Development Proposal and Environmental Management Plan for the Riley Mine Project

November 2012
Volume 1 of 2
Revision B
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Foreword

This Development Proposal and Environmental Management Plan (DPEMP) has been prepared to support a development application by Venture Minerals Limited to the West Coast Council.

The application is for the development and operation of a new hematite DSO mine (mining lease application number 5M/2012), to be located approximately 18 km west of Tullah in western Tasmania.

The proposed operations will be located on Crown Land, which is currently managed by Forestry Tasmania. Venture Minerals has submitted an application for a mining lease to Mineral Resources Tasmania.

The purpose of this DPEMP is to provide:

- Supporting documentation to the development application to the West Coast Council
- A basis for the West Coast Council and the Board of the Environment Protection Authority to consider the planning and environmental aspects of the proposal under the Land Use Planning and Approvals Act 1993 and the Environmental Management and Pollution Control Act 1994
- A basis for the Commonwealth Department of Sustainability, Environment, Water, Population and the Communities and the Minister for the Environment to make an assessment and approval decision under the Environment Protection and Biodiversity Conservation Act 1999
- A basis for the conditions under which any approval can be given
- A source of information for interested individuals and groups to gain an understanding of the proposal.

The DPEMP has been prepared according to the Board of the Environment Protection Authority’s (EPA) General Guidelines for the preparation of a Development Proposal and Environmental Management Plan for Level 2 activities and ‘called in’ activities, May 2010 and the EPA’s Guidelines for the preparation of a Development Proposal and Environmental Management Plan for Venture Minerals Ltd Riley’s Creek DSO Hematite Mine, off Pieman Road, West Coast, Tasmania, 8 October 2012.

The DPEMP guidelines were developed by the Board of the EPA based on the information supplied by the proponent in a Notice of Intent (NOI) submitted 27 July 2012 in accordance with the Board of the EPA NOI guidelines and the requirements of Section 27B of the Environmental Management and Pollution Control Act 1994.

The project was referred in April 2012 to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC). The DSEWPC determined in 24 July 2012 that the action was a controlled action and subsequently that it was to be assessed under the Bilateral Agreement between the Commonwealth and Tasmania.

The EPA’s DPEMP guidelines, including the DSEWPC guidelines, were issued to Venture Minerals on 8 October 2012.

The development application will be advertised by the West Coast Council in relevant newspaper(s) and the DPEMP will be available for public scrutiny at the:

- West Coast Council offices in Queenstown, and
- The Environment Protection Authority’s internet site.
For a period of 42 days following the formal newspaper advertisement of the application any member of the public may submit a representation on the proposal, describing their comments and/or objections.

Representations must be in writing and lodged within the statutory period with:

Mr Paul Lockwood  
General Manager  
West Coast Council  
PO Box 63  
Queenstown TAS 7467.

Council will consider the development application in accordance with its obligations under the *Land Use Planning and Approvals Act 1993* and the *Environmental Management and Pollution Control Act 1994*.

Because the proposed activity is deemed a Level 2 activity under Schedule 2 of the *Environmental Management and Pollution Control Act 1994*, the Board of the Environment Protection Authority (the Board) will assess the potential environmental impacts and impose conditions for the proposed activity in accordance with the *Environmental Management and Pollution Control Act 1994*. The EPA has advised that the assessment will be undertaken as a class 2C, the highest assessment class.

The environmental conditions from the Board’s assessment will be forwarded to the West Coast Council for inclusion in the permit, if and when Council approves the proposed activity.

Any persons who made written representations on the proposal will be notified of the decision.

Persons aggrieved by a decision to approve the development, or by the conditions or restrictions of the permit, may appeal to the Resource Management and Planning Appeal Tribunal (the Tribunal). The applicant, Venture Minerals Ltd, may also appeal a refusal of the proposal or the conditions or restrictions imposed.

Appeals must be lodged in writing within 14 days of notification. The Tribunal will hear appeals and either confirm, overturn or modify the decision and/or the permit conditions and restrictions.

At the Commonwealth level, the Minister for Sustainability, Environment, Water, Population and Communities will make a separate approval decision under the EPBC Act.
Executive summary

Venture Minerals Limited is proposing to develop a direct shipping ore (DSO) hematite mine located approximately 16 km west Tullah in north western Tasmania. The Riley DSO hematite deposit is situated within granted exploration licence (EL45/2010) held 100% by Venture Minerals. A mining lease application (5M/2012) has been submitted to Mineral Resources Tasmania.

The project area is well served by existing State and Forestry Tasmania roads, with access from Tullah via the Murchison Highway, Pieman Road and existing forestry roads.

The resource is a surface deposit of pisolitic hematite, a mix of unconsolidated and cemented lateritic gravel with depth of approximately 3.0 metres. It covers an area of approximately 1.2 square kilometres of undulating hills and valleys situated between Pieman Road and Lake Pieman. The deposits are underlain by ferruginous clay derived from the Wilson River Ultramafic complex and the Crimson Creek formation.

The resource is estimated to be around 2.0 million tonnes of ore with an average density of 2.5 t/m³. The ore and underlying clay and ultramafic rock has been tested for acid generating potential, with all samples except one being classified as either LAC (likely to be acid consuming) or UAG (unlikely to be acid generating).

The potential for acid mine drainage at the Riley DSO Hematite mine is therefore considered to be extremely low.

The mine will provide approximately 60 jobs for 2 years, the anticipated life of the mine producing the planned 1 million tonnes of ore per year.

Despite a long tradition and history of mining in western Tasmania, the prosperity of the region is lower than the national average. This development will assist the region to progress towards a more resilient future as a key component of regional Australia, with improved social equity and quality of life within its community.

The surficial nature of the resource means that the maximum depth of excavation in the mine is expected to be only 3 to 4 m, with an average depth of 1 to 2 m. There will be no conventional open pit mine and no underground shafts, nor waste rock dumps or tailings dams. As the resource will be easily won by excavators, there will be no need for blasting.

The area will be mined in 25 m wide panels along the length of the resource using excavators and trucks. As mining progresses along the panel, clearing of vegetation and ground cover will commence in the next panel, with all material cleared immediately spread across recently mined out areas. Any large timber debris will be mulched and also spread across the recently mined area.

Revegetation will therefore progress alongside the mining of each panel. The extent of exposed bare land will be kept to a minimum at any one time, thereby reducing the risk of surface erosion.

The mined ore will be crushed and screened on site. Drying of the ore will be undertaken using a portable rotary dryer when necessary. Crushed ore will be loaded onto trailer trucks and transported east along the Pieman Road to a rail loading facility at Bastyan Dam, approximately 12 km away. The ore will then be railed to the port of Burnie for export.

The construction of the rail loading facility is a separate project by others. If product transport is required before the rail loading facility becomes available, product will be
trucked to Burnie via the Murchison Highway. To minimise roadkill risks for Tasmanian fauna, this road transport would be limited to daylight hours only, which would restrict production to an equivalent 600,000 tonnes per year.

Any material rejected from the screening plant will be placed back in the mined out areas prior to being covered with vegetation and topsoil. This means that no waste rock will be generated as a result of the mining process. A waste rock storage facility will therefore not be required. Only drying, crushing and screening will be undertaken and there will therefore be no need for a tailings dam, and no need for a water dam storage facility.

The mine will have basic support infrastructure including parking, workshops, offices, ablutions, potable and non-potable water tanks, diesel powered generators, storage buildings and areas, and re-fuelling zones. All buildings will be transportable and temporary.

The proposed mine is located within the Natural Resources Zone of the West Coast Planning Scheme on Crown Land, approximately 1.4 km from the 690 ha Huskisson River Forest Reserve, and 1.5 km from the 63,728 ha Meredith Range Regional Reserve. Mineral prospectivity is a primary value of regional reserves.

The proposed mine lies within strategic prospectivity zones established under the Mining (Strategic Prospectivity Zones) Act 1993. The act zones high prospectivity areas and prohibits changes to tenure of land within those zones without the approval of both Houses of Parliament if those changes will lead to mining being excluded. The establishment and protection of these zones by Parliament clearly recognise mining as being a priority land use.

Four small creek systems run through the mine area: Trinder-Fowler creek system, Riley Creek, Three Mile Creek and Sweeney-Gold Creek system. The Sweeney-Gold Creek system drains north to a tributary of the Huskisson River. The other three creek systems combine to discharge to Lake Pieman.

There will be no direct discharges from the mine to any of the creek systems. All discharges will be managed.

Buffer strips will be maintained between the mining areas and all creek systems. A range of best practice mitigation and management strategies will be employed to manage erosion potential and sediment loss to the creek systems, including progressively rehabilitating the areas as soon as possible to reduce exposure of bare ground, staged clearing of land in preparation for mining, and using cut-off drains, sediment basins and silt fences to manage and control any sediment laden run-off.

The total disturbance footprint of the mine is approximately 119 ha.

No vegetation community listed under Schedule 3A of the Tasmanian Nature Conservation Act 2002 or the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) occurs within or adjacent to the proposed mine area.

One threatened vascular plant species, *Micrantheum serpentinum* (western tridentbush) listed as rare under Schedule 5 of the Threatened Species Protection Act 1995 (TSPA) was found on the mine site at three locations: along the mine access road, within the infrastructure area, and near the resource at Three Mile Creek.

The core area of the local *Micrantheum serpentinum* population occurs on the slopes of Serpentine Ridge, outside the proposed disturbance area of the mine site to the north west. The number of plants that could be affected by the proposed mining activity represent only a very minor proportion of the total Serpentine Ridge population.
In the context of Tasmania, there are 8 to 9 apparently distinct recorded populations of *Micrantheum serpentinum*, of which the Serpentine Ridge population is one. The mine will not affect the capacity of the local Serpentine Ridge population to continue, and will not affect wider populations or status of this species.

No threatened vascular plant species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) have been found on the proposed Riley mine site.

Two fauna species listed under the Tasmanian *Threatened Species Protection Act 1995* (TSPA) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the Tasmanian devil and the spotted tailed quoll, have suitable habitat within or adjacent to the proposed mine area.

However, surveys of the proposed mining areas have found no den sites for either species. Indeed, the majority of the mine site is considered to have only minor habitat for denning.

Nevertheless, Venture Minerals have committed to pre-clearing surveys for dens prior to any land disturbance. Any den opportunities lost through vegetation clearing will be replaced by the creation of compensatory new denning opportunities.

The mine site is used by Tasmanian devils for foraging, as evidenced by the occurrence of scats. While vegetation removal will in affect the carrying capacity of the local disturbance area to support devils, because of the very large extent of continuous similar habitat in the immediate vicinity, over 64,000 ha, the impact on foraging habitat will be insignificant.

No evidence of use of the proposed mine site by spotted-tailed quolls has been found.

The proposed mine will result in an increase in truck traffic on Pieman road, with an additional 148 truck movements each day at full production. This has the potential to increase roadkill.

The following mitigation measures will therefore be undertaken to reduce the increased risk of roadkill:

- The provision of a daily bus service to the mine site from Tullah for all shift workers
- Imposing speed limits on all project vehicles during the dusk to dawn period to give drivers a greater opportunity to avoid a collision with animals
- Deterring animals from crossing the road when vehicles are approaching
- Discouraging Tasmanian devils and spotted-tailed quolls from scavenging on the Pieman Road by the removal of roadkill
- Educating staff and contractors
- On-going monitoring, analysis and adaptive management (where required).

This Development Proposal and Environmental Management Plan (DPEMP) has been developed in accordance with the project specific guidelines from the Board of the Tasmanian Environment Protection Authority issued on 8 October 2012, entitled: *Development Proposal and Environmental Management Plan Project Specific Guidelines for Venture Minerals Limited Riley’s Creek Hematite DSO Mine, off Pieman Road, West Coast, Tasmania*.

The Development Proposal and Environmental Management Plan has identified and assessed the potential impacts associated with the proposed project.
The specific commitments contained in the DPEMP demonstrate that appropriate operational and management measures will be in place to minimise any potential impacts and to minimise any risks to the environment and human health. With these measures in place, there are no significant risks of significant residual environmental impacts.

The DPEMP demonstrates that the proposal will be compliant with Tasmanian and Commonwealth policies, legislation and regulations.
1. Introduction

1.1 Background

Venture Minerals Limited is proposing to develop a direct shipping ore (DSO) hematite mine near Tullah in north western Tasmania. The Riley DSO hematite deposit is situated within granted exploration licence (EL45/2010) held 100% by Venture Minerals. A mining lease application (5M/2012) has been submitted to Mineral Resources Tasmania.

Venture Minerals was incorporated in Western Australia on 12 May 2006 and listed on the ASX in September 2006.

The Riley project has become a focus for the company since the discovery of hematite late last year while working nearby to the Mt Lindsay Tin-tungsten-magnetite project, for which an NOI has been submitted and where Venture Minerals has spent over $25 million during the last 4 years to bring it into production. Riley is the second of two DSO hematite bodies that have been identified by the company, the other being nearby at Livingstone for which a NOI has also been submitted.

The Riley DSO Hematite Mine project area is located approximately 16 km west of the township of Tullah (approximately 25 km by road), and 125 km south-west of Burnie in north western Tasmania. The Mt Lindsay and Livingstone projects are located approximately 10 km and 12 km respectively west of the Riley DSO Hematite mine project.

Each project is separate and stand alone and are not components of a single larger project nor are they part of a staged project.

At the time of writing, there were no known other proposals in the area.

Relevant company details are:

Venture Minerals Limited
PO Box 186
West Perth WA 6872
Tel 08 9381 4222
Fax 08 9381 4211
ACN 119678385

Registered Office Address: Freemasons Hall, 181 Roberts Road, SUBIACO, WA, AUSTRALIA, 6008.

The Venture Minerals Environment Policy is:

The actions and behaviour of our organisation have the capacity to impact on the world in which we operate, affecting land, water, air, flora, fauna and local communities.

Our responsibilities and values cover the preservation of cultural and indigenous heritage, conservation of flora and fauna, and protection of current and future land use opportunities.

We exercise these responsibilities by:

1. Complying with legislation, regulations and industry standards;
2. Training our workforce to share our corporate values, promoting understanding of cultural and environmental heritage and integrating
progressive environmental management into planning and operational activities;
3. Consulting and working with local communities to achieve sustainable development through mutual understanding of requirements and objectives and the sharing of our corporate knowledge and resources;
4. Rehabilitating land areas after cessation of exploration and mining activities and commitment to the minimisation of pollution;
5. Preferential selection of organisations, suppliers and contractors with whom we work, who share our values and adhere to our standards of environmental awareness;
6. Continuously improving our use and management of resources to minimise our impact on the environment through workforce and contractor participation, industry initiatives and research.
7. Developing an Environmental Management System which outlines and defines accountabilities, objectives and targets.

Venture will strive to minimise the environmental impact of operational activities and will endeavour to implement programs which offer long term improvement to the environment and benefits to the communities with which we interact.

The Riley project will be managed under an Environmental Management System consistent with the principles of ISO14001.

1.2 Environmental legislation

1.2.1 Commonwealth legislation

The Environment Protection and Biodiversity Conservation Act 1999 is triggered by this proposal (EPBC 2012/6339) as the project area includes matters of national environmental significance (MNES), namely listed threatened species and communities and listed migratory species. The Commonwealth Department of Sustainability, Environment, Water, Population and Communities will assess the project in accordance with the Bilateral Agreement between the Tasmanian and Commonwealth governments, which provides for a combined assessment process (but separate decisions).

1.2.2 State legislation

The Tasmanian Resource Management and Planning System (RMPS) was established to achieve sustainable outcomes from the use and development of the State’s natural and physical resources. Several pieces of legislation embody the aims of the RMPS.

Within the context of this development proposal, there are a number of applicable statutes:

- State Policies and Projects Act 1993
- Land Use Planning and Approvals Act 1993

These are briefly outlined below.

Mineral Resources Development Act 1995

This Act governs the management of Tasmania’s mineral resources, including the issue of mining leases.
State Policies and Projects Act 1993

The State Policies and Projects Act 1993 establishes the process to put in place State Policies under the Resource Management and Planning System of Tasmania. State policies seek to ensure a consistent and coordinated approach and incorporate the minimum amount of regulation necessary to achieve their objectives of managing natural resources. State Policies are implemented through their integration into Local Government Planning Schemes.

Currently there are three State Policies:

- **State Coastal Policy 1996 (Coastal Policy)**
- **State Policy on Water Quality Management 1997 (Water Quality Policy)**
- **State Policy on Protection of Agricultural Land 2009 (PAL Policy).**

State Coastal Policy 1996 (Coastal Policy)

The purpose of the State Coastal Policy 1996 is to implement the sustainable development objectives of the RMPS in Tasmania’s coastal areas.

The Policy is based on the following three core principles that address these objectives:

- Natural and cultural values of the coast shall be protected
- The coast shall be used and developed in a sustainable manner
- Integrated management and protection of the coastal zone is a shared responsibility.

The Coastal Policy is applicable to all Tasmanian State waters and land (excepting Macquarie Island) within one kilometre inland of the high-water mark.

The Coastal Policy is not applicable to any part of this proposal as no part of the site is within one kilometre of the high-water mark.

State Policy on Water Quality Management 1997 (Water Quality Policy)

The purpose of the Water Quality Policy is to achieve the sustainable management of Tasmania’s surface water and groundwater resources by protecting or enhancing their qualities while allowing for sustainable development in accordance with the objectives of the RMPS.

A baseline surface water and groundwater monitoring program has been implemented for this project to investigate water quality data and to ensure that any potential project impacts on the waterways are monitored, controlled or managed appropriately.

The management measures that will be applied to ensure compliance with the Water Quality Policy include:

- Construction areas will be clearly demarcated in contract documents so that disturbed areas are kept to a minimum and no unnecessary soil or vegetation disturbance occurs
- Where required, erosion and sediment control measures such as silt stop fencing, sediment traps and erosion control matting will be installed prior to the commencement of construction activities
- Overland drainage flow will be diverted away from disturbed areas and bare soil to outfalls with sediment traps to reduce the potential for erosion
• Rehabilitation and revegetation of disturbed areas will occur as soon as practicable on completion of construction and mining activities to reduce the potential for ongoing soil erosion
• Stockpiled materials will be managed to ensure that dust and potential runoff is minimised and does not enter watercourses
• Erosion control measures and sediment traps will be regularly monitored; and sediment material collected and disposed of on site.

A full description of erosion and sediment control measures is provided in sections 2.1.2 and 4.3.

State Policy on Protection of Agricultural Land 2009 (PAL Policy)
The purpose of the PAL Policy is to “conserve and protect agricultural land so that it remains available for the sustainable development of agriculture, recognising the particular importance of prime agricultural land”. The main objective of the PAL Policy is to ensure that the productive capacity of agricultural land is appropriately recognised and protected in the use and development of agricultural land.

The PAL Policy focuses on protecting prime agricultural land (land capability classes 1, 2 and 3) from conversion to non-agricultural uses or from being fettered from being used for agricultural activities.

There is no prime agricultural land in the area of the proposed mine development.

Land Use Planning and Approvals Act 1993 (LUPAA)
Under LUPAA, Councils are required to administer the development and use of land within their municipal boundary. The assessment of development and use is undertaken in accordance with the relevant planning scheme(s).

Environmental Management and Pollution Control Act 1994 (EMPCA)
The project is a level 2 activity under Schedule 2 of the Environmental Management and Pollution Control Act 1994 and a Development Proposal and Environmental Management Plan (DPEMP) will be submitted to Environment Protection Authority for assessment and approval.

This DPEMP describes in detail how the potential environmental impacts of the mining proposal will be managed and mitigated. Approval under this Act will establish the environmental operating permit and conditions for the mine.

Other state legislation applicable to the project
Aboriginal Relics Act 1975
An Aboriginal Cultural Heritage Assessment of the site has been undertaken for the proposed project by Cultural Heritage Management Australia (CHMA) in November 2011. Refer to section 3.4.9 for the key findings from this assessment.

Threatened Species Protection Act 1995
A botanical survey and fauna habitat assessment was undertaken for the project by North Barker Ecosystem Services, late October 2011 and early November 2011, with additional field investigations undertaken in February 2012 and April 2012. Refer to sections 3.4.7 and 3.4.8 for the key findings of the survey and assessment.

2 North Barker Ecosystem Services, 2012, Riley Iron Laterite Prospect Proposal - Botanical Survey and Fauna Habitat Assessment.
Historic Cultural Heritage Act 1995
Historic heritage desk top and field assessments have been undertaken for the project by Austral Tasmania in April 2012\(^3\), with additional field investigations undertaken in May and June 2012. Refer to section 3.4.10 for the key findings from this assessment.

Forest Practices Act 1985
For many activities a Forest Practices Plan (FPP) is required under the Forest Practices Act 1985 where the clearing of forest is in excess of 1 hectare or 100 tonnes of timber (in areas of ‘vulnerable land’ these thresholds are lower). However, mining operations are explicitly excluded from this requirement where a LUPAA permit is in place, which will be the case for this project.

1.2.3 Local government
The proposed development is located within the boundaries of the West Coast Municipality. The proposed use and development within the municipality will be assessed in accordance with the West Coast Planning Scheme 2002.

West Coast Planning Scheme 2002
The proposed development is solely within the Natural Resources Zone.

Resource Development, including extraction of rocks and minerals, along with any buildings and works directly associated with this use is a primary use class in the Natural Resources Zones.

Refer to section 3.1 for information on the key planning aspects of the project.

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\(^3\) Austral Tasmania, Riley Creek, Tullah, Historic Heritage Desktop Assessment, Unpublished report for Venture Minerals Ltd., Austral Tasmania April 2012
2. Proposal description

2.1 Proposal outline

Venture Minerals propose to extract direct shipping ore (DSO) in the form of hematite at the Riley mine site.

The near surface ore will be extracted by mining in panels.

Approximately 1.3 million tonnes of mined ore per year will be crushed and screened on site to produce about 1 million tonnes of screened ore that will be trucked to the Bastyan rail loading facility (to be constructed separately by others), from where it will be railed to the port of Burnie for export. If the mine commences operations before the rail facility is available product will be trucked all the way to Burnie via the Murchison Highway. To minimise roadkill risks for Tasmanian fauna, this road transport would be limited to daylight hours only, which would restrict production to an equivalent 600,000 tonnes per year.

Table 1 summarises the proposed project.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life of project</td>
<td>2 years</td>
</tr>
<tr>
<td>Resource</td>
<td>DSO (Hematite)</td>
</tr>
<tr>
<td>Mining method</td>
<td>Panel mining</td>
</tr>
<tr>
<td>Mine operation</td>
<td>12 hour shifts</td>
</tr>
<tr>
<td>Average depth of extraction</td>
<td>3 m</td>
</tr>
<tr>
<td>Depth to water table</td>
<td>Variable (from 0 m to 17 m across the project site)</td>
</tr>
<tr>
<td>Total area of disturbance</td>
<td>Approximately 119 hectares (ha)</td>
</tr>
<tr>
<td>Total mined ore tonnage</td>
<td>Approximately 2.3 million tonnes (Mt)</td>
</tr>
<tr>
<td>Total material mined (only ore will be mined)</td>
<td>Approximately 2.3 million tonnes (Mt)</td>
</tr>
<tr>
<td>Power supply</td>
<td>Diesel generators</td>
</tr>
<tr>
<td>Product rates (approximately)</td>
<td>1.3 million tonnes pa</td>
</tr>
<tr>
<td>Construction duration</td>
<td>1 to 3 months</td>
</tr>
<tr>
<td>Commencement production</td>
<td>2013 Quarter 1 (Q1)</td>
</tr>
</tbody>
</table>

2.1.1 General description

This section provides a full description of the proposal, including the construction, commissioning, operational and decommissioning phases, as well as any infrastructure and offsite ancillary facilities required.

Location

The project area is located approximately 16 km west of the township of Tullah (approximately 25 km by road), and 125 km southwest of Burnie in north western Tasmania.

The regional setting of the Riley DSO Hematite Mine project is shown in Figure 1.

Road access from Tullah is via the Murchison Highway and then the Pieman Road. Access tracks to the proposed mine site and resource are in good condition, having been upgraded for recent forestry activities, with the main tracks accessible by 2WD.
Figure 1: Regional setting of Riley DSO Hematite Mine project
Two other mining projects in the local region, the Mt Lindsay Tin-tungsten-magnetite mine project and the Livingstone DSO mine project are located further west along Pieman Road, approximately 10 km and 12 km respectively from the Riley DSO Hematite Mine project.

The local setting of the Riley DSO Hematite Mine project is shown in Figure 2.

The Rosebery base metal mine and Renison Bell tin mine are located south of Tullah on the Murchison Highway, approximately 10 km south east and 5 km south of the Riley DSO Hematite Mine project respectively.

Product from the Riley mine will be transported along Pieman Road to the Bastyan rail loading facility, approximately 12 km east of the mine by road, and then railed to the port of Burnie.

**Mine setting**

The Riley iron ore resource is a surface deposit of pisolitic hematite situated between Pieman road and Lake Pieman, overlaying the Wilson River Ultramafic complex to the northeast and the Crimson Creek formation to the southwest.

The iron laterite deposits comprise a mixture of unconsolidated and cemented lateritic gravel mixed and underlain by ferruginous clay. Four significant deposits are recognised. They are, from west to east then north, Areas A, B, C and D as shown in Figure 3.

The combined area of laterite and ferruginous clay is approximately 1.2 km². Areas A and C are the most significant of the laterite deposits. The laterites are largely restricted to topographic highs, with Areas A and C separated (dissected) by Riley creek.

Area A is bound in the northwest by Three Mile creek and Area C in the west and south by Trinder and Fowler creeks. The laterite and lateritic gravel reaches up to 4 m thickness, underlain by clay to a depth of up to 17 m beneath the surface. Scours and quartz-rich sands beds a few centimetres thick are common at the base of the laterite suggesting a colluvial origin for the gravels, which are thought to be eroded off the ultramafic ridge upslope. Pockets of relict lateritic soil are widespread along Serpentine Ridge.

The ferruginous clays commonly grade down into greenish and cream coloured clays and ultimately the ultramafic serpentinite basement. The clays are currently thought by Venture to represent *in situ* saprolitic clay. Around the margins of the deposits the laterite commonly laps directly onto the ultramafic serpentinite basement.

Two representative sections across the deposit, Figure 4 and Figure 5 show the layering of the different lithologies, including the resource and probable boundary to the serpentinite basement, as logged in test pitting undertaken in October and December 2011⁴.

---

Figure 2: Local setting of the Riley DSO Hematite Mine project
Figure 3: Mine geological setting
Figure 4: Section through Riley deposit, Area C

Figure 5: Section through Riley deposit, Area A
Laterite Areas A and C overlay the contact between the south western margin of the Wilson River Ultramafic Complex and the Crimson Creek Formation (Figure 3).

The contact between the Wilson River Ultramafic and Crimson Creek Formation is most likely faulted⁵, although the fault has not been observed by Venture Minerals geologists. The contact trends northwest-southeast, and is subvertical. Individual horizons within the Crimson Creek Formation are expected to be subvertical also, and perhaps steeply-east dipping like the ore-bearing skarns at Mt Lindsay, 10 km to the west. Little structural information is available for the ultramafics, although subvertical igneous layering is known from Rileys Knob⁶ and it is reasonable to assume that other intraformational units will be subvertical also. To the east, Area C abuts a large terrace of unconsolidated fluvioglacial gravels.

See section 3.4 for a description of the mine area topography, surface water drainage, groundwater and vegetation communities. Photographs showing the general mine landscape are shown in Table 3.

Resource

The Riley iron ore resource is a surface deposit of pisolidic haematite of varying thickness, with an average depth of approximately 1.5 m: 29% of mining blocks are <1 m deep, 71% are >1 m deep; 27% are >2 m deep; 6% are >3 m deep and the maximum depth is approximately 4.4 m. It covers an undulating hill and extends down into a valley with surface area of approximately 1.0 square kilometre. The average density is ~2.5 t/m³.

The surficial nature of the resource is shown in photographs in Table 3.

The resource was initially defined in March 2012 as an inferred resource which was then upgraded in July 2012 to an indicated resource with 312 test pits on a 50m by 50m grid. The resource estimate is reported for +1mm screened product above a 53% Fe cut-off on samples that were crushed to -10mm. The estimate is shown in Table 2.

Table 2: Riley DSO hematite deposit resource estimate

<table>
<thead>
<tr>
<th>Resource</th>
<th>Tonnes</th>
<th>Fe (%)</th>
<th>Fe (%) calcined</th>
<th>SiO₂ (%)</th>
<th>Al₂O₃ (%)</th>
<th>P (%)</th>
<th>S (%)</th>
<th>Cr (%)</th>
<th>LOI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicated</td>
<td>2.0 Mt</td>
<td>57</td>
<td>61</td>
<td>3.7</td>
<td>2.6</td>
<td>0.03</td>
<td>0.08</td>
<td>2.8</td>
<td>7.7</td>
</tr>
</tbody>
</table>

The extent of the resource can be seen in Figure 3.

The resource definition in Area D will be defined prior to commencement of mining, as test pitting and analysis is completed.

The resource potential for Area D, however, is estimated to be approximately 300,000 tonnes, so only approximately 11.5% of the estimated total resource tonnage is still to be defined.

The total resource estimate for the Riley mine is approximately 2.3 million tonnes.

---

Table 3: Photographs showing mine landscape

<table>
<thead>
<tr>
<th>Images</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="West along Pieman Road from the mine access road junction" /></td>
<td>West along Pieman Road from the mine access road junction</td>
</tr>
<tr>
<td><img src="image2" alt="East along Pieman Road from the mine access road junction" /></td>
<td>East along Pieman Road from the mine access road junction</td>
</tr>
<tr>
<td><img src="image3" alt="Mine access road" /></td>
<td>Mine access road</td>
</tr>
<tr>
<td><img src="image4" alt="Internal access track" /></td>
<td>Internal access track</td>
</tr>
<tr>
<td><img src="image5" alt="Access track through regrowth Eucalyptus nitida forest" /></td>
<td>Access track through regrowth Eucalyptus nitida forest</td>
</tr>
<tr>
<td><img src="image6" alt="DSO Resource on the surface" /></td>
<td>DSO Resource on the surface</td>
</tr>
<tr>
<td><img src="image7" alt="DSO Resource shown in road cutting" /></td>
<td>DSO Resource shown in road cutting</td>
</tr>
<tr>
<td><img src="image8" alt="Artificially straightened section of Riley Creek dug by previous mining activity" /></td>
<td>Artificially straightened section of Riley Creek dug by previous mining activity</td>
</tr>
</tbody>
</table>
**Acid mine drainage potential**

To determine the potential for acid and metalliferous drainage, Venture Minerals undertook a sampling program of the resource and surrounding waste rock, in October and December 2011. Static test work was undertaken on 42 samples, representing all lithologies present in the deposit: lateritic gravel, cemented laterite, clay and serpentinite.

Sample locations and lithologies are shown in Figure 6.

All 42 samples were submitted to ALS Environmental in Brisbane for testing.

Samples were analysed for NAPP (Net Acid Producing Potential) and ANC (Acid Neutralising Capacity), and total sulphur by LECO. MPA (Maximum potential acidity) was calculated as the difference between NAPP and ANC.

![Figure 6: Riley AMD sample locations](image)

[Red = lateritic gravel, brown = cemented laterite, blue = clay, green = serpentinite. Current resource is shaded in orange. 5 metre Lidar topographic contours are shown in black.]

All samples were assigned an AMD risk category. Risk categories are described in Table 4, in accordance with a risk classification system developed by Earth Systems (pers. comm.), a company with considerable experience and standing in acid drainage risk assessment and management.

Results for all samples are listed in Table 5, with summary statistics by lithology provided in Table 6.
Table 4: AMD risk classifications

<table>
<thead>
<tr>
<th>AMD Risk Category</th>
<th>Description</th>
<th>Criteria 1</th>
<th>Criteria 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>AG1</td>
<td>high potential for acid generation</td>
<td>NAPP &gt; 75 and MPA ≥0</td>
<td>na</td>
</tr>
<tr>
<td>AG2</td>
<td>moderate/high potential for acid generation</td>
<td>30 &lt; NAPP ≤ 75 and MPA ≥ 0</td>
<td>na</td>
</tr>
<tr>
<td>AG3</td>
<td>moderate potential for acid generation</td>
<td>5 ≤ NAPP ≤ 30 and MPA ≥ 0</td>
<td>na</td>
</tr>
<tr>
<td>AG4</td>
<td>low potential for acid generation</td>
<td>-10 &lt; NAPP ≤ 5 and MPA ≥ 10</td>
<td>-40 &lt; NAPP ≤ -10 and MPA ≥ 20</td>
</tr>
<tr>
<td>UAG</td>
<td>unlikely to be acid generating</td>
<td>-10 &lt; NAPP ≤ 5 and MPA &lt; 10</td>
<td>-40 &lt; NAPP ≤ -10 and MPA &lt; 20</td>
</tr>
<tr>
<td>LAC</td>
<td>likely to be acid consuming</td>
<td>NAPP &lt; -40 and MPA &lt; 20</td>
<td>na</td>
</tr>
</tbody>
</table>

Table 5: AMD static test results and AMD risk categories

<table>
<thead>
<tr>
<th>Sample</th>
<th>Lithology</th>
<th>NAPP (kgH2SO4/t)</th>
<th>ANC (kgH2SO4equiv/t)</th>
<th>ANC (%CaCO3)</th>
<th>FizzRating</th>
<th>S_LECO%</th>
<th>MPA (kgH2SO4/t)</th>
<th>AMD Risk Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>RYAMD002</td>
<td>Clay</td>
<td>2.1</td>
<td>1</td>
<td>0.1</td>
<td>0</td>
<td>0.1</td>
<td>3.1</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD005</td>
<td>Clay</td>
<td>1.7</td>
<td>1.4</td>
<td>0.1</td>
<td>0</td>
<td>0.1</td>
<td>3.1</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD009</td>
<td>Clay</td>
<td>-2</td>
<td>3.8</td>
<td>0.4</td>
<td>0</td>
<td>0.06</td>
<td>1.8</td>
<td>AG4</td>
</tr>
<tr>
<td>RYAMD010</td>
<td>Clay</td>
<td>-0.8</td>
<td>1.8</td>
<td>0.2</td>
<td>0</td>
<td>0.08</td>
<td>2.4</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD011</td>
<td>Clay</td>
<td>&lt;0.5</td>
<td>&lt;0.5</td>
<td>&lt;0.5</td>
<td>0</td>
<td>0.11</td>
<td>~3</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD012</td>
<td>Clay</td>
<td>-4</td>
<td>4.6</td>
<td>0.5</td>
<td>0</td>
<td>0.02</td>
<td>0.6</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD013</td>
<td>Clay</td>
<td>1.3</td>
<td>0.8</td>
<td>&lt;0.1</td>
<td>0</td>
<td>0.07</td>
<td>2.1</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD014</td>
<td>Clay</td>
<td>5.8</td>
<td>&lt;0.5</td>
<td>&lt;0.1</td>
<td>0</td>
<td>0.19</td>
<td>~5.8</td>
<td>AG4</td>
</tr>
<tr>
<td>RYAMD015</td>
<td>Clay</td>
<td>0.8</td>
<td>2</td>
<td>0.2</td>
<td>0</td>
<td>0.09</td>
<td>2.8</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD016</td>
<td>Clay</td>
<td>-0.6</td>
<td>1.8</td>
<td>0.2</td>
<td>0</td>
<td>0.04</td>
<td>1.2</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD018</td>
<td>Clay</td>
<td>&lt;0.5</td>
<td>1.8</td>
<td>0.2</td>
<td>0</td>
<td>0.07</td>
<td>~1.8</td>
<td>UAG</td>
</tr>
<tr>
<td>RC01</td>
<td>Clay</td>
<td>-0.7</td>
<td>1.6</td>
<td>0.2</td>
<td>0</td>
<td>0.03</td>
<td>0.9</td>
<td>UAG</td>
</tr>
<tr>
<td>RC02</td>
<td>Clay</td>
<td>&lt;0.5</td>
<td>2</td>
<td>0.2</td>
<td>0</td>
<td>0.06</td>
<td>~2</td>
<td>UAG</td>
</tr>
<tr>
<td>RC03</td>
<td>Clay</td>
<td>-11.4</td>
<td>11.4</td>
<td>1.2</td>
<td>1</td>
<td>&lt;0.01</td>
<td>0</td>
<td>UAG</td>
</tr>
<tr>
<td>RC04</td>
<td>Clay</td>
<td>-2.4</td>
<td>4.2</td>
<td>0.4</td>
<td>0</td>
<td>0.06</td>
<td>1.8</td>
<td>UAG</td>
</tr>
<tr>
<td>RC05</td>
<td>Clay</td>
<td>-1.9</td>
<td>2.8</td>
<td>0.3</td>
<td>0</td>
<td>0.03</td>
<td>0.9</td>
<td>UAG</td>
</tr>
<tr>
<td>RC06</td>
<td>Clay</td>
<td>&lt;0.5</td>
<td>3.2</td>
<td>0.3</td>
<td>0</td>
<td>0.12</td>
<td>~3.2</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD006</td>
<td>Cemented Laterite</td>
<td>0.4</td>
<td>2.5</td>
<td>0.2</td>
<td>0</td>
<td>0.1</td>
<td>3.1</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD008</td>
<td>Cemented Laterite</td>
<td>0.7</td>
<td>1.4</td>
<td>0.1</td>
<td>0</td>
<td>0.07</td>
<td>2.1</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD001</td>
<td>Lateritic Gravel</td>
<td>1.5</td>
<td>&lt;0.5</td>
<td>&lt;0.1</td>
<td>0</td>
<td>0.05</td>
<td>~1.5</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD003</td>
<td>Lateritic Gravel</td>
<td>1.5</td>
<td>3.4</td>
<td>0.4</td>
<td>0</td>
<td>0.16</td>
<td>4.9</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD004</td>
<td>Lateritic Gravel</td>
<td>1.2</td>
<td>&lt;0.5</td>
<td>&lt;0.1</td>
<td>0</td>
<td>0.04</td>
<td>~1.2</td>
<td>UAG</td>
</tr>
<tr>
<td>RYAMD007</td>
<td>Serpentinite</td>
<td>-85.7</td>
<td>85.7</td>
<td>8.7</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYAMD017</td>
<td>Serpentinite</td>
<td>-32.9</td>
<td>32.9</td>
<td>3.4</td>
<td>1</td>
<td>&lt;0.01</td>
<td>0</td>
<td>UAG</td>
</tr>
<tr>
<td>RYSR01</td>
<td>Serpentinite</td>
<td>-39.2</td>
<td>39.2</td>
<td>4</td>
<td>1</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR02</td>
<td>Serpentinite</td>
<td>-39.6</td>
<td>39.6</td>
<td>4</td>
<td>1</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR03</td>
<td>Serpentinite</td>
<td>-27.7</td>
<td>27.7</td>
<td>2.8</td>
<td>1</td>
<td>&lt;0.01</td>
<td>0</td>
<td>UAG</td>
</tr>
<tr>
<td>RYSR04</td>
<td>Serpentinite</td>
<td>-37.9</td>
<td>37.9</td>
<td>3.9</td>
<td>1</td>
<td>&lt;0.01</td>
<td>0</td>
<td>UAG</td>
</tr>
<tr>
<td>RYSR05</td>
<td>Serpentinite</td>
<td>-74.9</td>
<td>74.9</td>
<td>7.6</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR06</td>
<td>Serpentinite</td>
<td>-24.2</td>
<td>24.2</td>
<td>2.5</td>
<td>1</td>
<td>&lt;0.01</td>
<td>0</td>
<td>UAG</td>
</tr>
<tr>
<td>RYSR07</td>
<td>Serpentinite</td>
<td>-102</td>
<td>102</td>
<td>10.4</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR08</td>
<td>Serpentinite</td>
<td>-101</td>
<td>101</td>
<td>10.3</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR09</td>
<td>Serpentinite</td>
<td>42</td>
<td>42</td>
<td>4.3</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR10</td>
<td>Serpentinite</td>
<td>-44.5</td>
<td>44.5</td>
<td>4.5</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR11</td>
<td>Serpentinite</td>
<td>-63.9</td>
<td>63.9</td>
<td>4.5</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR12</td>
<td>Serpentinite</td>
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<td>56</td>
<td>5.7</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR13</td>
<td>Serpentinite</td>
<td>-95</td>
<td>95</td>
<td>9.7</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR14</td>
<td>Serpentinite</td>
<td>-65.8</td>
<td>65.8</td>
<td>6.7</td>
<td>2</td>
<td>&lt;0.01</td>
<td>0</td>
<td>LAC</td>
</tr>
<tr>
<td>RYSR15</td>
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<td>57.9</td>
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<td>9.8</td>
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<td>0</td>
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<td>0</td>
<td>LAC</td>
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Table 6: Summary of AMD statistics

<table>
<thead>
<tr>
<th>Lithology</th>
<th>Lateritic Gravel</th>
<th>Cemented Laterite</th>
<th>Clay</th>
<th>Serpentinite</th>
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<tr>
<td>Ore/Waste</td>
<td>Ore</td>
<td>Waste</td>
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<td>no. of samples</td>
<td>3</td>
<td>2</td>
<td>17</td>
<td>20</td>
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<td>NAPP_kg_H2SO4/t</td>
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<td>-11.4</td>
<td>-102</td>
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<tr>
<td></td>
<td>max</td>
<td>1.5</td>
<td>5.8</td>
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<tr>
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<td>0</td>
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<td>max</td>
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<td>ANC_%CaCO3</td>
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<td>0.004</td>
<td>0.045</td>
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</table>

All of the serpentinite samples are free of sulphur and fall firmly into the NAF category, with a mean NAPP value of -59.54 kg H₂SO₄/t (range from -102 to -24.2 kg H₂SO₄/t).

