, the likelihood has been assessed as rare. Where this is not the case, the likelihood has been determined to be greater due to a higher frequency of travel. However, this has not resulted in a likelihood rating of more than unlikely. Therefore, in all cases, while the potential consequences are moderate to high, the likelihood of these outcomes occurring is typically rare.

Consequently, for the majority of consumables, a release to the environment has been ranked as a low risk (Class I). Consumables ranked as a medium risk include sulfuric acid (Class II) with diesel and anhydrous ammonia ranked as high (Class III). Due to their inherent eco-toxicological characteristics, sulfuric acid, diesel and anhydrous ammonia have potential for more significant consequence at sensitive locations should a release occur. The likelihood that a sulfuric acid release event may occur was assessed as unlikely while an event associated with either diesel or anhydrous ammonia was considered rare.

Within the risks to environmental values and conservation significant species, the transport of sulfuric acid accounts for 20 of the 25 moderate (Class II) while diesel and anhydrous ammonia combined, account for 32 of the 47 (Class III) risks (refer **Table 12-12**).

As with the risk profile for public health and safety, risks to the environment remain the same whether the Project proceeds or not.

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<sup>7</sup> As listed under the NT Territory Parks and Wildlife Conservation Act 2006 and Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

<sup>8</sup> The maximum reasonable consequence is the largest realistic or credible consequence from an event, considering the credible failure of controls. It is generally a higher consequence than the "most likely" consequence and less severe than the "worst case" consequence which considers the failure of all controls.

## 12.8 MITIGATION

ERA has been transporting materials and its product to and from the Ranger mine for more than 30 years. In that time, ERA has continued to develop transport logistics management, consistent with regulatory requirements and leading industry practice. The Project will utilise the same consumables and product transport requirements as used for existing operations, although consumables quantities will vary.

ERA recognises the importance of road safety through its current risk management activities and collaboration with transport providers and the NT Department of Transport. In 2012, this proactive approach to traffic risk management was nationally recognised, with ERA receiving the Australian Road Safety Foundation's Award for Outstanding Achievement at the Australia Road Safety Awards.

While current controls are commensurate with the company's traffic risk profile, ERA seek to continuously improve upon existing practices to mitigate risks that may be more specific to particular hazards. These include wandering stock and a high proportion of international (tourist) road users.

As a core business activity, ERA undertakes a rigorous assessment and ongoing evaluation of contractors who carry out transport activities for Ranger mine operations. Contractor management seeks to ensure that contractors either meet or exceed regulatory and industry standards. The controls and the management strategies which underpin this will continue to be employed for the Project.

There are a range of pre-existing management practices and mitigation measures which are a fundamental aspect of current transport logistics for the Ranger mine. These same controls will be utilised for the Project, as described below.

The Bow Tie process discussed in **Appendix 16** identified a range of controls that limit the likelihood that a potential traffic incident will occur. The risk assessment did not identify that further additional or alternate controls would materially reduce the likelihood or consequence of a hazardous event.

### 12.8.1 Project Controls

As an outcome of the collaborative Bow Tie process, 142 controls were identified. Controls have been categorised into the following areas:

- ERA contractor management system;
- Dangerous goods regulations and code of compliance;
- National heavy vehicle accreditation scheme compliance;
- Hazard identification and risk management; and
- Emergency preparedness and response.

### 12.8.1.1 Contractor Management System

The transport of consumables is undertaken by suppliers and transport providers on behalf of ERA. ERA has an established contractor management system to ensure that suppliers and transport providers meet stringent environment, safety, health and legal requirements.

The contractor management system is designed to systematically identify and evaluate the systems and processes that its potential contractors have in place to meet regulatory and ERA standards. ERA requires contractors to have the capability and resources to provide a level of logistical support that minimises risk to the public and the environment to the greatest extent practicable.

Specifically, the contractor management system requires that suppliers and transport providers meet both a pre-qualification process and periodic audits that assess their performance. This ensures that contractor systems continue to align with ERA requirements for logistical stewardship. This ongoing management and monitoring process is consistent with the following:

- AS/NZS ISO 14001:2004 Environmental Management Systems;
- AS/NZS 4801:2001 Occupational Health and Safety Management Systems;
- Rio Tinto freight preparation policy; and
- Code of Practice – Safe Transport of Radioactive Material.  
(Australian Radiation Protection and Nuclear Safety Agency 2008)

For the complete list of controls applicable to the ERA contractor management system is provided in **Appendix 16**.

