F

Risk Register (Environmental)
1. Site establishment (including vegetation clearing and soil disturbance) results in altered environment character and modification to ecological processes from construction of Project.

2. Potential event

   a. Site establishment (including vegetation clearing and soil disturbance) results in altered environment character and modification to ecological processes from construction of Project.

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    a. Site establishment (including vegetation clearing and soil disturbance) results in altered environment character and modification to ecological processes from construction of Project.

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Table 1: Environmental Factors and Potential Controls

<table>
<thead>
<tr>
<th>Ref</th>
<th>Potential event</th>
<th>EnvironmentalFactor</th>
<th>Description of consequences (including how the Project interacts with assets, values, uses and location)</th>
<th>Impact pathway</th>
<th>Potential Controls to Manage Risk</th>
<th>Initial Risk</th>
<th>Additional Controls Recommended to Reduce Risk</th>
<th>Standard Risk</th>
<th>Comment</th>
<th>Application Technical Report / EIS chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Diversion of Kerosene Camp Creek and alteration of waterway form</td>
<td>Surface water</td>
<td>Diversion of Kerosene Camp Creek and downstream alteration of the downstream catchments and disturbance</td>
<td>Surface water</td>
<td>Site drainage and implementation of riparian management practices to prevent.</td>
<td>High</td>
<td>Austrian Environmental Law; Riparian management; Surface water management</td>
<td>Medium</td>
<td>High</td>
<td>Appendix M, Chapter 7 - Surface water</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>by loss of vegetation, fauna and flora due to the diversion.</td>
<td></td>
<td>Development and implementation of a Riparian Management Plan (RMP); including</td>
<td>High</td>
<td>- Use of buffer zones, sediment fences and sediment ponds to control water run off and deposition.</td>
<td>Medium</td>
<td>- Develop and implement a Biodiversity Management Plan (BMP), including</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>at the downstream location of the diversion.</td>
<td></td>
<td>Riparian rehabilitation; Riparian revegetation; Development of a Site Management Plan (SMP); including</td>
<td>High</td>
<td>- Use of water sprays on haul roads and unsealed surfaces to control dust deposition.</td>
<td>Medium</td>
<td>- Implement road speed limits including lower speeds during highest dust events.</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Erosion during diversion and upstream and downstream</td>
<td></td>
<td>Development and implementation of a Water Management Plan, including</td>
<td>High</td>
<td>- Use of vehicles off-road</td>
<td>Medium</td>
<td>- Application for licence for dingo control;</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>alteration of waterway form and downstream location</td>
<td></td>
<td>Riparian rehabilitation; Riparian revegetation; Development of a Site Management Plan (SMP); including</td>
<td>High</td>
<td>- Use of vehicle off-road</td>
<td>Medium</td>
<td>- Workforce education program to prevent feeding of dingos;</td>
<td>Medium</td>
</tr>
<tr>
<td>7</td>
<td>Transport of sediment, machinery and vehicle movements and</td>
<td>Fauna</td>
<td>Loss of riparian woodland and groundwater dependent ecosystems downstream of the diversion and within the site.</td>
<td>Fauna</td>
<td>Increase in the incidence of weed species leading to reduction in habitat availability and reduction of listed threatened species such that the population declines.</td>
<td>High</td>
<td>- Use of buffer zones, sediment fences and sediment ponds to control water run off and deposition.</td>
<td>Medium</td>
<td>- Develop and implement a Biodiversity Management Plan (BMP), including</td>
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<td></td>
<td></td>
<td></td>
<td>riparian vegetation downstream of the diversion and within the waterway.</td>
<td></td>
<td>Implementation of a Riparian Management Plan (RMP); including</td>
<td>High</td>
<td>- Use of water sprays on haul roads and unsealed surfaces to control dust deposition.</td>
<td>Medium</td>
<td>- Implement road speed limits including lower speeds during highest dust events.</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Riparian removal and disturbance of riparian vegetation upstream of the diversion.</td>
<td></td>
<td>Riparian rehabilitation; Riparian revegetation; Development of a Site Management Plan (SMP); including</td>
<td>High</td>
<td>- Use of vehicles off-road</td>
<td>Medium</td>
<td>- Application for licence for dingo control;</td>
<td>Medium</td>
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<td></td>
<td></td>
<td></td>
<td>Fauna</td>
<td>Increase in the incidence of weed species leading to reduction in habitat availability and reduction of listed threatened species such that the population declines.</td>
<td>Medium</td>
<td>- Use of buffer zones, sediment fences and sediment ponds to control water run off and deposition.</td>
<td>Medium</td>
<td>- Develop and implement a Biodiversity Management Plan (BMP), including</td>
<td>Medium</td>
<td>- Application of the sustainable practices as per Project Description, and elements of Standards / Codes of Practice.</td>
</tr>
<tr>
<td>8</td>
<td>Transport of sediment, vehicle movements and inappropriate waste management allow for introduction of new weeds</td>
<td>Flora</td>
<td>Loss of riparian woodland and groundwater dependent ecosystems downstream of the diversion and within the site.</td>
<td>Flora</td>
<td>Increase in the incidence of weed species leading to reduction in habitat availability and reduction of listed threatened species such that the population declines.</td>
<td>High</td>
<td>- Use of buffer zones, sediment fences and sediment ponds to control water run off and deposition.</td>
<td>Medium</td>
<td>- Develop and implement a Biodiversity Management Plan (BMP), including</td>
<td>Medium</td>
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<td></td>
<td></td>
<td></td>
<td>Riparian rehabilitation; Riparian revegetation; Development of a Site Management Plan (SMP); including</td>
<td></td>
<td>Riparian rehabilitation; Riparian revegetation; Development of a Site Management Plan (SMP); including</td>
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<td></td>
<td>Development and implementation of a Riparian Management Plan (RMP); including</td>
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<td>- Use of vehicle off-road</td>
<td>Medium</td>
<td>- Application for licence for dingo control;</td>
<td>Medium</td>
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</tbody>
</table>