The majority of these samples (14 samples) fall into the LAC (likely to be acid consuming) category, with the remaining six classified as unlikely to be acid generating.

With the exception of one sample, the clay samples have NAPP values below 5 kg H₂SO₄/t, with an average value of -0.62 kg H₂SO₄/t (range from -11.4 to 5.8 kg H₂SO₄/t). Only one of the 17 clay samples tested shows a potential to be acid generating, and this is a very low potential, having a NAPP value of 5.8 kg H₂SO₄/t, 0.8 kg H₂SO₄/t above the UAG category threshold.

The clay has a low total sulphur content, average 0.07% (<0.19% maximum), and no visible sulphides were encountered during logging of the test pits.

The five ore samples analysed show low NAPP values. The lateritic gravel NAPP values range from 1.2 to 1.5 kg H₂SO₄/t, with a mean of 1.4 kg H₂SO₄/t. The cemented laterite NAPP values range from 0.6 to 0.7 kg H₂SO₄/t, with a mean of 0.65 kg H₂SO₄/t.

All ore samples fall into the UAG (unlikely to be acid generating) category.

The potential for acid mine drainage at the Riley DSO Hematite mine is therefore considered to be extremely low.

**Mining methods**

The area is planned to be mined in 25 metre wide panels along the length of the resource (Figure 7), from the top of the hill down into the valley, using an excavator and trucks. The nature of the surficial deposit means that the average depth of excavation is expected to be approximately 1.5 m, so there will be no conventional open pit mine and associated benching.
The top soil in the area is limited and there is no rock overburden as the resource is present at the surface, as can be seen from the photographs in Table 3. Mining of the resource will therefore be able to commence as soon as the land is cleared of vegetation.

The iron laterite deposits comprise a mixture of unconsolidated and cemented lateritic gravel which will be easily won by excavators. No blasting will be required.

The proposed mining method for each resource area is as follows:

- After completion of forestry activities (by others), an initial 25 metre wide mining panel will be established by clearing all remaining vegetation and debris.

- Large ground debris and vegetation will be stockpiled for mulching later for rehabilitation. Remaining topsoil material will be stockpiled separately. Details of the stockpiling of vegetation and topsoil for rehabilitation is provided in section 4.3.4 and in the Decommissioning and Rehabilitation Plan (Appendix M).

- Mining will progress along the initial 25 metre panel to the edges of the resource. The material will be easily won by an excavator and loaded onto trucks for haulage to the run-of-mine (ROM) pad. No blasting will be undertaken.

- The location of the initial panel and the panels at 4 monthly intervals for the Riley mine are shown in Appendix B (see also ‘Mining schedules’ below for a description).

- As mining progresses along the panel, clearing and preparation will commence in the next panel, as illustrated in Figure 7. Large ground debris and vegetation will be removed and piled temporarily near the recently mined area. All remaining material together with available topsoil will be removed and immediately spread across the recently mined out area. The ground debris and vegetation will then be redistributed on top of the topsoil.

- The vegetation and topsoil from the second panel will therefore be used to cover and rehabilitate the first panel as the resource is progressively mined. A description of the rehabilitation process is provided in section 7 and in the Decommissioning and Rehabilitation Plan.

- Revegetation of the mined strips would therefore commence as soon as possible.

- The extent of exposed bare land would also be kept to a minimum at any one time, thereby reducing the risk of surface erosion and loss of sediment to the neighbouring creek systems (see section 2.1.2). No more than the equivalent of one panel in each area will be cleared and exposed to the elements at any one time. As a conservative measure, based on a 25 metre wide panel and the widest section to be mined (during Stage 1, area A and C mined consecutively, see Appendix B) this equates to a maximum area of approximately 1,114 metres in length (area A and C combined) by 25 metres wide, or 2.78 ha.

- At the end of the mining sequence in each area, the vegetation and topsoil stockpiled from the first mined out panel will be used to cover and rehabilitate the final mined panel.

Figure 7 shows a schematic of the proposed mining method.

The section below, ‘Mining schedules’ describes the mining sequence and plan.

A haul road will be maintained to each of the resource areas during mining operations, largely using the existing road and track network. These roads are marked in the mining plans illustrated in Appendix B, described below in ‘Mining schedules’. Ore will be transported to the ROM pad for crushing and screening as it is won by the excavator.

Any material rejected from the screening plant will be placed back in the mined out areas prior to being covered with vegetation and any topsoil. This means that no waste
rock will be generated as a result of the mining process, and hence there is no requirement for a waste rock storage facility. Also, as there will be no processing of the ore, other than crushing and screening, there will be no requirement for a tailings dam.

A description of site drainage and management strategies for potential erosion and sediment loss from the mining activities is provided in section 2.1.2.

**Ore screening**

Screening will either be wet or dry, subject to further test work to be undertaken as part of detailed design.

Ore is expected to have a moisture content of approximately 9%. Screening rejects (minus 1 mm) will be returned to the mined out areas for rehabilitation. These returns will be either dry (approximately 4% moisture content) or wet (approximately 30% moisture content) depending on whether dry or wet screening is used. The fines content will be approximately 15%, based on crushing and screening trials undertaken during the resource assessment. The underlying clays will be avoided to all practical extents (they would be undesirable in the process) and colloidal clays are not likely to be a significant component of the fines.
Wet screening is being considered as an alternative to dry screening because:

- It may provide more efficient removal of organic and clay material for use in rehabilitation;
- It would reduce hydrocarbon fuel use (no diesel drier);
- It would reduce dust generation.

The wet screening process would be a standard process, as used in commercial gravel washing plants.

Wet screening would recirculate water. There would be no discharge of water. The only water loss would be that going out with the fines to the rehabilitation areas. The only reagent to be used would be a biodegradable flocculant, which would be bound to the fines returned to the rehabilitation areas. The returned fines would be covered with the removed vegetation to allow rehabilitation to commence immediately.

The wet screening process flow would consist of the following unit steps:

- Run of Mine (ROM) loading;
- Primary jaw crushing;
- Primary washing step;
- Secondary crushing;
- Wet screening to produce final product and -1 mm fines;
- Dewatering of -1 mm fines;
- Water recovery storage and distribution;
- Fine transport for rehabilitation.

The preliminary process flow chart is shown in Figure 8.

A front end loader or excavator will load run of mine (ROM) ore into the process facilities. A static grizzly mounted over the feed hopper will ensure that oversize rocks are removed prior to being fed into the primary jaw crusher. Oversize rocks will be moved to a stockpile on the ROM pad where they will be broken down to a suitable size to feed the plant, by a mobile rock breaker.

Primary crushing will reduce the ore top size to less than 125 mm, the crushed product will be fed by conveyor into the feed box of a twin shaft washer. Process water will be added to the washer, enabling the clays in the ore to be washed from the coarse particles and for organic material to float off the slurry. The undersize material from the washer will be pumped direct to the wet screening plant.

Coarse material from the washer will report to a scalping screen for the removal of -10 mm material prior to being fed to the secondary cone crusher. Scalping screen undersize material will combine with secondary crusher product and be conveyed to the wet screening plant.

The wet screening plant will consist of a multiple deck screen that will produce three main streams. The first stream will be oversize material which will recycle back to the secondary cone crusher, the second flow stream will be the product that is within size specification which will be directed to the product stockpiles and the third stream will be the -1 mm fine material.
Figure 8: Preliminary process flow for wet screening option
The -1 mm material will be pumped to the slurry dewatering stage. The dewatering stage will involve proven technology which may include such as thickeners, dewatering cyclones and pressure filters to reduce the moisture content in the fines to a level suitable for removal to the rehabilitation areas.

Returned fines would be deposited in a layer approximately 150 mm thick. Depositing areas would be protected by silt fences down-gradient to prevent sediment runoff while the deposited fines are stabilising. The deposits will be covered with mulch on an approximately daily basis to protect them from the potentially erosive effects of rain.

The mulch cover will be approximately 150 mm thick. It will be a combination of slash and chipped vegetation, which will be managed and stockpiled in sufficient quantities to ensure a complete cover of the returned fines.

The combination of silt fences and quick cover will allow the fines to drain and stabilise, with minimal release of sediments to surrounding areas. Underlying clays will be avoided to all practical extents during mining. Mining will be targeting high grade materials and the remaining exposed surface would be low grade laterites rather than the underlying colloidal clays. By intent, colloidal clays are therefore not expected to form a significant component of the fines, and suspended sediments in runoff waters are therefore unlikely to exceed natural runoff loads.

Water recovered from the dewatering stage will be transferred to a holding tank where the process plant water pumps will deliver process water to the ore washer and wet screen.

Water supply for the process plant will be drawn from the local creek systems. Sediment catchment facilities will be installed on these creeks as part of the mining process. These areas of sediment catchment will also allow for water to be pumped to the process plant for washing purposes.

The ore in the ground has a moisture content of 9-10% and the concentrate to be shipped will have a similar moisture content of approximately 7-8%.

Water lost from the wet screening process will be that bound up with the minus 1 mm fines, which will have a moisture content of approximately 30%. This amount will be the net water consumption of the plant.

Assuming the wet screening plant processes 170 t/hr and there is a 15% fines content, approximately 25 t/hr of fines will be generated. If these have a moisture content of 30%, approximately 8 t/hr (8 kL/hr) of water will be going to the rehabilitation areas with the fines, amounting to a diversion of approximately 0.2 ML per day from the creek systems to the rehabilitation areas. These areas are within the catchments of the source creeks, meaning that there will be no net loss of water from the catchments.

Stream flows are estimated in the hydrological report in Appendix F, and show an ample supply of water.

The median annual flow of Riley Creek, for example, is estimated to be 1000 ML/yr, or 2.7 L/day. The process water needs are approximately 7% of this flow.

An appropriate water extraction licence would be obtained from the Department of Primary Industries, Parks, Water and Environment (Water Management Branch). If supplementary water is required during dry periods, approval would be sought from
Hydro Tasmania (and/or DPIPWE as necessary) to install a temporary pumped supply via polypipe from Lake Pieman.

**Mining schedules**

Venture Minerals personnel will maintain responsibility for supervision and the technical aspects of the project. The initial estimated achievable rate of mining is 1.3 million tonnes per annum.

Mining will be undertaken 7 days a week on day shift only. Ore drying, crushing and screening, will be undertaken 24 hours per day, 7 days per week.

Mining will commence in Areas A and C and the upper half of Area B. At the completion of mining in these areas, it will commence in Area D.

A resource block model, interrogated using Mine2-4d, was used to establish a mine scheduling sequence for resource Areas A, C and the upper part of Area B. This work was undertaken by Mine Engineering Consultants at Rock Team Pty Ltd⁷ (see Appendix B), with details summarised below.

A block model and scheduling sequence for resource Area D will be developed as resource definition in these areas progresses, and will be completed prior to the commencement of mining.

The mining schedule for Areas A, C and B was established with the aim of achieving an annual shipped product of 1 million tonnes at a monthly grade of 57% Fe (+/- 0.3%). This was achieved through the blending of 'as mined' high grade (> 57% Fe) and low grade (< 57% Fe) ore (see Table 7).

The schedule is based on a mined recoverable rate of approximately 100,000 tonnes per month. Mining will progress over a 21 month period, with a corresponding shipping period of 24 months.

Mining plans for Areas A, C and B are shown in Appendix B for the following:

- Stage 1 - 0-4 months
- Stage 2 - 5-8 months
- Stage 3 - 9-12 months
- Stage 4 - 13-16 months
- Stage 5 - 17-20 months.

The existing road network that will be used to access the resource at each mining stage is shown on each plan.

The first mining stage will commence part way along resource area A and resource area C. Stage 2 mining will only be undertaken in resource area C. Stage 3 mining will be undertaken in resource Areas C and B. Stage 4 mining will be undertaken in all areas, A, C and B, and will complete the mining sequence for resource areas C and B. Stage 5 mining will be undertaken in area A, and will complete the mining sequence for this area.

Mining will be undertaken in a south west direction, i.e. progression from one panel to the next, unless otherwise marked on the mining plans in Appendix B.

While Appendix B shows the mining plan at 4 monthly intervals, Table 7 shows the monthly predicted mine plan, as defined by mined tonnage of high and low grade ore.

---

Table 7: Predicted monthly high (FE > 57%) and low (FE < 57%) grade mining schedule

<table>
<thead>
<tr>
<th>Month</th>
<th>Stage</th>
<th>High grade (Fe &gt; 57%) tonnes</th>
<th>Low grade (Fe &lt; 57%) tonnes</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Stage 1</td>
<td>30,071</td>
<td>69,134</td>
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<td>39,636</td>
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<td>21</td>
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</table>

Mining in Area D will commence at the completion of mining in Areas A, C and B.

**Mining infrastructure and equipment**

All mining infrastructure will be contained within the mine lease boundary (a mining lease application was made to Mineral Resources Tasmania in May 2012). Infrastructure for the Riley mine project will consist of, but is not limited to:

- Portable rotary dryer
- Crushing and screening plant
- Redial stockpiler
- Stockpile areas (vegetation/topsoil, ore)
- ROM pad
- Lay down yard and workshops (including provision for welding, vehicle maintenance, fitting and machining and hydrocarbon storage)
- Go no-go area
- Mine offices and ablutions area
- Car parking area
- Refuelling facility
- Rainwater tanks (potable water)
- Non potable water tank
- Power generators
- Cut-off drains and sediment basins
- Internal road network (approximately 1000 metres in length).

All buildings will be temporary.

The types of equipment proposed are conventional haul trucks and excavators that are proven in similar working environments. Ancillary equipment has also been considered.

The proposed equipment includes:
- 2 x excavators (Hitachi ZX870-3 Backhoe);
- 5 x haul trucks (Hitachi 350D);
- 1 x bull dozers (Cat D9T);
- 1 x service truck;
- 3 x light vehicles;
- Mobile crushing and screening plant;
- Astec portable 42’ rotary dryer (if dry screening is used);
- Lighting;
- Diesel generators and associated cabling.

The general mine site layout is shown in Appendix A. The infrastructure layout is shown in Appendix C.

**Personnel**

The project workforce will be accommodated in Tullah and sourced, where possible, from the surrounding local communities. Rosters are planned to be two shifts per day, 12 hours in length, every day of the year.

Full time employee roles on site will include:
- Maintenance/mobile plant personnel
- Machine operators
- Surveying personnel
- Administration/management personnel.

Venture Minerals personnel not required on site daily, but required for operations, will include:
- Geological personnel
- Engineering personnel
- Environmental personnel
- Management and administration personnel.
**Ore processing**

There will be no on-site processing of the ore. It will only be crushed and screened on site then transported off-site for sale to others for processing.

Ore handling, drying, crushing and screening, will be undertaken 24 hours per day, 7 days per week.

Material not suitable for shipping will be returned to the mined out areas prior to being covered with vegetation and top soil.

**Ore and waste rock haulage**

The alignment of existing tracks will be used to create haul and site access roads of an appropriate width and surface to facilitate use by mine vehicles.

The main haul road on-site will be from the resource areas to the infrastructure area and from there to the external access road.

The location of the haul roads are marked on the mine plans in Appendix B.

**Disturbance footprint**

The proposed mining and associated infrastructure will require the clearing of up to 119 ha of land, of which approximately 114 ha will be mined.

A breakdown of the disturbance footprint is:

- Mine infrastructure and ore crushing areas 4.4 ha
- Resource Area A 34.8 ha
- Resource Area B/C 55.5 ha
- Resource Area D 23.9 ha.

There will be minimal clearance for roads, as Forestry Tasmania already has an established network of roads within the mining area and these will be used for the mining operations.

**Product transport**

The proposed mine site is located in north western Tasmania approximately 16 km west of the township of Tullah (25 km by road) and approximately 125 km southwest of Burnie.

Riley ore will be crushed and screened on site. Ore will be loaded on to trailer trucks and transported east along the Pieman road to a Tasrail rail loading facility at Bastyan Dam. The ore will then be railed to the port of Burnie for export (but, if necessary, prior to the rail facility being available a reduced tonnage will be trucked all the way through to Burnie via the Murchison Highway).

The infrastructure site will operate on two 12 hour shifts, seven days per week.

At full production, approximately 74 loads of ore are expected to be transported each day (24 hour period), leading to 148 additional daily truck movements on the Pieman Road.
The proposed development will therefore constitute an increase in the truck numbers on Pieman Road of:

- 1 truck every 19 minutes (~3 trucks per hour) in each direction.

The construction of the rail loading facility is a separate project by others and requires a separate statutory and commercial approval and capital investment. At least 6 months lead time may also be required to allow the purchase of the new rolling stock required for the rail transport task. It is therefore possible that the loading facility will not be available before mine production commences.

If this situation arises, product will be transported by road from the mine all the way to Burnie, via the Murchison Highway. This transport will be confined to daylight hours so as not to significantly increase wildlife (in particular Tasmanian devil) roadkill risk along the transport route. This restriction would reduce the achievable mine production rate accordingly. Approximately 50 truck deliveries would be possible in a 10 hour day, i.e. 5 deliveries (10 two-way movements) per hour, which would allow an equivalent annual production rate of 600,000 tonnes (compared with the 1+ million tonnes possible by rail). This restricted production rate would continue until the rail facility became available.

Approximately 30 staff will be on site during any one shift. Staff will be accommodated at Tullah and transported to the site on buses. Assuming a 45 seat bus this will require 4 bus movements per day.

In addition to truck and bus traffic, a small volume of light and medium vehicle traffic will be generated through maintenance activities, deliveries and transport of professional staff for short stay inspections. The number of such vehicle movements during any given day is anticipated to be less than 30.

Venture Minerals engaged pitt&sherry to undertake a Traffic Impact Assessment (TIA) for the proposed mine (see Appendix D).

The key findings from the TIA are summarised below (see section 4.20 for more detailed discussion):

- The Riley mine is expected to have negligible impact on the operational performance of Pieman Road, the internal roads within Tullah, and the efficiency of road junctions associated with product transport
- The junction of the mine access road and Pieman Road should be upgraded so that the geometry meets the requirements of the *Austroads Guide - Part 4A: Unsignalised and Signalised Intersections for a Type BAR/BAL junction*
- The available sight distance at the junction of the Bastyan Dam access road and Pieman Road needs to be increased to a minimum of 214 m in both the east and west directions
- The junction of the Bastyan Dam access road and Pieman Road should be upgraded to meet the requirements of the *Austroads Guide for a Type BAR/BAL junction* for the turning movements that will be undertaken by B-double vehicles.

### 2.1.2 Water management

This section describes the water management of the mine, which will involve the following:

- Surface water and groundwater monitoring
- Site drainage
- Drainage at final landform.
As there will be no ore processing on site, there is no need for a tailings dam or process water. The only water that maybe required will be for dust suppression during hot dry periods. In such instances, water will be obtained from sediment basins and the non-potable water tank (see section 4.1).

Management of acid water is not required as AMD is highly unlikely to be generated. Monitoring the run-off collected from the ore crushing, screening and stockpiling area, and resources areas B and D will nevertheless be undertaken for AMD precursors to confirm expectations that the site will not generate AMD (see below and section 4.2).

**Surface water and groundwater monitoring**

The project area straddles four surface drainage sub-catchments:

- Trinder-Fowler creeks, Class 2 stream (250 ha catchment above Three Mile Creek junction)
- Riley Creek, Class 3 stream (100 ha catchment)
- Three Mile Creek, Class 3 stream (60 ha catchment)
- Sweeney-Gold Creeks, Class 3 stream (60 ha catchment above Pieman Road).

The Sweeney-Gold creek system drains north to a tributary of the Huskisson River. The other three catchments combine to discharge to Lake Pieman.

Annual rainfall at Riley is likely to be similar to that at Rosebery (10 km to the east southeast) and Tullah (16 km to the east). The averages of these have been adopted for Riley and the mean annual rainfall has been rounded to 2,000 mm. A preliminary estimate of annual discharge from the four sub-catchments, based on effective rainfall, is approximately 5,400 ML.

A discussion of the existing surface drainage network is provided below.

A surface water and groundwater monitoring program was established in April 2012. The locations of the surface water sampling sites and groundwater monitoring bores in relation to the sub-catchments and proposed Riley mine area are shown in Figure 9 and Figure 10.

Surface water monitoring site locations are:

- RYSW1: 367010E 5376770N: on Three Mile Creek, 20 m north of its confluence with Trinder Creek, downstream from proposed mining operations in Area A
- RYSW2: 367470E 5376550N: at the base of Riley Creek, 50 m north of its confluence with Trinder Creek, downstream from proposed mining operations in Areas A, B and C
- RYSW3: 367445E 5376510N: on Trinder Creek, 20 m upstream from its confluence with Riley Creek, downstream from proposed mining operations in Area C
- RYSW4: 368730E 5379000N: on Sweeney Creek downstream from the Sweeney-Gold Creek confluence, where it crosses under Pieman road, downstream from mining operations in Area D
- RYSW5: 368940E 5376755N: on Trinder Creek upstream from proposed mining operations in Area C.

---

Figure 9: Surface water monitoring sites

Figure 10: Groundwater monitoring sites
Groundwater monitoring site locations are:

- RYWB001: 368532E 5378761N: in the Sweeney Creek catchment
- RYWB002: 367708E 5377096N: along the watershed divide between Riley Creek and Three Mile Creek
- RYWB003: 367706E 5377096N: along the watershed divide between Riley Creek and Three Mile Creek
- RYWB004: 368283E 5377671N: at the head of the watershed divide between Riley Creek and Trinder Creek
- RYWB005: 367380E 5376828N: downstream end of the watershed divide between Riley Creek and Trinder Creek.

Surface water and groundwater baseline monitoring commenced in May 2012.

Monitoring will continue to be conducted at three monthly intervals to assess water quality on a seasonal basis.

The following field parameters will be measured:

- Discharge
- pH
- EC
- Eh
- DO
- Temperature.

The following laboratory testing will be undertaken:

- pH, EC, TDS, TSS, colour
- Alkalinity (CO$_3$ and HCO$_3$), acidity
- Chloride, sulphate, ammonia, nitrate, nitrite, total N, dissolved P and total P
- Metals.

Results to date are described in section 3.4.5 and 3.4.6.

Monitoring of the sediment basin water will also be undertaken during mining operations for turbidity and AMD precursors. The sediment basins will be located downstream from the infrastructure and ore crushing, screening and stockpile area, and resource area B and D.

**Site drainage**

The resource covers an area of undulating hills and valleys. The resource is bound by Three Mile Creek to the north and Trinder Creek to the south. Areas A and C are separated by Riley Creek. The south east section of Area C borders Fowler Creek. The headwaters of Riley Creek and Gold Creek lie within Resource Areas B and D respectively (Appendix A).

The mine offices, ore stockpile, crushing and screening and infrastructure areas are located west of Area D, in the upper most parts of Sweeney Creek (Appendix A).

**Site drainage from the ore crushing, screening and infrastructure area**

To minimize the risk of sediment laden run-off from the ore crushing, screening and infrastructure areas entering the Sweeney Creek system and downstream environments, all runoff during rainfall events will be collected and diverted by a series of cut-off drains to a sediment basin.
See Appendix E for a layout of the infrastructure area showing the site drainage features.

The drainage system will be designed to provide adequate capacity for heavy rainfall events, and will incorporate energy dissipation structures and erosion control measures as necessary.

The water diverted into the sediment basin will not be subject to contamination and will be directed into Sweeney Creek, through energy dissipation structures as necessary.

The upper section of Sweeney Creek will be diverted around the infrastructure site to a section of creek downstream of the sediment basin (see Appendix C).

The natural hydrology of Sweeney Creek will be unaffected by mining operations. A temporary culvert will be used to pass the diversion flow across the mine access road (see Appendix C). The culvert will be properly sized and will comply with the Forest Practices Code 2000.

Flow from the catchment upstream of the site will not pass through the infrastructure area and will be kept separate from all site runoff and the sediment basin. The water quality of Sweeney Creek will therefore remain unaffected by the mining operations (see section 4.2 and 4.3).

While the temporary creek diversion will result in a localised and temporary loss of aquatic macro invertebrate life, it will not result in an overall loss of biological diversity in the creek system.

The sediment basin downstream of the infrastructure site (Appendix C) will be sized to handle all potential site run-off. The size of the sediment basin will be based on the following ratio of basin surface area to inflowing discharge: 3000 m$^3$ per m$^2$/s, which will provide approximately 100% removal efficiency for silt sized particles (0.02 mm)$^9$.

Internal site roads will need to cross the Sweeney Creek channel at two locations in the vicinity of the site infrastructure (see Appendix C). As all flow will be temporarily diverted, the channel will only be carrying run-off from the infrastructure site. Temporary culverts will be installed at these two locations to pass all storm flow that may be generated from the infrastructure site.

All culverts will be installed so as to minimise erosion potential.

All liquid waste on site, such as sewage and waste fuels and oils, will be stored and managed appropriately (see section 4.2).

**Site drainage and sediment management from mining resource areas A and C**

Mining of the resource from areas A and C will be undertaken upslope from Three Mile Creek, Riley Creek and Trinder Creek.

A minimum width of 15 meter buffer strips will be kept between the up-slope mined areas and Three Mile Creek and Riley Creek. A 30 meter buffer strip will be kept between the up-slope mined areas and Trinder Creek.

A 15 metre buffer strip is considered to be adequate given the other erosion and sediment control measures that will be implemented, as described below.

---

The following measures will be employed to manage erosion and sediment loss to the receiving creek systems:

- Clearing of the land in preparation for mining will be staged to occur as close as practicable to the actual mining of the cleared area.
- Exposure of bare substrate to the elements, and the corresponding erosion potential, will be minimised by covering recently mined areas with vegetation as soon as possible. Vegetation will be dozed into exposed mined out areas as neighbouring panels are prepared for mining, as described above in ‘Mining methods’.
- The extent of land exposed to the elements will therefore be kept to a minimum with no more than the equivalent of one panel cleared of vegetation per resource area at any one time. Conservatively, this equates to a maximum area of exposed land at any one time of approximately 2.8 ha.
- Silt fences in combination with up slope trenches will also be used at the base (downslope) of each cleared and mined 25 m panel to stop sediment from leaving the site during rainfall events’.
- A minimum 15 metre buffer strip will be maintained between the up-slope mined areas and the creek systems.
- Stockpiled topsoil and vegetation will be managed to encourage water infiltration and microbial activity, and prevent erosion in the period between stockpiling and reuse in site rehabilitation (see section 4.3.4). Note, only topsoil and vegetation from the first panel will be stockpiled from the mining areas.

See Appendix E for the site drainage plan.

A system of cut-off drains and sediment basins around the perimeter of the proposed mining areas was considered but rejected because the extent of resource Areas A and C means that a system of drains intercepting and diverting flow from the mining activities would significantly reduce the effective catchment area of Riley Creek, which bisects Areas A and C. This would greatly affect the hydrology of the system and result in an artificially reduced flow over an extended length of the creek.

Sediment basins are also not particularly effective in removing clay or dispersive particles due to the long settling rates involved. For example, to achieve 50% removal efficiency for clay particles, a ratio of basin surface area to inflowing discharge of approximately 20,000 m² per m³/s is required. The basins would need to be located downstream of resource areas A and C, necessitating the clearance of large additional areas of vegetation.

The emphasis is therefore on erosion control and prevention by minimizing the extent of land exposed to the elements at any one time. The proposed method of covering the ground with vegetation and mulch (in the form of chipped timber) provides excellent protection of the soil against erosion by rain.

Silt fences in combination with upstream trenching will trap particles entrained by sheet flow during rainfall events.

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11 Environment Australia, Department of the Environment and Heritage, 1999, Best Practice Environmental Management in Mining, Water Management, Department of the Environment and Heritage.
The following installation guidelines\textsuperscript{13}, recommended by the Institute of Engineers, Australia, will be adhered to:

- The contributing catchment area should not exceed 0.6 ha per 100 m of fence; for each 25 metre panel, this equates to 60 metres distance upslope and fences will therefore be established across the panel every 60 metres of sloping ground.
- The geo-textile fabric will be anchored in a 0.2 m deep backfill trench that is positioned on the upslope side.
- If wire is used to secure material to the posts, it will only be used at the top to prevent creating large holes through which water can flow.

Figure 11 shows a schematic diagram of a typical silt fence set up.

The silt fence is intended to be installed so that sediment-laden water can pond upstream, thus allowing the sediment to fall out of suspension and separate from the runoff.

The silt fence should be no higher than 0.9 m, as higher fences map impound volumes of water sufficient to cause failure of the structure\textsuperscript{14}.

![Figure 11: Schematic diagram of a typical silt fence set up](image)

Typical silt fence arrangements (plan view) that will be used to control runoff are shown in Figure 12.

\textsuperscript{13} Local government Association of Queensland Inc, 2006, Introductory erosion and sediment control guidelines for Queensland Councils.

Site drainage and sediment control during mining of resource area B
The mining of resource Areas B will require mining within the headwaters of Riley Creek.

While the mining will not extend below the regional water table and does not require a conventional open pit, some localised groundwater ingress is expected particularly where mining at the topographic low points.

Note that the mining in resource area B will be undertaken upstream from Riley Creek proper, where there is no continuously defined channel on the surface.

The following measures will be employed to manage drainage, erosion and sediment loss from mining in the upper catchments of Riley Creek:

- The mining of resource area B will be undertaken upstream from Riley Creek channel proper, in an area where there is no continuously defined drainage channel.
- A buffer strip will be left between the mining of area B and the upstream most point of Riley Creek channel proper, as defined by a continuous surface channel (see Appendix E).

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Where practicable, mining of low topographic points within the upper catchment of Riley Creek will be undertaken during times of no flow, thereby minimising the potential for erosion, sediment loss and localised groundwater ingress (groundwater is discussed in section 4.5).

The upper most panels in area B will be mined before the lower downslope panels (i.e. stage 3 will mine the upper most part in area B and stage 4 the small section downslope, see Appendix B ‘Mining schedules’). Keeping vegetated zones intact for as long as possible downslope of stage 3 mining will help maintain a large buffer zone during this mining stage (see Appendix E).

An off-line sediment basin downslope from resource area B will collect any water that ponds within the topographic low point during mining, including groundwater ingress (see Appendix E and Section 4.5).

Site drainage and sediment control during mining of resource area D
The mining of resource area D will require mining within the headwaters of Gold Creek.

While the mining proposed for Riley DSO hematite will not extend below the regional water table and does not require a conventional open pit, localised groundwater ingress is expected as the channel of Gold Creek will be mined (groundwater is discussed in section 4.5).

The following mitigation measures will be implemented to control potential erosion, site drainage and sediment loss in the upper catchment of Gold Creek:

- Where practicable, all mining within 20 metres of Gold Creek, including mining of the channel, will be undertaken during summer at times of no flow, thereby minimising potential for erosion, sediment loss and localised groundwater ingress (groundwater is discussed in section 4.5)
- An on-line sediment basin will be constructed on Gold Creek downstream from all mining activities
- The upper most panels in the catchment will be mined first, leaving the downstream panels and vegetated buffer zones along the creek channel to be mined last.

The size of the sediment basins associated with the mining activities of resource areas B and D will be based on the following ratio of basin surface area to inflowing discharge: 3000 m³ per m³/s, which will provide approximately 100% removal efficiency for silt sized particles (0.02 mm)16.

A full description of the mining method, including illustrative figure, is provided in section 2.1.1.

A description of erosion mitigation measures to control potential erosion and sediment transport arising from construction activities is described in section 2.1.3.

Drainage at final landform
The Riley DSO hematite resource is a surface deposit with an average depth of approximately 1.5 m. It covers an area of approximately 1.2 km² of undulating hills and valleys.

The mine site varies in altitude from approximately 140 m to 260 m above sea level. The removal of up to the top 4 m (approximate maximum) will therefore have little effect on the overall topography.

---

While the surface drainage of the four catchments, Three Mile Creek, Riley Creek, Trinder Creek and Gold Creek will remain largely unchanged from the mining activities, there is potential to locally alter the drainage pattern on closure as a result of the following mining activities:

- Mining close to the creek boundary to cause perched creek systems;
- Mining the upper Riley Creek and Gold creek catchments, thereby lowering of the ground level and possibly leading to ponding of water in former drainage lines and low topographic areas.

The following measures will be undertaken to ensure such alterations do not occur:

- A buffer width will be maintained along Riley Creek between the creek channel and resource Areas A and C so that the depth of the mining activity will not extend below the level of the top of the creek bank. This will ensure the creek system does not become perched.
- A maximum mining depth of 2 m will apply near the creek systems. This will ensure that a 15 m buffer will be sufficient for the majority of the length of Riley and Three Mile creeks.
- A section of Riley Creek has been identified where the resource extends close to the creek channel in an area where the creek may be susceptible to perching. A 15 m buffer width may not be sufficient here if mining were to extend to 2 m (see section 3.4.5, creek geomorphology and Figure 17). In this area, the buffer width will be extended, depending on the depth of mining at this location, to ensure that perching of the creek system does not occur.
- If the final rehabilitated surface level of the mined out sections in the upper catchment of Gold Creek is below the level of the channel creek bed down slope, then the channel bed will be regraded to ensure no ponding of water occurs upslope. The length of channel regraded will depend on the depth of mining. For example, given a slope of 0.032423 rise/run17 and a maximum mined depth of 2 m near the channel, the maximum length of channel that could be regraded is approximately 65 m. A control point will be established in the creek bed to ensure that no headcuts are produced.
- No ‘benches’ will be left around the edges of the mined out sections upslope that may promote ponding of water.

The infrastructure drainage system will be removed and in-filled on mine closure as part of the rehabilitation of the mine (see Decommissioning and Rehabilitation Plan, Appendix M). This will ensure that the natural drainage patterns in this area are returned on closure.

Flow will also be reinstated along the section of Sweeney Creek diverted during mine operation. The creek diversion channel will be retained along the edge of the mine access road to act as road drainage.

### 2.1.3 Construction

Construction activities will be for the preparation and development of the infrastructure area and associated buildings, roads and equipment (see Appendix C).

**Site preparation works**

The surveys undertaken for the DPEMP and the permit approval when issued will form the basis for the approval to clear the mine and infrastructure site areas.

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17 Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIPWE
The expected site preparation and construction works are summarised as follows:

- A vegetation valuation and removal plan will be developed in consultation with Forestry Tasmania.
- Commercially viable trees will be separated and sold or managed as determined by Forestry Tasmania.
- The vegetation and topsoil in the footprint of the infrastructure areas will be removed and windrowed in accordance with a site vegetation clearance plan.
- The vegetation and topsoil will be stored or reused on surfaces to be rehabilitated as soon as possible to benefit from the viability of the topsoil seed bank.
- The windrowing will be undertaken by Venture Minerals contractors - no ‘burn offs’ are proposed for the site clearance and preparation works.
- The windrows will be at least 20 m from any class 4 stream.
- All refuelling equipment will be located at least 40 m from any water course.
- Standard wash down procedures will be undertaken for equipment entering the site from outside the mining lease and leaving the mining lease from the project area.
- Existing access roads and tracks will be used to access the mine site and infrastructure area.
- Existing drainage systems will be kept functional during the preparation and construction works.
- During construction safety fencing will be installed around sensitive areas to prevent unauthorised access.

Vegetation clearance of the mining areas will be undertaken sequentially during mining operations, as described in section 2.1.1.

A suite of erosion mitigation measures to control and manage erosion and sediment transport arising from construction activities will be implemented. These measures are described in section 4.3.4.

**Plant hygiene measures**

Plant hygiene measures will be implemented to prevent the introduction and/or spread of introduced plant species, weeds, pests and diseases (such as *Phytophthora cinnamomi*) during the preparation and construction of the mine.

The plant hygiene measures are as follows:

- A *Phytophthora cinnamomi* and weed management strategy will be implemented.
- Machinery used in the clearance and construction work will be washed down prior to moving onto the mining lease, to reduce the possibility of importing weed and soil pathogens onto the premises.
- Machinery used in the clearance and construction work will be washed down prior to moving to another site off the mining lease, to reduce the possibility of transmitting any weed and soil pathogens in soil on machinery to other premises.
- Any material required from outside the lease area will be sourced from suppliers that are certified to be free of *Phytophthora cinnamomi*.
- In the event that *Phytophthora cinnamomi* is detected, wash down procedures will be instigated in accordance with Appendix 5 (Washing down) of the Interim *Phytophthora cinnamomi* Management Guidelines produced by the former
Construction materials
The current project design requires the following material and project resources:

- Materials for internal infrastructure roads
- Base/foundations for site offices and other infrastructure.

The equipment expected to be used for construction is outlined below (however contractors may use different equipment to that specified):

- Cranes
- Fork trucks
- Bulldozers
- Excavators
- Front end loaders
- Trucks
- Rollers (including vibrating).

The proposed development activities will be undertaken during daylight hours. It is preferred that the bulk of the earthworks are undertaken during the drier summer period to minimise the risk of sediment loss and wet weather interfering with construction schedules. However, with a project of this size, and dependant on the approvals timeframe, some earthworks may be required to be undertaken during wetter months.