### 12.8.1.2 Dangerous Goods Regulations and Code Compliance

The transport of dangerous goods by road in the NT is regulated by NT WorkSafe. In particular, operators are required to comply with the requirements of the Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Regulations. The regulations detail specific obligations with regard to (National Transport Commission 2011):

- Design, manufacture and licensing of vehicles, tanks, vessels and equipment;
- Training, competence and licensing of drivers;
- Procedures for marking, stowing and restraining materials during transport;
- Emergency equipment, plans and procedures; and
- Powers of NT WorkSafe to suspend or revoke operator licenses and impose penalties.

The regulations also refer to the Australian Code for the Transport of Dangerous Goods by Road and Rail. This is the leading technical document in the Australian regulatory system which is aligned with international best practice in dangerous goods management.

The transport of radioactive material has additional requirements. This activity must comply with the Australian Code of Practice for the Safe Transport of Radioactive Materials and

where applicable, the NT *Radioactive Ores and Concentrates (Packaging and Transport) Act* and regulations.

Compliance with the above regulations and codes provide a robust framework to ensure that dangerous goods are transported in a manner that eliminates or minimises risk so far as is reasonably practicable. The contractor management system specifies that transport providers must adhere to the requirements contained with these regulations and codes.

For the complete list of controls applicable to dangerous goods refer to **Appendix 16**.

### **12.8.1.3 National Heavy Vehicle Accreditation Scheme**

The Commonwealth Government National heavy vehicle regulator manages the National heavy vehicle accreditation scheme. The scheme enables heavy vehicle transport operators to gain formal recognition that their operational management systems meet prescribed performance requirements (National Heavy Vehicle Regulator 2013). In order to gain this recognition, compliance with the following accreditation modules is required:

- Mass management: designed to prevent a nominated vehicle from operating in excess of applicable mass limits;
- Maintenance management: designed to ensure nominated vehicles are effectively maintained in a roadworthy condition and are regularly serviced; and
- Fatigue management: designed to ensure that the effects of driver fatigue for nominated drivers are effectively managed.

While the National heavy vehicle accreditation scheme is not currently a mandatory requirement in the NT, ERA have in place contractual arrangements as managed through our contractor management system which requires that its transport suppliers demonstrate conformance with the fore mentioned accreditation modules.

For the complete list of controls applicable to the National heavy vehicle accreditation scheme refer to **Appendix 16**.

### **12.8.1.4 Hazard Identification and Risk Management**

ERA has in place an existing health, safety and environment framework aligned with AS/ISO 31000 and Rio Tinto's risk management standard, which is applied to all aspects of its current operations. This approach is contained within ERA's current integrated health, safety and environment risk register and links identified hazards with controls that mitigate risks to an acceptable level. ERA's current risk register recognises light vehicle travel as its greatest safety risk. In addition, loss of containment scenarios while in transit to the Ranger mine are well defined and managed accordingly.

The pre-qualification evaluation of its transport providers requires them to demonstrate that they have a systematic risk management system in place. The controls identified in the Bow Tie process are the result of collaborative hazard identification, risk management and continuous improvement between ERA and the transport providers, several of which exceed requirements under road transport legislation, these controls include:

- GPS-based vehicle monitoring which enables 'real time' surveillance of vehicle location and speed and is able to detect if location specific speed limits are being exceeded;
- A quarterly industry safety briefing between ERA and transport providers, which provides a forum to collaboratively engage in transport related issues and the identification of opportunities for safety improvement;
- Ongoing monitoring of light vehicle travel between Darwin and Ranger mine. This travel is logged at the Bark Hutt mandatory rest stop.
- The ERA light vehicle committee review road conditions and identify opportunities to further enhance existing controls where travel between Darwin and Ranger mine cannot be undertaken by air.

For further information on controls associated with hazard identification and risk management refer to **Appendix 16**.

#### **12.8.1.5 Emergency Preparedness and Response**

An emergency preparedness plan is designed to provide an effective response in the event of an emergency. The extent of the response provided depends upon the characteristics of the consumable or product being transported, the incident type and the potential impacts that the incident may give rise to.

The pre-qualification process for transport providers requires, emergency response plans that are appropriate to foreseeable incident scenarios to be in place. These plans are verified through ongoing audits and conformance checks and augmented by ERA's emergency response plans which address the types of incident scenarios that the traffic risk assessment has considered. These plans form part of ERA's business resilience framework which take into consideration a range of emergency response scenarios. Elements of these plans are simulated during business resilience exercises in order to test their effectiveness and identify opportunities to further improve response to incident management.

In addition to specific response strategies, the transport route passes through a number of emergency service jurisdictions, each with its own disaster management strategy and team. Depending on the scale of the incident, these teams have the necessary resources and capability to deploy as required and assist in a range of emergency scenarios.

For further information on controls associated with emergency preparedness refer to **Appendix 16**.