Note: Table 1 continues on the next page.
<table>
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<tr>
<th>Ref.</th>
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<th>Environmental Factor</th>
<th>Description of consequence</th>
<th>Action</th>
<th>Initial Risk</th>
<th>Additional Controls Recommended to Reduce Risk</th>
<th>Residual Risk</th>
<th>Comment</th>
<th>Applicable Technical Report / EIS chapter</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Wind erosion mobilising dust from exposed surfaces, such as from mine spoils, waste dumps, and open storage facilities</td>
<td>Air quality</td>
<td>Deposition of particulate material (PM10, PM2.5) and radioactive dust</td>
<td>Developing and implementing a project dust management plan and radiation management plan. To include standard dust mitigation procedures including:</td>
<td>Significant</td>
<td>Occasional controls</td>
<td>Occasional controls</td>
<td></td>
<td>Appendix Q, Chapter 13 - Air dispersion of radioactive dust or gas with impacts to human health</td>
</tr>
<tr>
<td>Ref</td>
<td>Potential event</td>
<td>Environmental/Factor impacted</td>
<td>Description of consequences</td>
<td>Planned Controls to Manage Risk</td>
<td>Initial Risk</td>
<td>Additional Controls Recommended to Reduce Risk</td>
<td>Reduced Risk</td>
<td>Comment</td>
<td></td>
</tr>
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<td></td>
</tr>
<tr>
<td>12</td>
<td>Loss or disturbance of fauna habitats due to dust deposition</td>
<td>Fauna</td>
<td>The operation of concentrator (comminution and beneficiation circuits) at the site will result in dispersion of particulate, gas or dust, leading to loss or disturbance of fauna habitats due to dust deposition</td>
<td>Developing and implementing a dust management plan</td>
<td>Medium Level</td>
<td>None</td>
<td>Medium Level</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Radiation from processing waste, cultural, social and plant and gas flare generation</td>
<td>Fauna</td>
<td>The operation of concentrator (comminution and beneficiation circuits) at the site will result in dispersion of emissions</td>
<td>Developing and implementing a dust management plan</td>
<td>Medium Level</td>
<td>None</td>
<td>Medium Level</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Noise and vibration from processing waste, cultural, social and plant and gas flare generation</td>
<td>Fauna</td>
<td>The operation of concentrator (comminution and beneficiation circuits) at the site will result in dispersion of emissions</td>
<td>Developing and implementing a dust management plan</td>
<td>Medium Level</td>
<td>None</td>
<td>Medium Level</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

**Noise and Vibration**

- **Appendix R, Chapter 14**
- **Appendix N, Chapter 10**
- **Appendix M, Chapter 9**
- **Appendix Q, Chapter 13**
- **Appendix P, Chapter 12**

**Radiation**

- **Appendix Q, Chapter 13**

**Air quality**

- **Develop and implement a Biodiversity Management Plan (BMP)**
- **Include consideration of blasting noise and vibration limits**
- **Minimising noise wherever possible**
- **Consideration of NT EPA Noise Guidelines for Development**

**Surface water**

- **Design all aspects of the rare earths plant to include emission controls and improve if necessary**
- **Develop and implement a Air and Dust Management Plan and Radiation Management Plan. To include standard dust mitigation procedures including:**
  - ** cảnh of noise monitoring for dust deposition and dispersion at site:**
  - **Use of buffer zones, sediment fences and sediment ponds to arrest the transport of water borne sediment from the site:**
  - **Sprays used on ore stockpiles (ROM and Low grade or long term storage):**
  - **Minimising dust. Some gases given off. Likely within a shed. Impact out of a shed with a scrubber (polymerisation with carbon fiber or baffle fiber).**

**Flora**

- **Develop and implement a Biodiversity Management Plan (BMP)**
- **Include consideration of blasting noise and vibration limits**
- **Minimising noise wherever possible**
- **Consideration of NT EPA Noise Guidelines for Development**

**Surface water**

- **Design all aspects of the rare earths plant to include emission controls and improve if necessary**
- **Develop and implement a Air and Dust Management Plan and Radiation Management Plan. To include standard dust mitigation procedures including:**
  - **न्हात of noise monitoring for dust deposition and dispersion at site:**
  - **Use of buffer zones, sediment fences and sediment ponds to arrest the transport of water borne sediment from the site:**
  - **Sprays used on ore stockpiles (ROM and Low grade or long term storage):**
  - **Minimising dust. Some gases given off. Likely within a shed. Impact out of a shed with a scrubber (polymerisation with carbon fiber or baffle fiber).**
Mining operations, including drilling, blasting and excavations result in ground borne vibration at elevated levels

Community
- Noise
- Dust
- Artificial light

Flora
- Disturbance
- Habitat modification
- Sudden death of plants

Fauna
- Habitat modification
- Sudden death
- Reduced foraging space

Aboriginal and cultural heritage
- Disturbance of Aboriginal sacred sites or heritage places (sites caused by vibration impacts e.g. subsidence or modification to observed deposits and structures)

Progressive water table drawdown from groundwater extraction

Decline in availability of water to existing and/or future users within the Greater Flinders Ranges, Northern Flinders Ranges (Ryan Well) and Flinders Ranges (Laramba). Less groundwater availability to surrounding agricultural lands.

Excessive vibration levels resulting in disruption to nesting / roosting / foraging behaviour or displacement of fauna into sub-optimal habitats, increasing their susceptibility to predation and competition.

Environmental Factors
- Noise
- Dust
- Artificial light

Mineralisation focused on palaeochannels, including Arden Roadhouse, project accommodation village and Aranas Research Station.