Timeframe
At this stage, depending on the approvals timeframe, construction work is planned to be commenced first quarter 2013 with production scheduled to commence in the second quarter of 2013.

2.1.4 Commissioning
The initial operation will require the installation of a plant to dry, crush and screen the ore, the development of a shallow mining operation based on this ore and the establishment of infrastructure to load the crushed and screened ore.

Ore processing, storage and site office areas
The designated ore processing, storage, workshop and related infrastructure areas will be cleared of vegetation. All vegetation and available topsoil will be stockpiled for rehabilitation.

Testing will be undertaken of major equipment such as the rotary dryer, crushers, generators, and refuelling equipment.

Mine area
No commissioning of the mining area is required.

Port infrastructure
Any port infrastructure required to stockpile and load the ore will be developed in the commissioning phase.
2.2 Off-site infrastructure

All mine infrastructure will be on-site. The only off-site infrastructure used will be the Pieman Road for product transport to the Bastyan Dam rail loading facilities and at the Port of Burnie.

Development of the rail loading facilities at the Bastyan Dam site is being undertaken as a separate project by Tasrail and will go through a separate approval process. However, because this DPEMP has been prepared under the Bilateral Assessment process and the loading facility is considered to be a direct consequence of the Riley project under the EPBC Act, the potential impacts on Matters of National Environmental Significance of the loading facility are addressed in this DPEMP. The flora and fauna values of the loading facilities are described in section 5.1.1 and potential impacts on MNES are described in section 5.1.2.

A traffic impact assessment has been undertaken and is described in section 4.20.

Road upgrading is required at the junction of the mine access road and Pieman Road, and Bastyan Dam access road and Pieman Road (see section 4.20 for details).

Sight distance at the junction of the Bastyan Dam access road and Pieman Road needs to be increased to a minimum of 214 m in both the east and west directions.

The power supply for the mine site will be from diesel generators on-site. No off-site power transmission infrastructure is required.

2.3 Technical and management alternatives

The project design has been rigorously developed to optimise the efficient use of the site while minimising potential environmental impacts.

An alternative location for the infrastructure site was considered, south of the current proposed location but was rejected due to topographical constraints.

The current location of the infrastructure site has been selected to take advantage of reasonably flat terrain within proximity of the resource and mine access road, assisting to minimise greenhouse gas emissions resulting from ore haulage and the requirement to develop unnecessary roads.

Various alternative configurations of mine elements within the infrastructure site were considered. The chosen configuration (see Appendix C) achieves the best balance between health and safety considerations, necessary alignment of ore processing facilities, patches of *Micrantheum serpentinum* (see section 3.4.7), and the location of Sweeney Creek.
3. The existing environment

3.1 Planning aspects

The project is located in the West Coast Municipal area on Crown Land, approximately 1.4 km from the 690 ha Huskisson River Forest Reserve, and 1.5 km from the 66,920 ha Meredith Range Regional Reserve. Mineral prospectivity is a primary value of regional reserves.

Figure 13 shows the land tenure surrounding the proposed mining development.

The John Lynch Forest Reserve borders the Meredith Range Regional Reserve to the east (Figure 13). There are a number of smaller forest reserves east of John Lynch Forest Reserve including, Burns Peak Forest Reserve, Sawmill Creek Forest Reserve, Mount Kershaw Forest Reserve, Boco Creek Forest Reserve and MacKintosh Forest Reserve, together forming a large continuous area of approximately 11,257 ha.

The proposed mine is situated on two land parcels managed by Forestry Tasmania: PID 2531948 (LPI JTN35) and LPI GFZ63.

The mining lease area is located within an area subject to the West Coast Planning Scheme 2000 (the Scheme).

The proposed development falls within the Resource Development use category, defined as follows:

*Definition-Use of land for primary production which involves the use, and the planting, growing, harvesting and extraction, of natural resources. It includes but is not necessarily limited to:*

*animal husbandry, cropping, commercial forestry, extraction of rocks and minerals, grain and vegetable production, grazing, horticulture, marine farming and aquaculture. It includes buildings and works directly associated with these uses.*

The development proposed is for extraction of a natural resource and will include associated support infrastructure, such as buildings.

Land parcel LPI GFZ63 forms the Pieman Lake Forest Reserve, and lies within the Environmental Protection Zone of the Scheme. The forest reserve is a dedicated formal reserve, approximately 1,007 ha in area. Trinder Creek forms the northern boundary of the reserve.

No land disturbance will be undertaken on Land parcel LPI GFZ63. Because there is no proposed activity within the Environmental Protection Zone, the provisions of that zone do not require assessment.

Land parcel LPI JTN35 is located within the Natural Resources Zone of the West Coast Planning Scheme. All mining and related activities will be restricted to Land parcel LPI JTN35, and hence wholly located within the Natural Resources Zone of the West Coast Planning Scheme.

The proposed development is wholly within the Natural Resources Zone.
Figure 13: Land tenure surrounding the proposed mining development
It is the intent of the Natural Resources Zone to:

- Protect and allow for the sustainable use and development of the resources on which tourism, hydro electricity and forestry depend
- Allow for a range of other uses such as recreation and tourism in ways and in locations that do not adversely affect the values of the zone.

Resource Development, including extraction of rocks and minerals, along with any buildings and works directly associated with this use is a primary use class in the Natural Resources Zone.

A development application and permit (subject to full compliance with the relevant acceptable solutions or performance criteria) is required. Because the project is a level 2 activity under Schedule 2 of the Environmental Management and Pollution Control Act 1994, Council will refer the development application to the Board of the Environment Protection Authority for environmental assessment.

The West Coast Planning Scheme (2002) prescribes the standards applicable to use or development in the Natural Resources Zone.

The following Codes in the planning scheme are directly relevant to this project:

- Part D.22 Wetlands and Waterways Code
- Part D.16 Siting of Developments Code
- Part D.17 Standard Attenuation Distances Code
- Part D.19 Heritage Code.

The mine will meet the performance criteria standards (or acceptable solution in cases where there is no performance criterion) of the Natural Resources Zone and above Codes through the measures described in this DPEMP and summarised below.

Appendix C provides an infrastructure layout plan and building plans.

The buildings will be all be relocatable buildings, brought to site for the duration of the mine life and removed at mine closure. Venture Minerals plans to use relocatable buildings supplied by Ausco or similar for all but the workshop. The workshop is planned to be two 12 m shipping containers connected by a roof, supplied by Universal Fabric Structures or similar.

Building types are as follows:

- Offices: drawing number MP1230
- Lockers: drawing number MP6030
- Security, first aid and communications: drawing number MP6030
- Crib: drawing number MP6030
- Ablutions: drawing number T6030
- Workshop: drawing number RSCM8/12.

Surface finishes of the buildings will be CCS MESA profile external sheets in “Merino” colour. Barge boards and gutters will be Colorbond “Plantation” colour.

The workshop containers and connecting roof colours will be similar to the buildings (and not as shown in the Appendix C drawing RSCM8/12, which is only a display drawing).
The external lighting plan is shown in Figure 14. Three lighting towers are planned, each with four 1500 watt lights, orientated to shed light as shown.

Figure 14: External lighting plan

3.1.1 Applicable zone standards

Table 8 provides responses to the issues raised within the Natural Resources Zone.

Table 8: Natural Resources Zone standards and responses

<table>
<thead>
<tr>
<th>Scheme Provision</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Issue 1 - The Conduct of Mineral Exploration and Mining</strong></td>
<td></td>
</tr>
<tr>
<td>1.1 The application is for mineral extraction and does not include mineral exploration.</td>
<td></td>
</tr>
<tr>
<td>1.2 As above</td>
<td></td>
</tr>
<tr>
<td>1.3 All quarrying activities will be carried out in accordance with the Quarry Code of Practice 1999 published by Department of Primary Industries, Water and Environment.</td>
<td></td>
</tr>
<tr>
<td><strong>Issue 2 - Mineral Exploration and Mining</strong></td>
<td></td>
</tr>
<tr>
<td>2.1 This report acts as a full and comprehensive suitability assessment that addresses avoidance of natural hazards. Natural hazards have been considered in the risk assessment provided in Appendix L. Fire risk is addressed in section 4.19.</td>
<td></td>
</tr>
<tr>
<td>2.2 &amp; 2.3 Natural hazard risk levels, mitigation measures and residual risks are assessed in the risk assessment provided in Appendix L.</td>
<td></td>
</tr>
<tr>
<td><strong>Issue 3 - Commercial Forestry Outside State Forests and Declared Private Timber Reserves</strong></td>
<td></td>
</tr>
<tr>
<td>3 Not Applicable as the harvesting that is to occur will be in a State Forest Reserve.</td>
<td></td>
</tr>
<tr>
<td><strong>Issue 4 - Use and Development in Private Timber Reserves</strong></td>
<td></td>
</tr>
<tr>
<td>4.1 Not applicable as the mining lease area is not within the boundary of</td>
<td></td>
</tr>
<tr>
<td>Scheme Provision</td>
<td>Response</td>
</tr>
<tr>
<td>------------------</td>
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<tr>
<td>a private timber reserve.</td>
<td></td>
</tr>
<tr>
<td>Issue 5 - Protection of Riparian Vegetation</td>
<td>5.1 Performance criteria are met, refer to section 4.9.</td>
</tr>
<tr>
<td>Issue 6 - Road Access and Set Backs</td>
<td>6.1 See discussion on Road Assets Code below.</td>
</tr>
<tr>
<td>Issue 7 - Pollution</td>
<td>7.1 Erosion, sediment loss and the potential impact of sediment laden run-off on the creek systems is considered in section 4.3. Hydrology, the final landform and groundwater are considered in section 4.4 and 4.5 respectively.</td>
</tr>
<tr>
<td>Issue 8 - Protection of Vistas</td>
<td>8.1 Buildings and works will not be visible from tourist roads, refer to section 4.15.</td>
</tr>
<tr>
<td>Issue 9 - Subdivision</td>
<td>9 Not applicable as this development does not involve subdivision.</td>
</tr>
<tr>
<td>Issue 10 - Infrastructure Provision</td>
<td>10.1 All infrastructure costs associated with the mine construction and operation will be borne by the developer.</td>
</tr>
<tr>
<td>Issue 11 - Attenuation Distances - Separation of Incompatible Use and Development</td>
<td>11 Refer to section 4.6.</td>
</tr>
<tr>
<td>Issue 12 - Secondary Use Classes</td>
<td>12 Resource Development is a Primary Use Class within the Natural Resources Zone.</td>
</tr>
<tr>
<td>Issue 13 - Management of Balance Land</td>
<td>13.1 Land management is described in section 0.</td>
</tr>
</tbody>
</table>

### 3.1.2 Codes

**Car parking and access code**

Resource Development does not fit under the purpose of Business and Civic, Industrial, Recreation or Residential. Car parking requirements are therefore specified within the performance criteria of Table 15.1 (1.1) of the Scheme.

The Infrastructure Layout Plan (refer Appendix C) shows the location of proposed car parking on site. The car parking spaces are being made available for Venture Minerals' professional staff and any contractors or visitors that might visit the site. The mining employees are proposed to be transported onto the site from Tullah on 45 seater buses and will therefore not require any car parking provision on site. Section 4.22.4 provides further detail on proposed traffic movements to and from the site.

The car parks will not be located at the entrance to the site as they are located within close proximity to the office buildings. The car park will be located on a relatively flat area. The gradient of the land will not act as a constraint in parking opportunities. The
car parking will not be visible from the Pieman Road. Car parking spaces will be
designed and surfaced to facilitate stormwater infiltration into surrounding unpaved
and landscaped areas within the boundaries of the development site.

**Siting and development code**

The Siting and Development Code is intended to protect aspects of visual and environmental significance. Many of the issues raised within the applicable standards relate to development within the coastal zone, which is not applicable to this development. The proposed location of all buildings can be found within the Infrastructure Layout Plan (Appendix C). Responses to code standards are shown in Table 9.

Table 9: Siting and development code standards and responses

<table>
<thead>
<tr>
<th>Scheme Provision</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issue 1 - Coastal Use or Development</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Not applicable as the proposal is not for urban or residential development and the site is not in the coastal zone.</td>
</tr>
<tr>
<td>Issue 2 - Environmental Impact</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Geotechnical investigations will be undertaken as part of detailed design. The development will be appropriately drained and will not cause land instability or erosion. Waste water distribution will not be compromised by the location of building and works. See section 4.2 and 4.4.</td>
</tr>
<tr>
<td>2.2</td>
<td>As above.</td>
</tr>
<tr>
<td>2.3</td>
<td>Surface water will be managed so as not to affect the natural hydrology of the area. See section 4.4.</td>
</tr>
<tr>
<td>Issue 3 - Coastal Landscape Protection, Visual Amenity and Public Access</td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Buildings and works will not be visible from tourist roads (Murchison Highway). See section 4.15.</td>
</tr>
<tr>
<td>3.2</td>
<td>Not applicable as the subject site does not adjoin a public beach, foreshore or reserve. Regardless, this document acts as a full and comprehensive development site analysis.</td>
</tr>
<tr>
<td>Issue 4 - Natural Hazards</td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Not applicable as the development site is not likely to be subject to tidal inundation, erosion, beach erosion, shoreline recession, sand drift, slope or cliff instability, flooding or sea level rise.</td>
</tr>
<tr>
<td>4.2</td>
<td>The buildings and works could be subject to risk of bushfire. Section 4.19 addresses this hazard.</td>
</tr>
<tr>
<td>Issue 5 - Coastal Processes and Coastal Habitat Protection</td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>Not applicable as development is not proposed on a coastal dune system.</td>
</tr>
<tr>
<td>5.2</td>
<td>Not applicable as the proposal is not occurring at a beach.</td>
</tr>
<tr>
<td>5.3</td>
<td>Not applicable as there will be no vegetation removal from any fore or hind dunes, dune swales or beaches.</td>
</tr>
</tbody>
</table>
Standard attenuation distances code
The subject site is not within close proximity to any sensitive uses - the nearest residential locality is Rosebery, approximately 5 km distant (Tullah is approximately 16 km away). However, attenuation distances and potential impacts have been discussed in detail in section 4.6.

Road asset code
The Pieman Road is considered a Category V road, which are all ‘other’ public roads primarily providing property access. Many of the issues raised within the Road Asset Code are therefore not applicable.

There are no deficient junctions identified within Table 18.3 of the Road Asset Code, indicating that Issue 3 is not applicable. In response to the issues raised in Issue 2.2, the Traffic Impact Assessment provides sufficient detail regarding access and site distance and can be found Appendix D.

Heritage code
Built heritage has been discussed in detail in section 4.13.2. A historic heritage assessment was undertaken by Austral Tasmania, refer Appendix G. The site has a history of mining activity in the 1900s and any discarded refuse or materials found during works will be examined and documented in order for maximum interpretation of the lifestyle of past workers.

Aboriginal heritage
Aboriginal heritage has been discussed in detail in section 4.13.1. An Aboriginal Cultural Heritage Assessment was undertaken by CHMA. One isolated artefact was identified during the field assessment in the south western edge of the study area, and will not be impacted by the project. The remainder of the study area is assessed as having a low level of archaeological sensitivity. In the event of an unexpected discovery, the Unanticipated Discovery Plan will be followed.

Subdivision and building in bushfire prone areas code
The application does not include subdivision. Bushfire risk is discussed in section 4.19.

Wetlands and waterways
The intent of the Wetlands and Waterways Code is:

It is the intent of the code to provide protection for the following features of wetlands and waterways:

a) sensitive ecosystems which occur in a variety of forms and in a range of locations;
b) flow regimes, water levels, biological activity and physical characteristics;
c) the rich variety of flora and fauna; and
d) their role for water supply, flood mitigation, environmental protection, water regulation and nutrient filtering, as resources for recreational activities and as attractive features in the landscape.

The purpose is to achieve sustainable management of surface and groundwater resources through a focus on the achievement of water quality objectives which will maintain or enhance water quality, and ensure that diffuse and point source pollution does not prejudice the achievement of water quality objectives.
**Applicable standards**

Table 10 provides a response to the standards of the Wetlands and Waterways Code.

**Table 10: Wetlands and waterways code standards and responses**

<table>
<thead>
<tr>
<th>Scheme Provision</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Issue 1 - Works on or Near Wetlands or Waterways</strong></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>There will be no dams, weirs or permanent bridges constructed over any wetland or waterway. However, temporary culverts and diversion of the natural waterways will be undertaken in order to fully restore the natural flow regimes, water quality and biological diversity of the waterways following the completion of the mining activities. Refer to sections 2.1.2, 4.3 and 4.4.</td>
</tr>
<tr>
<td><strong>Issue 2 - Riparian Vegetation</strong></td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Vegetation buffers of 15 m from permanent waterways will be maintained. See section 2.1.2.</td>
</tr>
<tr>
<td>2.2</td>
<td>See issue 1.1 above.</td>
</tr>
<tr>
<td><strong>Issue 3 - Water Quality</strong></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>The methods of treatment management of waste discharge can be found in section 4.2 and 4.3.</td>
</tr>
<tr>
<td><strong>Issue 4 - Road and Private Roadways Construction</strong></td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>Roads will not be directly parallel to the waterway and appropriate mitigation measures are proposed in order to prevent erosion or increased sediment flows and to protect the water quality of the streams. Refer section 2.1.2.</td>
</tr>
<tr>
<td>4.2</td>
<td>As above.</td>
</tr>
<tr>
<td>4.3</td>
<td>Drainage works are to be in accordance with Part 3 of the Forest Practices Code 1985; however, the Forest Practices Code 1985 has been superseded by the Forest Practices Code 2000. There is no 'Part 3' within the Forest Practices Code 2000; however, road drainage is addressed within Section B3.2. The proposed development complies with Section B3.2 of the Forest Practices Code 2000. Refer to section 2.1.2 for more detail.</td>
</tr>
<tr>
<td>4.4</td>
<td>Drainage scour will be eliminated as described in section 4.3.</td>
</tr>
<tr>
<td><strong>Issue 5 - Road and Private Roadways Construction</strong></td>
<td></td>
</tr>
<tr>
<td>5.5</td>
<td>Drainage scour will be eliminated as described in section 4.3.</td>
</tr>
<tr>
<td>5.6</td>
<td>There will be no permanent bridges or crossing.</td>
</tr>
<tr>
<td>5.7</td>
<td>There will be no quarries or borrow pits established within 40 m of any class 1-4 stream.</td>
</tr>
</tbody>
</table>

**3.2 Land capability**

The proposed mine site was logged in 1982 when access tracks and roads were established, and has a long history of exploration and mining dating back to 1903 (see section 3.4.10).
An area proposed for mining between Three Mile Creek and Riley Creek (coup MD099F) and Riley Creek and Trinder Creek (coup MD099G) is planned for timber harvesting by Forestry Tasmania (see Figure 28, page 151).

An area approximately 500 m directly west of the proposed mine site (coup MD102A) is also planned for timber harvesting by Forestry Tasmania (Figure 28).

A small area on the western side of Three Mile Creek, outside the bounds of the proposed mining site, was recently harvested.

Although a specific land capability survey has not been undertaken for the area, an estimation of the likely land capability classes can be made, based on the known geology, land systems (discussed in following section) and current and historic land usage.

If any of this land was capable of being converted to an agricultural land classification, it would be likely to be classified as land capability Class 7 (land with very severe to extreme limitations which make it unsuitable for agricultural use) or Class 6 (land marginally suitable for grazing because of severe limitations).

### 3.3 Strategic prospectivity zones

The mine lies within a strategic prospectivity zone established under the *Mining (Strategic Prospectivity Zones) Act 1993*. The zones are shown in Figure 15.

The act zones high prospectivity areas and prohibits changes to tenure of land within those zones without the approval of both Houses of Parliament if those changes will lead to mining being excluded.

The proposed Riley mine is consistent with the intent of Parliament to protect and foster the mining of mineral resources in this area.

![Figure 15: Strategic prospectivity zones (source: Mining (Strategic Prospectivity Zones) Act 1993)]
3.4 Environmental aspects

3.4.1 Geology

The Riley iron ore resource is a surface deposit of pisolithic hematite, overlaying the Wilson River Ultramafic complex to the northeast and the Crimson Creek formation to the southwest.

The Crimson Creek Formation is approximately 5,000 m thick and comprises mainly volcanogenic sandstone and siltstone with scattered laminated felsic tuffites, carbonate horizons and rare tholeiitic basalt. The Wilson River Ultramafic complex is composed of layered ultramafic bodies of Eocambrian -Cambrian age, forming part of a group of similar ultramafic bodies scattered along the Dundas and Adamsfield troughs in northwestern and western Tasmania.

General interpretation is that the Wilson River Ultramafic complex is fault bounded, with the lower margins abutting against the Early Cambrian volcanites and carbonates of the Crimson Creek Formation, although the fault has not been observed by Venture Minerals geologists.

Geology of the mine site and resource is described in section 2.1.1.

3.4.2 Topography

The mine site is located at the southeast end of northwest/southeast trending Serpentine ridge. The area is characterised by broad rounded hills, with locally steep sideslopes, undulating plains and steep incised valleys. The area is raised above the partially submerged Pieman river valley to the south, now Lake Pieman.

The surface over the mine site varies from approximately 140 m at the base of the creek systems to 250 m above sea level near the proposed mine offices and workshop and laydown area, and 260 m at the highest point of resource Area D, east of the infrastructure area.

Localised flat or very low gradient areas comprising small floodplain pockets occur in the mid to upper sections of Riley Creek, Three Mile Creek and Trinder Creek. The topography of the lower sections of these creek systems through the Crimson Creek formation locally steepens. Here the creeks are incised with valley slopes abutting the channel margins.

The DSO hematite deposits are generally confined to the hill slopes in the upper creek catchments overlying the Wilson Creek ultramafics. The south west end of resource areas A and C, however, form distinctly flat areas perched above the incised creek systems to the south west, in the Crimson Creek formation.

3.4.3 Land systems and soil

Three land systems are mapped within the proposed project area, and are described as follows.

793121 Tullah

This land system covers only a small section on the southern side of the project area, south of Riley Creek. The undulating plain occurs on areas of alluvium and glacial

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deposits, associated with the Pieman River and its tributaries in the Rosebery-Tullah-
Bulgobac area. The floodplain and upper terraces are characterised by their dark
organic soils and buttongrass vegetation. On the upper terrace the soils are shallow
and gravelly with a siliceous gravel pan. On the floodplain gravel is absent and the
profiles are much deeper. A mixture of soils was found on the higher rises, due to the
variety of glacial parent material involved.

822241 Bald Hill
This land system covers the majority of the project area running from north west to
south east. The hills have typically broad rounded crests but steep sideslopes. The
area is formed on Cambrian basic igneous rocks. The grey soils found on the crests are
shallow, with scattered outcrops of bedrock. Soils are grey on the sideslopes as well,
but are much deeper and are stony. The greatest hazard exists on the steep midslopes
and serious slumping of roadside batters was observed in this situation.

824141 Pieman River
This land system covers the south western side of the project area as well as a small
area on the north eastern corner. It is characterised by low hills on Cambrian
greywacke turbidite sequences. Gradational soils with a thin surface layer of peat
cover the system. The soils are deepest in the swales, where profiles are mottled and
are shallowest on the crests and upper slopes, where they are reddish brown in colour.
Gravelly yellowish brown profiles typify the soils on the mid and lower slopes. There is
moderate potential for soil erosion.

3.4.4 Climate
The study area is situated in the cool temperate climatic zone.

The two closest active Bureau of Meteorology (BOM) weather stations are located at
Rosebery (Gepp Street, 10 km to the east southeast of the mine site at an altitude of
160 mASL) and Tullah (Meredith Street, 16 km to the east at an attitude of 167 mASL).

These stations only record rainfall.

A new weather station was installed at the Mt Lindsay project site in March 2011. Data
being collected includes rain, evaporation, humidity, temperature and wind speed. A
fairly strong regional rainfall gradient, however, exists in north western Tasmania,
which suggests that the annual rainfall at the Riley site may be more similar to that at
Rosebery and Tullah than Mt Lindsay (approximately 16 km to the west northwest of
the Riley mine site)21.

The average rainfall records (1997-2011) for Rosebery and Tullah have been adopted
for the Riley mine site and are shown in Table 11.

The prevailing winds at the Riley mine site are north westerly to south westerly.

The closest Bureau of Meteorology (BOM) temperature station is located at Rosebery
(HEC substation), at an altitude of 165 m ASL. This site operated from 1979 to 1993,
when it closed.

William C. Cromer Pty. Ltd., 14 June 2012.
Table 11: Monthly rainfall statistics adopted for Riley mine site (averaged from data derived from the Rosebery and Tullah BOM stations)\textsuperscript{22}

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean monthly Rainfall (mm)</td>
<td>94</td>
<td>83</td>
<td>118</td>
<td>145</td>
<td>195</td>
<td>195</td>
<td>247</td>
<td>246</td>
<td>228</td>
<td>199</td>
<td>117</td>
<td>153</td>
<td>2,000</td>
</tr>
<tr>
<td>Highest monthly Rainfall (mm)</td>
<td>212</td>
<td>225</td>
<td>205</td>
<td>337</td>
<td>301</td>
<td>386</td>
<td>468</td>
<td>410</td>
<td>320</td>
<td>229</td>
<td>264</td>
<td>2,418</td>
<td></td>
</tr>
<tr>
<td>Lowest monthly Rainfall (mm)</td>
<td>18</td>
<td>17</td>
<td>64</td>
<td>34</td>
<td>80</td>
<td>70</td>
<td>124</td>
<td>114</td>
<td>66</td>
<td>66</td>
<td>21</td>
<td>92</td>
<td>1,827</td>
</tr>
</tbody>
</table>

The temperature data (from the Rosebery site) are summarised in Table 12.

Table 12: Temperature statistics for Rosebery HEC substation

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean maximum (°C)</td>
<td>21.0</td>
<td>21.9</td>
<td>20.1</td>
<td>17.0</td>
<td>14.1</td>
<td>11.3</td>
<td>11.0</td>
<td>12.1</td>
<td>13.3</td>
<td>18.6</td>
<td>16.4</td>
<td>20.5</td>
<td>16.4</td>
</tr>
<tr>
<td>Mean minimum (°C)</td>
<td>10.1</td>
<td>9.7</td>
<td>9.2</td>
<td>7.7</td>
<td>6.2</td>
<td>4.3</td>
<td>3.5</td>
<td>4.3</td>
<td>5.0</td>
<td>6.4</td>
<td>7.7</td>
<td>9.6</td>
<td>7.0</td>
</tr>
</tbody>
</table>

### 3.4.5 Surface water drainage

The following elements of the surface water drainage system of the proposed mine site are discussed in this section:

- Creek systems
- Water quality
- Geomorphology.

#### Creek systems

The project area straddles four surface drainage sub-catchments (see Figure 9):

- Trinder-Fowler creeks, Class 2 stream (250 ha catchment above Three Mile Creek junction)
- Riley creek, Class 3 stream (100 ha catchment)
- Three Mile creek, Class 3 stream (60 ha catchment)
- Sweeney-Gold creeks, Class 3 stream (60 ha catchment above Pieman Road).

The creeks are part of a larger fluvial landscape called the Western Dissected Surfaces, characterized by moderately dissected erosion surfaces in the Pieman catchment\textsuperscript{23}.

The general characteristics of the stream systems within the Riley DSO Hematite mine project area are shown in Table 13.


\textsuperscript{23} Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIPWE
Table 13: General characteristics of the stream systems within the project area

<table>
<thead>
<tr>
<th>Stream Name</th>
<th>Slope (%)</th>
<th>Altitude (m AHD)</th>
<th>Length (m)</th>
<th>Geomorphic condition</th>
<th>Strahler stream order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trinder Creek</td>
<td>2.4 to 3.8</td>
<td>141 to 237</td>
<td>3275</td>
<td>High</td>
<td>1, 2 and 3</td>
</tr>
<tr>
<td>Riley Creek</td>
<td>2.6 to 4.4</td>
<td>155 to 208</td>
<td>1549</td>
<td>High</td>
<td>1 and 2</td>
</tr>
<tr>
<td>Three Mile Creek</td>
<td>3.9 to 6.5</td>
<td>141 to 215</td>
<td>1474</td>
<td>High</td>
<td>1 and 2</td>
</tr>
<tr>
<td>Gold Creek</td>
<td>4.3</td>
<td>205 to 240</td>
<td>804</td>
<td>High</td>
<td>1</td>
</tr>
<tr>
<td>Sweeney Creek</td>
<td>4.4</td>
<td>190 to 250</td>
<td>1349</td>
<td>High</td>
<td>1</td>
</tr>
</tbody>
</table>

A preliminary estimate of monthly and annual discharge from each of the four sub-catchments within the mine project area, based on the effective rain method, is provided in Table 14.

Table 14: Estimated stream discharge (for decile 9 rainfall) from each sub-catchment

<table>
<thead>
<tr>
<th>Mean monthly and annual discharge (ML)</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Annual*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trinder-Fowler Creek (at sample location RYSW3)</td>
<td>80</td>
<td>0</td>
<td>80</td>
<td>240</td>
<td>420</td>
<td>500</td>
<td>520</td>
<td>520</td>
<td>500</td>
<td>360</td>
<td>220</td>
<td>160</td>
<td>2,200</td>
</tr>
<tr>
<td>Riley Creek (at sample location RYSW2)</td>
<td>40</td>
<td>0</td>
<td>40</td>
<td>120</td>
<td>210</td>
<td>250</td>
<td>260</td>
<td>250</td>
<td>250</td>
<td>180</td>
<td>110</td>
<td>80</td>
<td>1,100</td>
</tr>
<tr>
<td>Three Mile Creek (at sample location RYSW1)</td>
<td>20</td>
<td>0</td>
<td>20</td>
<td>70</td>
<td>130</td>
<td>150</td>
<td>160</td>
<td>150</td>
<td>110</td>
<td>70</td>
<td>50</td>
<td>700</td>
<td></td>
</tr>
<tr>
<td>Sweeney-Gold Creek (at sample location RYSW4)</td>
<td>20</td>
<td>0</td>
<td>20</td>
<td>60</td>
<td>110</td>
<td>130</td>
<td>130</td>
<td>130</td>
<td>90</td>
<td>60</td>
<td>40</td>
<td>600</td>
<td></td>
</tr>
</tbody>
</table>

* Annual totals may not match the sum of monthly totals because they are calculated independently.

A preliminary estimate of the annual discharge (for decile 9 rainfall) from the four sub-catchments at the mine site is approximately 4,600 ML, with approximately 4,000 ML draining into Lake Pieman and 600 ML draining into the Huskisson River system.

Based on this method, there is no net flow at any of the sites during February in an average year. It is likely that these four creek systems, at least part thereof, are ephemeral in nature, with periods of no flow occurring during dry summer months. During detailed design, Venture will investigate installing a temporary polypipe supply from Lake Pieman as a contingency against this.

Estimated peak flows for an assumed maximum rainfall event of 75 mm in one day range from 300 to 1,300 L/s.

24 Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIW
Stream discharge was recorded at the following locations on 2 May 2012 (see Figure 9 for location of monitoring sites):

- RYSW1 Three mile Creek 10 L/s
- RYSW2 Riley Creek 35 L/s
- RYSW3 Trinder Creek 80 L/s
- RYSW4 Sweeney Creek 20 L/s.

Measurements of stream flow will continue during the pre-approvals stage, with the information providing a reference base against which future discharge in the creek systems can be assessed, when the proposed mine becomes fully operational.

A discussion of mine water management is provided in section 2.1.2.

A description of mine site hydrology is provided in the hydrogeological report in Appendix F.

**Water quality**

One surface water monitoring run has been completed, undertaken 2 May 2012. Samples were analysed in the field and laboratory for the following parameters:

- pH, EC, Eh, DO, Temperature, TDS, TSS, colour
- Alkalinity (CO$_3$ and HCO$_3$), acidity
- Chloride, sulphate, ammonia, nitrate, nitrite, total N, dissolved P and total P
- Total heavy metals.

Surface water quality at the five sampling locations from May 2012 is summarised in Table 15. The full water quality report is presented in Appendix F.

In general, the surface waters sampled were slightly alkaline (average pH 7.6), very low salinity (average EC 203 µS/cm) waters of the magnesium bicarbonate type$^{27}$. Suspended solids were very low, and despite draining lateritic surrounds, the waters were also relatively low in dissolved iron. The trace metals nickel and chromium, however, were elevated relative to the surface waters in the district, reflecting the presence of soils derived from ultramafic bedrock.

The data contained within the water quality report (Appendix F) will provide a reference against which future surface water quality in the creek systems can be assessed, when the mine becomes operational.

---

Table 15: Water quality results, May 2012

<table>
<thead>
<tr>
<th></th>
<th>pH</th>
<th>EC (µS/cm)</th>
<th>DO (mg/L)</th>
<th>TDS (mg/L)</th>
<th>TSS (mg/L)</th>
<th>SO₄²⁻ (mg/L)</th>
<th>Alkalinity (mgCaCO₃/L)</th>
<th>Cl (mg/L)</th>
<th>Ammonia (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RYSW01</td>
<td>7.4</td>
<td>196</td>
<td>12</td>
<td>116</td>
<td>2</td>
<td>3.2</td>
<td>78</td>
<td>17.7</td>
<td>0.002</td>
</tr>
<tr>
<td>RYSW02</td>
<td>7.6</td>
<td>190</td>
<td>12.1</td>
<td>111</td>
<td>&lt;1</td>
<td>2.4</td>
<td>74</td>
<td>16.0</td>
<td>&lt;0.002</td>
</tr>
<tr>
<td>RYSW03</td>
<td>7.7</td>
<td>135</td>
<td>12.1</td>
<td>112</td>
<td>3</td>
<td>2.0</td>
<td>48</td>
<td>15.3</td>
<td>0.01</td>
</tr>
<tr>
<td>RYSW04</td>
<td>7.2</td>
<td>202</td>
<td>12.9</td>
<td>126</td>
<td>2</td>
<td>3.5</td>
<td>80</td>
<td>16.4</td>
<td>0.003</td>
</tr>
<tr>
<td>RYSW05</td>
<td>7.5</td>
<td>296</td>
<td>11.5</td>
<td>190</td>
<td>&lt;1</td>
<td>2.0</td>
<td>168</td>
<td>15.5</td>
<td>&lt;0.002</td>
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<table>
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<th></th>
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<th>Nitrite (mg/L)</th>
<th>Total N (mg/L)</th>
<th>Dissolved P (mg/L)</th>
<th>Total P (mg/L)</th>
<th>Al (µg/L)</th>
<th>As (µg/L)</th>
<th>Ni (µg/L)</th>
<th>Zn (µg/L)</th>
<th>Fe (µg/L)</th>
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<tr>
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<td>0.15</td>
<td>0.007</td>
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<td>17</td>
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<td>0.45</td>
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<td>0.009</td>
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<tr>
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<td>0.004</td>
<td>0.008</td>
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<table>
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<th>Cr  (µg/L)</th>
<th>Co  (µg/L)</th>
<th>Cu  (µg/L)</th>
<th>Pb  (µg/L)</th>
<th>Mn  (µg/L)</th>
<th>K  (mg/L)</th>
<th>Mg  (mg/L)</th>
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<td>&lt;0.5</td>
<td>7.9</td>
<td>0.33</td>
<td>19.4</td>
<td>9.66</td>
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<td>1</td>
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<td>9.33</td>
</tr>
<tr>
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<td>&lt;0.5</td>
<td>&lt;1</td>
<td>&lt;0.5</td>
<td>2.2</td>
<td>0.16</td>
<td>41.3</td>
<td>8.76</td>
</tr>
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</table>

EC = electrical conductivity; DO = Dissolved oxygen; TDS = total dissolved solids; TSS = total suspended solids; SO₄²⁻ = sulphate; Cl = chloride; Al = aluminium; As = arsenic; Cd = cadmium; Cr = chromium; Co = cobalt; Cu = copper; Pb = lead; Mn = manganese; Ni = nickel; Zn = zinc; Fe = iron. Metal concentrations are dissolved (totals are available in the report in Appendix F).

Information on groundwater quality is discussed in section 3.4.6.

Creek geomorphology

A geomorphological field survey of Riley Creek was undertaken by pitt&sherry in April 2012. The key aims of the survey were to establish the condition of Riley Creek and to assess the likelihood of creek perch ing if the resource was to be mined close to the creek system.

A walk over was undertaken along 4 sections of Riley Creek noting key geomorphological features, and five channel cross sections were surveyed, focused on sections of the creek where mining is likely to be undertaken close to the creek boundary.

The findings are described below.

Three main geomorphological styles were identified:

- Zone A: A partially confined bedrock controlled creek system in the lower catchment (valley margin abuts creek system for greater than 50% of channel length). The channel is characterised by riffles, pools, small bedrock drops, waterfall, runs, and small floodplain pockets. A large amount of woody debris was observed. The channel is approximately 3 m wide (bank full width) and 0.46 m deep (bank full depth). The substrate is dominated by pebbles and gravel, although larger particles occur along with bedrock.

- Zone B: An unconfined single, low sinuosity channel in the mid-catchment. A floodplain exists on both sides of the channel for most of the length. The channel is
characterised by extended riffles and runs, with occasional small drops. A large amount of woody debris was observed. Channel widening has occurred at several locations, characterised by multiple flow lines within gravel deposits. At these locations the channel (bank full width) was over 15 metres wide.

- Zone C: A discontinuous, ill defined channel in the upper catchment. This section of the stream is marked by a groundwater fed pool discharging into a defined channel at the upstream end of the mid-catchment.

Figure 16 shows the location of the geomorphological styles described above. The location of the channel cross sections are also shown on the figure, and discussed below.

The geomorphology of Riley Creek has clearly been altered through historic mining and forestry activities.

Austral Tasmania undertook a desk top assessment of historic heritage of the mine site in March 2012. A follow up field survey was undertaken by them in April 2012.

According to their report28 (see Appendix G), mining and exploration activities have been undertaken in the area since 1891. Between 1903 and the 1930s osmiridium was mined from alluvial deposits, with all the creeks on the proposed mine site, Three Mile Creek, Riley Creek, Trinder Creek, Sweeney Creek and Gold Creek seemingly worked. Activities surrounding Riley Creek, however, appear to have been particularly intense.

Section 3.4.10 provides an overview of the historic heritage and mining history of the area.

The geomorphological field survey identified the following fluvial features indicative of historic mining and forestry activities:

- Channel straightening and incision
- Channel re-alignment by in-channel wooden structures
- Channel widening and development of multiple flow lines
- Gravel heaps on floodplain
- Artificial drainage channels and water races on the floodplain
- Artificial drainage channels and water races entering the channel
- Large amounts of woody debris.

Recent mineral exploration activity has resulted in the following disturbances to the creek system:

- Degradation of channel boundaries at creek crossings
- Large amount of woody debris pushed across the channel at creek crossings
- In-stream sediment basins downstream from creek crossings and trenching activities.

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28 Austral Tasmania, Riley Creek, Tullah, Historic Heritage Desktop Assessment, Unpublished report for Venture Minerals Ltd., Austral Tasmania April 2012
Figure 16: Location of field (Tr) and map (A-A’ system) based transects and changes in geomorphological style on Riley Creek as indicated by zone labels.
All the features and disturbances described above were identified from the mid-catchment zone (the unconfined single channel, Zone B), although disturbance to the creek channel and/or bank or floodplain is also apparent in the lower (Zone A) and upper (Zone C) sections of the creek.\(^{29}\)

Given the relatively low slope of the system (2.6 to 4.4 %), the presence of bedrock waterfalls, and the cohesive nature of the banks (clay dominated), the Riley creek system is likely to be relatively stable. The channel widening observed is likely to be associated with historic disturbance.