#### **12.8.2 Controls Effectiveness**

An assessment of the effectiveness of the identified controls was undertaken based on the following:

- Controls that either prevent or mitigate a hazardous event; and
- The reliability of controls as managed through pre-qualification evaluations and qualification reviews as part of ERA's contractor management system.

### **12.8.2.1 Controls Compliance**

The Bow Tie diagrams for the identified risk events highlight current controls and their role in preventing an event from occurring, or mitigating the impact once an event has occurred. These controls were identified from the collective experience of transport providers and consumable suppliers, supplemented by knowledge of the consumables deliveries for existing operations at the Ranger mine.

The Bow Tie diagrams demonstrate that for each of the identified risk events, multiple layers of protection are in place. These include equipment design, procedures, preventative maintenance programs and emergency response processes. The current controls comply with, and in some cases exceed legislative requirements, codes of practice, voluntary accreditation schemes and the risk management practices of the transport industry.

A complete list of controls is provided in **Appendix 16**.

### **12.8.2.2 Controls Reliability**

The second aspect in assessing controls is to check that the controls are reliable and achieve their intended function. ERA's risk management framework and the systematic approach to contractor management, ensures that controls are consistent with regulatory requirements, and commensurate with ERA's traffic risk profile. A smaller set of controls is administered directly by government or statutory authorities.

The ongoing reliability of controls and their continued application is achieved through contractor review and third party auditing. ERA's pre-qualification process requires contractors to demonstrate that systems are in place to monitor health, safety and environmental performance through regular inspection and auditing protocols. This approach is consistent with recognised integrated management systems.

## **12.9 SUMMARY**

The Project will utilise the current road transport network and requires the same consumables as those currently used for existing Ranger operations, although the quantities will vary. The characteristics of these consumables are well understood, and their management is, and will continue to be, commensurate with ERA's understanding and experience.

The total traffic volume for the Ranger mine is anticipated to consist of up to 20 round trips per day, of which, the Project will contribute 6 round trips. The route capacity assessment has determined that these volumes, in addition to forecast other user traffic movement, are well within the capacity of the road transport network.

The traffic impact assessment considered risks to threatened and migratory species as identified under the EPBC Act and the Territory Parks and Wildlife Conservation Act, along with risks to public health and safety. It identified locations along the transport study corridor that are of greater environmental sensitivity to a spillage of consumables/product or associated with greater than average crash rates. The relative consequence of these events has been informed by expertise in transport logistics, and ecological impact assessment.

The likelihood of incidents involving public health and safety, environmental values and species of conservation significance has been quantified using available traffic data. For each of the event scenarios considered, using both relevant consequence and quantified likelihood, risk rankings have been derived.

Extensive preventative and mitigation strategies are currently in place around the transport of hazardous and dangerous goods and light vehicle travel to and from the Ranger mine. These controls comply with, and in some cases exceed legislative requirements, codes of practice, voluntary accreditation schemes and the risk management practices of the transport industry. These same controls will continue to be employed by the Project. In addition to these established controls, ERA collaboratively engages with its suppliers, transport providers and the NT Department of Transport to discuss transport risks, and identify opportunities to further improve road safety.

The risk assessment identified a total 246 risks across listed threatened and migratory species, environmental values, and public health and safety. The total number of risks for listed threatened and migratory species and environmental values is an outcome of assessing the same risk event at up to 14 separate locations. For example, in consideration of a release event, for listed threatened and migratory species, diesel was assessed at 14 locations while anhydrous ammonia was assessed at 7 locations. Similarly, the total number of risks to public safety is an outcome of assessing a primary and secondary event associated with each of the 14 consumables/product for the entire study road corridor.

The residual risk profile indicates 47 Class III risks and 4 Class IV risks. Of the consumables/materials and incident scenarios considered, there were no catastrophic consequences to listed threatened and migratory species or environmental values. The likelihood of an event associated with threatened and migratory species or environmental values was assessed as rare in the majority of cases and consequently there were no critical (Class IV) risks to listed threatened and migratory species or environmental values. Class IV risks were identified for public health and safety where there is potential for a catastrophic outcome should a vehicles collision occur.

The remainder of residual risk rankings were either Class I or Class II. The total number of risks reflects the assessment of a range of consumables at a number of locations for each of the sensitive receptors considered.

The Project does not materially alter the existing transport risk profile. These risks remain materially the same whether the Project proceeds or not. The assessment did not identify any additional controls that would significantly influence these risks. The current controls will continue to be maintained for the Project, providing a high level of ongoing protection to the public and the environment.

## 12.10 REFERENCES

- Australian Radiation Protection and Nuclear Safety Agency (2008) Code of Practice - Safe Transport of Radioactive Material. Radiation Protection Series No.2. Australian Capital Territory, ARPANSA Chief Executive Officer.
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