Palaeochannels
- Fluvial deposits
- Fluvial gravel deposits

Flora
- Invasions
- Habitat modification

Fauna
- Habitat modification
- Sudden death
- Reduced foraging space

Appendix K, Chapter 8 - Flora
Appendix U, Chapter 16 - Fauna
Appendix N, Chapter 10 - Flora
Appendix K, Chapter 8 - Flora
Appendix U, Chapter 16 - Fauna
Appendix N, Chapter 10 - Flora

Risk and Vibration

- Groundwater
- Sediment and Erosion Control Plan
- Mine Management Plan
- Ongoing AMD sampling and analysis
- Undertake hydrogeological investigations and predictive groundwater flow modelling;
- Install groundwater monitoring bores and provide substitute water for impacted users, or change to borefield management if water decline, therefore can assess likely ecosystem ability to respond to rate of change.

- Waste
- Sediment and Erosion Control Plan
- Mine Management Plan
- Ongoing AMD sampling and analysis
- Undertake hydrogeological investigations and predictive groundwater flow modelling;
- Install groundwater monitoring bores and provide substitute water for impacted users, or change to borefield management if water decline, therefore can assess likely ecosystem ability to respond to rate of change.

- Noise
- Vibration intensive activities during the least sensitive time periods, where possible
- Use of static rollers opposed to vibratory roller/compactors where possible
- Use of smaller capacity vibratory rollers, where possible
- No additional controls

- Dust
- Dust suppression
- Dust suppression
- Dust suppression
- Dust suppression

- Artificial light
- Avoid placement of future stock bores within close proximity of any potential for impact. Nearest registered site is around 5km south of RWA8.
- Avoid the flood of light into natural habitats and limit the escape of light into surrounding areas of human habitation.
- Ensure that artificial lighting is not directed upwards or laterally - Use lower rather than higher lighting installations
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- No additional controls

- Metals and Chemical Heritage
- Seismic investigation
- Seismic investigation
- Seismic investigation
- Seismic investigation