The channel cross sections, surveyed at the five locations within the mid-catchment shown in Figure 16, are shown in Figure 17 (Tr 1 to 5). The dashed lines illustrate the 1 and 2 metre contour heights above the creek bank.

These 1 and 2 m heights provide a guide as to how deep mining can occur close to the creek without creating a perched creek system. If mining extended too deeply, the new land surface elevation would be below the elevation of the creek bank, and surface water could no longer flow to the creek. This would create ponding and/or a parallel creek system, both of which should be avoided. As a conservative general principle, mining will not go below the 1 m limit unless specific surface grading is going to be undertaken after mining to ensure that surface water can flow to the natural creek channel.

For example, mining of resource area C will be undertaken close to the creek on the left hand bank (left side of figure) at four locations: transects Tr1, Tr3, Tr4 and Tr5 (see Figure 16).

At Tr3, Tr4 and Tr5 a buffer width of 15 metres on the left hand bank (shown as a green bars in Figure 17) will be adequate, without additional restrictions on mining depth, to maintain the natural hydrology. This is because the ground surface is sufficiently elevated outside the buffer zone to allow the surficial resource to be extracted without going below the 1 m-above-stream-bank limit. Maintenance of local surface flow and groundwater discharge to creek channel will be retained, with no need for special grading measures.

However, at Tr1 the ground surface is only 1 m above the creek bank at the edge of the 15 m buffer zone, which is not likely to be adequate. Removal of the surficial resource in the area is likely to lower the residual ground surface to below the elevation of the creek bank. Surface water could then not flow into the creek channel, and ponding would occur. To prevent this happening, a buffer width of approximately 25 m would be required in this location.

Similar considerations will apply throughout the mining area wherever mining approaches the creek channels. The objective in all cases will be to prevent perched creeks being left and to ensure that there is no significant potential for ponding on the residual ground surface.

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\(^{29}\) Austral Tasmania, Riley Creek, Tullah, Historic Heritage Desktop Assessment, Unpublished report for Venture Minerals Ltd., Austral Tasmania April 2012
Figure 17: Cross sections of Riley Creek (looking downstream, left side of figure is left bank) at selected locations (see Figure 16)
Figure 18: Cross sections of Riley Creek used map based 2.5 metre contours at selected locations (TS 1 to TS 4) (see Figure 16)
3.4.6 Groundwater

Based on general groundwater principles, a conceptual groundwater model was developed for the Riley mine site by William C. Cromer Pty Ltd\textsuperscript{30}, and is presented in Figure 19. The locations of the two cross sections are shown in Figure 10 (page 28) as dashed red lines.

In Figure 19, the main components of the hydrogeological water balance are shown in blue type. The key features of the conceptual model are as follows:

- Steeply east-dipping sandstones and ultramafics constitute a fractured rock aquifer. Fracturing is expected to be relatively intense at and near the surface, becoming less intense with depth. Hydraulic conductivity and storativity are expected to be variable.
- The regional water table is a subdued replica of the land surface, and intersects the land surface along drainage lines.

Near-surface groundwater flow to Riley Creek and other watercourses in the area is controlled by local systems, and recharge and discharge occur on hills and intervening valleys respectively.

At increasing depths, flow becomes intermediate and then regional in scale.

To assess groundwater conditions, a groundwater monitoring program has been established at the mine site by William C. Cromer Pty Ltd. Bore locations are shown in Figure 10 (page 28).

One groundwater monitoring run has been completed, undertaken 2 May 2012. Results are summarised below, with the full report provided in Appendix F.

**Groundwater levels and yields**

Groundwater levels and estimated yields recorded in the initial monitoring run are summarised in Table 16.

<table>
<thead>
<tr>
<th>Bore</th>
<th>Bore depth (m)</th>
<th>Depth to groundwater (m)</th>
<th>Estimated yields (L/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RYWB001</td>
<td>12.5</td>
<td>5.3</td>
<td>0.04</td>
</tr>
<tr>
<td>RYWB002</td>
<td>23.1</td>
<td>8.9</td>
<td>0.03</td>
</tr>
<tr>
<td>RYWB003</td>
<td>4.4</td>
<td>Dry</td>
<td>N/A</td>
</tr>
<tr>
<td>RYWB004</td>
<td>18.0</td>
<td>15.6</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>RYWB005</td>
<td>23.0</td>
<td>15-17</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Bore locations are shown in Figure 10 (page 28).

All the bore holes within the lateritic area are located on or near interfluves on relatively high ground\textsuperscript{31}. The watertable in May 2012 was relatively close to the surface in bore holes RYWB001 and RYWB002, but deeper in bore hole RYWB004, on the low saddle separating east and west flowing surface streams. The water table in RYWB005 was underdetermined but is expected to be at a depth of approximately 15 - 17 m.


Figure 19: Conceptual groundwater model for the Riley mine site
The water table on the lower slopes is expected to be closer to the surface, and seasonally intersect the ground surface at the water courses. At the time of sampling, shallow groundwater seepage was observed entering an exploratory trench from the base of the laterite overlying clayey silt. Seepage into excavations near the watercourses may be encountered during mining operations.

Groundwater yields encountered in the bore holes were low to very low, reflecting the extremely weathered nature of the bedrock materials. Pathways for groundwater movement, at least locally, are expected to be relatively limited.

**Groundwater quality**

Parameters analysed were the same as for surface water.

Groundwater quality from the bore holes is summarised in Table 17. Note that bore hole RYMB003 was dry so no samples were taken.

### Table 17: Groundwater quality results, May 2012

<table>
<thead>
<tr>
<th>Parameter</th>
<th>RYWB00 1</th>
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<tr>
<td>EC (µS/cm)</td>
<td>118</td>
<td>185</td>
<td>400</td>
<td>70</td>
</tr>
<tr>
<td>DO (mg/L)</td>
<td>1.4</td>
<td>7.7</td>
<td>108</td>
<td>63</td>
</tr>
<tr>
<td>TDS (mg/L)</td>
<td>90</td>
<td>107</td>
<td>290</td>
<td>63</td>
</tr>
<tr>
<td>TSS (mg/L)</td>
<td>338</td>
<td>87</td>
<td>108</td>
<td>3.6</td>
</tr>
<tr>
<td>SO4 (mg/L)</td>
<td>16.1</td>
<td>10.2</td>
<td>17.2</td>
<td>17.2</td>
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<tr>
<td>Cl (mg/L)</td>
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<td>84</td>
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<tr>
<td>TDS (mg/L)</td>
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<tr>
<td>Total suspended solids</td>
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<td>108</td>
<td>3.6</td>
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<tr>
<td>SO4 (mg/L)</td>
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<td>Cl (mg/L)</td>
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<td>Total suspended solids</td>
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<tr>
<td>EC (µS/cm)</td>
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<tr>
<td>SO4 (mg/L)</td>
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<tr>
<td>TDS (mg/L)</td>
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<tr>
<td>pH</td>
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<td>6.5</td>
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<tr>
<td>EC (µS/cm)</td>
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<td>DO (mg/L)</td>
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<td>TDS (mg/L)</td>
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<td>TSS (mg/L)</td>
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<td>SO4 (mg/L)</td>
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<tr>
<td>Cl (mg/L)</td>
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<td>3</td>
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<tr>
<td>TDS (mg/L)</td>
<td>12</td>
<td>37</td>
<td>84</td>
<td>3</td>
</tr>
</tbody>
</table>

[EC = electrical conductivity; DO = Dissolved oxygen; TDS = total dissolved solids; TSS = total suspended solids; SO4 = sulphate; Cl = chloride; Al = aluminium; As = arsenic; Cd = cadmium; Cr = chromium; Co = cobalt; Cu = copper; Pb = lead; Mn = manganese; Ni = nickel; Zn = zinc; Fe = iron. Metal concentrations are dissolved (totals are available in the report in Appendix F).]
The groundwaters are slightly acidic, low salinity waters that tend towards sodium chloride types (compared to the magnesium bicarbonate type surface waters).

Despite draining lateritic areas, they are relatively low in dissolved iron. Dissolved nickel and chromium, however, were elevated in groundwater tested from the two bore holes drilled into ultramafic bedrock (RYWB002 and RYWB004). RYWB004 also had anomalously high sulphate content, suggesting that sources of sulphate (or sulphides) may be present. The outlying nature of this sample also suggests that RYWB004 may access a different aquifer to the other three bore holes, which has limited association with surface waters.

Background data will provide a reference against which future groundwater quality and depth can be assessed, when the mine becomes fully operational.

3.4.7 Flora

An initial flora assessment of the proposed mining area was undertaken in October/November 2011 by North Barker Ecosystem Services. A helicopter search targeting wedge-tailed eagle nests was undertaken in February 2012. A targeted search for *Epacris glabella* occurred in April 2012, following further definition of the mine areas. A further survey was undertaken in July 2012 following changes to the infrastructure layout at the northern end of the site. The full North Barker Ecosystem Services report is provided in Appendix H.

A summary of the report is provided in the following.

**Vegetation communities**

Eight vegetation communities were recorded in the study area but no vegetation communities of national (*Environment Protection and Biodiversity Conservation Act 1999*) or State (*Nature Conservation Act 2002*) significance were found.

The extent of each vegetation community in relation to the proposed mine is shown Figure 20 with a brief description provided below.

**Eucalyptus nitida dry forest and woodland (DNI)**

The canopy layer was dominated by *Eucalyptus nitida* which rarely grew in excess of 18 m. The communities on the northern/north eastern slopes of serpentine ridge supported a mallee form which was restricted to a height no more than 10 m.

*Eucalyptus nebulosa* is a newly described species that potentially matches this mallee form observed. This species was confined to the ultramafics and, apart from its mallee habitat and geology, was very similar in appearance to *Eucalyptus nitida*.

This community consists of a relatively dense secondary shrub layer with moderately dense low shrubs and dense vascular plant ground cover.

*Micrantheum serpentinum* (western tridentbush) is listed as rare under the *Threatened Species Protection Act 1995* and was recorded in large numbers within this community. This is consistent with but broader ranging than past records of this species along the roads and tracks within the study area.

The DNI community is well reserved and not threatened.

**Eucalyptus nitida forest over Leptospermum (WNL)**

The canopy layer is dominated by *Eucalyptus nitida* with associated species of *Eucalyptus delegatensis*. The area near Three Mile creek is currently subject to

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forestry activities with tree heights of up to 50 m observed. The area near Riley Creek has been historically mined and the regrowth vegetation in this area was much shorter, reaching an average height of 20 m with thickets of *Leptospermum* dominating the understorey. Between Riley and Trinder Creeks some trees reach 60 m.

In the more mature stands, a crown cover of 55% was consistently observed. A distinct change occurred to the understorey of the community just south of the upper reaches of Riley Creek. This community was very open in the understorey.

The WNL community is well reserved and not threatened.

The vegetation community at the Bastyan rail loading facility site is this vegetation community also (see report in Appendix H). This facility will be a separate project by others but is mentioned here because the facility is treated as a direct consequence of the Riley project under the EPBC Act and needs to be considered by the Commonwealth under the Bilateral Assessment of this DPEMP.

**Eucalyptus delegatensis forest with broad-leaf shrubs (WDB)**

This community only occurs between Riley and Three Mile Creek within the study area. The tall canopy is dominated by 50 m high *Eucalyptus delegatensis* with *Eucalyptus nitida* an associated species. This community is likely to be poorly mapped within the bioregion and is either not correctly recognised or recorded as WDU (*Eucalyptus delegatensis* wet forest undifferentiated).

Of this vegetation type, 30,300 ha occurs state wide, of which 9,900 ha or 32% is reserved. At the bioregional level there is 300 ha mapped present with 100 ha or 30% reserved.

This community is not listed as threatened.

**Eucalyptus obliqua dry forest and woodland (DOB)**

This community occurs around the upper part of Gold Creek around 250 m asl. The canopy is dominated by 35 m high *Eucalyptus obliqua* with *Eucalyptus delegatensis* and *Eucalyptus nitida* as associated species.

The DOB community is well reserved and not threatened. There is 32 approximately hectares of this community within the study area.

**Eucalyptus delegatensis forest over Leptospermum (WDL)**

This community occurs around the upper part of Gold Creek at around 250 m asl. The canopy is dominated by 35 m high *Eucalyptus delegatensis* with *Eucalyptus nitida* being an associated species.

The WDL community is well reserved and not threatened.

**Eucalyptus obliqua forest over Leptospermum (WOL)**

The only occurrences of this community within the study area were to the south of the power line easement at the north-eastern corner of the site. This community occurs on Cambrian igneous rock, siltstone, sandstone and conglomerate. A 40 m high open forest was dominated by *Eucalyptus obliqua* with associated *Eucalyptus nitida*. Where this community grades into WDL, *Eucalyptus delegatensis* also occurs.

The WOL community is well reserved and not threatened.

**Leptospermum scrub (SLW)**

This vegetation type is non forest dominated by *Leptospermum* spp. In this case the scrub is dominated by *L. scoparium*. Some emergent *Eucalyptus nitida* is evident on the edges of this community.
Figure 20: Vegetation communities and threatened flora and fauna observations within the study area
This community is well reserved and not threatened.

**Buttongrass moorland with emergent shrubs (MBS)**

Buttongrass moorlands occur along the southern boundary of the study area with small pockets also along the eastern edge.

The buttongrass community near the north eastern easement showed some evidence of *Phytophthora cinnamomi* dieback. This was evident in the large number of dead *Sprengelia incarnata*.

The MBS community is well reserved and not threatened.

**Nothofagus - Atherosperma rainforest (RMT)**

This callidendrous rainforest only occurred to the south west corner of the study area on the lower slopes towards Lake Pieman. The forest consists of mainly mature and old growth myrtle *Nothofagus cunninghamii* with sassafras *Atherosperma moschatum* and leatherwood *Eucryphia lucida* and an occasional emergent *Eucalyptus delegatensis*.

This community is well reserved and not threatened.

Table 18 shows the extent and reservation status for the vegetation communities on the proposed mine site.

**Table 18: Conservation status of vegetation communities**

<table>
<thead>
<tr>
<th>Equivalent described floristic community</th>
<th>Equivalent Mapped Community</th>
<th>State Wide Extent/NRS Reservation Status</th>
<th>Bioregional Extent/All Reservation Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eucalyptus nitida dry forest and woodland</td>
<td>- Eucalyptus nitida dry forest and woodland DNI</td>
<td>52 300 ha intact 30 600 ha reserved Not threatened Well reserved</td>
<td>23 300 ha intact 17 300 ha reserved Not threatened Well reserved</td>
</tr>
<tr>
<td>Eucalyptus nitida forest over Leptospermum</td>
<td>- Eucalyptus nitida forest over Leptospermum WNL</td>
<td>109 700 ha intact 106 100 ha reserved Not threatened Well reserved</td>
<td>86 800 ha intact 85 200 ha reserved Not threatened Well reserved</td>
</tr>
<tr>
<td>Eucalyptus delegatensis forest with broad-leaf shrubs</td>
<td>- Eucalyptus delegatensis forest with broad-leaf shrubs WDB</td>
<td>30 300 ha intact 6 400 ha reserved Not threatened</td>
<td>3 500 ha intact 2 100 ha reserved Not threatened</td>
</tr>
<tr>
<td>Eucalyptus obliqua dry forest and woodland</td>
<td>- Eucalyptus</td>
<td>178 100 ha intact 10 600 ha intact</td>
<td></td>
</tr>
</tbody>
</table>

35 Harris, S and Kitchener, A. 2005, From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation, DPIW, Hobart
36 Harris, S and Kitchener, A. 2005, From Forest to Fjaeldmark: Descriptions of Tasmania's Vegetation, DPIW, Hobart
37 DPIPWE 2010 Tasveg 2 Tas Reserve System
<table>
<thead>
<tr>
<th>Equivalent described floristic community(^{34, 35})</th>
<th>Equivalent Mapped Community(^{36})</th>
<th>State Wide Extent/NRS Reservation Status</th>
<th>Bioregional Extent/All Reservation Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>obliqua dry forest and woodland DOB</td>
<td>39 200 ha reserved</td>
<td>7 100 ha reserved</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not threatened inadequately reserved</td>
<td>Not threatened</td>
<td>Well reserved</td>
</tr>
</tbody>
</table>

**Eucalyptus delegatensis forest over Leptospermum**

<table>
<thead>
<tr>
<th>Eucalyptus delegatensis forest over Leptospermum WDL</th>
<th>21 000 ha intact</th>
<th>2 300 ha intact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>14 400 ha reserved</td>
<td>2 300 ha reserved</td>
</tr>
<tr>
<td></td>
<td>Not threatened</td>
<td>Not threatened</td>
</tr>
<tr>
<td></td>
<td>Well reserved</td>
<td>Well reserved</td>
</tr>
</tbody>
</table>

**Eucalyptus obliqua forest over Leptospermum**

<table>
<thead>
<tr>
<th>Eucalyptus obliqua forest over Leptospermum WOL</th>
<th>338 100 ha intact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60 700 ha reserved</td>
</tr>
<tr>
<td></td>
<td>Not threatened</td>
</tr>
</tbody>
</table>

**Leptospermum scrub**

<table>
<thead>
<tr>
<th>Leptospermum scrub SLW</th>
<th>76 200 ha intact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>45 000 ha reserved</td>
</tr>
<tr>
<td></td>
<td>Not threatened</td>
</tr>
<tr>
<td></td>
<td>Well reserved</td>
</tr>
</tbody>
</table>

**Buttongrass moorland with emergent shrubs**

<table>
<thead>
<tr>
<th>Buttongrass moorland with emergent shrubs MBS</th>
<th>87 200 ha intact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>83 900 ha reserved</td>
</tr>
<tr>
<td></td>
<td>Not threatened</td>
</tr>
<tr>
<td></td>
<td>Well reserved</td>
</tr>
</tbody>
</table>

**Nothofagus - Atherosperma rainforest**

<table>
<thead>
<tr>
<th>T5.1 Nothofagus cunninghamii - Atherosperma moschatum - Eucryphia lucida over Trochocarpa gunnii</th>
<th>606 400 ha intact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothofagus - Atherosperma rainforest RMT</td>
<td>432 200 ha reserved</td>
</tr>
<tr>
<td></td>
<td>Not threatened</td>
</tr>
<tr>
<td></td>
<td>Well reserved</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>378 600 ha intact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>339 000 ha reserved</td>
</tr>
<tr>
<td></td>
<td>Not threatened</td>
</tr>
<tr>
<td></td>
<td>Well reserved</td>
</tr>
</tbody>
</table>

**Threatened flora species**

A total of 87 vascular plant species were recorded during the survey, including 18 endemic and 2 declared weeds. There was a paucity of aquatic flora as the creeks were generally small and fast flowing.
One threatened vascular plant species, *Micrantheum serpentinum* (western tridentbush) listed under the schedule of the *Threatened Species Protection Act 1995* (TSPA) was recorded on the proposed mine site at the following locations (Figure 20):

- Along the mine access road
- Within the infrastructure area
- On the northwestern edge of resource area A, near Three Mile Creek.

Two small patches within the proposed infrastructure area, one to the north and one to the south, have high densities of *Micrantheum serpentinum*. The patch to north has an estimated 1,680 plants and the one to the south an estimated 1,200 plants (Figure 20).

The core area of the local *Micrantheum serpentinum* population, however, is on the slope of Serpentine Ridge within the DNI community, outside the disturbance area of the proposed mine site to the North West.

The potential impact of the proposed mine on *Micrantheum serpentinum* is discussed in section 4.9.3.

No threatened vascular plant species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) were recorded on the proposed mine site.

Table 19 lists threatened plant species previously recorded within a 5 km radius of the study area. Notes on the habitat and the likelihood of the species being in the study area are included.

**Table 19: Threatened flora species previously recorded in the vicinity (within 5 km)**

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Conservation Status</th>
<th>Previous records, preferred habitat and other observations.</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Micrantheum serpentinum</em></td>
<td>Vulnerable/-</td>
<td>This species is restricted to Cambrian serpentinite substrate, typically on rocky hillsides at approximately 170 to 480 m above sea level. Habitat includes heathy shrubland, shrubby <em>Eucalyptus nitida</em> woodland, and moist, shaded gullies or creek banks. 27 previous records occur within the study area. Field surveys collected a large number of this species present within the DNI community surrounding Serpentine Ridge.</td>
</tr>
</tbody>
</table>

*Epacris glabella*, which is listed as endangered under the EPBC and the TSPA, is known to occur just outside the 5 km of the study area. This species was listed on the EPBCCA Protected Matters Report. Targeted searches for this species concentrated on the northern areas of the mine impact area with the search finding no presence of *Epacris glabella*.

There are no threatened flora species at the Bastyan rail loading facility site (see report in Appendix H). *Barbarella australis* (native wintercress) is the only MNES species recorded by the Protected Matters Search Toll within a 5 km radius of the loading facility and there is no suitable habitat for this species at the site. This facility will be a separate project by others but is mentioned here because the facility is treated as a direct consequence of the Riley project under the EPBC Act and needs to be considered by the Commonwealth under the Bilateral Assessment of this DPEMP.

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39 Tasmanian State Government 2008
**Introduced plants**

Two declared weed species were recorded during the 2011 survey\(^{40}\), Spanish heath and English broom.

English broom was observed near the entrance gate and was pulled out and removed from the site. The Spanish heath occurred outside of the proposed Riley mine site along the Pieman Road. No other introduced species were recorded within the proposed Riley mine site.

The level of weed infestation within the proposed mine site is considered to be low.

Blackberry, Spanish heath and gorse occur in and adjacent to the Bastyan rail loading facility site (see report in Appendix H). Blackberry and gorse are Weeds of National Significance. This facility will be a separate project by others but is mentioned here because the facility is treated as a direct consequence of the Riley project under the EPBC Act and needs to be considered by the Commonwealth under the Bilateral Assessment of this DPEMP.

**Plant pathogens**

*Phytophthora cinnamomi*

*Phytophthora cinnamomi* is a soil borne fungal pathogen that invades the roots of plants and starves them of nutrients and water. Heath communities are the most susceptible to infection with a consequent serious loss of species diversity. It is generally spread by the transportation of soil on vehicles, construction machinery and walking boots.

The mine site is marginal in terms of the potential establishment of *Phytophthora cinnamomi* both in terms of conducive conditions and vegetation susceptibility.

Symptomatic evidence of *Phytophthora* was observed within the buttongrass moorland community near the power line easement to the north east of the study area. Dieback was evident in *Sprengelia incarnata*. Some die-back in *Banksia marginata* was also observed but it is not necessarily due to *Phytophthora cinnamomi*.

Upon entry to the site, it is currently required to spray down vehicles with a preventative solution which is provided near the gate in a pump action spray bottle.

*Myrtle wilt (Chalara australis)*

*Chalara australis* is a naturally occurring fungus that causes disease in mature myrtle beech (*Nothofagus cunninghamii*) and regenerating trees (40-60 years), which results in death of the trees. This disease is commonly referred to as ‘myrtle wilt’.

Disturbance which causes damage to older myrtles has the potential to trigger local epidemics of myrtle wilt killing a high proportion of the mature trees and spreading into adjacent undisturbed areas of myrtle forest.

Symptoms of myrtle wilt were not seen on the proposed Riley mine site. The tall open *Nothofagus* rainforest that occurs to the south west of the mine site is the most susceptible community.

3.4.8 Fauna

A fauna habitat assessment of the proposed mining area was undertaken in October/November 2011 by North Barker Ecosystem Services\(^{41}\). A helicopter search

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\(^{40}\) North Barker Ecosystem Services, 2012, *Riley Iron Laterite Prospect Proposal - Botanical Survey and Fauna Habitat Assessment*.

\(^{41}\) North Barker Ecosystem Services, 2012, *Riley Iron Laterite Prospect Proposal - Botanical Survey and Fauna Habitat Assessment*. 

68
was undertaken on the 16\textsuperscript{th} February 2012, targeting wedge-tailed eagle nests. A survey for selected threatened fauna over some of the proposed mine site was also completed in October 2011 by Nick Mooney\footnote{Mooney, N., 2011, Survey of Select Threatened Fauna for Venture Minerals’ Proposed Mining at Riley Creek, Tullah.}. The reports provided by Nick Mooney and North Barker Ecosystem Services are provided in Appendix H.

The following is a summary from these reports.

**Terrestrial fauna habitat**

The proposed mine site is a mixture of mature and regrowth wet and dry sclerophyll forest with an area of callidendrous rainforest with an altitudinal range from approximately 160 m asl to about 270 m asl.

The complex structure of the predominantly forest mixes provides suitable habitat for a range of bush birds and mammals. The presence of old growth eucalypt trees provides hollow nesting and roosting habitat for fauna and potentially eagles. Logs and hollowed bases in mature myrtle (restricted to the south west of the study area) are potential cover for mammals and deep litter is prevalent on the ground which is favourable for invertebrates.

A number of small fast flowing streams are also present within the study area where a large number of Burrowing crayfish mounds were observed within the RMU community.

**Threatened fauna for which habitat could be significant**

Table 20 lists threatened fauna species previously recorded from within 5 km of the proposed mine site.

Table 20 also notes species recorded within a 5 km radius of the Bastyan rail loading facility site. This facility will be a separate project by others but is mentioned here because the facility is treated as a direct consequence of the Riley project under the EPBC Act and needs to be considered by the Commonwealth under the Bilateral Assessment of this DPEMP.

<table>
<thead>
<tr>
<th>Species</th>
<th>Status TSPA/EPBCA</th>
<th>Likelihood of occurrence\footnote{For broad ranging species such as eagles and devils this refers to breeding structures such as nests or dens.} and Observations\footnote{Bryant, S. &amp; Jackson, J., 1999, <em>Tasmania’s Threatened Fauna Handbook: what, where and how to protect</em>. Threatened Species Unit, Parks &amp; Wildlife Service, Hobart.}</th>
<th>Preferred Habitat\footnote{Natural Values Report 25/11/08, DPIW, Natural Values Report 15/11/2010} and Observations\footnote{Natural Values Report 25/11/08, DPIW, Natural Values Report 15/11/2010}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azure kingfisher \textit{Ceyx azurea diemenensis}</td>
<td>Endangered/Endangered</td>
<td>LOW (mine site)</td>
<td>Inhabits tree-lined waterways, lakes, ponds and other wetlands with dense streamside vegetation, in particular in western and north-western Tasmania\footnote{Higgins (1999)}. It is historically also known from eastern Tasmania. No known nest sites or records occur within 5 km of the study area. Suitable habitat is considered unlikely. Creeks on site hold fast flowing water with banks that are generally unsuitable for nesting as they are predominantly sheer rock rather than sediments. Visual searches did not locate any azure kingfishers.</td>
</tr>
<tr>
<td>Species</td>
<td>Status TSPA/EPBCA</td>
<td>Likelihood of occurrence</td>
<td>Preferred Habitat and Observations</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------------------</td>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Grey goshawk <em>Accipiter novaehollandiae</em></td>
<td>Endangered/Endangered</td>
<td>MODERATE (mine site)</td>
<td>Inhabits large tracts of open wet mixed forest and rainforest particularly favouring mature blackwood and tea tree. One known record occurs within 5 km of the study area but this dates to 1981 with a high GPS error rate. No prime nesting habitat (mature blackwood or Manuka) occurs within the study area; however, the open tall rainforest is occasionally used for nesting and this species will forage there particularly in the riparian areas.</td>
</tr>
<tr>
<td>Swift parrot <em>Lathamus discolor</em></td>
<td>Endangered/Endangered</td>
<td>NIL (mine site)</td>
<td>Requires tree hollows for nesting and feeds on nectar of blue gum (<em>E. globulus</em>) and black gum (<em>E. ovata</em>) flowers. Three records of this species have been recorded within 5 km of the study area. The survey area is not considered suitable nesting habitat, nor would it provide suitable foraging habitat during the species annual migration from and back to the Australian mainland. May be a temporary visitor to the site for short periods of time as a fly over area.</td>
</tr>
<tr>
<td>Wedge-tailed eagle <em>Aquila audax</em></td>
<td>Endangered/Endangered</td>
<td>LOW (mine site)</td>
<td>Requires large eucalypts trees in sheltered locations for nesting and is highly sensitive to disturbance during the breeding season. One nest site record of this species has been recorded within 5 km of the study area - a little more than 1.5 km away on Lake Pieman. A wedge-tailed eagle was observed on-site during field surveys however no nest was observed. The site contains marginal habitat with potential old growth trees that may offer some suitability for nesting. The survey area is utilised for foraging. Past mining and forestry activities indicate the site may have a low chance for breeding. A targeted helicopter search was undertaken in February 2012 to look for active nests within the study area. No nest was recorded.</td>
</tr>
<tr>
<td>Tasmanian masked owl <em>Tyto novaehollandiae subsp. castanops</em></td>
<td>Endangered/Vulnerable</td>
<td>VERY LOW (mine site)</td>
<td>Preferred habitat is lowland dry forest and woodlands. Nests in large hollow bearing trees. The wet vegetation types are sub optimal habitat although there are large trees with hollows occurring across much of the study area. There are no records for the study area on NVA.</td>
</tr>
<tr>
<td>Australasian bittern <em>Botaurus poiciloptilus</em></td>
<td>Endangered/Endangered</td>
<td>NONE</td>
<td>No suitable habitat</td>
</tr>
<tr>
<td>Migratory MNES birds</td>
<td>Migratory</td>
<td>NONE</td>
<td>No suitable habitat</td>
</tr>
<tr>
<td>White-bellied Sea-eagle <em>Haliaeetus leucogaster</em></td>
<td>Vulnerable/Endangered</td>
<td>LOW (mine site)</td>
<td>This species nests and forages mainly near the coast but will also live near large rivers and inland lakes, often moving on a seasonal basis. The nearby Lake Pieman is considered potential hunting habitat for this species. No records of this species have been recorded within 5 km of the study area.</td>
</tr>
</tbody>
</table>
The sea-eagle sometimes chooses to nest in more exposed situations than the wedge-tailed eagle. Although some mature trees provide possible nesting sites, a targeted helicopter search was undertaken in February 2012 to look for active nests within the study area. No nest was recorded.

MAMMALS

**Spotted-tailed quoll**  
*Dasyurus maculatus ssp. Maculatus*  
Rare/Vulnerable  

<table>
<thead>
<tr>
<th>STATUS</th>
<th>LIKELIHOOD OF OCCURRENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH (mine site)</td>
<td>LOW (rail site)</td>
</tr>
</tbody>
</table>

This naturally rare forest-dweller most commonly inhabits rainforest, wet forest and blackwood swamp forest. It forages and hunts on farmland and pasture, travelling up to 20 km at night, and shelters in logs, rocks or thick vegetation. No records of this species have been recorded within 5 km of the study area and it is considered to be outside the core northern lowland habitat. No scats were observed on-site.

**Tasmanian devil**  
*Sarcophilus harrisii*  
Endangered/Endangered

<table>
<thead>
<tr>
<th>STATUS</th>
<th>LIKELIHOOD OF OCCURRENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIGH (mine site)</td>
<td>LOW (rail site)</td>
</tr>
</tbody>
</table>

Inhabits a range of forest types, usually within extensive tracts of remnant native vegetation. Three records of this species have been recorded within 5 km of the study area. Two fresh devil scats were found during this survey along Trinder Creek at the same location a large number of wombat scats were observed. This type of habitat has a low carrying capacity for devils and no suitable natal den sites were located nearby. Potential den structures were confined to logs and beneath trees, which are less likely to be used as natal dens than dry caverns or caves with tight entrances on warm aspects. Wombat burrows in high numbers in the vicinity of Trinder Creek were recorded and these may also provide suitable den sites for Tasmanian devils.

AMPHIBIANS

**Green and gold frog**  
*Litoria raniformis*  
Vulnerable/Vulnerable

<table>
<thead>
<tr>
<th>STATUS</th>
<th>LIKELIHOOD OF OCCURRENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE (mine site)</td>
<td>VERY LOW (rail site)</td>
</tr>
</tbody>
</table>

Inhabits still open water bodies with emergent aquatic vegetation. There is a very small shallow pool of water with *Baumea tetragona* emergent at the side of the railway line. This is unlikely to provide suitable habitat.

**Australian grayling**  
*Prototroctes maraena*  
Vulnerable/Vulnerable

<table>
<thead>
<tr>
<th>STATUS</th>
<th>LIKELIHOOD OF OCCURRENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>NONE (mine site)</td>
<td>NONE (rail site)</td>
</tr>
</tbody>
</table>

Inhabits the middle and lower reaches of rivers and streams that open to the sea. The survey area is above the Reece dam and so it is no longer possible for the sea dependant breeding cycle of this species to function.

INVERTEBRATES

**Hydroboid Snail**  
(Bowry Creek)  
*Beddomeia bowryensis*  
Rare/-

<table>
<thead>
<tr>
<th>STATUS</th>
<th>LIKELIHOOD OF OCCURRENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW (mine site)</td>
<td>NONE (rail site)</td>
</tr>
</tbody>
</table>

Only collected from Bowry Creek, Savage River with the tributary to the Blythe River a key site. Many of the species in the ‘Beddomeia Complex’ are threatened because of their very small geographic ranges, being found at a single site such as a small stream or seep. It has been suggested that the large number of species have evolved in different areas because the snails appear to be very selective in their habitat and have no obvious means of
<table>
<thead>
<tr>
<th>Species</th>
<th>Status TSPA/EPBCA</th>
<th>Likelihood of occurrence</th>
<th>Preferred Habitat and Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tasmanian devil</td>
<td></td>
<td></td>
<td>dispersal, either structurally or by physical vectors. They are cryptic in their habits and tend to live in sheltered and inaccessible parts of the stream channel, such as under rock slabs. This field survey did not include any detailed searches for this species but a number of small freshwater creeks are present on-site.</td>
</tr>
</tbody>
</table>

There are two listed fauna species for which the habitat at the site could be considered suitable. These are described below.

**Tasmanian devil**

The proposed mine site supports devils, as evidenced by recent scats found in the study area at four locations. Two scats were observed in close proximity to Trinder Creek (Figure 20). This area also contained a high number of wombat scats indicating grazing resource is available. Indeed, the disturbance and opening in the forest associated with the numerous access tracks, such as where the devil scats were found, provides grazing habitat and hence helps support herbivorous prey species.

The other scats were located in close proximity to the mine access road in the area of the proposed infrastructure site (Figure 20).

While the proposed mine area is potential foraging habitat, site surveys undertaken by North Barker and Nick Mooney, a recognised devil expert, found no active dens or lay-ups.

The mature tall rainforest at the southern end of the proposed mine has the greatest potential to support dens in the hollows at the bases of large trees or in shelters created under fallen logs. However, this type of den opportunity is not ideal, especially for natal dens. While the hollows could be large and reasonably dry, the nature of the logs, hollows and the natural shape of most pith hollows observed suggested poor potential. Tasmanian devils also have den opportunities in the wombat burrows that occur on site, although again no evidence of current or prior use of wombat burrows was observed.

A number of outcrops occurred in the upper reaches of Gold Creek but these were considered low quality denning/lay-up habitat.

The regrowth forest over the mine site has low potential for containing any dens.

Note that some areas of vegetation were too dense to search satisfactorily.

Mr Mooney considers devils are at low densities within the study area, with indices of abundance, their food and competitors suggesting a density as low as perhaps 0.2 devils/km² (ie. per 100 ha). The 119 ha disturbance area for the mine, which is devil habitat, is therefore unlikely to be used by more than 1 devil. In comparison, in open old growth eucalypt forest, densities of Tasmanian devils are estimated to be between 2 and 3 per km² (ie. per 100 ha).

While denning habitat is not ideal, there still exists the possibility for dens to be found. Because of the possibility for dens to occur, pre-clearing surveys for occupied dens will be undertaken, refer to section 4.9.4 for further details.

Like all devil populations, the local devils will be vulnerable to population loss due to DFTD.
DFTD has not been recorded in the vicinity of the proposed mine despite regular local checks of road kills and trapping. The most recent trapping by the Save the Tasmanian Devil Program (from 26/10/10 to 19/11/10) was a search for the disease front and found no disease west of the Murchison Highway (DPIPWE unpublished data)\textsuperscript{48}.

The spread of DFTD is continuing, with the disease front moving 15 km west since 2008. It was once thought that DFTD will reach the northwest in 3-10 years, but the recent finding of a diseased devil near Zeehan, approximately 15 km to the south indicates that the rate of spread may have been underestimated.

It is not known whether mortality will be as high in the western populations or whether these populations will react to the disease in the same way that eastern ones have.\textsuperscript{49}

Symbolix has been commissioned by Venture Minerals to establish baseline roadkill statistics on the Pieman Road that will be used in an ongoing road kill monitoring program during operations.

An analysis of baseline road kill along the Pieman Road is presented in the report \textit{Pieman Road mortality analysis (fauna), baseline monitoring, June 2012, Symbolix} (Appendix I).

The key points arising from the first analysis of road kill are as follows:

- Roadkill data collection started February 2012, and was undertaken in accordance with a robust statistical design\textsuperscript{50}.
- The headlight survey detected around 15 animals per night along the length of the road. Around two thirds of nights surveyed found no road kill, with average road kill rates of 0.63 finds/night for all species combined (a total of 33 animals over 52 nights).
- Tasmanian devils made up around 3\% of both the headlight and road kill observations (in total, 3 headlight observations and 1 road kill observation).
- Pademelons and brushtail possums were most common in both sets of observation (headlight and road kill).
- Overall, the activity and road kill count for the species is correlated (the more active the species is in headlight surveys, the more common it is in road kill).
- Spatially, headlight and road kill activity is also correlated, which is not unexpected.
- The main hotspots for both headlight and road kill activity occur approximately 7-10 km, and 25 km west of the Murchison Highway junction (Figure 21).
- Due to the very low level of activity it was not feasible to compare road kill patterns with vegetation/road features.
- The low level of activity indicates the survey zones should be revised to ensure that enough baseline data is captured to allow robust estimation of changes from before to after construction.

Traffic volumes along the Pieman Road section of the transport route have not been measured, although they are known to be low. The road is not a major tourist route and there are no towns or other centres on the road.

\textsuperscript{48} Nick Mooney pers. comm.  
\textsuperscript{49} Ibid  
\textsuperscript{50} Symbolix, 2012, Pieman Road kill levels, baseline monitoring, Symbolix.
Figure 21: Road kill and headlight survey points
A description of the proposed traffic to and from the proposed mine site area is provided in section 2.1.1. Other Venture Minerals mine proposals (Mt Lindsay and Livingstone), which are the subject of separate referrals, may also contribute to increased traffic volumes.

A roadkill minimisation strategy will be implemented for the Tasmanian devil, refer to section 4.10.4 for details.

The cumulative effect of the mining operations proposed in the area (Riley, Mt Lindsay and Livingstone) on roadkill is discussed in section 4.22.6.

No tracks, scats or dens of the Tasmanian devil were observed at the Bastyan rail loading facility and the site is not considered to be significant for the devil. This facility will be a separate project by others but is mentioned here because the facility is treated as a direct consequence of the Riley project under the EPBC Act and needs to be considered by the Commonwealth under the Bilateral Assessment of this DPEMP.