- Groundwater
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<th>Potential event</th>
<th>Impact pathway</th>
<th>Description of consequences</th>
<th>Potential Controls to Manage Risk</th>
<th>Initial Risk</th>
<th>Risk Rating</th>
<th>Additional Controls Recommended to Reduce Risk</th>
<th>Residual Risk</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Embankment failure of Tailings Storage Facility (TSF) containing radioactive material, metals, with localized contamination of groundwater exceeding guideline thresholds</td>
<td>Surface water</td>
<td>Contamination of surrounding land and ephemeral waterways from uncontrolled leachate resulting in ecosystem health, waterway downstream of TSF on Karina Creek, Nolans Creek and Thistlethwaite River</td>
<td>Development and implementation of Water Management Plan, Selection of appropriate ANCOLD risk category and adherence to relevant design standards for the provision of adequate storage capacity and freeboard allowance.</td>
<td>High</td>
<td>Medium Level</td>
<td>Avoid placement of future stock bores within close proximity</td>
<td>Low</td>
<td>The most effective method is to provide a buffer between the TSF and the receiving waterbody. Design features to include consideration of properties of storage materials (such as solubility of metals), practical life of liners, design of seepage collection systems.</td>
</tr>
<tr>
<td>21</td>
<td>Embankment failure of Tailings Storage Facility (TSF) containing radioactive material, metals, with localized contamination of groundwater exceeding guideline thresholds</td>
<td>Groundwater</td>
<td>Release of radioactive material leaching to groundwater, with impacted area exceeding guideline thresholds</td>
<td>Multi-stage neutralisation process, pH control, Thickener in beneficiation plant to reduce volume of entrained water, Groundwater monitoring program, Thicker in benefactor to reduce volume of entrained water, Multi-stage neutralisation process (pH control), Superintend soil from leachate and seepage disposal</td>
<td>High</td>
<td>Medium Level</td>
<td>Multi-stage neutralisation process, Thickener in benefactor to reduce volume of entrained water, Groundwater monitoring program, Superintend soil from leachate and seepage disposal</td>
<td>Low</td>
<td>The most effective method is to provide a buffer between the TSF and the receiving waterbody. Design features to include consideration of properties of storage materials (such as solubility of metals), practical life of liners, design of seepage collection systems.</td>
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<td>Embankment failure of Tailings Storage Facility (TSF) containing radioactive material, metals, with localized contamination of groundwater exceeding guideline thresholds</td>
<td>Surface water</td>
<td>Contamination of surrounding land and ephemeral waterways from uncontrolled leachate resulting in ecosystem health, waterway downstream of TSF on Nolans Creek, Karina Creek, Nolans Creek and Thistlethwaite River</td>
<td>Development and implementation of Water Management Plan, Selection of appropriate ANCOLD risk category and adherence to relevant design standards for the provision of adequate storage capacity and freeboard allowance.</td>
<td>High</td>
<td>Medium Level</td>
<td>Avoid placement of future stock bores within close proximity</td>
<td>Low</td>
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<td>Groundwater</td>
<td>Release of radioactive material leaching to groundwater, with impacted area exceeding guideline thresholds</td>
<td>Multi-stage neutralisation process, pH control, Thickener in beneficiation plant to reduce volume of entrained water, Groundwater monitoring program, Thicker in benefactor to reduce volume of entrained water, Multi-stage neutralisation process (pH control), Superintend soil from leachate and seepage disposal</td>
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<td>Description of consequence</td>
<td>Relevant Design Standards for the provision of Adequate Storage Capacity and Freeboard Allowance</td>
<td>Selection of Appropriate ANCOLD Risk Category</td>
<td>Development and Implementation of Water Management Plan</td>
<td>Embankment Piezometers and Survey Pins, Regular Dam Inspections</td>
<td>Adherence to prescribed maximum operating level and Retention of Freeboard</td>
<td>Application Technical Report / EIS chapter</td>
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<td>Surface water</td>
<td>Contamination of a significant groundwater resource due to an uncontrolled release resulting in impact on ecosystem health</td>
<td>- Adherence to prescribed maximum operating level and retention of freeboard</td>
<td>- Selection of appropriate ANCOLD risk category</td>
<td>- Development and implementation of Water Management Plan</td>
<td>- Adherence to prescribed maximum operating level and retention of freeboard</td>
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<td>Appendix K, Chapter 8 - Surface water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Groundwater</td>
<td>Immediate inundation of flora within flow path of failed pond. Process plant, directed to one of the ponds.</td>
<td>- Adherence to prescribed maximum operating level and retention of freeboard</td>
<td></td>
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<td></td>
<td>Appendix K, Chapter 8 - Groundwater</td>
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<td></td>
</tr>
<tr>
<td>Flora</td>
<td>Localised loss or disturbance of fauna habitats due to inundation or contamination of surrounding land and ephemeral waterways from uncontrolled release</td>
<td>- Adherence to prescribed maximum operating level and retention of freeboard</td>
<td></td>
<td></td>
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<td></td>
<td>Appendix K, Chapter 8 - Flora</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fauna</td>
<td>Immediate inundation of flora within flow path of overtopped pond, with secondary longer term impacts including potential vegetation loss associated with the contamination of surrounding land and ephemeral waterways from the uncontrolled release</td>
<td>- Adherence to prescribed maximum operating level and retention of freeboard</td>
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<td>Description of consequence</td>
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<td>Planned Controls to Manage Risk</td>
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<td>Additional Controls recommended to reduce risk</td>
<td>Comment</td>
<td>Reference Technical Report / EIS chapter</td>
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<tr>
<td>28</td>
<td>Ingestion or exposure by wildlife, including Princess Parrot, of Contamination of ephemeral waterways and subsequently After decommissioning the mine void modelled to act as a sink, Contamination of a groundwater resource, including acidity, salinity</td>
<td>Medium Level</td>
<td>Medium Level</td>
<td>Low Level</td>
<td>No additional controls</td>
<td>Moderate, Appendix C, Chapter 12 - Radiation Management Plan. To include standard dust mitigation procedures: including</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>First flush</td>
<td>Concentration of a groundwater resource, including acidity, salinity or metals.</td>
<td>Low</td>
<td>Low</td>
<td>No additional controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>First flush</td>
<td>Physical isolation of radionuclide material by non-radioactive material;</td>
<td>Medium</td>
<td>Medium</td>
<td>No additional controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>First flush</td>
<td>Contamination of a groundwater resource, including acidity, salinity or metals.</td>
<td>Low</td>
<td>Low</td>
<td>No additional controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>First flush</td>
<td>Surface water balance. Undermine hydrogeological investigations;</td>
<td>Medium</td>
<td>Medium</td>
<td>No additional controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>First flush</td>
<td>Contamination of a groundwater resource, including acidity, salinity or metals.</td>
<td>Low</td>
<td>Low</td>
<td>No additional controls</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ref. | Potential event | Impact pathway | Environmental Factor | Description of consequence | Initial Risk | Additional Controls Recommended to Reduce Risk | Residual Risk | Comment | Application Technical Report / EIS chapter
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
34 | Leak in concentrate slurry pipeline between Mine Site and Process | Hydrochloric acid, cerium carbonate, barium chloride, RE chloride. | Concentrate to surface water. | Occurrence is considered likely. Spill could result in contamination of soils and groundwater resources. Assessors assessed 6 levels of loss. | High | Additional controls | Medium | None additional controls | Appendix N, Chapter 10 - Environmental Impact Statement - Risk Register
35 | Leak in sewage pipes from failure, physical impact or vandalism resulting in contamination to groundwater | Hydrochloric acid, cerium carbonate, barium chloride, RE chloride. | Contaminant to groundwater in contamination of soils and groundwater resources. | Occurrence is considered likely. Spill could result in contamination of soils and groundwater resources. Assessors assessed 6 levels of loss. | Medium | Additional controls | Low | None additional controls | Appendix N, Chapter 10 - Environmental Impact Statement - Risk Register
36 | Pipeline failures, including structural failure and failure of access conduits, products or galleon of gas inventory | Natural history, or injury | Air or equipment | Applicable risk assessment process. | Low | Additional controls | Insignificant | None additional controls | Appendix O, Chapter 11 - Human Health and Safety
37 | Road vehicle accidents due to the transport of materials and personnel offsite or public roads, including vehicle to vehicle impacts, singles vehicle incidents (collides, veers over the road, vehicle impact with structure) and vehicle to pedestrian impacts. | Natural history, or injury | Minor injury to fatality. | Maximum reasonable consequence could be a multiple fatality event when multiple vehicles are involved or multiple people are the vehicle(s). The event may occur at any time throughout the life of the project. | Low | Additional controls | Insignificant | None additional controls | Appendix N, Chapter 10 - Environmental Impact Statement - Risk Register
38 | Transit of materials and personnel purpose related during project works impacts on road network operations, impact on operational network capacity. | Natural history, or injury | Lack of control of contamination of places. | Occurrence is considered likely. Spill could result in pollution of surrounding land. | Medium | Additional controls | Medium Level | None additional controls | Appendix O, Chapter 11 - Human Health and Safety
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
| | | | | | | | | |
Transport of materials and personnel on public roads results in:

- Consequences will vary depending on the height and location of the incident, including derailment, associated with the transport of materials by rail, resulting in loss of containment to the environment.
- The event may occur at any time throughout the life of the project.
- The event may occur when multiple vehicles are involved or multiple personnel in the vehicle(s).
- The likelihood will vary depending on severity of impact between vehicles (e.g. failure of scaffold with multiple fatalities may occur e.g. failure of scaffold with multiple fatalities).
### Personnel exposed to a confined space incident e.g. engulfment

- **Consequences will vary depending on the size of material falling**
- **Personnel struck by ground failure, rock fall or flyrock event in**
  - **Consequences will vary depending on the type of contact and**
  - **Consequences will vary depending on the situation and will range**
- **Personnel in contact with an electrical source (low or high voltage)**

#### Exposed to electrical sources at substations, transformers, generators, local panels, switching activities. Electricians can be exposed to electrical installing electrical equipment or infrastructure, and during construction, operation or decommissioning. Exposed could occur for a variety of reasons including faulty cables greater than 1 kV AC or 1.5 kV DC.

- **High voltage includes fixed assets, overhead and underground assets at substations, transformers, generators, local panels, switching activities. Electricians can be exposed to electrical installing electrical equipment or infrastructure, and during construction, operation or decommissioning. Exposed could occur for a variety of reasons including faulty cables greater than 1 kV AC or 1.5 kV DC.**

- **Low voltage includes all electrical sources less than 1 kV, for example lighting, pumps, portable tools, weaternisers, etc. High voltage includes fixed assets, overhead and underground cables greater than 1 kV or 3.5 kV DC.**

- **Exposure could occur for a variety of reasons including faulty equipment, equipment damage, excavation or penetration, when personnel are working with electrical equipment or infrastructure, during switching activities. Exposures can be exposed to electrical sources at substations, transformers, generators, local panels, switching activities. Non-electrical personnel can be exposed through extension cords, portable tools and distribution systems are considered in this assessment as well as contact with cable ties and to electrical cables and contacts with overhead cabling.**

### Impact pathway

<table>
<thead>
<tr>
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<th>Environmental factor trigger</th>
<th>Description of consequences</th>
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<th>Residual Risk</th>
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<tr>
<td>44</td>
<td>Personnel exposed to a confined space incident e.g. engulfment, partial or complete asphyxia</td>
<td></td>
<td></td>
<td>Medium</td>
<td>Low</td>
<td>None</td>
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<td>Personnel exposed to a confined space incident e.g. engulfment, partial or complete asphyxia</td>
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<td></td>
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<td>Low</td>
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### Potential Events - Human Health and Safety

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<td>Personnel struck by a dropped or swinging load during lifting by a lifting device or tipping a lifting device.</td>
<td>Personnel impacted by an explosives incident during transport, personnel impacted by fire or explosion. This includes equipment and structures. Consequences will vary depending on the size of the load and how personnel are impacted and will range from minor injury to fatality. The maximum reasonable consequence would be a single fatality. The event may occur at any time throughout the life of the project.</td>
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### Planned Controls to Manage Risk

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### Human Health and Safety

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### Application Technical Report / EIS chapter

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Personnel impacted by a tyre or rim incident associated with mobile equipment. Incidents may occur during tyre maintenance activities, while personnel are engaged with tyres and include, but are not limited to, dropped tyres, tyre explosion, dropped tire and rim upon release.

Causes include:
- Tyre handler failure:
  - Tyre explosion (manufacturing defects, damage, hot work environment, contact with mechanical source, poor inflation management, vehicle overload); numerous toes, lighting strike, mechanical heat source; e.g., buttrose, vehicle fire;
  - Pressure release; tyre explosion (damaged rim, tire, overloading, tire deflated prior to changing; over tyre changing/braking;)
  - Drop from tyre handler failure, restricted work area, unplanned movement of plant, incorrect storage.

Personnel exposed to a flood or inrush event into the pit or workings and includes:

- Isolation points, incorrect isolation etc.;
- Interlock failure, modifications to guards, defective / damaged equipment e.g. screens, engine bays, drills etc.;
- Guarding failures (failure to replace guards, bypassing guards, inadequate guarding);
- Poor stacking / restraining practices etc.

Falling equipment / components from structures (poor design, equipment etc. Structures include buildings, concentrator, vehicle crossings or dam failures. Common causes are:

- Natural event flooding (failure of drainage system insufficient sump / pump capacity, accessing flooded crossings etc.);
- Environmental Factor /馥
  - Adverse weather procedure;
  - Weather monitoring;
  - Structural and equipment inspection and maintenance regime including HDPE liner, shear stress / slope analysis, level sensors; interlocks, vibration monitoring, level sensors;
  - Catch trays / mesh above walkways;
  - Emergency response procedures, team and equipment;

- People / equipment / products through to fatality from engulfment.

The event may occur at any time throughout the life of the project. The maximum reasonable consequence would be a single fatality. 

Nolans Project Environmental Impact Statement – Risk Register

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<tr>
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<th>Impact pathway</th>
<th>Environmental Factor</th>
<th>Description of consequence</th>
<th>Planned Controls to Manage Risk</th>
<th>Initial Risk</th>
<th>Standard Risk</th>
<th>Additional Controls Recommended to Reduce Risk</th>
<th>Comment</th>
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<tbody>
<tr>
<td>54</td>
<td>Personnel impacted by a tyre or rim incident associated with mobile equipment. Incidents may occur during tyre maintenance activities, while personnel are engaged with tyres and include, but are not limited to, dropped tyres, tyre explosion, dropped tire and rim upon release.</td>
<td>Tyre and rim management Plan including: Tyre and rim design specifications and associated procurement management; Tyre &amp; rim inspection and maintenance regime including pre-start inspections and routine maintenance change out; No work on or near thin tires or rims; Signage &amp; demarcation of electrical cables; Procedure for working near overhead powerlines; Tyre management standards; Tyre fire procedures; Tyre and rim safety procedures; Fire extinguishers &amp; suppression on mobile equipment; Tyre maintenance and handling facility; Tyre and rim handling and isolation point training and operator competency; Competency of tyre operator; Tyre eg; Emergency response procedures, team and equipment;</td>
<td>Low</td>
<td>Low</td>
<td>No additional controls</td>
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</tbody>
</table>
Personnel impacted by a high pressure release (stored energy). This may occur during construction or operations. This includes high pressure releases from pipes and storage vessels where personnel may be impacted either by fluidprojection or shock by flying debris. Fluids may include greases, oils, hydrocarbons, gas etc.