**Spotted-tailed quoll**

The spotted-tailed quoll has not been recorded within 5 km of the study area, and no evidence of the species was found during the field surveys.

The spotted-tailed quoll is most abundant in areas containing rainforest, wet forest and blackwood swamp forest. The core range for the quoll is the lowland forested areas of the north, bounded by Wynyard, Gladstone and the central and north eastern highlands.

Lower densities of animals occur elsewhere in suitable habitat throughout Tasmania.

The proposed Riley mine site is likely to be part of a home range for this species, albeit outside of the core range described above. If present it is likely to be in low densities.

The quality of foraging habitat is likely to be similar throughout the proposed mine site, although denning opportunities are likely to be greater in the mature rainforest in dry hollows of large myrtles and to a lesser extent mature eucalyptus trees.

There were no headlight or road kill observations of spotted-tailed quoll during the baseline road kill monitoring study\(^{51}\) described above.

No tracks, scats or dens of the spotted-tailed quoll were observed at the Bastyan rail facility site and the site is not considered to be significant for the quoll. This facility will be a separate project by others but is mentioned here because the facility is treated as a direct consequence of the Riley project under the EPBC Act and needs to be considered by the Commonwealth under the Bilateral Assessment of this DPEMP.

**Aquatic fauna**

Characteristics of the aquatic fauna of the creek systems within the proposed Riley mine site and downstream environments are shown in Table 21 (Information derived from the Conservation of Freshwater Ecosystem Values (CFEV) database).

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\(^{51}\) Symbolix, 2012, Pieman Road kill levels, baseline monitoring, Symbolix.
<table>
<thead>
<tr>
<th>Creek systems within project area</th>
<th>Likely fish assemblage</th>
<th>Likely macroinvertebrate assemblage</th>
<th>Likely AUSRIVAS O/E ranked index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trinder Creek above Fowler Creek</td>
<td>Fish absent or low probability of occurrence and/or at very low densities</td>
<td>Natural total density levels and natural assemblage composition of benthic macroinvertebrates</td>
<td>A=Equivalent to natural</td>
</tr>
<tr>
<td>Trinder Creek below Fowler Creek</td>
<td>Assemblage (F 36) distributed within inland streams and waterbodies extending along most of the west coast.</td>
<td>Natural total density levels and natural assemblage composition of benthic macroinvertebrates</td>
<td>A=Equivalent to natural upstream of Riley Creek; A/B =Close to natural or moderately impaired downstream of Riley Creek</td>
</tr>
<tr>
<td>Riley Creek</td>
<td>Fish absent or low probability of occurrence and/or at very low densities</td>
<td>Natural total density levels and natural assemblage composition of benthic macroinvertebrates</td>
<td>A/B =Close to natural or moderately impaired</td>
</tr>
<tr>
<td>Three Mile Creek</td>
<td>Fish absent or low probability of occurrence and/or at very low densities</td>
<td>Natural total density levels and natural assemblage composition of benthic macroinvertebrates</td>
<td>A/B=Close to natural or moderately impaired</td>
</tr>
<tr>
<td>Gold Creek</td>
<td>Fish absent or low probability of occurrence and/or at very low densities</td>
<td>Natural total density levels and natural assemblage composition of benthic macroinvertebrates</td>
<td>A=Equivalent to natural</td>
</tr>
<tr>
<td>Sweeney Creek</td>
<td>Fish absent or low probability of occurrence and/or at very low densities</td>
<td>Natural total density levels and natural assemblage composition of benthic macroinvertebrates</td>
<td>A/B=Close to natural or moderately impaired;</td>
</tr>
</tbody>
</table>

**Downstream environments**

<table>
<thead>
<tr>
<th>Lower section of Three Mile Creek</th>
<th>Extensive assemblage (F49) in river sections and waterbodies covering most of the western part of the state</th>
<th>Natural total density levels and natural assemblage composition of benthic macroinvertebrates</th>
<th>A/B=Close to natural or moderately impaired;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Pieman</td>
<td>Assemblage (F29) distributed within coastal streams and waterbodies that extend along most of the west coast.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A macroinvertebrate monitoring program will be established, with baseline samples taken prior to construction.
**Freshwater conservation management priority**

The Conservation Management Priority Potential provides an estimate of the priority to maintain freshwater dependent ecosystem values. It is also used to highlight those freshwater dependent ecosystems that need to be considered in the situation where future development or changes to land or water management are proposed within the catchment.

None of the creek systems within the proposed Riley mine site are of high conservation management priority.

Lake Pieman has high Conservation Management Priority Potential (CFEV database). The waterbody is a high priority for conservation management when development is proposed which may contribute to a change in the aquatic ecological condition or status of the system.

Lower Three Mile Creek, downstream from the proposed Riley mine site, is not of high conservation management priority.

### 3.4.9 Aboriginal cultural heritage

An Aboriginal heritage survey and assessment of the proposed Riley mine site was undertaken by Cultural Heritage Management Australia (Appendix J but not provided publicly due to a desire of the Aboriginal community to keep the locations of heritage sites confidential).

As part of the background review of the proposed mine site area, a search of the Tasmanian Aboriginal Site Index (TASI) resulted in no registered Aboriginal heritage sites identified within the study area boundaries. The closest known site is situated over 20 km to the west of Mount Lindsay.

A field survey was undertaken in November 2011 by Rose O’Sullivan and Marta Piech (CHMA) and Vernon Graham (Aboriginal Heritage Officer) and Keirrin Graham (field assistant). Rose O’Sullivan and Vernon Graham returned to the site in June 2012 to assess the location of specific infrastructure, as a result of the revised infrastructure layout for the site.

Approximately 15.4 km of survey transects were walked within the bounds of the study area during the field survey in 2011, with an additional 3.03 km of survey transects walked in June 2012, which focussed on the proposed infrastructure area in the northern section of the site.

The survey led to the identification of one Aboriginal heritage site. The site was identified is an isolated artefact located on the south western edge of the study area. A full site record is provided in the CHMA report. The site is assessed as being of low-moderate archaeological significance.

The site is within a 20 km radius of Riley Creek, on the edge of a distinct vegetation change. It was identified in a cleared area with unusually high surface visibility. The remainder of the study area had reduced visibility due to thick vegetation cover. However, by surveying 13 km of tracks with visibility ranging from 20-40% it was possible to achieve a good level of surface visibility over approximately 65,000 m².

The remainder of the study area is assessed as having a low level of archaeological sensitivity, based on the landscape model and survey results.

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[52] Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIPWE
[53] Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIPWE
Based on the findings of this investigation, the following was recommended:

- Mining and associated infrastructure should not be located within a 50 m radius of the identified site
- The remainder of the study area has been assessed as being of low archaeological sensitivity with no other identified heritage constraints
- In the event that previously unrecorded cultural material is discovered during construction of the mine, the Unanticipated Discovery Plan (section 11.0 of the CHMA report) should be followed.

### 3.4.10 Historic heritage

Austral Tasmania undertook a desk top assessment of historic heritage of the proposed Riley DSO Hematite Mine site in March 2012, with field surveys of the proposed mine site undertaken in March, April and July 2012, to record and assess sites of potential heritage significance\(^{55}\).

The following is a discussion of the historic heritage of the mine site based on their report, which is provided in Appendix G.

From the late nineteenth century, c1891-1893, considerable interest existed in the mineral prospects of the broader Wilson and Pieman River region. Whilst it was tin and silver that first bought prospectors to the area, it was the precious metal osmiridium that is central to the history of the proposed Riley mine site.

In 1903, osmiridium was discovered at Trinder Creek, and the area subsequently developed into an important source of the metal. While the area was worked from 1903 to the 1930s, three key phases were evident. Initial discovery and exploration between 1903 and 1905; a second phase of workings to the outbreak of the First World War between 1910 and 1914; and the key period of development on the field between 1918 and 1930s, primarily between 1918 and 1922.

On 20 April, 1913, the then largest single nugget of osmiridium discovered in the world was found near the source of Sweeney Creek, which commences its course in the northern part of the proposed Riley mine site.

The osmiridium appears to have been mostly mined from alluvial deposits, with all the creeks in the area, including Three Mile Creek, Riley Creek, Trinder Creek, Sweeney Creek and Gold Creek seemingly worked. Development surrounding Riley Creek appears to have been particularly intense. While hard rock mining has also been recorded from the area, it is poorly documented in comparison.

A third phase of exploration and prospecting within the mine site occurred between 1945 and the mid 1980s.

In 1945, the Wilson River district was identified as one of five important mineral zones in the Pieman River area. While it was recognised at the time that the primary alluvial deposits in the creeks had been ‘completely worked out’, secondary deposits were present within the basins and flats around the water courses. Selective test pitting and cuts were undertaken of the area but projects were abandoned as the results were disappointing. In 1985 exploration in the area for platinum group elements was undertaken. Testing works included excavation of costeans located on the creek beds and slope materials. The testing centred on Riley Creek.

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\(^{55}\) Austral Tasmania, Riley Creek, Tullah, Historic Heritage Assessment, Unpublished report for Venture Minerals Ltd., Austral Tasmania July 2012
Heritage values of the proposed mine site area

No heritage properties, sites and/or values as listed on the National Heritage List, Register of the National Estate, Tasmanian Heritage Register or the Tasmanian Historic Places Inventory exist in the area of the proposed mine site.

The area of the proposed mine site forms the core of the former Wilson River osmiridium field.

The key heritage findings from the field surveys were:

- 54 sites or features relating to historic alluvial osmiridium mining
- Features include, mullock heaps, areas of ground works, test pits, water channels or drains, log lined creek sections and stacked stones retaining creek banks
- Riley Creek and surrounding valley best demonstrates the processes of historical osmiridium mining and has been assessed as the most significant part of the area
- The stacked stone wall feature on Sweeney Creek has also been assessed to have historic value
- Evidence of historic workings found on or near Three Mile Creek and Trinder Creek were assessed as being of less importance than those found on Riley Creek and Sweeney Creek
- 33 sites or features were found that are indicative of exploration works carried out in the 1980s, such as costeans and test pits.

There are two aspects of the history of the Wilson River osmiridium field that are noteworthy:

- As the location where osmiridium was first discovered in Tasmania in 1897
- It appears to have been early in the development of the Tasmanian osmiridium industry with short lived attempts at mining beginning in c.1902-1903.

In general, the area of proposed Riley mine site has some representative value for its ability to demonstrate small-scale alluvial osmiridium production from the early twentieth century. In particular, Riley Creek demonstrates landscape modification and disturbance consistent with the techniques of alluvial mining undertaken by individuals or small groups. Other fields, however, such as Adamsfield and Bald Hill, demonstrate greater variety in mining techniques and more fully demonstrate the processes of early osmiridium mining in Tasmania.

In summary, the area of the proposed mine site contains features of historic heritage significance, and that this significance is manifest at the local level. The area therefore has some limited research potential as one of the less important osmiridium fields.

The following management guidelines will be applied:

- The information related to the historic mining operations within the area of the proposed mine site has been secured in the document Riley, Tullah, Historic Heritage Assessment, Unpublished report for Venture Minerals Ltd., Austral Tasmania, 2012 (Appendix G)
- Discussions will be held with relevant organisation, for example the West Coast Pioneers Memorial Museum, to determine if opportunities exist to present and interpret the history and heritage of mining on the Wilson River Osmiridium field for the public benefit.
3.5 Socio-economic aspects

The proposed mine is located in a region where mining is the principal economic activity and the project will be consistent with the existing social fabric of the region.

The mine will provide a social and economic stimulus for the township of Tullah, which is likely to be the primary residential location of the mine workers. Venture Minerals is considering establishing a worker accommodation facility in Tullah to provide residential facilities for its staff.

The mine will be located in an area subjected to more than a century of previous mining and exploration activities and will therefore be consistent with established land use.

Elements of the mine are unlikely to be visible from the Pieman Road due to the thick road side vegetation and local topography.

The mine lies within a broad region that has been nominated for inclusion on the National Heritage List, primarily due to claimed wilderness values. This nomination is currently the subject of an assessment by the Australian Heritage Council. Venture Minerals has provided detailed submissions about the site and its past mining activities to the Council to support an excision of the proposed mining lease and its surrounding areas from any listing, should any such listing be recommended.

3.6 Alternatives

The proposed mining activities are confined to the resource location.

An alternative location for the infrastructures site was considered, south of the current proposed location. This was rejected, however, due to topographical constraints.

The current location of the infrastructure site has been selected to take advantage of reasonably flat terrain within proximity of the resource and mine access road to minimise haulage traffic, fuel consumption and associated greenhouse gas emissions.

The rail loading facility (by others) will be located within an already disturbed area near the Bastyan power station. Any feasible alternative location would require the removal of currently undisturbed vegetation.

For the rail transport to be economic, 24 hour trucking of product from the mine to the rail loading facility will be required. If the rail loading facility is not available by the time the mine commences operations, an alternative transport contingency will be to truck product all the way through to Burnie via the Murchison Highway. This trucking would be confined to daylight hours only, however, so as to avoid any significant increase in roadkill risk on the Murchison Highway. The daylight hours restriction would reduce the mine’s achievable production rate during this period but the lower capital costs of the transport infrastructure would make this reduced rate viable for that contingency period.

There are no feasible alternatives available that do not result either in greater disturbance to flora and fauna or greater haulage distances and thus greater greenhouse gas emissions.
3.7 Community consultation

Venture Minerals has undertaken consultation with key stakeholders, including:

- Municipal councils and organisations
  - West Coast Council
  - Waratah-Wynyard Council
  - Burnie City Council
  - Tullah Progress Association
  - Cradle Coast Authority
  - Devonport City Council
  - Circular Head Council.

- State and Federal Members of Parliament
  - Department of Infrastructure, Energy and Resources (including Mineral Resources Tasmania)
  - Department of Primary Industries, Parks, Water and Environment (including Aboriginal Heritage Tasmania)
  - Department of Economic Development, Tourism and the Arts

- Commonwealth Government Departments
  - Department of Sustainability, Environment, Water, Populations and Communities

- State Authorities
  - Tasrail
  - Tasports
  - Forestry Tasmania

- Other mining companies:
  - Savage River (Grange Resources)
  - Rosebery (MMG)
  - Shree Minerals
  - Bass Metals
  - Tasmania Magnesite

- Other organisations
  - Save the Devil Program
  - Circular Head Aboriginal Corporation
  - Civil Contractors Federation
  - Industry Capability Network
  - UTAS Burnie campus
  - National Industry Skills Council
  - Burnie Sports and Events
  - West Coast Pioneer Cemeteries
  - Keep Australia Working
  - Enterprise Connect
  - Regional Development Australia
  - Forest Work Project
  - Smithton Lions Club
- Smithton Rotary Club
- Wynyard Rotary Club
- Burnie Probus Club
- Queenstown Lions Club
- Queenstown Rotary Club
- Tullah Lodge.

The west coast community, and specifically the local Tullah community, strongly support this project. While there is some political opposition from environmental groups, such as the Tarkine National Coalition, these groups represent only a minority section of the community and certainly do not represent the broad west coast community or the local Tullah community.
4. Potential effects and their management

The key environmental issues for the proposed Riley DSO Hematite Mine, as identified in the Development Proposal and Environmental Management Plan for Venture Minerals Limited, Riley’s Creek Hematite DSO Mine, 2012 are:

- Sediment loss, erosion and impacts on surface water quality
- Impacts on threatened flora and fauna
- Closure strategy.

These issues are considered in detail in this section. Other environmental issues relevant to the proposed mine are also considered.

4.1 Air emissions

Air emissions could occur during the construction and operational phases of the mine.

The primary air pollutant sources during the construction phase will be:

- Dust generation from clearing and preparation of the infrastructure site and opening up of the mining areas, including activities associated with movement of vehicles, machinery and excavation, and transportation and stockpiling of soil and vegetation for rehabilitation
- Emissions from the operation of construction and transportation equipment.

The primary air pollutant sources during the operational phase will be:

- Dust from extraction activities (including excavation, loading, transport and handling of materials)
- Dust from the crushing and screening plant and from returned fines in mined areas if dry screening is used
- Emissions from the diesel generator, equipment and vehicles.

4.1.1 Existing conditions

There are currently no known primary air pollutant sources in the area.

Forestry operations on site are planned for 2012 and are likely to generate smoke and particulate matter during forest burn-offs.

Recent forestry activities have been undertaken immediately to the west of Three Mile Creek.

4.1.2 Performance requirements

Air emissions from the mining and processing operations must comply with the following:

- Tasmanian OHS requirements (Workplace Health and Safety Regulations 1998)
- National Environment Protection Measure (Air) - PM10 and PM2.5 limits at the boundary of the premises
- Tasmanian Environment Protection Policy (Air Quality) 2004
- Tasmanian Quarry Code of Practice 1999
- Tasmanian Environmental Management and Pollution Control 1994 environmental nuisance provisions
- West Coast Council Planning Scheme.
4.1.3 Potential effects

Dust has the potential to cause an environmental nuisance if it is blown beyond the boundary of the proposed construction and operational activities. It can cause respiratory annoyance or problems, reduce visual amenity and fall out onto land or surfaces in other ownership, with the potential to soil clean surfaces and contaminate roof-collected water supplies. In addition to nuisance to people, dust can also fall onto vegetation and in extreme cases retard plant growth by blocking photosynthesis.

The prevailing winds at the Riley DSO Hematite mine site are north westerly to south westerly. The closest sensitive receptors are located in Rosebery, 10 km south east, and Tullah, 16 km east of the mine site.

Renison Bell is located approximately 5 km south of the proposed mine site.

The Riley DSO Hematite mine must also comply with the Standard Attenuation Distances Code, Table 17.2 of the West Coast Planning Scheme (2002), and are to demonstrate compliance with acceptable solutions set out in Table 17.1 of that Code.

The following attenuation distances apply for dust:

- Crushing - 750 m
- Vibratory screening - 500 m.

Note, the Tasmanian Planning Commission is currently reviewing SRADs and it is likely that the attenuation distance for open cut mines will be in the order of 3,000 m, and for crushing in the order of 2,000 m56.

All attenuation distances are readily met by the proposed activities.

Diesel exhaust fumes can also cause an environmental nuisance and, like all fossil fuel exhausts, contribute to greenhouse gases.

Given the buffer distances and existence of topographic high points between the proposed activity and sensitive receptors (topographic highs up to 920 metres between the proposed mine site and Tullah and 280 metres between the mine site and Rosebery), it is unlikely that dust and exhaust emissions from the activity would result in an environmental nuisance.

Under certain weather conditions, however, such as particularly hot, dry windy periods, if appropriate management measures are not undertaken, dust may be carried from the site by the prevailing winds.

Venture Minerals will therefore put in place appropriate mitigation measures, described below, to ensure dust generated from the activity will not be carried from the proposed mine site.

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56 EPA advice pers. comm.
4.1.4 Avoidance and mitigation measures

The following mitigation measures will be utilised to minimise the generation of dust and emissions during construction and operations:

- Vegetation clearance will not be undertaken during hot, dry and windy periods.
- The construction works will be planned and supervised by a qualified engineer so that the construction of each facility is undertaken in the most efficient and effective manner.
- Existing native vegetation will be maintained for windbreaks where possible.
- Revegetation of the mined panels will be undertaken in a progressive manner, as described in section 2.1.1. The extent of exposed bare land will therefore be kept to a minimum at any one time, thereby reducing the risk of the aeolian sediment loss. Indeed, covering the ground and returned fines with vegetation residues, as described in section 2.1.1, effectively prevents wind erosion by reducing soil drying and wind speed at ground level, and assists in anchoring particles57.
- Most soils require at least 30% ground cover to prevent wind erosion58. A minimum of at least 50% ground cover will be maintained across a given resource area (A, B, C, D) during mining operations.
- Haul roads, ore dumps, crusher and conveyor drop points, and earth stockpiles will be watered as necessary during hot, dry and windy conditions.
- Exhaust emissions will be minimised by ensuring that all equipment is properly maintained; only reputable contractors with well maintained equipment will be used on-site.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 1: Haul roads, ore dumps, crusher and conveyor drop points, and earth stockpiles will be kept watered in dry windy conditions to reduce the potential for dust generation.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 2: Construction phase dust impacts will be minimised by road tanker watering as required.</td>
<td>During construction</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 3: All mining and processing equipment, including trucks, excavators, crushers and generators, will be operated appropriately, in accordance with design specifications, and regularly maintained.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 4: The extent of exposed bare land will be kept to a minimum at any one time, thereby reducing the risk of aeolian sediment loss.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
</tbody>
</table>

4.1.5 Assessment of residual effects

Dust generation associated with the mining operations is expected to be low as the area has a relatively high rainfall, and management activities will ensure the extent of bare ground is kept to a minimum and the roads, dumps, crusher and conveyor drop points and earth stockpiles are watered during hot, dry windy periods.

Adoption of the above mitigation measures and commitments will therefore ensure dust and air emissions will not cause environmental nuisance.

It is the intent of the mitigation measures and commitments to avoid dust being blown beyond the lease boundaries, and to protect workers on site from dust.

Air emissions associated with the operation of the generators, mining and transport equipment are expected to be kept to acceptable levels by use of appropriate and properly maintained equipment.

4.2 Liquid waste

Liquid waste is likely to be generated during the construction and operational phases of the mine.

The primary sources during are likely to be:
- Storage and use of fuel, oils and grease
- Sewage and waste water.

Acid mine drainage, although highly unlikely to occur, is also considered in this section.

Erosion, sediment loss and the potential impact of sediment laden run-off on the creek systems (including from return fines from the screening process) is considered in section 4.3 and the final landform and groundwater are considered in section 4.4.

4.2.1 Existing conditions

The relevant receptors considered in this section are the natural surface drainage systems of the mine site, and the downstream environment.

Existing conditions are described in sections 3.4.5 and 3.4.8.

In summary:
- There are four main surface water drainage systems in the project area: Three Mile Creek, Riley Creek, and Trinder Creek which combine to drain into Lake Pieman, and the Gold and Sweeney Creek catchment which drains north to a tributary of the Huskisson River.
- The Conservation Management Priority Potential of these systems is moderate.
- Lake Pieman has high Conservation Management Priority Potential.
- According to the CFEV database, fish are absent or of low probability of occurrence and/or at very low densities in all streams except Trinder Creek below Fowler Creek. Fish assemblage F 36 (assemblage distributed within inland streams and water bodies extending along most of the west coast; see CFEV database for more detail) is expected in Trinder Creek below Fowler Creek.
- Natural total density levels and natural assemblage composition of benthic macroinvertebrates are expected in all creeks.
- Surface waters are slightly alkaline and have very low salinity. Suspended solids are very low, and despite draining lateritic surrounds, the waters are also relatively low in dissolved iron. The trace metals nickel and chromium are elevated relative to the surface waters in the district, reflecting the presence of soils derived from ultramafic bedrock.

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59 Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIPWE
4.2.2 **Performance requirements**

No designated and scheduled aqueous discharge points will be required for the project.

Aqueous emissions, including diffuse emissions to surface waters and groundwater, during construction must meet the requirements of the *State Policy on Water Quality Management 1997*.

The standard measures to control and manage surface water quality and sediment loads during mine site extraction activities are outlined in the *Quarry Code of Practice 1999*.

For the establishment of Protected Environmental Values (PEVs) for the surface waters relevant to this proposal, the following applies:

- Three Mile Creek, Riley Creek, Sweeney Creek and Gold Creek represent surface waters flowing through Forest Reserves from state forest (managed under the *Forestry Act 1920*).
- Trinder Creek and Fowler Creek represent surface waters that have their headwaters within Forest Reserves.

The following PEVs apply for Three Mile Creek, Riley Creek, Sweeney Creek and Gold Creek:

**A) Protection of Aquatic Ecosystems**

(ii) Protection of modified (not pristine) ecosystems from which edible fish are harvested, and having regard to the management objectives for Forest Reserves outlined in Schedule 3 of the *Forestry Act, 1920*.

**B) Recreational Water Quality and Aesthetics**

(i) Primary contact water quality

(ii) Secondary contact water quality

(iii) Aesthetic water quality

**E: Industrial Water Supply (Hydro-Electric Power Generation)**

That is, as a minimum, the water quality shall be managed to provide water of a physical and chemical nature to support a modified, but healthy aquatic ecosystem from which edible fish are harvested; that allows people to safely engage in primary and secondary contact recreational activities such as swimming, rafting and fishing in aesthetically pleasing waters; and is suitable for use (following impoundment) in the Gordon Power Scheme.

The following PEVs apply for Trinder Creek and Fowler Creek:

**A) Protection of Aquatic Ecosystems**

(i) Protection of pristine or nearly pristine ecosystems, having regard for the management objectives for forest reserves outlined in Schedule 3 of the *Forestry Act, 1920*.

That is, as a minimum, the water quality shall be managed to provide water of a physical and chemical nature to support a pristine or near pristine aquatic ecosystem and which will allow people to safely engage in recreation activities such as swimming, paddling or fishing in aesthetically pleasing waters.
4.2.3 Potential effects

Storage and use of fuel and oils
Any loss of fuels or oils has the potential to contaminate surface water, reduce the water quality of the creek systems, degrade aquatic habitat and cause reductions/loss of aquatic populations.

Loss of fuel or oil during construction and operation may occur during refuelling or from spillage and breakage during normal construction or operational mining activities.

Loss of fuel or oil on flat ground away from creek systems is likely to be absorbed by the soils and vegetation. Loss in or near creek systems on impermeable clay substrate is likely to represent the shortest pathway into the creek systems and present the greatest risk.

Sewage
Any loss of sewage effluent has the potential to contaminate surface water, reduce the water quality of the creek systems, degrade aquatic habitat and cause reductions/loss of aquatic populations.

Loss of sewage effluent on flat ground away from creek systems is likely to be absorbed by the soils and vegetation. Loss in or near creek systems on impermeable clay substrate is likely to represent the shortest pathway into the creek systems and present the greatest risk.

Acid mine drainage
To determine the potential for acid and metalliferous drainage Venture Minerals undertook a sampling program of the resource and surrounding waste rock, in October and December 2011.

Static test work was undertaken on 42 samples, representing all lithologies present in the deposit; lateritic gravel, cemented laterite, clay and serpentinite. The results of the test work were presented in section 2.1.1.

In summary:
- All serpentinite samples are free of sulphur and fall firmly into the NAF category, with the majority of the samples classified as likely to be acid consuming.
- Only one of the 17 clays samples tested potential to be acid generating and this potential is very low. All other samples were classified as unlikely to be acid generating.
- No visible sulphides were encountered during logging of the test pits.
- All ore samples were classified as unlikely to be acid generating.

The potential for acid mine drainage is therefore extremely low.

Mining operations will not access groundwater at depth. Groundwater ingress will only occur at the low topographic points near natural discharge zones. While groundwater sampled from the bores was slightly acidic compared with surface water, it should not present an acid mine drainage concern. A discussion of the potential impact of groundwater quality on surface water quality is provided in section 4.5.

Acid mine drainage nevertheless has the potential to cause significant harm to the surrounding aquatic environments. Measures will therefore be undertaken to minimize acid mine drainage, as outlined below.
4.2.4 **Avoidance and mitigation measures**

Neither fuels nor oils will be stored in bulk on site in any permanent facility during the construction phase. Fuel and oil will be brought onto the site as required in a mobile tanker for the construction activities. The tanker will be parked away from the class 1 and 2 drainage lines in a secure area for refuelling activity.

Fuels and oils will be stored on site in a permanent facility once the mine moves to the operation phase. This facility will be located in an appropriately designed and operated bunded area.

Refuelling and repairs of plant and equipment will be undertaken on site within a bunded area. These operations will be performed in appropriately designed and operated workshop facilities equipped with measures to contain and clean up any spills that might occur.

**Storage and use of fuel and oils**

The fuel storage and transport requirements of the *Dangerous Substances (Safe Handling) Act 2005* will be met.

**Construction phase**

- The fuel tanker will satisfy appropriate construction standards. The fuel tanker will be located in a bunded area with 110% capacity of the tank.
- The tanker will carry fuel cleanup equipment in case fuel spills occur during refuelling.
- Refuelling and lubrication will be undertaken away from any freestanding water.
- Oil spill absorption materials will be used immediately for cleanup if there is a spill.
- If there is any residual contaminated soil evident after a spill and clean up, it will be excavated immediately and taken for disposal or treatment at an appropriately licensed facility.

**Operation phase**

- The fuel tanks will satisfy appropriate standards and will be located within a bunded area with 110% capacity of the tanks.
- Maintenance and repair facilities and workshop will be appropriately designed and operated; they will be designed to contain any fuel and oil spills and will be equipped with measures to contain and clean up any spills that might occur.
- Fuel cleanup equipment will be stored in readily accessible sites.
- Oil spill absorption materials will be used immediately for cleanup if there are any spills.
- If there is any residual contaminated soil evident outside the bunded area after a spill and clean up, it will be excavated immediately and taken for disposal or treatment at an appropriately licensed facility.
- All workers will be trained to respond to spills and leaks.
- The EPA will be notified as soon as possible of any spills.
- Surface water monitoring commenced in May 2012. Monitoring will be conducted at three monthly intervals to assess water quality on a seasonal basis.
- All equipment will be properly maintained and serviced regularly.
Sewage

A package sewage treatment system will be installed on site. The system will use UV disinfection, and will be regularly maintained.

Acid mine drainage

While the acid mine drainage potential of the proposed Riley mine site is considered extremely low, the following measures will be undertaken to reduce the potential for acid mine drainage development, and assist in managing any AMD that may be formed.

- The proposed mining method will ensure that the extent of exposed bare land will be kept to a minimum (see section 2.1.2). As a general rule, no more than the equivalent of one panel in area will be cleared and exposed to the elements at any one time. The underlying clay will therefore be covered soon after exposure.
- Water collected in the sediment basins will be monitored for pH and AMD precursors.
- An AMD contingency plan will be developed, which will incorporate dosing the sediment basins with lime or another appropriate medium. Note that if AMD is detected, it is expected to be at very low levels, and easily managed by such an approach.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 5: The fuel tanker used during construction will be located in a bunded area with 110% capacity of the tanker. The fuel tanks during operation will be located in a facility in a bunded area with 110% capacity of the tanks.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 6: Fuel cleanup equipment will be stored in readily accessible sites, including the fuel tanker during construction.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 7: In the event of a spill, appropriate absorption materials will be used immediately, and any hydrocarbon contaminated soil will be removed and taken to an appropriate authorised disposal or treatment facility. The Director, Environment Protection Authority, will be notified immediately.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 8: All equipment will be properly maintained and serviced regularly.</td>
<td>During operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 9: A package sewage treatment system using UV disinfection will be installed on site. The system will be regularly maintained.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 10: Surface water monitoring will be conducted at three monthly intervals at all five surface water sampling sites.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 11: Runoff from the settlement basins will be field-monitored weekly for turbidity, pH and dissolved oxygen.</td>
<td>During operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 12: The infrastructure area settlement basin will be sampled monthly for laboratory analysis of total petroleum hydrocarbons and oil and grease. All sediment basin water will be sampled for AMD precursors.</td>
<td>During operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 13: An AMD contingency plan will be developed, which will incorporate dosing the sediment basins with lime or another appropriate medium.</td>
<td>During operation</td>
<td>Relevant contractor</td>
</tr>
</tbody>
</table>
4.2.5 Assessment of residual effects

The measures outlined above should ensure that any potential aqueous emissions during the construction and operation phases are properly controlled, monitored and managed and present a negligible risk to the environment.

4.3 Erosion and sediment loss

There is a need to manage site runoff and erosion, and stop sediment laden water from entering the creek systems.

Mining of resource areas A and C will take place upslope from Three Mile Creek, Riley Creek and Trinder Creek. Resource Areas B and D lie within the headwaters of Riley Creek and Gold Creek respectively. Mining of resource area B will be undertaken upslope of the Riley Creek channel and mining of resource D will be undertaken within the upper most parts of Gold Creek.

4.3.1 Existing conditions

The relevant receptors considered in this section are the natural surface drainage systems of the mine site, and the downstream environment.

A summary of existing conditions is provided in section 4.2.1, with full descriptions provided in sections 3.4.5 and 3.4.8.

4.3.2 Performance requirements

The performance requirements outlined in section 4.2.2 apply.

4.3.3 Potential effects

The potential for erosion and sediment loss to the natural creek systems on the Riley mine site is considered to be relatively high due to the naturally high rainfall on the west coast of Tasmania. While a fairly strong regional rainfall gradient exists in north western Tasmania, with the Riley mine site experiencing less rainfall than places like Mt Lindsay and Mt Read, relatively high mean monthly rainfalls are still likely to occur on site.

Erosion and sediment loss can potentially occur during the preparation and construction of the infrastructure area, and during the mining operations. Construction and mining will create exposed surfaces that could be vulnerable to erosion and sediment loss. The return of fines to the mined areas could also add to the sediment runoff risk.

Sediment loss to the creek systems has the potential to:

- Increase turbidity
- Displace aquatic organisms from river bed
- Affect fish health
- Degrade aquatic habitat
- Alter geomorphology.

Sediment laden runoff from the mine site work area during construction has the potential to enter Sweeney Creek.

Venture Minerals will manage all runoff from the construction of the infrastructure area. A suite of erosion and sediment control mitigation measures will be implemented during the construction phase, as described in section 4.3.4.
During the operation of the mine, erosion and sediment loss can potentially occur from the infrastructure area, the mining of the resource areas A and C upslope from Three Mile Creek, Riley Creek and Trinder Creek, and from the mining of resource areas B within the upper most part of Riley Creek catchment and D within the headwaters of Gold Creek.

Mining of the resource will be undertaken close to Three Mile Creek, Riley Creek, Trinder Creek and within Gold Creek. Given that there is potential for heavy rainfall events to occur over the mine site, erosion and sediment loss to these creek systems from exposed surfaces and/or from returned fines could be significant if not managed properly.

To reduce the potential for erosion and sediment loss to the creek systems, buffer strips will be maintained between the creek channels and upslope mining. A suite of erosion and sediment control mitigation measures will also be implemented to reduce the risk of erosion events and sediment loss from the mine activities. These measures are described in section 4.3.4.

4.3.4 Avoidance and mitigation measures

Mitigation measures for erosion and sediment loss during construction

The following mitigation measures to control potential erosion and sediment loss arising from clearing and construction of the infrastructure area will be implemented:

- No clearance or construction works will be undertaken during high rainfall conditions that may present an unacceptable risk of sediment loss to the environment
- During the construction phase Sweeney Creek will be diverted around the infrastructure site, and a sediment basin will be placed downstream of the site within Sweeney Creek channel
- Overland drainage flow from the construction areas will be directed to drains and the sediment basin prior to discharge to Sweeney Creek downstream
- Temporary silt fencing will be utilised where required to prevent transport of any eroded material into Sweeney Creek channel prior to channel diversion
- Stockpiled topsoil and vegetation will be managed to encourage water infiltration and microbial activity, and prevent erosion in the period between stockpiling and use in site rehabilitation, in accordance with the Quarry Code of Practice
- Any area outside the footprint of the new mining and processing areas that requires clearance to facilitate construction will be rehabilitated with stockpiled topsoil and revegetated as soon as practicable
- The areas disturbed will be kept to the minimum practicable level required for construction
- Where any river/drainage line crossings require activities to be undertaken within the channel boundary, for example construction/maintenance of infrastructure road crossings of Sweeney Creek channel
  - All work will be undertaken at times of low or no flow to minimise the potential for sediment generation
  - If activities are undertaken within the channel boundary during times of flow, silt stop netting will be established at an appropriate distance downstream to collect any disturbed sediment.
- All erosion and sedimentation controls will be established prior to the commencement of the works
Mitigation measures will be detailed in the Construction Environmental Management Plan.

Mitigation measures for erosion and sediment loss during operation

Mitigation measures are considered for the following areas during operation of the mine:

- Infrastructure area
- Resource areas A and C
- Resource area B
- Resource area D.

The management of site water and control for erosion and sediment loss is described in section 2.1.2.

The following mitigation measures will be implemented to control potential erosion, site drainage and sediment loss from the infrastructure work areas during operation:

- All runoff from the mine site work areas will be collected and diverted by a series cut-off drains to a sediment basin (Appendix E)
- The drains will utilise the natural topography of the infrastructure area
- The drainage system will be designed to provide adequate capacity for heavy rainfall events, and will incorporate energy dissipation structures and erosion control measures as necessary
- Water diverted into the sediment basins will not be subject to contamination and will be directed into natural drainage lines (see section 4.2.4, mitigation measures for control of oil and fuel)
- The size of the sediment basin will be based on the following ratio of basin surface area to inflowing discharge: 3,000 m$^3$ per m$^3$/s, which will provide approximately 100% removal efficiency for silt sized particles (0.02 mm)$^{60}$
- The headwaters of Sweeney Creek will be diverted around the infrastructure area to connect back with the natural system downstream of the sediment basin
- Disturbance to Sweeney Creek channel through the infrastructure site will be kept to a minimum, with the removal of bank side vegetation and disturbance to the channel only undertaken at two locations where the creek intersects infrastructure site roads.

The following mitigation measures will be implemented to control potential erosion, site drainage and sediment loss from mining resource areas A and C:

- Buffer strips (15 m minimum) will be maintained between the up slope mined areas and Three Mile Creek and Riley Creek.
- A 30 m buffer strip will be kept between the up slope mined areas and Trinder Creek, which is located within the Environmental Protection Zone of the West Coast Planning Scheme 2002.
- Clearing of the land in preparation for mining will be staged to occur as close as practicable to the mining of the resource.
- Exposure of bare substrate to the elements, and the corresponding erosion potential, will be minimised by covering recently mined areas with topsoil and vegetation as soon as possible. Vegetation will be dozed into mined out areas as neighbouring panels are prepared for mining, as described in section 2.1.1.

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$^{60}$ Environment Australia, Department of the Environment and Heritage, 1999, Best Practice Environmental Management in Mining, Water Management, Department of the Environment and Heritage.
The extent of land exposed to the elements will therefore be kept to a minimum with no more than the equivalent of one panel cleared of vegetation per resource area at any one time. Conservatively, this equates to a maximum area of exposed land at any one time of approximately 2.8 ha.

Silt fences in combination with upslope trenches will be used at the base (downslope) of each cleared and mined 25 m panel to stop sediment from leaving the site during rainfall events.

Silt fences will be installed and maintained appropriately, based on Institute of Engineers Australia guidelines.

Stockpiled topsoil and vegetation from the first panel will be managed to encourage water infiltration and microbial activity, and prevent erosion in the period between stockpiling and reuse in site rehabilitation.

The emphasis is on erosion control and prevention by minimizing the extent of land exposed to the elements at any one time. The proposed mining method, described in section 2.1.1, has been designed to achieve this. The method proposed of covering the recently mined out areas with vegetation and mulch will provide excellent protection of the bare substrate against raindrops\(^{61}\), and hence reduce the potential for erosion.

A full description of the mining method, including illustrative figures, is provided in section 2.1.1.

A system of cut-off drains and sediment basins around the perimeter of the proposed mining areas A and C was rejected (see section 2.1.2).