**Cause include:**
- Equipment failure (poor design, incorrect material rating, poor installation, aged/damaged equipment, over-pressurisation etc.);
- Human failure (lack of effective, suitable, operating outside specifications etc.);
- External factors (fire impact, external mechanical damage etc.).

**Human health and safety**

- Personnel in close proximity to the pressure release (vessel) may be struck by flying debris resulting in either a minor injury or fatality if the object is large enough or where it strikes the person.
- The maximum reasonable consequence would be a single fatality.
- The event may occur at any time throughout the life of the project.

**Personnel exposed to hazardous materials via all means**
- **Causes include:**
  - Handling, use & disposal (inappropriate use, isolation failure, incompatible storage, external impact to storage facilities);
  - Equipment factors (poor design e.g. incorrect material rating, poor installation, aged/damaged equipment, over-pressurisation etc.);
  - External factors (fire impact, external mechanical damage etc.).

**Human health and safety**

- Personnel may experience heat stress when working in hot conditions either due to direct solar radiation or from hot surfaces, contact with hot water or other hot surfaces.
- The maximum reasonable consequence would be a single fatality.
- The event may occur at any time throughout the life of the project.

**Personnel exposed to hazardous materials via all means**
- **Causes include:**
  - Liquid bodies include tailings and residue storage facilities (flotation basins, tailings, water beach recirc, mechanical recirc, phosphate pools, evaporation ponds), surge, spray water, bank etc.;
  - Liquid bodies will be present in the pit, processing plant, tailing and residue storage areas, water and waste treatment plants.

**Human health and safety**

- Liquid bodies may include minor injuries e.g. due to trips and falls through fatigue (shovelling).
- The maximum reasonable consequence would be a single fatality.
- The event may occur at any time throughout the life of the project.

**Personnel exposed to hazardous materials via all means**
- **Causes include:**
  - Transport & storage releases (leaks from tanks, containers, piping, valves etc., incompatible storage, external impact to storage facility, transport vehicle collision, overflow etc.);
  - Handling, use & disposal (inappropriate use, isolation failure, incompatible disposal, poor identification / labelling of materials, over- or under pressure event etc.).

**Human health and safety**

- Consequences may include minor injuries e.g. due to trips and falls through fatigue (shovelling).
- The maximum reasonable consequence would be a single fatality.
- The event may occur at any time throughout the life of the project.

**Personnel exposed to hazardous materials via all means**
- Change management;
- Equipment design specifications and associated procurement specifications - includes pressure rating, pressure relief, isolation procedures etc. Based on relevant design standards;
- Equipment maintenance program including pre-start inspections, routine maintenance and statutory pressure vessel inspections;
- Change management;
- Equipment and task specific procedures / work instructions;
- Equipment and task specific training and competency assessment (including ongoing refresher).

**Human health and safety**

- Exposure to hazardous materials via all means includes:
  - Isolation procedure and associated training;
  - Change management;
  - Isolation procedure and associated training;
  - Change management - includes pressure rating, pressure relief, exclusion procedures etc.;
  - Equipment maintenance program including pre-start inspections, routine maintenance and statutory pressure vessel inspections;
  - Change management;
  - Equipment and task specific procedures / work instructions;
  - Equipment and task specific training and competency assessment (including ongoing refresher).

**Personnel exposed to hazardous materials via all means**
- Change management;
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- Equipment maintenance program including pre-start inspections, routine maintenance and statutory pressure vessel inspections;
- Change management;
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- Equipment and task specific training and competency assessment (including ongoing refresher).