The following mitigation measures will be implemented to control potential erosion, site drainage and sediment loss from mining resource area B:

- The mining of resource area B will be undertaken upstream from Riley Creek channel, in an area where there is no continuously defined drainage channel.
- Mining will therefore not be undertaken within the continuous channel.
- A buffer strip will be left between the mining of area B and the upstream most point of Riley Creek channel, as defined by the continuous surface channel (Appendix E).
- Where practicable, mining of low topographic points within the upper catchment of Riley Creek will be undertaken during summer at times of no flow, thereby minimising potential for erosion, sediment loss and localised groundwater ingress (groundwater is discussed in section 4.5).
- The upper most panels in area B will be mined before the lower down slope panels (i.e. stage 3 will mine the upper most part in area B and stage 4 the small section downslope, see Appendix B ‘Mining schedules’). Keeping vegetated zones intact for as long as possible downslope of stage 3 mining will help maintain a large ‘buffer’ zone during this mining stage (see Appendix E).
- An off-line sediment basin downslope from resource area B will collect any water that ponds within the topographic low point during mining, including groundwater ingress (see Appendix E and section 4.5).
- Exposure of bare substrate to the elements, and the corresponding erosion potential, will be minimised by covering recently mined areas with topsoil and vegetation as soon as possible. Vegetation will be dozed into mined out areas as neighbouring panels are prepared for mining, as described in section 2.1.1.

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The extent of land exposed to the elements will be kept to a minimum with no more than the equivalent of one panel of land cleared and exposed at any one time.

The following mitigation measures will be implemented to control potential erosion, site drainage and sediment loss from mining resource area D:

- Where practicable, all mining within 20 m of Gold Creek, including mining of the channel, will be undertaken during times of no flow, thereby minimising potential for erosion, sediment loss and localised groundwater ingress (groundwater is discussed in section 4.5).
- An on-line sediment basin will be constructed on Gold Creek downstream from all mining activities.
- Cut-off drains will be established (see Appendix C) between the resource and the infrastructure area to divert flow to the on-line sediment basin on Sweeney Creek.
- The upper most panels in the catchment will be mined first, leaving the downstream panels and vegetated buffer zones along the creek channel to be mined last.
- Exposure of bare substrate to the elements, and the corresponding erosion potential, will be minimised by covering recently mined areas with topsoil and vegetation as soon as possible. Vegetation will be dozed into mined out areas as neighbouring panels are prepared for mining, as described in section 2.1.1.
- The extent of land exposed to the elements will be kept to a minimum with no more than the equivalent of one panel of land cleared and exposed at any one time.

The size of the sediment basins associated with the mining activities of resource areas B and D will be based on the following ratio of basin surface area to inflowing discharge: 3,000 m² per m³/s, which will provide approximately 100% removal efficiency for silt sized particles (0.02 mm)\(^2\).

In all resources areas, targeted erosion and sediment runoff control measures will be applied when fines are being returned from the screening process. Temporary silt fences will be installed down gradient to allow the fines to drain without sediment runoff and returned fines will be covered with mulch to protect against erosion by rain and to help stabilise them.

A full description of the mining method, including illustrative figures is provided in section 2.1.1.

General mitigation

- Where any river/drainage line crossings require activities to be undertaken within the channel boundary, for example construction/maintenance of road crossings:
  - All work will be undertaken at times of low or no flow to minimise the potential for sediment generation
  - If activities are undertaken within the channel boundary during times of flow, silt stop netting will be established at an appropriate distance downstream to collect any disturbed sediment.

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Commitment 14: Overland drainage flow from the infrastructure area will be directed via a series of drains to a sediment basin established in Sweeney Creek prior to discharge to the receiving environment.

Commitment 15: Temporary silt stop fencing will be utilised where appropriate to prevent transport of any eroded material into the Sweeney Creek channel during construction.

Commitment 16: Erosion and sedimentation controls will be established prior to the commencement of the works during construction.

Commitment 17: All drainage systems and cut-off drains will be designed to provide adequate capacity for heavy rainfall events, and will incorporate energy dissipation structures and erosion control measures as necessary.

Commitment 18: The headwaters of Sweeney Creek will be diverted around the infrastructure area to connect back with the natural system downstream of the sediment basin.

Commitment 19: A 15 m minimum buffer strip will be maintained between the up slope mined areas of resource areas A and C and Three Mile Creek and Riley Creek. A 30 meter buffer strip will be maintained between the up slope mined area of resource area C and Trinder Creek.

Commitment 20: The extent of land exposed to the elements will be kept to a minimum with no more than the equivalent of one mined panel per resource area of land cleared and exposed at any one time during mining operations.

Commitment 21: Silt fences will be used at the base (downslope) of each cleared and mined 25 m panel in resource areas A and C.

Commitment 22: An off-line sediment basin will be established downslope from resource area B to collect any water that ponds within the topographic low point during mining, including groundwater ingress, prior to discharge.

Commitment 23: An on-line sediment basin will be constructed on Gold Creek downstream of all mining activities from resource area D.

Commitment 24: Cut-off drains will be established (see Appendix C) between the resource and the infrastructure area to divert flow to the on-line sediment basin on Sweeney Creek.

Commitment 25: Temporary silt fences will be placed downstream of areas where fines are being returned from the screening process to allow the fines to drain without causing significant suspended sediment loss and the fines will also be covered with mulch to protect them from rain erosion.

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<thead>
<tr>
<th>Commitment</th>
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<th>Responsible person</th>
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<tbody>
<tr>
<td>Commitment 14</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
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<tr>
<td>Commitment 15</td>
<td>During construction</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 16</td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 17</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 18</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
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<tr>
<td>Commitment 19</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
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<tr>
<td>Commitment 20</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
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<td>Commitment 21</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
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<td>Commitment 22</td>
<td>Ongoing</td>
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<tr>
<td>Commitment 23</td>
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<tr>
<td>Commitment 24</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
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<tr>
<td>Commitment 25</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
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</table>

4.3.5 Assessment of residual effects

There is not expected to be any impact on the creek systems as a result of excessive erosion and sediment loss during the construction of the infrastructure area or during the proposed mining operations.

The emphasis is on erosion control and prevention by minimizing the extent of land exposed to the elements at any one time. The proposed mining method, described in
section 2.1.1, has been designed to achieve this. The method proposed of covering the recently mined out areas with vegetation and mulch will provide excellent protection of the bare substrate against raindrops\textsuperscript{63}, and hence reduce the potential for erosion.

There will, however, be an impact to the hydrology of the upper most reaches of Gold Creek and Sweeney Creek as a result of activities undertaken within the headwaters of these catchments. This impact is discussed in the following section.

4.4 **Hydrology and final landform**

There is a need to consider local hydrology and final landform to ensure ponding of water does not occur on closure and the creek systems within the mine site do not end up perched.

4.4.1 **Existing conditions**

The relevant receptor considered in this section is the natural drainage of the mine site.

A summary of existing drainage is provided in section 4.2.1, with a full description provided in sections 3.4.5 and 3.4.8.

Mining will be undertaken close to the boundaries of Three Mile Creek, Riley Creek and Trinder Creek, and undertaken within the headwater catchments of Riley Creek and Gold Creek.

The upper parts of Sweeney Creek will be to be diverted around the infrastructure area.

4.4.2 **Performance requirements**

The following performance requirements apply:

- *State Policy on Water Quality Management* 1997
- *Environmental Management and Pollution Control Act* 1994
- *Water Management Act* 1999

4.4.3 **Potential effects**

The Riley DSO hematite resource is a surface deposit with depth of approximately 3 metres.

As the proposed mine varies in altitude from approximately 140 m to 260 m above sea level, the removal of up to the top 4 m (approximate maximum) will have little effect on the overall topography of the site. That is, no hills will be removed or significantly lowered and no significant depressions or holes will be created.

Figure 4 and Figure 5 in section 2.1.1, for example, shows the estimated depth of the resource, and hence mining, in areas A and C relative to the topography. It can be clearly seen that there will be no overall change in the topography of the area.

Mining will, however, be undertaken close to the boundaries of Three Mile Creek, Riley Creek and Trinder Creek, and undertaken within the headwater catchments of Riley Creek and Gold Creek.

\textsuperscript{63} Local government Association of Queensland Inc, 2006, Introductory erosion and sediment control guidelines for Queensland Councils.
If the resource from areas A and C is to be mined to approximately 2 m near the 15 m buffer zone with Riley Creek, two areas have been identified where perching of the creek may occur (Transect A- A’ (Tr1) and Transect E - E’ (Tr5) on Figure 16, section 3.4.5). This is due to the width of the floodplain and the local topography in these areas relative to the extent of the resource.

Perching of the creek system during mining would result in a loss of connectivity between the stream system and surface run-off and potentially groundwater discharge, and possibly lead to localised abandonment of the creek bed. On closure it could potentially lead to channel avulsion.

The mining within the headwater catchments of Riley Creek (resource area B) and Gold Creek (resource area D) will impact the upper catchments during mining. The mining of the resource at topographic low points in the catchment will potentially result in the localised ponding of water.

During mining groundwater ingress at topographic low points is also expected.

The hydrology of the creek systems as a whole will not be substantially altered during mining, as any ponded water will be discharged to the creek systems downstream via sediment basins.

On closure, however, if the morphology of the mined areas of Riley and Gold Creek systems are not managed, localised ponding of water may occur in the headwaters.

The mining of area B will be undertaken in the upper sections of the Riley catchment where there is no continuous, defined stream channel. In this area it is difficult to discern the course of the flow but the area does contain ponded areas where water intersects the surface.

Figure 22 shows a ponded area where the water intersects the surface in the upper parts of the Riley catchment.

![Figure 22: Ponded area in upper Riley catchment where water intersects the surface (due to thick vegetation it is difficult to take fully representative photographs).](image)

If the final rehabilitated surface level of the mined out sections in the upper catchment of Riley Creek results in ponding of water, a defined channel will be created
on closure to connect the mined out ponded section with the continuous Riley channel proper (see Appendix E for approximate location of new channel).

Similarly, if the final rehabilitated surface level of the mined out sections in the upper catchment of Gold Creek is below the level of the channel creek bed down slope, then the channel bed will be re-graded to ensure that no ponding of water occurs and that the natural hydrology of the creek system is returned (see Figure 23) (see Appendix E for approximate location of channel re-sectioning if required).

Note that the requirement for any channel works on closure, and indeed length of channel works, will depend on the mining depth within the topographical low points in the upper Riley Creek and Gold Creek catchments in relation to the local topography and creek gradient.

As an example, with a creek bed slope of 0.032423 rise/run (slope of upper Riley Creek\(^{64}\)) and a mined depth of 2 m near the channel, the maximum length of channel that could be regraded is approximately 65 m (‘Regraded section of creek’ shown in Figure 23). A control(s) point will be established in the creek bed to ensure no headcuts are produced.

The upper most parts of Sweeney Creek will be diverted around the mine infrastructure site. On closure the natural course of the creek system will be re-established.

The vegetation along the banks of Sweeney Creek and channel proper will be retained along the majority of its length through the infrastructure area. Only two small areas will be disturbed, where road crossings are required.

The infrastructure drainage system maintained for the construction and operation of the mine will be removed and in filled as part of the rehabilitation of the mine. This will ensure the natural drainage patterns of the local area are returned on mine closure.

Note that between 1903 and the 1930s osmiridium was mined from alluvial deposits, with all the creeks on the proposed mine site, Three Mile Creek, Riley Creek, Trinder Creek, Sweeney Creek and Gold Creek having seemingly been worked (section 3.4.10 provides an overview of the historic heritage and mining history of the area).

\(^{64}\) Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIW
The creek systems on the Riley mine site have therefore experienced varying degrees of disturbance, including historical:

- Channel straightening and incision
- Channel re-alignment
- Development of artificial drainage and water races.

### 4.4.4 Avoidance and mitigation measures

The following measures will be undertaken to ensure perching of the creeks systems does not occur during mining, and the hydrology of the area is not permanently altered on closure:

- A buffer width will be maintained along Riley Creek between the creek channel and resource Areas A and C so that the depth of the mining activity will not extend below the level of the top of the creek bank. This will ensure that the creek system does not become perched.

- A maximum mining depth of 2 m will apply near the creek systems. This will ensure that a 15 m buffer will be sufficient for the majority of the length of Riley and Three Mile creeks.

- A section of Riley Creek has been identified where the resource extends close to the creek channel in an area where the creek may be susceptible to perching. A 15 m buffer width may not be sufficient here if mining were to extend to 2 m (see section 3.4.5 and Figure 17). In this area the buffer width will be extended, depending on the depth of mining at this location, to ensure perching of the creek system does not occur.

- If the final rehabilitated surface level of the mined out sections in the upper catchment of Riley Creek and Gold Creek results in ponding of water, then the channel bed will be re-graded and or channel created to ensure no ponding of water on mine closure.

- A control point will be established if necessary to ensure no headcuts are produced.

- No ‘benches’ will be left around the edges of the mined out sections upslope that may promote ponding of water.

- On closure the natural course of Sweeney Creek will be re-established.

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<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
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<tbody>
<tr>
<td>Commitment 26: A buffer width will be maintained along Riley Creek and Three Mile Creek between the creek channel and resource areas A and C such that the depth of the mining activity will not extend below the level of the top of the creek bank</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 27: If the final rehabilitated surface level of the mined out sections in the upper catchment of Riley Creek and Gold Creek results in ponding of water, then the channel bed will be re-graded and or channel created to ensure no ponding of water on mine closure.</td>
<td>Ongoing</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 28: No ‘benches’ will be left around the edges of the mined out sections upslope that may promote ponding of water.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 29: On closure the natural course of Sweeney Creek will be re-established.</td>
<td>Closure</td>
<td>Relevant Contractor</td>
</tr>
</tbody>
</table>
4.4.5 Assessment of residual effects

There is expected to be a minor impact on Gold Creek and Sweeney Creek during mining operations as a result of alterations to the channel in the upper most parts of the catchment.

The mining of resource area B will not impact the Riley Creek channel proper as it will be undertaken upstream from the creek channel.

During mining operations any ponding of water within low topographic points will be discharged to the respective creek channel via a sediment basin.

On closure, there will be no ponding of water or perching of creek systems.

Any creek bed regrading or new channel works undertaken will ensure no long term ponding. Works will be undertaken to ensure a stable geomorphological system. Due to the artificial nature of some sections of Riley Creek and others, such as channel straightening and incision, any regrading of the creek bed may allow for a general improvement in the channel form.

4.5 Groundwater

The mine does not require a conventional open pit and will not extend below the regional water table.

However, the mine has the potential to intercept local groundwater near natural discharge zones. Seepage into excavations may therefore be encountered in mining operations in low lying areas near the creek systems.

This section will therefore consider the impact of the mine on groundwater flow and quality and also the potential for groundwater to impact surface water quality.

4.5.1 Existing conditions

The relevant receptor considered in this section is the groundwater quality and quantity of the mine site.

A description of existing groundwater conditions is provided in section 3.4.6.

In summary:65:

- The water table encountered in the bore holes varied from 5.3 m to 15.6 m
- All the bore holes are located on or near interfluves on relatively high ground
- The water table on the lower slopes is expected to be closer to the surface, and seasonally intersect the ground surface at the water courses
- Seepage into excavations near the watercourses may be encountered during mining operations
- Groundwater yields encountered in the bore holes were low to very low
- Pathways for groundwater movement, at least locally, are expected to be relatively limited
- Dissolved nickel and chromium were in groundwater tested from the two bore holes drilled into ultramafic bedrock but this material will not be mined

---

• Borehole RYWB04 had anomalously high sulphate. The outlying nature of this sample suggests that RYWB04 may access a different aquifer to the other three bore holes, and that it may have limited association with surface waters.

4.5.2 Performance requirements

Groundwater emissions from mining must comply with the following

• State Policy on Water Quality Management 1997
• Environmental Management and Pollution Control Act 1994
• Water Management Act 1999

4.5.3 Potential effects

The mine has the potential to intercept local groundwater near natural discharge zones in the low lying areas near the creek systems.

This is likely when mining the topographic low points in resource areas D and B.

Due to the shallow nature of the mining operations and the likely interception of groundwater near natural discharge points anyway, the mining operations are unlikely to have much effect on the local water table or groundwater pathways, and no effect on the regional groundwater resource.

There is potential for the mining operations to impact groundwater quality via surficial fuel and oil spillages, which have the potential to seep into the local water table. The potential impacts on groundwater quality are similar to those for surface water, as discussed in section 4.2.

The differing water quality between that sampled from the bore holes and the surface water means there is a potential for intercepted groundwater to affect the quality of the receiving surface water.

The key differences between the groundwater and surface water quality are as follows:

• Groundwater was slightly acidic, surface water was slightly alkaline
• Dissolved nickel and chromium were elevated in both, although slightly higher levels were sampled from the two groundwater bores drilled into ultramafics
• One groundwater bore had significantly higher sulphate levels than surface water.

There is potential for groundwater to therefore increase the sulphate levels and acidity of the surface water, with potential to also slightly increase dissolved levels of nickel and chromium.

Such impacts, however, are highly unlikely as the groundwater incept will only be occurring in topographic low points, very close to where groundwater naturally discharges to the surface environment. The quality of the intercept would therefore not be expected to differ significantly from the natural discharge to the surface environment.

Indeed, the outlying nature of the bore sample analysed for high sulphate content suggests that the bore hole (RYWB04) may have accessed a different aquifer to the other three bore holes66, with potentially little movement between aquifers.

---

Further, all groundwater sampled from the bore holes was taken at depths lower than what will be occurring during the mining operations, with the two holes sampled for higher levels of chromium and nickel drilled into ultramafics, a substrate which is unlikely to be encountered in the mining of the topographic low points associated with resource areas B and D.

Groundwater intercepted by the mining operation is therefore unlikely to affect surface water quality.

### 4.5.4 Avoidance and mitigation measures

The mitigation measures used to protect surface waters from fuel and oil, sewage and potentially AMD contamination will also protect groundwater. These are discussed in section 4.2.4. The measures outlined in section 4.2.4 therefore apply here.

The following measures will also be applied to protect surface water quality:

- Where practicable, all mining and works at the low topographic points within the upper catchment areas of Riley and Gold Creek will be undertaken during summer at times of no flow, thereby minimising potential for localised groundwater ingress and potential for erosion and sediment loss to the creek systems.
- Groundwater intercept collected within mined out panels of areas B and D will be pumped to a sediment basin prior to discharge to the receiving environment.
- Groundwater monitoring, which commenced in May 2012, will continue during the operation of the mine at three monthly intervals.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 30: Where practicable, all mining and works at the low topographic points within the upper catchment areas of Riley Creek and Gold Creek will be undertaken during summer at times of no flow.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 31: Groundwater intercept collected within mined out panels of areas B and D will be pumped to a sediment basin prior to discharge to the receiving environment.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 32: Groundwater monitoring, which commenced in May 2012, will continue during the operation of the mine at three monthly intervals.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
</tbody>
</table>

### 4.5.5 Assessment of residual effects

There is not expected to be any significant impact on groundwater quality or flow as a result of the proposed mining operation.

There is not expected to be any significant impact on surface water quality as a result of groundwater intercept during mining operations.

### 4.6 Noise emissions

Noise emissions will be associated with the construction and operation phase of the project.

During construction, noise emissions will result from the operation of heavy equipment, including earthmoving equipment, generators and trucks associated with the preparation and construction of the infrastructure site.

During operation, noise emissions will be associated with the mining (earth moving equipment), crushing, screening, haulage and transport of ore. Noise will also result
from the operation and running of the infrastructure area, including generators, workshop and general mine site traffic.

No blasting will be undertaken.

The closest sensitive receptors are located in Rosebery, approximately 10 km south east, and Tullah, approximately 16 km east of the mine site.

Renison Bell is located approximately 5 km south but is not regarded as a sensitive receptor for noise emissions.

A noise survey for the site was not undertaken due to the buffering distance of the sensitive receptors.

4.6.1 Existing conditions

Ambient noise levels at the site are low as there are currently no mining or other activities in the area, apart from occasional use of machinery associated with exploration.

Recent forestry activity immediately to the north west of Three Mile Creek would have resulted in machinery noise similar to what is expected at the proposed Riley mine site.

4.6.2 Performance requirements

Noise emissions from proposed activities must comply with the following:

- *Environmental Management and Pollution Control Act 1994* - environmental nuisance
- *Environment Protection (Miscellaneous Noise) Regulation 2004*
- The Quarry Code of Practice
- West Coast Council Planning Scheme.

Sensitive uses are not to be located within the attenuation distances listed in Part D.17, Standard Attenuation Distances Code, Table 17.2 of the West Coast Planning Scheme and are to demonstrate compliance with acceptable solutions set out in Table 17.1 of that Code. 11.1.

The following attenuation distances apply for noise:

- crushing: 750 m
- vibratory screening: 500 m.

4.6.3 Potential effects

Noise has the potential to cause environmental nuisance at residential premises and other sensitive uses.

Ambient noise levels will be altered during both mine construction and operation.

There will be significant noise emissions from heavy earthmoving equipment and machinery and vehicles during mine construction. Once the mine is operational, noise emissions will be similar to those during construction, with the addition of noise emissions from crushing and screening.

No blasting will be undertaken.
**Earthmoving equipment and vehicles**

Using a typical engine power of up to 162 kW for the largest earthmoving equipment, a sound power level emission of approximately 105 dB(A) can be expected. A large front end loader or bulldozer of similar power will have a similar sound power level.

Other mobile equipment or a truck can be expected to have a sound pressure level at 1 m distance of 93 dB(A), which equates to a sound power level of 101 dB(A).

The combined sound power of both emissions operating simultaneously will be the logarithmic addition of 105 and 101 dB(A), which is 106.5 dB(A).

Assuming half-spherical sound propagation from this source over flat ground, the drop in sound pressure levels with distance from the source can be calculated. The resultant drop off in sound pressure levels at various distances from the construction equipment source (assuming no screening effects from intervening topography or vegetation) are shown in Table 22.

<table>
<thead>
<tr>
<th>Distance from noise source (m)</th>
<th>Sound pressure level (dB(A))</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>81.0</td>
</tr>
<tr>
<td>100</td>
<td>58.5</td>
</tr>
<tr>
<td>200</td>
<td>52.5</td>
</tr>
<tr>
<td>300</td>
<td>49.0</td>
</tr>
<tr>
<td>335</td>
<td>48.0</td>
</tr>
<tr>
<td>400</td>
<td>46.5</td>
</tr>
<tr>
<td>475</td>
<td>45.0</td>
</tr>
<tr>
<td>500</td>
<td>44.5</td>
</tr>
<tr>
<td>600</td>
<td>43.5</td>
</tr>
<tr>
<td>700</td>
<td>41.6</td>
</tr>
<tr>
<td>800</td>
<td>40.5</td>
</tr>
<tr>
<td>900</td>
<td>39.4</td>
</tr>
<tr>
<td>1000</td>
<td>38.5</td>
</tr>
</tbody>
</table>

Under schedule 2 of the *Environmental Management and Pollution Control (Miscellaneous Noise) Regulations 2004*, noise from equipment such as front end loaders must not exceed between 83 and 92 dB(A) (depending on engine power) 7.5 m away.

As shown in Table 22, this requirement will be met even with the combined noise from the two nominal sources.

Given the buffer distances and existence of topographic high points between the activity and sensitive receptors located in Rosebery and Tullah (topographic highs up to 920 m between the proposed mine site and Tullah and 280 m between the mine site and Rosebery), it is unlikely that the noise levels associated with earthmoving equipment would result in an environmental nuisance.

It is similarly unlikely that the noise levels associated with crushing and screening of the ore, and from other equipment such as generators, would result in an environmental nuisance.
Under regulation 14, unless otherwise approved by the Director, Environment Protection Authority, noise from the equipment must not exceed 45 dB(A) at domestic premises (sensitive uses) outside the 0700-1800 hours Monday-Friday, 0800-1800 hours Saturday and 1000-1800 hours on public holidays.

As there are no domestic premises or sensitive uses within the wider area, there should be no need for restrictions on construction or operation hours.

Exposure of personnel to high noise emissions can, however, affect human health if appropriate mitigation measures are not taken. The following section therefore outlines appropriate mitigation for noise levels on site.

### 4.6.4 Avoidance and mitigation measures

In order to mitigate noise levels on-site:

- Equipment and vehicles appropriate to the required tasks will be utilised.
- All equipment and vehicles will be fitted with the manufacturer’s silencing equipment and will be appropriately maintained.
- Crushing and screening plant will be appropriately designed, operated and maintained.
- Mandatory use of appropriate hearing protection will be required in all areas to protect the health of workers.

As there are no nearby residences or sensitive land users, no other specific measures are required to mitigate noise levels.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 33: All equipment and vehicles will be fitted with manufacturer’s silencing equipment, operated appropriately and regularly maintained.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 34: Use of appropriate hearing protection equipment will be mandatory in all relevant areas.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
</tbody>
</table>

### 4.6.5 Assessment of residual effects

Adherence to the mitigation measures and commitments, as outlined above, will ensure that any noise effects from construction and operation of the mine will be kept to acceptable levels. As a result:

- Noise from equipment will meet the requirements of the *Environmental Management and Pollution Control (Miscellaneous Noise) Regulations 2004*.
- Ambient noise will meet the requirements of the *Quarry Code of Practice* and will not cause an environmental nuisance under the *Environmental Management and Pollution Control Act 1994*.
- The occupational health and safety requirements of the *Workplace Health and Safety Act 1995 and the Workplace Health and Safety Regulations 1998* will be met.
4.7 Solid and controlled waste management

The mining development will not produce any waste rock or tailings or other material that will require specific disposal requirements. However, screened fines will be returned to the mining areas (see section 4.3 for management measures).

The only other solid waste produced will be general refuse waste and mined material that is not of sufficient grade for blending and shipment.

An estimated 2.3 million tonnes of ore will be mined from the proposed development.

The mining will be scheduled to achieve an annual shipped product of approximately 1 million tonnes at a monthly grade of 57% Fe\textsuperscript{67}, by blending as mined high grade and low grade ore.

Any mined material that is not of sufficient grade for blending and shipment will be returned to the mined out panels prior to cover with topsoil and vegetation.

4.7.1 Existing conditions

Bins with lids are currently in use on-site for general refuse and rubbish.

4.7.2 Performance requirements

Solid and controlled waste from mine sites must comply with the following:

- **Tasmanian Environmental Management and Pollution Control (Waste Management) Regulations 2000**
- **Tasmanian Quarry Code of Practice 1999**.

4.7.3 Potential effects

Waste material can cause environmental nuisance or harm if it is not contained and disposed of appropriately.

4.7.4 Avoidance and mitigation measures

The following mitigation measures will be undertaken:

- All waste materials will be disposed of offsite, in accordance with EPA and/or West Coast Council requirements
- Any mined material that is not of sufficient grade for blending and shipment will be placed back into the mined out panels prior to covering with topsoil and vegetation
- Rubbish bins will be provided with lids at appropriate locations around the site and all staff will be required to avoid littering and to collect and bin any rubbish and litter that they observe on site
- Refuse will be periodically taken to an approved waste disposal facility.

\textsuperscript{67} Rock Team, 2012, *Venture minerals Riley project prefeasibility study*, Unpublished report for Venture Minerals Ltd. by Rock Team, Perth, Western Australia
<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 35: Rubbish bins will be provided with lids at appropriate locations around the site and all staff will be required to avoid littering and to collect and bin any rubbish and litter that they observe on site.</td>
<td>Construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 36: Refuse will be periodically taken to an approved waste disposal facility.</td>
<td>Construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 37: Any hydrocarbon contaminated soil will be removed to an appropriate disposal site or treatment facility.</td>
<td>Construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 38: Any mined material that is not of sufficient grade for blending and shipment will be replaced back into the mined out strips prior to cover with topsoil and vegetation.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
</tbody>
</table>

### 4.7.5 Assessment of residual effects

Adherence to the commitments, as outlined above, will ensure that there will be no adverse impacts resulting from general refuse waste from the mine site.

### 4.8 Dangerous goods and environmentally hazardous materials

No blasting will be undertaken, and therefore no explosives will be used on site.

There will be no processing of the ore, and no need for chemicals on site.

The potential effects of fuel, oil and hydrocarbons, and associated avoidance and mitigations are covered in section 4.2.

### 4.9 Biodiversity and natural values flora and vegetation communities

#### 4.9.1 Existing conditions

An initial flora assessment of the proposed mining area was undertaken in October/November 2011 by North Barker Ecosystem Services. A targeted search for *Epacris glabella* occurred in April 2012, following further definition of the mine areas. A further survey was undertaken in July 2012 following changes to the infrastructure layout at the northern end of the site. The full North Barker Ecosystem Services report is provided in Appendix H.

The main findings of the assessment, including a description of the existing conditions, are provided in section 3.4.9.

In summary:

- Eight vegetation communities were recorded in the study area but no vegetation communities of national (*Environment Protection and Biodiversity Conservation Act 1999*) or State (*Nature Conservation Act 2002*) significance (refer 3.4.7).
- One threatened vascular plant species, *Micrantheum serpentinum* (western tridentbush) listed as Vulnerable under the schedule of the *Threatened Species Protection Act 1995* (TSPA), was recorded from the area.

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Two declared weed species were recorded from the site: Spanish heath and English broom. The English broom was observed near the entrance gate and was pulled out and removed from the site. The Spanish heath occurred outside of the study area along the Pieman Road. No other introduced species were recorded within the study area.

The level of weed infestation within the study area is considered to be low.

Symptomatic evidence of *Phytophthora cinnamomi* was observed within the buttongrass moorland community near the power line easement to the north east of the study area. Dieback was evident in *Sprengelia incarnata*. Some die-back in *Banksia marginata* was observed however the levels observed may also be due to natural reasons. The proposed mining and infrastructure areas are considered marginal in terms of the potential establishment of *Phytophthora cinnamomi* both in terms of conducive conditions and vegetation susceptibility.

### 4.9.2 Performance requirements

Flora and fauna management must comply with the following statutes:

- *Environment Protection and Biodiversity Conservation Act 1999*
- *Threatened Species Protection Act 1995*
- *Nature Conservation Act 2002*
- *Forest Practices Act 1985*
- *Forest Practices Code 2000*
- *Crown Lands Act 1976*
- *Weed Management Act 1999*.

### 4.9.3 Potential effects

#### Vegetation communities

The vegetation overlaying the resource contains mature forms of *Eucalyptus delegatensis* forest with broad leaf shrubs (WDB), *Eucalyptus obliqua* dry forest and woodland (DOB) and *Eucalyptus nitida* forest over *Leptospermum* (WNL). Small areas of *Eucalyptus nitida* dry forest and woodland (DNI), *Leptospermum* scrub (SLW), Buttongrass moorland with emergent shrubs (MBS) and *Nothofagus Atherosperma* rainforest (RMT) also overlay the resource.

Regrowth forms of some of these communities are present, largely due to past mining and forestry activities. Most of the proposed mining area was logged in the early 1980’s, as shown in Figure 24.

The regrowth areas are dominated by relatively short trees with thickets of *Leptospermum*.

The proposed clearance of the different vegetation communities is shown in Table 23. The total area to be cleared is approximately 119 ha. Figure 20 shows the extent of the proposed clearance in relation to the different vegetation communities.

None of the vegetation communities impacted has conservation significance.

Additional vegetation clearance has been kept to a minimum by negating the need for large sediment basins downstream of the proposed mining operations in areas A and C (see section 2.1.2).
Figure 24: Past forestry cleared areas (early 1980's) relative to the proposed mining areas, showing that most of the mine area was logged

[Red line = lease boundary. Green line = proposed mining extent. Purple lines = mine infrastructure. The brown lines criss-crossing the mining areas are logging roads. Tasmap photo date 9 December 1984.]
Table 23: Proposed clearance areas for vegetation communities

<table>
<thead>
<tr>
<th>Activity &amp; infrastructure</th>
<th>Vegetation</th>
<th>Area of disturbance (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining resource area A</td>
<td><em>Eucalyptus nitida</em> dry forest and woodland DNI</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus nitida</em> forest over Leptospermum WNL</td>
<td>10.4</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus delegatensis</em> forest with broad-leaf shrubs WDB</td>
<td>22.4</td>
</tr>
<tr>
<td></td>
<td>Nothofagus - Atherosperma rainforest RMT</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>34.8</strong></td>
</tr>
<tr>
<td>Mining resource area B</td>
<td><em>Eucalyptus nitida</em> dry forest and woodland DNI</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>Leptospermum scrub SLW</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus nitida</em> forest over Leptospermum WNL</td>
<td>6.4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>9.1</strong></td>
</tr>
<tr>
<td>Mining resource area C</td>
<td>Buttongrass moorland with emergent shrubs MBS</td>
<td>0.1</td>
</tr>
<tr>
<td></td>
<td>Nothofagus - Atherosperma rainforest RMT</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>Leptospermum scrub SLW</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus nitida</em> forest over Leptospermum WNL</td>
<td>44.1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>46.4</strong></td>
</tr>
<tr>
<td>Mining resource area D</td>
<td><em>Eucalyptus nitida</em> dry forest and woodland DNI</td>
<td>6.2</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus obliqua</em> dry forest and woodland DOB</td>
<td>13.7</td>
</tr>
<tr>
<td></td>
<td>Leptospermum scrub SLW</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td><em>Eucalyptus nitida</em> forest over Leptospermum WNL</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>23.9</strong></td>
</tr>
<tr>
<td>Infrastructure area</td>
<td><em>Eucalyptus nitida</em> dry forest and woodland DNI</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>4.4</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Overall total</strong></td>
<td><strong>118.5</strong></td>
</tr>
</tbody>
</table>

**Threatened flora**

One threatened vascular plant species, *Micrantheum serpentinum* (western tridentbush) listed as Vulnerable under the schedule of the Threatened Species Protection Act 1995 (TSPA) was recorded on the proposed mine site.

The species was found at three different locations, as shown in Figure 20:

- Along the mine access road
- Within the infrastructure area
- On the north western edge of resource area A, near Three Mile Creek.

Two areas within the proposed infrastructure site, an area to the north and one to the south, have higher densities of individuals than the surrounds. The area to north has an estimated 1,680 plants and the one to the south an estimated 1,200 plants (Figure 20).

Some plants will be disturbed by the proposed activity, as discussed below. The core area of the *Micrantheum serpentinum* population, however, is on the slope of
Serpentine Ridge within the DNI community, outside the proposed development footprint (see below for description and Figure 25).

**Potential direct impacts**

Mining activities are identified as potentially threatening this species, as there has been recent interest in mining areas of serpentinite in Tasmania.

While the mining lease lies partly across serpentinite of the Wilson Creek Complex, the proposed mining activity does not involve mining serpentinite, only the surficial laterite deposits.

Nevertheless, the species was found at three locations that will potentially result in localised impact.

Individuals of the species were located adjacent to the mine access road from the Pieman Road to the proposed infrastructure site, along a small track within the proposed infrastructure site, and along access tracks in the upper parts of Three Mile Creek.

While the layout of the mine has been designed to minimize impact to *Micrantheum serpentinum*, there will be some necessary disturbance to individuals associated with the infrastructure site.

The location of the infrastructure site is on serpentinite, a substrate requirement for *Micrantheum serpentinum*. Indeed, the species is locally abundant but highly geographically restricted due to its particular substrate requirement, i.e. Cambrian serpentinite.

The general location of the infrastructure site is constrained by a number of factors, including topography, location of resource, minimizing internal haulage of ore and thereby greenhouse gas emissions, and location of Serpentine Ridge, the core habitat for *Micrantheum serpentinum*. The layout of key elements within infrastructure site is also constrained by health and safety issues and ore processing efficiency.

Nevertheless, where possible elements such as the mine offices, car park and ablutions area, and the ROM PAD have been relocated and/or altered to minimize disturbance to the two areas where higher density of *Micrantheum serpentinum* were found (Figure 25).

Only a small section of the northern *Micrantheum serpentinum* patch, at the northern infrastructure entry/exit point, will be disturbed (Figure 25). The position and alignment of mine offices, ablutions and car park area has been altered to avoid disturbance to the majority of this patch.

The ROM pad has been moved to the east to avoid disturbance to the southern *Micrantheum serpentinum* patch.

Four of the individual plants and some of the area along the mine access road will also be disturbed. Figure 25 shows the location of these plants and provides an indication of the areas of disturbance associated with the mine access road.

The species was also noted on the north western edge of resource Area A near Three Mile Creek (Figure 20). The mining of resource area A will not disturb the plants in this area.

While some *Micrantheum serpentinum* plants will be disturbed by the proposed activity, the core area of the *Micrantheum serpentinum* population in this area, on the slope of Serpentine Ridge within the DNI community, lies outside the proposed

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69 *Micrantheum serpentinum* Tasmanian threatened flora listing statement
development footprint, except for a very small area along the western boundary of the infrastructure area (Figure 25).

The main area of disturbance, at the infrastructure entry/exit point, represents only a small fraction of the core *Micrantheum serpentinum* habitat in this area (Figure 25).

The number of *Micrantheum serpentinum* plants that will be affected by the proposed mining activity would represent only a very minor proportion of the total Serpentine Ridge population, and would certainly not affect the capacity of this population to continue.

In the context of Tasmania, there are 8 to 9 apparently distinct recorded populations of *Micrantheum serpentinum*, of which the Serpentine Ridge population is one\(^70\). The species is protected regionally with a population in the Heazlewood River Area, Duffs Hill. It also occurs in the Meredith Range Regional Reserve and at Nineteen Mile Creek in the Savage River Regional Reserve\(^71\). Mineral prospectivity is a primary value of regional reserves.

While the proposed mining activity will directly impact some plants, the mine will not affect the capacity of the local Serpentine Ridge population to continue, and will not affect wider populations and status of this species.

**Potential indirect impacts**
Disturbance associated with road construction and land clearance can have adverse indirect effects on *Micrantheum serpentinum* through increased risk of the spread of weeds and plant disease.

As with most *Euphorbiaceae*, *Micrantheum serpentinum* does not express effects of the plant pathogen *Phytophthora cinnamomi*. However, associated plant species such as the threatened *Epacris glabella* are known to be susceptible (e.g. at Serpentine Hills\(^72\)). As a result, habitat may become degraded as the pathogen spreads, where plant community structure and processes are altered.

The risk of indirect impacts to *Micrantheum serpentinum* through the spread of weeds and disease is low at the proposed mine site.

The current level of weed infestation within the proposed mine site is low, and while symptomatic evidence of *Phytophthora cinnamomi* was observed within the buttongrass moorland community to the north east of the study area (see Figure 20), the proposed mining and infrastructure areas are considered marginal in terms of the potential establishment of *Phytophthora cinnamomi*. Furthermore, the current practices of spraying vehicles entering the mine site, initiated during the exploration phase, further reduces the potential for *Phytophthora cinnamomi* establishment on the proposed mining site.

The effect of the proposed mine on the spread of *Phytophthora cinnamomi* is discussed in more detail below.

*Micrantheum serpentinum* occupies a small area in total, approximately 50 ha, and is therefore at risk of stochastic disturbances, for example two wildfires in quick succession.

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\(^{70}\) *Micrantheum serpentinum* Tasmanian threatened flora listing statement.

\(^{71}\) *Micrantheum serpentinum* Tasmanian threatened flora listing statement.

Figure 25: Occurrence of *Micranthemum serpentinum* on the mine site and area of core *M. serpentinum* habitat
Without appropriate fire management practices in place, the mining activity increases the risk of fire in the local area, including along the slopes of the Serpentine Ridge to the north west of the proposed mine site, where a population of *Micranthemum serpentinum* exists.

A Fire Management Plan will be implemented to reduce the risk of fire resulting from the mining activities.

See section 4.19 for a description of the fire management measures.

The proposed mining activities will not significantly impact the local or wider population of *Micranthemum serpentinum*.

**Declared weeds and pathogens**

The level of weed infestation within the proposed mine area is low as described in section 3.4.7.

*Phytophthora cinnamomi* and *Chalara australis* are discussed in section 3.4.7.

The movement of machinery and vehicles in general presents an increased risk of moving *Phytophthora cinnamomi* to communities at risk.

Mining, road construction and any other disturbance which causes damage to older myrtles has the potential to trigger local epidemics of myrtle wilt killing a high proportion of the mature trees and spreading into adjacent undisturbed areas of myrtle forest.

Vegetation clearance will remove *Nothofagus cunninghamii* trees. Disturbance and damage as a result of any clearance will result in a risk of causing myrtle wilt.

The risk of introducing weeds and/or plant diseases to the mine site is greatest during the initial mine construction phase, when earthmoving equipment is first brought to the site. Once the mine is operating, earthmoving will be undertaken by the mine’s own machines, which will remain on-site, and there will be very little requirement to bring external earthmoving equipment onto the site.

Product and worker transport will use existing formed roads and will not go off-road, so day to day operations do not present a significant risk.

During and after the proposed mining activity disturbed areas will be susceptible to weed regeneration and/or weed invasion, and plant disease outbreak.

If appropriate mitigation and management measures are not implemented, there exists a risk of Spanish heath and English broom, and *Phytophthora cinnamomi* and myrtle wilt becoming established on the proposed mine site. There also exists a risk of the mine activities subsequently contributing to the spread of these weeds and fungi to other sites in the area.

### 4.9.4 Avoidance and mitigation measures

**Vegetation communities**

No vegetation communities of national (*Environment Protection and Biodiversity Conservation Act 1999*) or State (*Nature Conservation Act 2002*) significance were found on the proposed mine site.
The following mitigation measures will be undertaken to reduce the overall impact of the mine on vegetation:

- The mining and infrastructure areas have been designed to avoid any significant disturbance to riparian habitat. Riparian buffer strips will be maintained along Three Mile Creek, Riley Creek and Trinder Creek.
- The mining plan, as described in section 2.1.1, ensures that rehabilitation of the mined areas is undertaken progressively and is commenced as soon as possible after the completion of mining along each panel.
- The extent of clearance required for the project will be clearly defined; appropriate measures (including marking tape, signs, site plans, site inductions and work inspections) will be undertaken to ensure no additional clearance occurs.
- All works, vehicles and materials will be confined to the designated works areas.
- Topsoil recovered during the construction of the mine infrastructure area will be stockpiled for future rehabilitation works. The stockpiles will be as low as practicable, with a large surface area, and will be revegetated for erosion protection and to assist rehabilitation on mine closure.
- A Fire Management Plan will be implemented as described in section 4.19.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
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<tbody>
<tr>
<td>Commitment 39: The extent of clearance required for the project will be clearly defined; appropriate measures (including marking tape, signs, site plans, site inductions, tool box talks and work inspections) will be undertaken to ensure that no additional clearance occurs.</td>
<td>Construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 40: All works, vehicles and materials will be confined to the designated works areas.</td>
<td>Construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
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**Threatened flora**

The mitigation measures outlined above in relation to disturbance to the vegetation communities apply to this section.

In addition to the mitigation measures outlined above, the following measures will be undertaken to prevent inadvertent disturbance and or destruction to *Micrantheum serpentinum*:

- There will be no direct disturbance of the population on Serpentine Ridge;
- The limits of the allowable disturbance in the vicinity of the infrastructure site, access road and Three Mile Creek populations will be marked on mine plans and in the field by visible signage (such as flagging tape).
- The reason for disturbance restrictions and the importance of staying within the limits of the disturbance footprint will form part of employee and contractor induction information.

If there is any proposed disturbance to land beyond areas that have already been surveyed, pre-clearance surveys for *Micrantheum serpentinum* will be undertaken.
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<tr>
<th>Commitment</th>
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<tr>
<td>Commitment 41: The limits of the allowable disturbance will be marked on</td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
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<tr>
<td>mine plans and in the field by permanent signage.</td>
<td>and ongoing</td>
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<tr>
<td>Commitment 42: The reason for disturbance restrictions and</td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
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<tr>
<td>the importance of staying within the limits of the disturbance footprint</td>
<td>and ongoing</td>
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<td>will form part of employee and site visitor induction information.</td>
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**Declared weeds and pathogens**

The spread of weeds and also plant diseases (such as *Phytophthora cinnamomi*) is highly undesirable. Indeed, active weed and disease management measures have already been implemented at the proposed mine site during the exploration phase.

The following plant hygiene measures will be implemented during the construction and operation of the mine:

- Appropriate hygiene protocols, including washdown procedures, will be maintained on the site during the construction and operation of the mine.

- These protocols, which will be consistent with the recommendations of the DPIWE Biodiversity Conservation Branch report titled: “Interim *Phytophthora cinnamomi* Management Guidelines”, will include maintenance of current hygiene treatment stations at entry points to the mine site and ensure that personnel observe strict protocols in treating boots, equipment, vehicles and machinery.

- *Phytophthora cinnamomi*, Myrtle wilt, English broom and Spanish heath signs and symptoms will form part of employee induction information.

- Any English broom and Spanish heath observed during construction and operation of the mine will be pulled out and removed from the site.

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<tr>
<th>Commitment</th>
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<th>Responsible person</th>
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<tbody>
<tr>
<td>Commitment 43: <em>A Phytophthora</em> quarantine protocol will be developed,</td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
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<tr>
<td>focusing on washdown of all machinery and equipment coming onto the site</td>
<td>and ongoing</td>
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<td>from other earthwork areas.</td>
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<tr>
<td>Commitment 44: All machinery and vehicles undertaking earthwork activities</td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
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<tr>
<td>will be cleaned prior to leaving the mining lease for work at other premises.</td>
<td>and ongoing</td>
<td></td>
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<tr>
<td>Commitment 45: Any areas that become infected with <em>Phytophthora cinnamomi</em></td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>will be managed in accordance with DPIW ‘Interim <em>Phytophthora cinnamomi</em> Management Guidelines’.</td>
<td>and ongoing</td>
<td></td>
</tr>
<tr>
<td>Commitment 46: <em>Phytophthora cinnamomi</em>, Myrtle wilt, English broom and</td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Spanish heath signs and symptoms will form part of employee induction</td>
<td>and ongoing</td>
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<tr>
<td>information.</td>
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</table>
4.9.5 Assessment of residual effects

Vegetation communities

Adherence to the avoidance and mitigation measures outlined above will ensure that clearance of vegetation will be kept to a minimum.

The proposed mine will nevertheless result in the clearance of approximately 119 ha of vegetation.

This land will be rehabilitated progressively during the mining operation and will be completely returned to a vegetated state in the medium term after closure.

Threatened flora

The proposed mining activities will not significantly impact the local or wider population of Micranthemum serpentinum.

Declared weeds and pathogens

Adherence to the avoidance and mitigation measures outlined above will ensure that the likely spread of weeds and disease to and from the mine site is kept to a minimum.

4.10 Biodiversity and natural values fauna

4.10.1 Existing conditions

A fauna habitat assessment of the proposed mining area was undertaken in late October early November in 2011 by North Barker Ecosystem Services\(^73\). A helicopter search was undertaken on the 16\(^{th}\) February 2012 targeting wedge-tailed eagle nests, and a survey for selected threatened fauna over part of the project area was completed in October 2011 by Nick Mooney\(^74\).

The main findings of the habitat assessment and surveys, including a description of the existing conditions, are provided in section 3.4.8.

In summary:

- Ten faunal species of conservation significance have been previously recorded, or may potentially occur, within 5 km of the proposed mining development (see Table 20, section 3.4.8). Only two of these species, Tasmanian devil (Sarcophilus harrisii) (listed as endangered TSPA and EPBCA) and spotted-tailed quoll (Dasyurus maculatus maculatus) (listed as rare TSPA, vulnerable EPBCA), are considered to have suitable habitat within the proposed mining area.

- Two fresh Tasmanian devil scats were found along Trinder Creek at the same location as a large number of wombat scats. No suitable natal den sites were found. Potential den structures were confined to logs and beneath trees.

- No spotted-tailed quoll scats were found on-site. The area is considered to be outside the core northern lowland habitat.

- No eagle wedge-tailed or white-bellied sea eagle nests were located within the proposed mining area.

\(^{73}\) North Barker Ecosystem Services, 2012, Riley Iron Laterite Prospect Proposal - Botanical Survey and Fauna Habitat Assessment.

\(^{74}\) Mooney, N., 2011, Survey of Select Threatened Fauna for Venture Minerals’ Proposed Mining at Riley Creek, Tullah.
4.10.2 Performance requirements

Fauna management must comply with the following statutes:

- Environment Protection and Biodiversity Conservation Act 1999
- Threatened Species Protection Act 1995
- Nature Conservation Act 2002
- Forest Practices Act 1985
- Forest Practices Code 2000

4.10.3 Potential effects

Two species are considered to have suitable habitat within the proposed mining area; Tasmanian devil \((Sarcophilus harrisii)\) and Spotted-tailed quoll \((Dasyurus maculatus maculatus)\).

A wedge-tailed eagle \((Aquila audax subsp. fleayi)\) was observed on-site during field surveys, and while no nest was found, one nest site has been recorded a little more than 2.5 km away on Lake Pieman.

The potential impact of the proposed mine development on these species is considered in this section.

The impact of the proposed mine development on MNES threatened species and communities (see section 5) is considered in Appendix K.

**Tasmanian devil**

The following potential impacts to Tasmanian devil are addressed:

- Habitat loss
- Devil facial tumour disease (DFTD)
- Road kill.

**Habitat loss**

For the Tasmanian devil, good quality habitat encompasses a combination of year round food supply, enough den sites for breeding and daily movements, and structural features for refuge and foraging. The Tasmanian devil is generally nocturnal and during the day it will retire to a cave/den, hollow log or thick scrub.

Habitat requirements include the following:

- Places to hide and shelter during the day (such as dense vegetation, hollow logs, burrows or caves)
- Areas with an open understorey mixed with dense patches of vegetation which allow hunting
- Soil suitable for burrowing for the purpose of maternal (natal) dens.

The combination of these features within a habitat is more important than a particular vegetation community or habitat type.

Devils occupy several different dens, changing them every 1 to 3 days, and they travel an average nightly distance of approximately 9 km (occasionally recorded up to 50 km). A typical home range across a two to four week period is estimated to be 13 km², equivalent
to 1,300 ha, (ranging from 4 to 27 km²)\(^7\). The animal is solitary but not territorial and foraging areas may overlap considerably.

The indices of abundance of devils, their food and competitors within the proposed mine area suggests devils are at low densities, perhaps in the order of 0.2 devils per square kilometre\(^8\).

The proposed mine area is potential foraging habitat and site surveys identified four scats (Figure 20), which show that the area is indeed used by devils.

Removal of native vegetation (disturbance footprint approximately 119 ha) for the proposed mine development will therefore reduce the local foraging area. The quantity of vegetation removal will affect the carrying capacity of the area to support devils; therefore there will be an impact on devils. However, because of the very large extent of continuous similar habitat in the immediate vicinity, the impact is likely to be insignificant\(^7\). Indeed, 119 ha it is an extremely small fraction (0.17\%) of the land contained within the nearby Huskisson River Forest Reserve, Meredith Range Regional Reserve and the Pieman Lake Forest Reserve (in combination a total of 68,617 ha).

Furthermore, the area of the vegetation clearance required for the mine is likely to be only a small proportion of any given devil’s home range (estimated to be 1,300 ha over a two to four week period).

Finally, as the clearance of vegetation will be staged throughout the life of the mine, and rehabilitation undertaken progressively, any devils displaced may recolonise the area during the life of the mine\(^8\).

No active natal den or lay-up was found during the surveys. The proposed mine area in general supports only minor habitat for denning. The forested environments offer low quality denning opportunities, largely restricted to the large dry hollows of large myrtle trees, the occasional rocky outcrop and wombat burrows. A number of small rocky outcrops in the upper reaches of Gold Creek may provide some low quality denning/lay-up habitat.

A large number of potential devil lay-up areas were observed in the older growth WDB and WNL communities and the rainforest area in the south west of the proposed mine area.

While no suitable natal den sites were located on the mine site, natal den disturbance can be destabilising to populations. While devils change non-maternal dens often, female adults are thought to remain faithful to their maternal (natal) dens for life\(^9\).

The significance of any destabilisation that might be caused by vegetation clearance, however, would of course be related to the number of natal dens disturbed or lost through vegetation clearance, and the availability of replacement dens in surrounding areas.

Given the possibility that dens may exist, and that devils could be occupying dens within vegetation to be cleared for the mine, pre-clearing surveys for occupied dens will be undertaken. The appropriate time for these surveys is immediately before each stage of clearing to ensure the temporal relevance of the surveys to the clearing activity. Any den opportunities lost through the vegetation clearing would be replaced by the creation of compensatory new opportunities (see section 4.10.4).

The species is not currently threatened by habitat loss and has proven to be tolerant of habitat modification by breeding successfully in human domestic environments, such as


\(^8\) Mooney, N, 2011, Survey of selected threatened fauna for Venture Minerals’ proposed mining at Riley creek, Tullah.

\(^9\) North Barker Ecosystem Services, 2012, Riley Iron Laterite Prospect Proposal Botanical Survey and Fauna Habitat Assessment.
under houses and sheds. However, due to the reduction in numbers caused by devil facial tumour disease (DFTD), discussed below, increasing importance is placed upon the protection of maternal dens so that breeding opportunities and successes are maximised.

**Devil Facial Tumour Disease (DFTD)**

Based on the understanding of DFTD, the project, which lies within the north-western devil population, will not introduce any changes to the environment that would increase the risk of DFTD becoming established in the area or facilitate the intermixing of devil populations. The project area has long been an area of mineral prospecting with human activity in the project area since the late 1800s, and most recently forestry activity immediately to the north west of the proposed mine site. Because the area has already been subject to a level of human activity, including recent forestry activity which includes access along forestry roads through the proposed mine site, the mine proposal is considered unlikely to accelerate the spread of DFTD into the area.

It is therefore very unlikely that the proposed mine could increase the risk of introduction of DFTD. The only conceivable way in which this could occur was if diseased or dead individuals (for example, retrieved road kill picked up approximately 25 km east of the site), or equipment that has come in contact with diseased individuals, was brought into the site. The likelihood of this occurrence is negligible, and as an added safeguard this issue will be addressed during staff and contractor induction.

While the area continues to have a healthy population of Tasmanian devils, increases in vehicle traffic volume may increase the incidences of roadkill, discussed below. If DFTD ever becomes established in the area, the increase in traffic that would be associated with the mine development could further reduce the viability of the Tasmanian devil population in the region if the effects of roadkill and DFTD are combined.

**Roadkill**

An increase in traffic volume to and from the site has the potential to result in a higher incidence of road kill or injury to the species. The scavenging diet of the species, their occasional reluctance to leave food, and their dark colour make them particularly vulnerable to being killed on the road. As a source of carcasses, and as a means of dispersion, roads attract the species and put them at risk of being killed themselves. In 2008, it was suggested that over 3,000 individuals are killed on Tasmanian roads each year.

The Save the Tasmanian Devil Program Roadkill Project has identified several key findings in relation to the impact of road kill on the species:

- There are high roadkill densities along the Murchison Highway in the northwest of Tasmania and on the Forestier Peninsula in the south east of Tasmania.
- The number of roadkill incidences reported to the project showed a clear temporal trend, with numbers peaking in summer and being relatively low in winter.
- Of the 100 roadkill reports in which speed limit was provided, 91 involved stretches of road with speed limits greater than 80 km/h. This suggests that higher speeds are a factor in the species roadkill rates, as seen in other Tasmanian roadkill studies (this does not take into account the relative prevalence or frequency of travel on roads with different speed limits).

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80. Nick Mooney pers. comm.
Wildlife biologists began publishing research on the effects of roads on wildlife populations in the 1970s. The following section provides a summary of a number of recent key studies looking at why animals are killed on roads and road features associated with roadkill.

Roads can be a significant source of mortality for wildlife because:

- Home ranges or territories are bisected by roads
- Animals intermingle with traffic as they move along open road corridors
- New food resources are available in road corridors
- Some roadside environments are attractive and serve as habitat for some species.

The spatial arrangement of resources is the main reason why animals are killed on roads — animals are struck by vehicles while trying to reach food, water, den sites etc.

In a three year study across five major transport routes, the frequency and distribution of species killed on Tasmanian roads was assessed by Hobday and Minstrell. The study involved 154 separate trips, over 15,000 km of road and recorded 5691 roadkill individuals. This study is one of the most extensive conducted in Australia, and possibly worldwide, in terms of time-span (>3 years), geographic range (>200 km), species coverage (>50) and survey effort (>15,000 km). The five areas surveyed were the Tasman Peninsula, the East Coast, and North, Central and Southern Tasmania.

The most common roadkill species were brushtail possums, Tasmanian pademelons and Bennetts’ wallaby, with Tasmanian devils accounting for 1.5% of the identified roadkill.

The density of roadkill was lowest in winter and highest in late summer and autumn. Overall, relatively more roadkill was observed at higher speeds, with 50% of roadkill detected when the survey vehicle speed was greater than 80 km/h. At low speeds relatively few roadkills were observed.

Faunal spotlight densities vary widely across Tasmania, suggesting different local population sizes of particular species. The Hobday and Minstrell study showed that the density of roadkill was not related to the density of live animals but that there were localised high-density roadkill areas, or ‘hotspots’, on Tasmanian roads. The study found that 70% of the roadkill occurred in 20-45% of the road in each of the five regions.

Shaw and others assessed six stretches of road in eastern Tasmania to identify local road features associated with wildlife roadkill. They found that visibility, roadside barriers (such as solid metal barriers and table drains) and escape routes were the most important predictors of the probability of finding wildlife roadkill.

Visibility is associated with drivers seeing animals and also animals being able to detect approaching vehicles. The frequency of road corners and undulations and also the time of day affect visibility.

It is well documented that most animals are hit at night; this is because:

- Most wildlife species in Tasmania are nocturnal
- Driver vision is restricted to headlight range
- Animal vision is compromised due to the contrast between on-coming headlights and the surrounding dark.

References:

Roadside table drains and the roadside clearance width are important predictors of the likelihood of roadkill. Deep table drains, metal barriers and steep batters can impede animals from escaping from the path of vehicles. Wide roads tend to have low kill rates compared with other roads, suggesting that wide clearance zones have an inhibitory effect on wildlife crossing. However, this may be as a result of many wide roads being major highways, which have operated as population sinks reducing local animal population densities.

The night time driver detection distances for Tasmanian fauna have recently been studied by Hobday in an attempt to inform speed limits to reduce roadkill87. The study used mounts of nine nocturnal Tasmanian mammal species to determine night time driver detection distances and then converted the data into stopping distances on the basis of reaction time and braking distance. In real situations a driver may slow down to allow an animal to escape, or swerve to avoid the animal, this would have the effect of increasing the safe detection distances highlighted in this study.

The Tasmanian devil had the shortest mean detection distance when the vehicles headlights were on high beam and the second shortest on low beam, these distances corresponded to a driving speed which would permit a safe stop of 54 km/h and 38 km/h respectively. The detection distances were not related to animal size, light coloured individuals (for example hare, Tasmanian bettong and eastern barred bandicoot) were more easily detected than darker species irrespective of size. This study found that there was a different detection distance for 4WD versus standard vehicles related to the headlight height. Because of their greater height, 4WD had a greater projection distance for high beam than standard vehicles (10 metres further on average).

The study recommended a night time driving speed of slower than 80 km/h to minimise roadkill.

Traffic volumes along the Pieman Road section of the transport route have not been measured, although they are known to be low. The road is not a major tourist route and there are no towns or other centres on the road. The road was built to construct the hydroelectric Reece Dam and serves no other primary purpose.

At full production, the Riley mine will increase the traffic volumes along the Pieman Road by approximately 148 truck movements, 4 bus movements and up to 30 light vehicle movements per day. Other Venture Minerals mine proposals (Mt Lindsay and Livingstone), which are the subject of separate referrals, may also contribute to increased traffic volumes.

A study into baseline roadkill statistics on the Pieman Road, commissioned by Venture Minerals, has recently been completed. This provides a baseline description of current roadkill rates on the Pieman Road, and forms part of the ongoing road kill monitoring program proposed later in this document. Roadkill data collection was undertaken from early February 2012 until early May 2012. The survey design and subsequent analysis has been undertaken in accordance with a robust statistical design that will allow statistical comparison between baseline rates and operational roadkill rates.

The analysis of road kill along the Pieman Road is presented in the report by Symbolix, provided in Appendix I. A summary of the key findings from the report is provided in section 3.4.8. One Tasmanian devil roadkill and three headlight observations were made along the study section of the Pieman Road during the study period. The main hotspots for both headlight and road kill activity during the study period occurred approximately 7-10 km, and 25 km east of the Murchison Highway junction.

The road traffic associated with the proposed mine has the potential to increase the incidence of Tasmanian devil road kill along Pieman Road. While the one Tasmanian devil road kill observation during the survey occurred outside the proposed ore transport route, one of the headlight observations occurred within the planned transport route along the Pieman Road (Figure 21).

A description of the proposed traffic to and from the proposed mine site area is provided in section 4.22.4.

A roadkill minimisation strategy, as discussed in section 4.22.6, will be implemented for threatened fauna species.

**Spotted-tailed quoll**

There are currently estimated to be 3,000 to 4,000 spotted-tailed quoll remaining in Tasmania based on a density of about 1 per 300 ha. The density can be higher in the core habitat area in northern Tasmania and in other limited ‘hot spots’; in the incised river valleys of the Gordon and Huon River catchments in southern Tasmania, and along a narrow strip of the west coast.

The species appears to be declining in abundance, and may be vulnerable to further declines through continued habitat removal and fragmentation.

The species is solitary and occupies large home ranges, which can extend to more than 1,500 ha of continuous suitable habitat for a male and a little less for a female. Three hundred hectares of core habitat is required to sustain a single female. Population densities are likely to be in the order of one individual per 4 km², with female ranges largely exclusive but male ranges overlapping. Habitat (denning and hunting) totalling more than 15,000 ha may be required to sustain a viable population.

The species is known to use multiple dens and changes these every 1-4 days. Den sites have been recorded in a variety of structure types, including rock crevices, hollow logs, hollow tree buttresses, tree hollows, clumps of vegetation, caves, boulder tumbles, under buildings, and in the dens of rabbits and wombats. They are also known to dig burrows when a suitable substrate is available. A study of the mainland populations indicates that prey density and den availability are the two main factors in the use of habitat. These results are likely to apply to Tasmanian populations. Habitat critical to the species is that which contains adequate denning resources in large forest areas.88

Less is known about quoll densities in the wider area of the proposed mine site than for Tasmanian devils, although densities are considered to be very much lower than the densities of devils.

The mine is likely to be part of a home range for this species, albeit outside of the core range.

The potential direct impacts resulting from habitat loss and indirect impacts resulting from road kill associated with the proposed Riley mine project are discussed below.

**Habitat loss**

Vegetation clearance associated with the mine will affect the carrying capacity of the area to support spotted-tailed quolls, although densities are considered to be low (one individual per 4 km²). Any impact on spotted-tailed quoll from vegetation clearance however is unlikely to be significant because the immediate vicinity supports very large tracts of suitable habitat89. Indeed, 119 ha is a small fraction (0.8%) of 15,000 ha of habitat thought to be required for a viable population, and an even smaller fraction (0.17%) of the land.

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89 North Barker Ecosystem Services, 2012, Riley Iron Laterite Prospect Proposal, Botanical Survey and Fauna Habitat Assessment.
contained within the nearby Huskisson River Forest Reserve, Meredith Range Regional Reserve and the Pieman Lake Forest Reserve (in combination a total of 68,617 ha).

Due to these large tracks of habitat adjacent to the mine site, vegetation clearance associated with the mine will also have no significant effect on the movement of the quolls across the region.

The species requires forested areas with suitable shelter sites such as hollow logs or rocky caverns as denning habitat. Vegetation clearance may remove denning opportunities over the mine site, which can be destabilising to populations. The majority of the vegetation to be cleared at the site however (i.e. *Eucalyptus nitida* forest over *Leptospermum*) is less likely to contain suitable denning habitat than taller mature rainforest due to a lack of hollow logs on the ground and large mature trees with hollow bases. The likelihood of losing potential denning sites due to vegetation clearance is considered to be very low90.

Nevertheless, because of the possibility of denning sites to occur on the proposed mine site, and for the species to be occupying dens within vegetation to be cleared for the mine, pre-clearing surveys for occupied dens will be undertaken. The appropriate time for these surveys will be immediately before each stage of clearing to ensure the temporal relevance of the surveys to the clearing activity.

Any den opportunities lost through the vegetation clearing will be replaced by the creation of compensatory new opportunities (see section 4.10.4).

**Roadkill**

It is estimated that 1-2 individuals are killed daily on the main road between Hobart and the north west of the state91, which is a very low kill rate per kilometre. Juvenile males are most at risk due to their extensive range. The full impacts of road mortality on the species are not well known but other carnivorous marsupials have been significantly impacted.92

As for the Tasmanian devil, increases in vehicle traffic volume associated with the proposed mine may increase the incidences of roadkill on the spotted-tailed quoll. There are no specific studies detailing the impacts of roadkill on spotted-tailed quoll populations but, given the low density of animals (one individual per 4 km²), it is a low risk, although potentially significant.

At full production, the Riley mine will increase the traffic volumes along the Pieman Road by approximately 148 truck movements, 4 bus movements and up to 30 light vehicle movements per day. Other Venture Minerals mine proposals (Mount Lindsay and Livingstone), which are the subject of separate referrals, will also contribute to increased traffic volumes.

As outlined above, a study into baseline roadkill statistics on the Pieman Road, commissioned by Venture Minerals, had been undertaken by Symbolix, and is presented in the following report, *Pieman Road mortality analysis (fauna), baseline monitoring, June 2012, Symbolix*, provided in Appendix I. Key findings from the report are discussed in section 3.4.8 (page 72).

In summary, there were no headlight or road kill observations of spotted-tailed quoll on Pieman Road during the initial baseline study93.

Background information on studies that have examined why animals are killed on roads, and road features associated with roadkill and the mitigation options that have been used elsewhere is provided in Appendix I.

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90 Ibid
92 Ibid
93 Symbolix, 2012, Pieman Road kill levels, baseline monitoring.
A description of the proposed traffic to and from the proposed mine site area is provided in section 4.22.4.

The road traffic associated with the mine has the potential to increase the incidence of spotted-tailed quoll road kill along the Pieman Road.

A road kill minimisation strategy will be implemented for the spotted-tailed quoll, as outlined above for the Tasmanian devil (see section 4.10.4 for a full description of the road kill mitigation measures).

**Wedge-tailed eagle**

One nest site record of this species has been recorded within 5 km of the study area, approximately 2.5 km to the west of the proposed mine site, on the western shore of Lake Pieman. A wedge-tailed eagle was observed on-site during field surveys but no nests were observed (potential nesting habitat areas were surveyed by helicopter on 16th February 2012). A helicopter search confirmed that the nest on the western shore of Lake Pieman was recently active.

The proposed mine site contains marginal habitat with potential old growth trees that may offer some suitability for nesting. Wedge-tailed eagles choose old growth trees in relatively sheltered sites for locating their nests. Territories can contain up to five alternate nests usually close to each other but may be up to 1 km apart where habitat is locally restricted. Adults are highly territorial and have very large home ranges.

Although considered to be widespread but uncommon at the time of European settlement, the species’ breeding success has decreased to a point where it is now considered that fewer than 100 pairs are successful at breeding each year. The greatest single threat to the species is the continuing decline in breeding success as a result of disturbance of breeding birds and loss of nesting habitat.

While no nests were observed during the surveys, the study area is likely to be used for foraging. Wedge-tailed eagles prey and scavenge on a wide variety of fauna including fish, reptiles, birds and mammals.

The clearance of vegetation associated with the mine is unlikely to have any significant affect on potential foraging habitat for the wedge-tailed eagle due to the large areas of suitable foraging habitat in the near vicinity.

While the proposed mine will have no impact on the eagles nest approximately 2.5 km to the west of the proposed mine site, the area is within the range of a pair of birds, and potential nesting habitat exists on the mine site.

A vegetation preclearance survey by foot will therefore be undertaken for nests over the mine site, to ensure the proposed mining activity does not affect the breeding success of local wedge-tailed eagle pairs.

Avoidance and mitigation measures are discussed below.

### 4.10.4 Avoidance and mitigation measures

**Tasmanian devil**

No active dens (either natal dens or lay-ups) were observed within the mine disturbance area.
The following measures nevertheless will be undertaken to protect and enhance denning habitat for devils:

- As a conservative protective measure to mitigate against the potential impact on Tasmanian devils, preclearance surveys will be undertaken.
- Because of the mobility of devils between dens, the surveys will be timed to closely precede clearing. If surveys were undertaken too early, the survey findings could not be relied upon.
- A temporary 50 metre buffer will be established around any natal devil den during the vegetation clearing operations. Only after the den has been confirmed to be vacated will the vegetation clearing be completed.
- In addition to identifying the dens actually in use, the preclearance surveys will determine the amount, quality and type of devil denning opportunities within the area to be cleared.
- Suitable large trees and rocks will be saved to be used to make potential den/lay-up sites outside the limits of the disturbance area, which will provide new denning opportunities for the species.
- The creation of new denning opportunities for devils will achieve at least the quantum and quality of the pre-existing natural opportunities identified during the pre-clearance surveys.
- Some of the large trees and rocks that need to be cleared from the infrastructure areas will be used to create windrows (piles of soil, green timber and other vegetation). This material will be moved to appropriate peripheral areas and stacked in a suitable manner to provide potential den sites. The design and establishment of windrows will be the responsibility of the mine manager but will be coordinated by a suitably qualified wildlife specialist.
- As a general guide\(^{94}\), at a well-drained site, 3 to 5 m long lengths of tree trunks larger than 50 cm in diameter will be pushed into a settled pile at least 25 m long, 10 m wide and 4 m high, preferably including pushed topsoil also. A 1 m (at least) thick layer of branches, bark and off-cuts will then be placed on top and around all sides of the pile. As many of these windrow piles as possible will be created.
- The new denning opportunities will be created as part of the vegetation clearing exercise for the mining panel within which the den was found.

The following monitoring will be undertaken:

- Monitoring of the effectiveness of the establishment of suitable denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations. These stations will comprise an infrared camera designed specifically for the detection of wildlife.
- Information from the sentinel monitoring stations will be used to measure occurrences of devils at the windrows.
- The monitoring stations will regularly be checked for functionality and damage. At these checks the data will be downloaded and interpreted by a suitably qualified person.
- Devil photos will also be examined for any signs of DFTD. Any evidence of potential symptoms will be forwarded immediately to the Save the Tasmanian Devil Program (STDP).
- Monitoring information will be provided to the STDP at regular intervals.

\(^{94}\) Nick Mooney pers. comm.
The following roadkill strategy will be implemented:

- The provision of a daily bus service from the town of Tullah to and from the mine site. This service will minimise the number of additional vehicles travelling on the region’s roads.
- Imposing speed limits for all project vehicles during the dusk to dawn period, restricting speeds to 40 km/hour on internal haul roads and 60 km/hour on Pieman Road.
- Deterring animals from crossing the road when vehicles are approaching, including by attaching ultrasonic animal alert whistles to vehicles and sounding car horns where animal hot spots are identified.
- Removing roadkill from the road between Bastyan rail storage facility and the mine site and on internal roads daily, to discourage animals from scavenging (a “permit to take” will be required from DPIPWE to remove roadkill carcasses).
- Educating staff and contractors, particularly transporters in the risk factors for roadkill and mitigation measures required to reduce potential roadkill numbers.
- Road kill monitoring program will be ongoing and will continue as part of the study into baseline roadkill statistics on the Pieman Road.
- As a transport contingency, if the rail loading facility (to be constructed by others) is not available when the mine starts production, product will be trucked from the mine all the way to Burnie, during daylight hours only.

The transport contingency (last dot point above) would add 12 to 13% to the daily traffic volume on the Murchison Highway, which is a small increase and not significant in terms of roadkill risk, particularly because of the daylight only restriction. It is well established that Tasmanian mammal species, including Tasmanian devils, encountered on roads are nocturnal, and as a result the great majority of roadkill occurs during the dusk-to-dawn period\(^95,96\). Daylight road use is not considered to be a significant roadkill risk.

This already insignificant risk is further reduced because the increase in traffic volumes would be in the form of heavy vehicles, which present a lower roadkill risk than light vehicles due to their lower speeds. As described in section 4.22.6 (page 167), travel speeds of 80 km/h (a practical maximum for heavy vehicles on the Murchison Highway) present about half the risk of travel speeds of 100 km/h, which light vehicles would be capable of. At travel speeds below 60 km/h, which would be a more typical speed for heavy vehicles on much of the Murchison Highway, roadkill risk is negligible.

The transport contingency therefore presents no credible increase in roadkill risk for the Tasmanian devil or other MNES species.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 47: A Devil Management Plan will be prepared, which will include preclearance surveys for devil dens to be undertaken immediately before each stage of clearing to identify any occupied dens. The surveys will be conducted by a suitably qualified person.</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 48: During vegetation clearing operations, a temporary 50 m buffer will be established around any occupied natal dens found in the pre-clearance surveys. The buffer will encompass all structural elements of the surrounding forest and will remain until the den has been confirmed to have been vacated. Only after the den has been confirmed to be vacated will the vegetation clearing be</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
</tbody>
</table>

Commitment

When

Responsible person

completed.

Commitment 49: Additional devil denning opportunities will be created as part of the vegetation clearing activities.

During construction and ongoing

Mine Manager / Relevant Contractor

Commitment 50: Monitoring of the effectiveness of the establishment of suitable devil denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations.

During construction and ongoing

Mine Manager / Relevant Contractor

Commitment 51: A road kill minimisation strategy will be implemented for the Tasmanian devil, including the provision of workers transport (bus) to and from the site, reducing traffic speed, improving visibility by use of driving lights, acoustically alerting animals, discouraging animals from scavenging and educating staff and contractors.

During construction and ongoing

Mine Manager / Relevant Contractor

Commitment 52: If product transport is required prior to the rail loading facility being operational, product will be trucked to Burnie via the Murchison Highway but during daylight hours only.

During operations

Mine Manager / Relevant Contractor

Commitment 53: Staff and contractor inductions will include education about Devil Facial Tumour Disease, its significance and measures to avoid contributing to its spread.

During construction and ongoing

Mine Manager / Relevant Contractor

Commitment 54: Road kill monitoring will be on going and will continue during construction and operation of the mine.

During construction and ongoing

Mine Manager / Relevant Contractor

Spotted-tailed quoll

No active dens were observed within the mine disturbance area.

The following measures nevertheless will be undertaken to protect and enhance denning habitat for spotted-tailed quoll:

- As a conservative protective measure to mitigate against the potential impact on spotted-tailed quoll, preclearance surveys will be undertaken.

- A temporary 50 metre buffer will be established around any spotted-tailed quoll den during the vegetation clearing operations. Only after the den has been confirmed to be vacated will the vegetation clearing be completed.

- In addition, to identifying the dens actually in use, the preclearance surveys will determine the amount, quality and type of spotted-tailed quoll denning opportunities within the area to be cleared.

- Suitable large trees and rocks will be saved to be used to make potential den sites outside the limits of the disturbance area, which will provide new opportunities for the species.

- The creation of new denning opportunities for spotted-tailed quoll will achieve at least the quantum and quality of the pre-existing natural opportunities identified during the pre-clearance surveys.

- Some of the large trees and rocks that need to be cleared from the infrastructure areas will be utilised to create windrows (piles of soil, green timber and other vegetation). This material will be moved to appropriate peripheral areas and stacked in a suitable manner to provide potential den sites. The design and establishment of windrows will be coordinated by a suitably qualified person.
- As a general guide\textsuperscript{97}, at a well-drained site, 3 to 5 m long lengths of tree trunks larger than 50 cm in diameter will be pushed into a settled pile at least 25 m long, 10 m wide and 4 m high, preferably including pushed topsoil also. A 1 m (at least) thick layer of branches, bark and off-cuts will then be placed on top and around all sides of the pile. As many of these windrow piles as possible will be created.

The following monitoring will be undertaken:

- Monitoring of the effectiveness of the establishment of suitable denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations. These stations will comprise an infrared camera designed specifically for the detection of wildlife.
- Information from the sentinel monitoring stations will be used to measure occurrences of devils at the windrows.
- The monitoring stations will regularly be checked for functionality and damage. At these checks the data will be downloaded and interpreted by a suitably qualified person.

The following road kill strategy will be implemented:

- The provision of a daily bus service from the town of Tullah to and from the mine site. This service will minimise the number of additional vehicles travelling on the region’s roads.
- Imposing speed limits for all project vehicles during the dusk to dawn period, restricting speeds to 40 km/hour on internal haul roads and 60 km/hour on Pieman Road.
- Deterring animals from crossing the road when vehicles are approaching, including by attaching ultrasonic animal alert whistles to vehicles and sounding car horns where animal hot spots are identified.
- Removing roadkill from the road between Bastyan rail storage facility and the mine site and on internal roads daily, to discourage animals from scavenging (a “permit to take” will be required from DPIPWE to remove roadkill carcasses).
- Educating staff and contractors, particularly transporters in the risk factors for roadkill and mitigation measures required to reduce potential roadkill numbers.
- Roadkill monitoring program will be on going and will continue as part of the study into baseline roadkill statistics on the Pieman Road.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 55: Preclearance surveys for spotted-tailed quoll dens will be undertaken immediately before each stage of clearing to identify any occupied dens. The surveys will be conducted by a suitably qualified person.</td>
<td>During construction and ongoing Mine Manager /Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment 56: During vegetation clearing operations, a temporary 50 m buffer will be established around any occupied natal spotted-tailed quoll dens found in the pre-clearance surveys. The buffer will encompass all structural elements of the surrounding forest and will remain until the den has been confirmed to have been vacated. Only after the den has been confirmed to be vacated will the vegetation clearing be completed.</td>
<td>During construction and ongoing Mine Manager /Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment 57: Additional spotted-tailed quoll denning opportunities will be created as part of the vegetation clearing activities.</td>
<td>During construction and ongoing Mine Manager /Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment 58: Monitoring of the effectiveness of the establishment of suitable spotted-tailed quoll denning habitat</td>
<td>During construction Mine Manager /Relevant</td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{97} Nick Mooney pers. comm.
<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>as a mitigation measure will be implemented by using sentinel camera monitoring stations.</td>
<td>and ongoing</td>
<td>Contractor</td>
</tr>
<tr>
<td>Commitment 59: A road kill minimisation strategy will be implemented for the spotted-tailed quoll, including the provision of workers transport (bus) to and from the site, reducing traffic speed, improving visibility by use of driving lights, acoustically alerting animals, discouraging animals from scavenging and educating staff and contractors.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 60: If product transport is required prior to the rail loading facility being operational, product will be trucked to Burnie via the Murchison Highway during daylight hours only.</td>
<td>During operations</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 61: Staff and contractors will be provided with quoll protection and management guidance before site work commences and as part of the induction of new workers.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 62: Road kill monitoring program will be ongoing and will continue during construction and operation of the mine.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
</tbody>
</table>

**Wedge-tailed eagle**

The proposed mine is within the range of a pair of birds, and potential nesting habitat exists on the mine site.