**Human health and safety**

- Exposure to hazardous materials via all means includes:
  - Isolation procedure and associated training;
  - Change management;
  - Isolation procedure and associated training;
  - Change management - includes pressure rating, pressure relief, exclusion procedures etc.;
  - Equipment maintenance program including pre-start inspections, routine maintenance and statutory pressure vessel inspections;
  - Change management;
  - Equipment and task specific procedures / work instructions;
  - Equipment and task specific training and competency assessment (including ongoing refresher).
<table>
<thead>
<tr>
<th>Ref.</th>
<th>Potential event</th>
<th>Description of consequences (Clearly outline areas where the final impact. Describe whether in construction, operation or decommissioning)</th>
<th>Initial Risk</th>
<th>Risk Rating</th>
<th>Additional Controls Recommended to Reduce Risk</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>54</td>
<td>Personnel engulfed in RE materials (e.g. bins, hoppers, chutes, etc. personnel may be engulfed while on foot or in mobile equipment)</td>
<td>The maximum reasonable consequence would be a single fatality. The event may occur at any time throughout the life of the project.</td>
<td>Rare</td>
<td>Low</td>
<td>Education and training programs;</td>
<td></td>
</tr>
<tr>
<td>Ref</td>
<td>Human health and safety</td>
<td>Environmental Factors</td>
<td>Description of consequence</td>
<td>Initial Risk</td>
<td>Potential Controls to Manage Risk</td>
<td>Residual Risk</td>
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<td>----------------------------------</td>
<td>--------------</td>
</tr>
<tr>
<td>61-62</td>
<td>Remote location due to the increased time for emergency response</td>
<td>Personnel exposed to increased risks due to the remote location of the site and/or undertaking long and isolated work. This includes individuals undertaking unprepared work in working in an isolated area, includes any incident where time for response is increased due to insufficient access to communications and monitoring networks as well as emergency, health and welfare breakdown services. Personnel conducting remote or isolated work may include exploration crews, drillers, geologists etc. surveyors, shot fliers, boom crews, supervisors and environmental specialists, third party contractors (electrical personnel, fibers etc.)</td>
<td>The remote location of the site increases the risk to personnel due to the increased time for emergency response. Potential construction failures and black spots, long travel distances etc.</td>
<td>Moderate</td>
<td>- Fitness for work management system including hours of work, rest breaks and fatigue management; - Equipment and task specific training and competency; - Equipment and task specific procedures / work instructions; - Pressure sensors;</td>
<td>Unlikely</td>
</tr>
<tr>
<td>63</td>
<td>Public exposure on footpath and across the operations.</td>
<td>Personnel may sustain injuries due to poor lifting technique, poor workplace and work station layout, incorrect working posture and position, extended duration or frequency of task, over reaching or extension of arm, repetitive actions, increased rate of work, increased weight, work environment e.g. dirty surfaces, confined or restricted work areas.</td>
<td>The maximum reasonable consequence would be musculoskeletal effects to tissues and joints or musculoskeletal disorders</td>
<td>Probable</td>
<td>- Building design specifications include radiation exposure considerations including ventilation requirements; - Operations procedures include radiation exposure considerations; - Access restrictions to areas of higher radiation levels; - Dust suppression systems e.g. roads, stockpiles, tipping points, conveyors, crushers etc.; - Dust collection systems and scrubbers; - Mobile equipment design specifications include filtered air conditioning systems; - Radiation monitoring program;</td>
<td>Insignificant</td>
</tr>
<tr>
<td>64</td>
<td>Exposure may occur through the following routes:</td>
<td>- Direct gamma 'shine' or direct irradiation from large masses of low specific activity material or smaller masses of high specific activity material.</td>
<td>- Direct gamma 'shine' or direct irradiation from large masses of low specific activity material or smaller masses of high specific activity material.</td>
<td>Insignificant</td>
<td>- PPE - respiratory protection; - Radiation Safe Work Permit; - Mobile equipment design specifications include filtered air conditioning systems; - Radiation monitoring program; - Radiation Safe Work Permit; - RPS - regulatory radiation; - Radioactive Waste Management Plan (RWMP) (including RPS #9):</td>
<td>Insignificant</td>
</tr>
<tr>
<td>65</td>
<td>Public exposure as a result of emissions from the Project</td>
<td>Exposure may occur through the following routes:</td>
<td>- Direct gamma 'shine' or direct irradiation from large masses of low specific activity material or smaller masses of high specific activity material.</td>
<td>Insignificant</td>
<td>- Monitoring and recording: any changes from original assumptions, with review and implementation of additional viable planned controls.</td>
<td>Insignificant</td>
</tr>
<tr>
<td>66</td>
<td>Public exposure during decommissioning and or shutdown</td>
<td>Exposure may occur through the following routes:</td>
<td>- Direct gamma 'shine' or direct irradiation from large masses of low specific activity material or smaller masses of high specific activity material.</td>
<td>Insignificant</td>
<td>- Monitoring and recording: any changes from original assumptions, with review and implementation of additional viable planned controls.</td>
<td>Insignificant</td>
</tr>
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</table>

### Appendix P, Chapter 11 - Human Health and Safety

<table>
<thead>
<tr>
<th>Level of Likelihood</th>
<th>Risk Rating</th>
<th>Suitable planned controls.</th>
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<tbody>
<tr>
<td>Rare</td>
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<tr>
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<td>Low</td>
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### Appendix O, Chapter 11 - Radiation

<table>
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<th>Level of Likelihood</th>
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### Appendix N, Chapter 11 - Human Health and Safety

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<th>Level of Likelihood</th>
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### Appendix M, Chapter 11 - Radiation

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### Appendix L, Chapter 11 - Human Health and Safety

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### Appendix K, Chapter 11 - Radiation

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### Appendix J, Chapter 11 - Human Health and Safety

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### Appendix I, Chapter 11 - Radiation

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### Appendix H, Chapter 11 - Human Health and Safety

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### Appendix G, Chapter 11 - Radiation

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### Appendix F, Chapter 11 - Human Health and Safety

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### Appendix E, Chapter 11 - Radiation

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### Appendix D, Chapter 11 - Human Health and Safety

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### Appendix C, Chapter 11 - Radiation

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### Appendix B, Chapter 11 - Human Health and Safety

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### Appendix A, Chapter 11 - Radiation

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<th>Level of Likelihood</th>
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<tr>
<td>High</td>
<td>High</td>
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</tr>
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</table>
Unintentional or emergency release of radioactive gases or residues

Worst credible consequence is rupture or split in line between the radioactive process plant and the RSF, with loss of study material. Material discharge is assumed to be over a 1-hour period.

Consistent development and assessment of Radionuclide Release Management Plan (RMP), including Radiological Information Management Plan (RIMP); Personal protection facilities and mobile equipment work top;

No additional controls

Appendix P, Chapter 12 - Radionuclear Release

68reo

Exposures occur through inhalation of radioactive elements containing and partitioning in the processing circuit, waste handling facilities and waste storage facilities and waste storage facilities

Worst credible consequence is exposure of construction, operation or decommissioning.

Consistent with relevant legislative requirements including the Code of Practice on Radionuclear Waste Management (CNWM 1990), the Code of Practice on Safe Storage of Radionuclear Materials (CPSRF 1995), Radiation Management Plan (RMP); Radiological Waste Management Plan (RWMP); and Code of Practice on Safe Transport of Radionuclear Materials (CPSRT 1993).

No additional controls

Appendix P, Chapter 12 - Radionuclear Release

70reo

Radionuclide concentration due to plant or process equipment contaminated with ore or process materials leaving the site while still contaminated.

Worst credible consequence is impact to populations of listed species due to exposure exceeding the trigger level (of 10 uGy/h).

Consistent with relevant legislative requirements including the Code of Practice on Radionuclear Waste Management (CNWM 1990), the Code of Practice on Safe Storage of Radionuclear Materials (CPSRF 1995), Radiation Management Plan (RMP); Radiological Waste Management Plan (RWMP); Plant and process design specifications include radionuclide concentration considerations including radionuclide concentration. Dust-suppression systems e.g. water, sprinkling, finished and similarly

No additional controls

Appendix P, Chapter 12 - Radionuclear Release

71reo

Progressive rehabilitation of landforms during operations to minimise environmental impacts

Worst credible consequence is exposure of construction, operation or decommissioning.

Consistent with relevant legislative requirements including the Code of Practice on Radionuclear Waste Management (CNWM 1990), the Code of Practice on Safe Storage of Radionuclear Materials (CPSRF 1995), Radiation Management Plan (RMP); Radiological Waste Management Plan (RWMP); and Code of Practice on Safe Transport of Radionuclear Materials (CPSRT 1993).

No additional controls

Appendix P, Chapter 12 - Radionuclear Release

72reo

Radionuclide concentration of similar activities in the pit lake sediments

Worst credible consequence is exposure of construction, operation or decommissioning.

Consistent with relevant legislative requirements including the Code of Practice on Radionuclear Waste Management (CNWM 1990), the Code of Practice on Safe Storage of Radionuclear Materials (CPSRF 1995), Radiation Management Plan (RMP); Radiological Waste Management Plan (RWMP); and Code of Practice on Safe Transport of Radionuclear Materials (CPSRT 1993).

No additional controls

Appendix P, Chapter 12 - Radionuclear Release

73reo

Closure designs not developed in detail to enable appropriate closure execution, resulting in significantly higher closure cost above closure prioritisation

Worst credible consequence is exposure of construction, operation or decommissioning.

Consistent with relevant legislative requirements including the Code of Practice on Radionuclear Waste Management (CNWM 1990), the Code of Practice on Safe Storage of Radionuclear Materials (CPSRF 1995), Radiation Management Plan (RMP); Radiological Waste Management Plan (RWMP); and Code of Practice on Safe Transport of Radionuclear Materials (CPSRT 1993).

No additional controls

Appendix W, Chapter 14 - Radiological and Decommissioning

74reo

Closure plans not accepted by CEOs of Mining and Energy (CNEM), including due to lack of transparent acceptance, resulting in delays to Project approval and requirement for more extensive rehabilitation.

Worst credible consequence is exposure of construction, operation or decommissioning.

Consistent with relevant legislative requirements including the Code of Practice on Radionuclear Waste Management (CNWM 1990), the Code of Practice on Safe Storage of Radionuclear Materials (CPSRF 1995), Radiation Management Plan (RMP); Radiological Waste Management Plan (RWMP); and Code of Practice on Safe Transport of Radionuclear Materials (CPSRT 1993).

No additional controls

Appendix W, Chapter 14 - Radiological and Decommissioning

75reo

Flaw managed or waste materials during operations leads to closure plans being underrun or costly.

Worst credible consequence is exposure of construction, operation or decommissioning.

Consistent with relevant legislative requirements including the Code of Practice on Radionuclear Waste Management (CNWM 1990), the Code of Practice on Safe Storage of Radionuclear Materials (CPSRF 1995), Radiation Management Plan (RMP); Radiological Waste Management Plan (RWMP); and Code of Practice on Safe Transport of Radionuclear Materials (CPSRT 1993).

No additional controls

Appendix W, Chapter 14 - Radiological and Decommissioning
<table>
<thead>
<tr>
<th>Ref</th>
<th>Potential event</th>
<th>Environmental Factor / Description of consequences</th>
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<th>Residual Risk</th>
<th>Additional Controls Recommended to Reduce Risk</th>
<th>Comment</th>
<th>Application Technical Report / EIS chapter</th>
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<tbody>
<tr>
<td>17</td>
<td>Mine closure</td>
<td>Delays in rehabilitation by project proponent, including through rework or underestimated seepage resulting in non sustainable exceptions and detrimental effects. Potentially exacerbated by closure designs not yet developed in detail at time of early closure.</td>
<td>Rare</td>
<td>Rare</td>
<td>- Undertake inspections &amp; monitoring</td>
<td></td>
<td>Appendix W, Chapter 10: Mine Rehabilitation, Decommissioning and Closure</td>
</tr>
<tr>
<td></td>
<td>Mine closure</td>
<td>Delays in effective rehabilitation, with unremediated Project site potentially acting as source of ongoing environmental hazards. Close credit consequence is involuntary administration, with NT Government to complete remediation with bands shortfall and consequential budgetary impact.</td>
<td>Rare</td>
<td>Rare</td>
<td>- Complete cover design trials at site prior to implementation; - Permit plans/designs planned to be refined during operations.</td>
<td></td>
<td>Appendix W, Chapter 10: Mine Rehabilitation, Decommissioning and Closure</td>
</tr>
<tr>
<td>20</td>
<td>Rehabilitation plan not adequately developed or performing to design due to ineffective implementation of design in poor rehabilitation execution or design failure.</td>
<td>Rare</td>
<td>Rare</td>
<td>- Update further sampling/monitoring to accurately define level and extent of any ground contamination and improve probabilistic estimates.</td>
<td></td>
<td>Appendix W, Chapter 10: Mine Rehabilitation, Decommissioning and Closure</td>
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</tr>
<tr>
<td>21</td>
<td>Mine closure</td>
<td>Delays in effective rehabilitation by project proponent, including through rework or underestimated seepage resulting in non sustainable exceptions and detrimental effects. Delays associated with cost overruns could be period of several years, resulting in increased risk of closure in adverse economic conditions. Potentially exacerbated by failure of post-closure TSF cover and batters, leading to erosion, with resultant seepage loss of material to the environment.</td>
<td>Rare</td>
<td>Rare</td>
<td>- Contain and manage any percolation via: surface surface waterl flow, with resultant downstream effects on dependent ecosystems.</td>
<td></td>
<td>Appendix W, Chapter 10: Mine Rehabilitation, Decommissioning and Closure</td>
</tr>
</tbody>
</table>