The following measures will therefore be undertaken:

- A vegetation preclearance survey for nest sites will be undertaken.
- Should nest sites be found, DPIPWE will be notified and advice sought.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 63: Preclearance surveys for wedge-tailed eagle nest sites will be undertaken immediately before each stage of clearing. DPIPWE will be notified and advice sought if nest sites are observed.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
</tbody>
</table>

**General commitments**

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 64: The construction of the Riley project will be undertaken in accordance with a Construction Environmental Management Plan (CEMP) that will be prepared to ensure that Matters and National Environmental Significance (MNES) are protected.</td>
<td>During construction</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 65: CEMP maps will note the location of all MNES within and adjacent to the project’s disturbance area, together with protective no-go buffer zones, and CEMP guidance instructions will describe MNES protection, avoidance and monitoring measures that must be implemented during construction.</td>
<td>During construction</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
</tbody>
</table>
## 4.10.5 Assessment of residual effects

### Tasmanian devil

The residual impacts following the avoidance and mitigation measures outlined in the commitments above are considered to not be significant.

A discussion of the residual impacts is provided below.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Assessment</th>
<th>Significant impact likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead to a long-term decrease in the size of a population</strong></td>
<td>The removal of vegetation (approximately 119 ha in total) is insignificant for devils relative to the surrounding several thousand hectares of similar vegetation and to the home ranges of the species, meaning that there will only be a marginal and insignificant impact on foraging habitat for the species. It is conservatively estimated that less than 1 individual is likely to be affected. Implementing a roadkill minimisation strategy, including the provision of a workers’ bus from Tullah, reducing traffic speed, improving visibility, alerting animals and educating staff and contractors will reduce potential roadkill impacts to a level of insignificance. Any residual impacts would be insignificant and unlikely to lead to a long term decrease in a devil population.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Reduce the area of occupancy of the species</strong></td>
<td>Although vegetation clearance will reduce the area of occupancy, the vegetation types mean that devils are considered to be at very low densities because of very low densities of prey species. The clearance of vegetation is not considered to be a significant reduction in the potential area of occupancy of the species relative to the surrounding several thousands of hectares of similar vegetation.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Fragment an existing population into two or more populations</strong></td>
<td>Devils from north-western Tasmania are genetically distinct from those found across the rest of the State. There is, however, a small amount of movement of devils between the two groups. Therefore all wild Tasmanian devils are therefore considered to be part of a single population. The project could therefore not fragment a biological population. At a local level, the loss of &lt;0.2% of potential habitat could not lead to a fragmentation of the local population.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Adversely affect habitat critical to the survival of a species</strong></td>
<td>Habitat critical to the survival of the Tasmanian devil includes: 1. all disease-free areas within mainland Tasmania with suitable devil habitat; 2. all areas of the pre disease core habitat; and 3. areas that may be required under the recovery program. The project area is not within “core habitat” as defined by the Draft Recovery Plan, 2010. Removal of native vegetation for the proposed development will reduce the local foraging area but the vegetation to be cleared is not considered to be denning habitat and given the extent of continuous</td>
<td>Unlikely</td>
</tr>
</tbody>
</table>

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99 Ibid
<table>
<thead>
<tr>
<th>Criterion</th>
<th>Assessment</th>
<th>Significant impact likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Disrupt the breeding cycle of a population</strong></td>
<td>Preclearance surveys for occupied dens will be undertaken immediately prior to each stage of vegetation clearance. Protective 50 m buffers will be delineated around any occupied dens found until the dens have been vacated. The project will therefore not impact on devil breeding. Cleared vegetation will be used to provide new denning opportunities by the creation of windrows. This would be done in consultation with devil ecology experts. The net effect will therefore be to create an enhanced denning potential for devils, away from the mining operations. The project will therefore not disrupt the devil breeding cycle.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</strong></td>
<td>The removal of vegetation is insignificant for devils relative to the surrounding areas of similar vegetation and to the home ranges of those species, meaning that there will only be a marginal and insignificant impact on foraging habitat for the species. Less than 1 individual is likely to be affected.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Result in invasive species that are harmful to an endangered species becoming established in the endangered species’ habitat</strong></td>
<td>The habitat preferences of the introduced European red fox (<em>Vulpes vulpes</em>) overlap heavily with those of Tasmanian devils. Foxes and devils are of a similar size and are likely to eat each other’s young. They share preferences for den sites and habitat so will compete for both food and shelter. However, there is no causal mechanism by which the presence of the mine could increase the likelihood of foxes (or other predators such as feral cats) becoming established in the region.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Introduce disease that may cause the species to decline</strong></td>
<td>The project will not introduce any changes to the environment that would increase the risk of DFTD becoming established in the area or facilitate the intermixing of devil populations. Because the area has already been subject to a level of human activity in the past, the mine proposal is considered unlikely to accelerate the spread of DFTD into the area. The only conceivable way in which this could occur was if diseased or dead individuals (for example, retrieved road kill picked up at least 25 km east of the site) or equipment that has come in contact with diseased individuals was brought into the site. The likelihood of this occurrence is negligible, and as an added safeguard this issue will be addressed during staff and contractor induction.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Interfere with the recovery of the species</strong></td>
<td>The low likelihood of adverse impacts, together with the impact avoidance and mitigation commitments, will mean that impacts on the Tasmanian devil will be insignificant and could not interfere with the recovery of the species.</td>
<td>Unlikely</td>
</tr>
</tbody>
</table>

**Overall assessment** Unlikely

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100 North Barker Ecosystem Services, 2012, *Riley Iron Laterite Proposal, Botanical Survey and Fauna Habitat Assessment*.

Spotted-tailed quoll

The residual impacts following the avoidance and mitigation measures as outlined in the commitments are considered to not be significant.

A discussion of the residual impacts is provided below.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Assessment</th>
<th>Significant impact likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lead to a long-term decrease in the size of an important population of a species</strong></td>
<td>The removal of vegetation (approximately 119 ha in total) is insignificant for quolls relative to the surrounding several thousand hectares of similar vegetation and to the home ranges of the species, meaning that there will only be a marginal and insignificant impact on foraging habitat for the species. It is conservatively estimated that less than 1 individual quoll is likely to be affected. Implementing a roadkill minimisation strategy, including the provision of a workers’ bus from Tullah, reducing traffic speed, improving visibility, alerting animals and educating staff and contractors will reduce potential roadkill impacts to a level of insignificance. Any residual impacts would be insignificant and unlikely to lead to a long term decrease in a quoll population.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Reduce the area of occupancy of an important population</strong></td>
<td>Although vegetation clearance will reduce the area of occupancy, the vegetation types mean that quolls are at very low densities because of very low densities of prey species. The clearance of 119 ha is not a significant reduction in the potential area of occupancy of the species relative to the several thousands of hectares of similar vegetation in the surrounding area.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Fragment an existing important population into two or more populations</strong></td>
<td>Due to the quolls large home range relative to the clearance area of vegetation the project is unlikely to fragment any quoll population in the area.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Adversely affect habitat critical to the survival of a species</strong></td>
<td>Removal of native vegetation for the proposed development will reduce the local foraging area but the vegetation to be cleared is not considered to be denning habitat and given the extent of continuous habitat in the immediate vicinity the impact is not likely to be significant. The lost habitat is not critical to the survival of the species.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Disrupt the breeding cycle of an important population</strong></td>
<td>Preclearance surveys for occupied dens will be undertaken immediately prior to each stage of vegetation clearance. Protective 50 m buffers will be delineated around any occupied dens found until the dens have been vacated. The project will therefore not impact on quoll breeding. Cleared vegetation will be used to provide new denning opportunities by the creation of windrows. This would be done in consultation with quoll ecology experts. The net effect will therefore be to create an enhanced denning potential for quolls, away from the mining operations. The project will therefore not disrupt the quoll breeding cycle.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Modify, destroy, remove or isolate or decrease the availability or</strong></td>
<td>The removal of vegetation is insignificant for quolls relative to the surrounding areas of similar vegetation and to the home ranges of those species, meaning that there will only be a marginal and insignificant impact on foraging habitat for the species.</td>
<td>Unlikely</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th>Criterion</th>
<th>Assessment</th>
<th>Significant impact likelihood</th>
</tr>
</thead>
<tbody>
<tr>
<td>quality of habitat to the extent that the species is likely to decline</td>
<td>Conservatively, less than 1 individual is likely to be affected. The loss of habitat is unlikely to cause the species to decline.</td>
<td></td>
</tr>
<tr>
<td>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species’ habitat</td>
<td>The habitat preferences of the introduced European red fox (<em>Vulpes vulpes</em>) overlap heavily with those of quolls. Foxes and quolls are of a similar size and are likely to eat each other’s young. They share preferences for den sites and habitat so will compete for both food and shelter. However, there is no causal mechanism by which the presence of the mine could increase the likelihood of foxes (or other predators such as feral cats) becoming established in the region.</td>
<td>Unlikely</td>
</tr>
<tr>
<td>Introduce disease that may cause the species to decline</td>
<td>There is no known causal mechanism by which the project could introduce a disease to the quoll.</td>
<td>Unlikely</td>
</tr>
<tr>
<td>Interfere substantially with the recovery of the species</td>
<td>The low likelihood of adverse impacts, together with the impact avoidance and mitigation commitments, will mean that impacts on the quoll will be insignificant and could not interfere with the recovery of the species.</td>
<td>Unlikely</td>
</tr>
<tr>
<td><strong>Overall assessment</strong></td>
<td><strong>Unlikely</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Wedge-tailed eagle**

The residual impacts of the proposed mine to wedge-tailed eagles following the avoidance and mitigation measures as outlined in the commitments are considered to not be significant.

**4.11 Marine and coastal**

The proposed Riley mine is approximately 50 km from the nearest coastal area, the western Tasmanian coast. The proposed mine development will not impact on any marine or coastal areas.

The operations will not be affected by any marine or coastal hazards including:

- Potential tidal inundation
- Storm surge inundation or wave impacts
- Climate change induced sea level rise impacts
- Potential coastal erosion processes.

**4.12 Greenhouse gases and ozone depleting substances**

**4.12.1 Existing conditions**

**Greenhouse gases**

Greenhouse gases (predominantly carbon dioxide) will be generated during the construction phase as a result of vehicle and construction machinery emissions.

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During the operational phase greenhouse gas emissions will be generated by:

- Mining machinery (excavators, dozers) and within mine transport vehicles
- Diesel powered generators (no mains power to the site)
- Processing plant operations (drier, crushers and screens)
- Ore transport offsite
- Mine worker transport
- Light vehicle transport activities, both onsite and offsite.

**Existing site conditions**

Currently generation of greenhouse gases on the site only occurs during periods of exploration activity as a result of emissions from vehicles and drilling equipment. No ozone depleting substances are used during exploration activities on the site.

Recent forestry activity immediately to the north west of the site would have resulted in the generation of greenhouse gases within the local area.

**Vegetation clearance**

The development of the mine and associated infrastructure will result in the progressive clearance of timber from the site. Vegetation that is not of commercial quality will be windrowed for rehabilitation activities.

In the event that all non-commercial cleared timber is stored for later use in mine site rehabilitation, no major change in the onsite carbon inventory is expected over time, beyond that which would have naturally occurred.

**Mining**

The onsite power generator, excavation and processing equipment, haulage vehicles and equipment, and other onsite transport vehicles will emit carbon dioxide.

**Offsite transport**

Offsite transport of the resource will be via road to the Bastyan rail storage facility, and by rail to the Port of Burnie.

There will be 148 truck movements per day between the mine site and Bastyan rail loading facility. This equates to 1036 truck movements per week.

The number of truck movements would be lower if the rail loading facility is not available before mine production commences, in which case lesser quantities of product would be trucked to Burnie during daylight hours only (see *Product transport*, page 25).

Venture Minerals will provide a bus for transporting workers to and from Tullah, so worker vehicle numbers will be kept to a minimum.

**4.12.2 Avoidance and mitigation measures**

Rehabilitation will be undertaken as the mining operation progresses, thereby quickly establishing a carbon sink.

All mining equipment, machinery and vehicles will be well maintained in order to minimise the generation of greenhouse gases.

The transport of the resource to the Port of Burnie by rail will reduce the greenhouse gas emissions associated with offsite transport.
The mine infrastructure area will be actively regenerated as soon as possible on closure to assist establishing a nominal carbon sink.

Where possible, on-site materials will be used for the construction of the internal infrastructure roads and hard stand to minimise the need for extraction and transport of offsite material to the mine.

No ozone depleting substances will be used or generated during construction and operation of the mine.

<table>
<thead>
<tr>
<th>Commitment</th>
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<th>Responsible Person</th>
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<tbody>
<tr>
<td>Commitment 66: All construction, mining equipment, machinery and vehicles will be appropriately maintained in order to minimise the generation of greenhouse gases.</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 67: Disturbed areas will be progressively revegetated.</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 68: Where possible onsite materials will be used for construction of the internal infrastructure roads and hard stand to minimise the need for extraction and transport of offsite material to the mine.</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 69: No ozone depleting substances will be used or generated during construction and operation of the mine.</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
</tbody>
</table>

4.12.3 Assessment of residual effects

The carbon sink effects of the mine will be maximised by progressive site rehabilitation.

Greenhouse emissions will be minimized by reducing the necessary road transport distances for the ore.

Utilising onsite resources to the maximum extent will minimize the transport of materials from offsite, and thereby greenhouse gas emissions.

No further reduction of greenhouse emissions for the project is deemed possible.

4.13 Heritage

The potential effects of the project on Aboriginal and non-Aboriginal heritage sites are discussed below.

4.13.1 Aboriginal heritage

Aboriginal people are known to have lived in the region. It is recognised that all registered and unregistered Tasmanian Aboriginal sites are protected by the State Aboriginal Relics Act 1975 and the Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984.

Existing conditions

An Aboriginal heritage survey and assessment of the project area has been undertaken by Cultural Heritage Management Australia104.

A description of their findings is provided in section 3.4.9.

---

104 CHMA (November 2011) Riley Creek Mine - Aboriginal Cultural Heritage Assessment (Confidential).
In summary, the survey led to the identification of one Aboriginal heritage site located on the south western edge of the study area. The site was identified is an isolated artefact, being of low-moderate archaeological significance.

The report is confidential and is not included as part of the DPEMP, but will be submitted separately to Aboriginal Heritage Tasmania, DPIPWE.

**Performance requirements**

The project must comply with:

- Tasmanian *Aboriginal Relics Act 1975*
- Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*.

**Potential effects**

Approximately 119 ha will be cleared over the life of the mine.

Mining will progress sequentially, and not all areas will be cleared initially.

The Aboriginal heritage site identified during the field survey is located further than 50 m from any proposed ground disturbance associated with mining activities or infrastructure development.

The remainder of the study area is assessed as being of low archaeological sensitivity with no other identified heritage constraints.

While very unlikely, the project clearance and mining has the potential to inadvertently destroy or damage Aboriginal cultural heritage that may exist in the project area.

It is also possible that activities could inadvertently disrupt or destroy the identified Aboriginal heritage site if appropriate avoidance and mitigation measures are not put in place.

**Avoidance and mitigation measures**

The following mitigation measures will be applied:

- Mining and associated infrastructure will not be located within a 50 m radius of the identified heritage site.
- The location of the identified site will be checked against the finalised mining lease. As the lease boundary was not pegged on the ground at the time of the survey, grid coordinates will be checked to determine whether the site falls within the bounds of the mining lease.
- In the event that previously unrecorded cultural material is discovered during construction of the mine, the Unanticipated Discovery Plan (section 11.0 of the CHMA report Appendix J, confidential) will be followed.

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<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
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<tbody>
<tr>
<td>Commitment 70: Mining and associated infrastructure will not be located within a 50 m radius of the identified site</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 71: The location and grid coordinates of the identified site will be checked against the finalised mining plan prior to construction</td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 72: In the event that previously unrecorded cultural material is discovered during construction of the mine,</td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
</tbody>
</table>
4.13.2 Historic heritage

Existing conditions

Austral Tasmania undertook a desk top assessment of the historic heritage of the mine site in March 2012 and two field surveys, March 2012 and April 2012.

A full description of their findings is provided in section 3.4.10. In summary, no heritage properties, sites and/or values as listed on the National Heritage List, Register of the National Estate, Tasmanian Heritage Register or the Tasmanian Historic Places Inventory exist in the area of the proposed mine site.

The area of the proposed mine site, however, forms the core of the former Wilson River osmiridium field, an area mined from 1903 until the 1930s.

The two field surveys of the proposed mine site identified 54 heritage sites or features that relate to early mining of the former Wilson River osmiridium field. These include mullock heaps, areas of ground works, test pits, water channels or drains, log lined creek sections and stacked stones retaining creek banks (Figure 26).

The key findings from the field survey include:

- Riley Creek and surrounding valley best demonstrates the processes of historical osmiridium mining, and has been assessed as the most significant part of the area;
- The stacked stone wall feature on Sweeney Creek has also been assessed to have historic value;
- Evidence of historic workings found on or near Three Mile Creek and Trinder Creek were assessed as being of less importance than those found on Riley Creek and Sweeney Creek; and
- 33 sites or features were also found that are indicative of exploration works carried out in the 1980s, such as exploration trenches and test pits.

There are two aspects of the history of the Wilson River osmiridium field that are noteworthy:

- It is the location where osmiridium was first discovered in Tasmania in 1897; and
- It appears to have been early in the development of the Tasmanian osmiridium industry with short lived attempts at mining beginning in c.1902-1903.
Figure 26: Location of historic features and sites relating to the Wilson River osmiridium field identified during field surveys
**Performance requirements**

The project must comply with the *Historic Cultural Heritage Act 1995*.

**Potential effects**

Construction and operation of the proposed mine and associated processing facilities will not have any impact on any listed heritage properties and/or values as no places or sites exist in the project area that are listed on the National Heritage List, Register of the National Estate, Tasmanian Heritage Register or the Tasmanian Historic Places Inventory.

There will, however, be direct impact to some of the features and sites that relate to early mining of the former Wilson River osmiridium field. Figure 26 shows the location of these features and sites in relation to the resource and infrastructure areas.

Detailed location and recording of the features and sites is provided in the following document, *Riley, Tullah, Historic Heritage Assessment*, Unpublished report for Venture Minerals Ltd., Austral Tasmania, 2012 (Appendix G).

The majority of disturbance will be to water channel and drainage features and alluvial workings within resource area B and the southern end of resource area D in the upper parts of Riley Creek catchment. This represents the most intensely developed area of the Wilson River osmiridium field, covering approximately 2.1 ha, and includes the only non-mining related site, a shoed-tree stump approximately 2.5 metres high, with two visible shoe holes.

The features along Riley Creek downstream from area B, which include mullock heaps, water channels, log lined creek sections and a small area of alluvial workings will be largely retained by a 15 metre buffer strip.

**Avoidance and mitigation measures**

Based on the scale and diversity of features, Riley Creek and surrounds has been assessed as the most significant part of the proposed mine area. The stacked stone walls on Sweeney Creek have also been identified to have particular value.

Where possible, Venture Minerals has sought to design the mine layout with as little impact as possible to Riley Creek and surrounds. This includes the establishment of a minimum 15 m buffer strip between the creek boundary and proposed mining activities, and reducing the extent of mining proposed for resource area B.

Information related to the historic mining operations has ultimately been secured in the following document *Riley, Tullah, Historic Heritage Assessment*, Unpublished report for Venture Minerals Ltd., Austral Tasmania, 2012 (Appendix G).

The preservation of information and understanding at this level is considered to be commensurate with the overall historic significance of the place, which is manifest at the local level.

Venture Minerals will nevertheless hold discussions with relevant organisations, for example the West Coast Pioneers Memorial Museum, to determine if opportunities exist to present and interpret the history and heritage of mining on the Wilson River Osmiridium field for the public benefit.

4.14 Land use and development

4.14.1 Existing conditions

The mining lease is situated in an area of Crown Land on two land parcels managed by Forestry Tasmania: PID 2531948 (LPI JTN35) and LPI GFZ63.
Land parcel LPI GFZ63 forms the Pieman Lake Forest Reserve. No land clearance or mining will be undertaken on land parcel LPI GFZ63.

Timber will be harvested on land parcel PID 2531948 (LPI JTN35) in agreement with Forestry Tasmania prior to mining.

Rehabilitation of the whole site will be undertaken, commencing during mining operations as described in sections 2.1.1 and section 2.1.2.

In agreement with Forestry Tasmania, the intention is to revegetate and reforest the mine with a similar mix of species that currently exists across the site.

The land has very low potential for viable agricultural production.

The final land form will be unchanged (see section 4.4).

The proposal will have no detrimental effects on potential land use and development in the area.

4.14.2 Performance requirements

The project must comply with the requirements of the West Coast Planning Scheme, 2002.

A mining lease has been applied for under Mineral Resources Development Act 1995 (MRDA) and this DPEMP addresses the approval requirements under Environmental Management and Pollution Control Act 1994 (EMPCA).

4.14.3 Potential effects

The project could conflict with other land use and developments if they occurred in the area. However, no significant other activities occur within the mine footprint.

4.14.4 Avoidance and mitigation measures

No specific mitigation measures are necessary as, apart from forestry, no other significant activities occur in the proposed mining area.

The Pieman Lake Forest Reserve will not be impacted.

4.14.5 Assessment of residual effects

No significant changes will result from the proposed mining activities.

On mine closure land use will become available for forestry activities.

4.15 Visual effects

4.15.1 Existing conditions

The proposed mine site is located approximately 1.2 km south from the Pieman Road, 3.5 km north of Woods Dam, at Rension Bell, and 5 km north of the Murchison Highway.

The topography of the mine site is described in section 3.4.2. Figure 2 shows the local setting of the mine.

The highest visible points will be the proposed infrastructure area, in particular the ROM pad at approximately 250 to 260 metres above sea level, and the mining area, resource D, which extends up to 260 metres.
Pieman Road is not a part of a major tourist route. The road was built to construct the hydroelectric Reece Dam and serves no other primary purpose.

The Murchison Highway is considered to be the nearest receptor relevant to visual impact.

4.15.2 Performance requirements

The project must comply with the requirements of the *West Coast Planning Scheme, 2002*.

4.15.3 Potential effects

The Murchison Highway at its closest point is approximately 5 km south from the proposed Riley mine site, at the mining complex of Renison Bell.

Topographic high points exist between the proposed mine site and Tullah (topographic highs up to 920 metres) and Rosebery (topographic highs up 280 metres).

Views from Murchison Highway towards the mine site are mostly blocked by these topographic high points.

The mine site may, however, be sighted from the highway at some locations. In considering the proximity of the proposed mine to the Murchison Highway (5 km), the general extensive nature of road side vegetation, and the proximity of Renison Bell to the Highway, the proposed Riley mine will not significantly alter the vista from the highway, nor will it significantly degrade the visual impact.

4.15.4 Avoidance and mitigation measures

No extra mitigation is necessary.

4.16 Socio-economic issues

The proposed mine is located in a region where mining is the principal economic activity, and hence the project will be consistent with the existing social fabric of the region.

The proposed mine lies within strategic prospectivity zones established under the *Mining (Strategic Prospectivity Zones) Act 1993*.

The act zones high prospectivity areas and prohibits changes to tenure of land within those zones without the approval of both Houses of Parliament if those changes will lead to mining being excluded. If mining is excluded, compensation is payable. The establishment and protection of these zones by Parliament clearly recognise mining as being a priority land use.

The mine will provide a social and economic stimulus for the township of Tullah, which is likely to be the primary residential location of the mine workers.

Establishment of the mine and associated facilities is likely to be undertaken, in part, by local construction contractors, providing further social and economic benefits for the local community.

The project is expected to provide significant economic and social benefits at the local and regional levels.

The proposal should have no effect on land value in the area, or recreational use in the surrounding region.

The project will provide significant economic and social benefits at the local and regional scale.
The project workforce will be accommodated in Tullah and sourced, where possible, from the surrounding local communities. The total projected employed personnel for the mine is approximately 60 people.

Rosters are planned for operating 365 days a year, 12 hrs a day.

Contractor roles will consist of:

- Maintenance personnel
- Mobile Plant personnel
- Machine operators
- Contractor Administration personnel

Venture Minerals personnel requirements will include:

- Geological personnel
- Engineering personnel
- Environmental personnel
- Surveying personnel
- Geo-technical personnel
- Management and administration personnel.

Contractors will be responsible for panel mining operations. The contractors will provide all the equipment and personnel for the panel mining and transport activities.

It is anticipated that this project will provide jobs for the next 2 to 3 years.

The construction of the mine and associated infrastructure will cost approximately $7M. It is expected that construction will be undertaken by a local contractor(s), thereby benefiting the local community, with an estimated 20 construction employees required over a 6 month period.

It is estimated that the annual gross income from the project would be in the order of $100M per annum and support an estimated 40 mining employees, 20 administrative and crushing operations employees, as well as indirect jobs.

North western Tasmania has a diverse range of wealth generating industries, including agricultural production and processing, forestry and forest processing, mining, specialized manufacturing and nature and culture based tourism. Despite this, the prosperity of the region is lower than the national average. The recent closure of several important manufacturing facilities has further reduced the resilience of the economy of this area.

Economic analyses have concluded that north western Tasmania:

- Has latent economic productive capacity which is currently undeveloped
- Is characterized by a level of productivity well below the national average
- Has the potential to further diversify and deepen Tasmania’s economic capability and performance
- Could build on its existing contribution to foster Tasmania’s competitive advantage.

This development will assist the region to progress towards a more resilient future as a key component of regional Australia, with improved social equity and quality of life within its community.
4.17 Health and safety issues

Safety management systems consistent with the requirements of Workplace Standards Tasmania, and any requirements attached to the approval of the project, will be applied during the construction and operation of the new mine and associated facilities.

All operations, maintenance, health and safety management on the mine site will be compliant with the Workplace Health and Safety Act 1995 and the Workplace Health and Safety Regulations 1998.

Appropriate security arrangements to prevent unauthorised access to the site of the mining and processing operations will be established.

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<tr>
<th>Commitment</th>
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<th>Responsible person</th>
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<tr>
<td>Commitment 73: All operations, maintenance, health and safety management on the mine site will be compliant with the Workplace Health and Safety Act 1995 and the Workplace Health and Safety Regulations 1998.</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
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</table>

4.18 Hazard analysis and risk assessment

The major possible hazard events identified relate to failure of the following mine features:
- Fuel storage
- Power generators.

There is a risk of erosion of cleared land in preparation for mining during severe storm events.

A detailed risk (hazard) assessment will be undertaken as part of the final design of the project components. A preliminary hazard risk assessment is provided in Appendix L.

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<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
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</thead>
<tbody>
<tr>
<td>Commitment 74: A detailed risk (hazard) assessment will be undertaken prior to commencement of construction activities.</td>
<td>Prior to construction</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
</tbody>
</table>

4.19 Fire risk

The project site clearance, construction, commissioning and operations will be conducted in accordance with the Fire Management Plan. The Fire Management Plan will be reviewed and updated as part of Environmental Management Plan (EMP) reviews.

Facilities will be designed in accordance with all relevant standards to ensure fire protection systems and equipment are installed and operational at all times.

The potential fire risks, potential onsite sources and potential onsite avoidance measures are identified below.

Potential fire risks
- Fire originating within the operations
- Fire escaping from the operations
- Fire originating from outside the operations.
**Potential onsite sources**

- Electrical fire
- Explosion from fuel vapours (storage or equipment)
- Oil/fuel fire
- Dry vegetation
- Equipment exhaust on flammable material and vegetation
- Discarded cigarettes and dry vegetation
- Lightning strike
- Building fire
- Arson.

### 4.19.1 Avoidance and mitigation measures

#### Potential onsite avoidance

- All buildings will have properly installed electrical equipment and safety earth and/or leakage detection devices
- Properly designed and ventilated oil/fuel storage tanks
- Appropriate security, fencing and site vigilance/monitoring
- Regular housekeeping and site safety audits
- Mobile equipment to have elevated and protected exhaust systems
- Smoking to be restricted to low fire risk areas
- Smoke detectors in all buildings
- Fire alarm and appropriate extinguishers installed
- Mobile fire fighting water pump(s) to extract water from storages (e.g. sedimentation dams and non-potable water tanks) as needed.

#### Mitigation measures for fire originating within the operations

- Buildings will have fire detection, alarm and appropriate fire extinguishers
- Fire/emergency action plan will be in place in consultation with local authorities, Forestry Tasmania, Tasmania Police, and SES.

#### Mitigation measures for fire escaping from the operations

- Contain within reason any fires onsite using generally accepted fire fighting equipment
- Have fire fighting extinguishers on mobile equipment and have a water tanker on site
- Maintain existing site access roads, tracks and containment lines to acceptable standard
- Maintain clear areas around the mine office, ore stockpile, crushing and screening, refuelling and workshop areas
- Fire/emergency action plan will be in place in consultation with local authorities, Forestry Tasmania, Tasmania Police, and SES.
**Mitigation measures fire originating outside the operations**

- Maintain fire breaks around the operations
- Maintain site access roads, tracks and containment lines to acceptable standard for fire fighting authorities to use
- Fire/emergency action plan will be in place in consultation with local authorities, Forestry Tasmania, Tasmania Police, and SES.

**4.19.2 Assessment of effects**

The potential fire risk associated with this proposal is considered to be low for the following reasons:

- No explosives will be used on site
- Wildfire originating outside the site (could only have some impact on the infrastructure area)
- As the site is surrounded by forest (Forestry Tasmania), it is subject to the scrutiny of their fire watch service during fire danger periods
- The availability of water and earthmoving equipment on site will enable a rapid and effective response in the event of fire.

**4.19.3 Preliminary Fire Management Plan**

The legislative and regulatory framework for the preliminary fire management plan is outlined below:

- The *Fire Services Act 1979*
- The *Workplace Health and Safety Act 1995*
- Relevant Australian Standards
- Forestry Tasmania requirements
- West Coast Planning Scheme requirements.

The objective of the Fire Management Plan is to be consistent with existing local fire authority requirements and public property management expectations. The main objectives of the plan are to protect life and property, and the natural values of the mine lease areas and surrounds in the event of fire.

**Action plan**

- Total fire ban days will be enforced on the mining lease.
- Fire weather information will be collected on a daily basis during designated fire alert days from the Fire Weather Forecaster, Bureau of Meteorology, Hobart. When required, back-up forecasts will be collected from the District Forester for the region, the nearest Forestry Tasmania office, or the Duty Technical Officer at Launceston airport.
- Ground patrols will be used for fire surveillance by the appointed Fire Officer on normal working days during designated fire alert days, with patrols of normal work areas being included in routine duties of all personnel and contractors.
- Appropriate fire fighting equipment will be located or stored on the Mining Lease during all phases from construction through to rehabilitation. This is expected to take the form of the following
  - Extinguishers in all buildings, all light vehicles and all mining and transport vehicles and equipment
  - Mobile tanker to be used for road watering and dust suppression
Emergency fire water tank (non-potable water tank) and emergency powered pump will be located in the infrastructure area.

- The Tasmanian Fire Service will be notified immediately in the case of fire in any of the project facilities.
- Fire risk associated with the generation of flammable gases and with the storage of hazardous materials onsite will be minimised through the application of appropriate mitigation measures and as assessed for the individual project hazards and associated risks.
- Site personnel and contractors will be required to carry a UHF radio capable of linking into the site UHF radio network.
- All employees and contractors will be briefed during induction on fire detection, reporting requirements, fire prevention and the site fire management plan.
- Any fire occurring on the Mining Lease will be reported immediately to the nominated Fire Officer or the administration office who will be responsible for follow-up action and reporting.
- Firebreaks will be maintained around areas and machinery from which there is a risk of fire escaping (while taking into account the need to minimise vegetation clearance in some areas).
- Hazard reduction burns will not be undertaken unless under the instruction of the State authority and Forestry Tasmania.
- Cleared vegetation at the site will not be burnt but used for windbreaks, runoff berms supports and potential fauna habitat.
- All vehicles and machinery will be kept in good working order and where necessary have spark arresters installed to minimise the potential for fires on site.
- All site staff will be trained in emergency procedures and the use of the designated fire fighting equipment.
- Vegetation clearance at the site will be consistent with the Forest Industry Fire Management Committee - Procedure: Fire Prevention at Forest Operations - Revised October 2009.

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<tr>
<th>Commitment</th>
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<tbody>
<tr>
<td>Commitment 75: A Fire Management Plan for the mine site will be developed and finalised in consultation with the appropriate authorities.</td>
<td>Prior to construction</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 76: The project site clearance, construction, commissioning and operations will be conducted in accordance with the Fire Management Plan.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 77: The Fire Management Plan will be reviewed and updated as part of any EMP review.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 78: Facilities in the infrastructure area will be designed in accordance with all relevant standards to ensure fire protection systems and equipment are installed and operational at all times.</td>
<td>Prior to construction</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
</tbody>
</table>

### 4.20 Infrastructure and off-site ancillary facilities

All mine infrastructure will be on-site. The only off-site infrastructure used will be the Pieman Road for product transport to the Bastyan rail loading facilities, and unloading at the Port of Burnie.
Development of loading facilities at Bastyan is being undertaken as a separate project. The existing facilities at the Burnie Port are adequate and no structural changes are required.

A traffic impact assessment has been undertaken and is described in section 4.23.

Road upgrading is required at the junction of the mine access road and Pieman Road, and Bastyan Dam access road and Pieman Road (see section 4.23 for details).

Sight distance at the junction of the Bastyan Dam access road and Pieman Road needs to be increased to a minimum of 214 m in both the east and west directions.

The power supply for the mine site will be from diesel generators on-site. No off-site power transmission infrastructure is required.

### 4.21 Environmental management systems

Operation of the mining and infrastructure facilities will be undertaken in accordance with the mine environmental management systems that will be developed as part of the operational requirements for the proposed mine, together with the requirements of any Environment Protection Notice (EPN) that may be placed on the mine site by the EPA.

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<th>Commitment</th>
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<tbody>
<tr>
<td>Commitment 79: A Mine Environmental Management System will be developed in accordance with EPA requirements.</td>
<td>Prior to construction</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 80: Operation of the mine and processing facilities will be undertaken in accordance with the Mine Environmental Management System.</td>
<td>During construction and ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
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</tbody>
</table>

### 4.22 Cumulative and interactive effects

The project area is located approximately 16 km west of the township of Tullah (approximately 25 km by road), and 125 km southwest of Burnie in north western Tasmania.

The Rosebery base metal mine and the Renison Bell tin mine, located south of Tullah on the Murchison Highway, are approximately 10 km directly east and 5 km directly south of the Riley DSO Hematite Mine project respectively.

There are two other mine proposals in the local region, the Mt Lindsay Tin-tungsten-magnetite mine project and the Livingstone DSO mine project, which are located west of the proposed Riley mine along Pieman Road, approximately 10 km and 12 km respectively (Figure 28).

The proposed Riley mine will be located in a region that has a history of forestry, hydro-electric, exploration and mining development. Tullah and Rosebery townships service these activities, and provide stop over points for tourists travelling the West Coast of Tasmania.

The Riley mine has a planned life of approximately 2 years. The proposed Livingstone mine operations are planned to commence after the completion of mining activities at Riley. There will be no operational overlap between the proposed Riley Mine and the Livingstone mine operations. These two mines have the most significant transport task and hence the most significant impact on road traffic on the Pieman Road.
Product from the Riley mine and subsequently the Livingstone mine will be transported along Pieman Road to the Bastyan rail loading facility, approximately 12 km east of the mine by road, then railed to the port of Burnie (if necessary, prior to the rail facility being available a reduced tonnage would be trucked all the way to Burnie but during daylight hours only to minimise Tasmanian devil roadkill risk).

Construction of the rail loading facility at Bastyan is a separate project, undertaken by others. This project will be completed prior to Riley mine becoming operational.

Product transport from the Mt Lindsay mine will be much lower volumes, due to it being a processed product rather than an ore. The additional traffic from Mt Lindsay will not be significant. Product transport will be along Pieman Road and then the Murchison Highway to Burnie. Approximately 40 truck movements (20 each way) per day are anticipated for Mt Lindsay product, adding to the 148 movements per day from the Riley mine. These additional 40 truck movements will be confined to daylight hours, so will not add any significant roadkill risk.

A brief summary of other activities in the area, current and proposed, is provided below.

Forestry Tasmania has several coups in State Forest in the Helilog and South Merton Rd areas along Pieman Rd, that are planned for harvesting operations in 2012, 2013 and 2014 (Figure 28). Future management of State Forest in the Helilog and South Merton Rd areas has been discussed by the TFIA round table group. Depending on the outcome of the TFIA, the planned operations in this area for 2012, 2013 and 2014 may change.

Rosebery base metal mine, approximately 10 km directly east of the proposed Riley mine, is an underground mine with capacity to produce approximately 700,000 tonnes of ore a year\textsuperscript{105}. The ore is processed on site into zinc concentrate, lead concentrate, gold and silver ore and some copper concentrate. Concentrates are transported to the port of Burnie by rail.

Renison Bell tin mine, approximately 5 km south of the proposed Riley Mine, is an underground tin mine. The mine has had several periods of closure since operations began in the 1890s. A $38 million development program was undertaken during the 1990s to access deeper ore bodies. The project was expected to extend the mine life to at least 2007, but the mine closed in 2003. Production recommenced in February 2005 but operations were again suspended in October 2005.

Mining recommenced in 2008/2009, with the company also operating an open-cut mine at Mt Bischoff, located next to the town of Waratah (35 kms north of the Riley mine), to provide ore feed for the processing plant located at Renson Bell mine (the Renison Tin Concentrator), which was brought up to full production in 2009\textsuperscript{106}. In 2009/2010 a total of 392,000 tonnes of ore was mined at the Renison Bell mine, with a further 198,000 tonnes mined at Mt Bischoff, leading to 6,267 tonnes of tin in concentrate being produced\textsuperscript{107}.

The owners of Renison Bell, Metals X limited, have also proposed a project (the Rentails project) aimed at re-processing and recovery of tin from an estimated 19 million tonnes of tailings from the historic processing of tin ores from the mine. The company completed a Detailed Feasibility Study (DFS) in 2008.

Figure 28 shows the location of proposed and current activities in the local area of the proposed Riley mine site.

\textsuperscript{105} http://www.mmg.com/en/Our-Operations/Mining-operations/Rosebery.aspx
\textsuperscript{106} http://www.metalx.com.au/operations/tasmanian-tin/
\textsuperscript{107} http://www.mrt.tas.gov.au/portal/page?_pageid=35,831259&_dad=portal&_schema=PORTAL
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Figure 27: Planned relative timing of the Riley, Livingstone and Mt Lindsay mines

Figure 28: Location of proposed developments and activities along Pieman Road. Current mining operations are located at Rosebery and Renison Bell
The following cumulative and or interactive effects are considered below:

- Air
- Liquid waste and sediment loss to the environment
- Noise
- Traffic
- Flora and fauna
- Roadkill.

4.22.1 Air emissions

The cumulative aspect of air emissions arise where the emissions from a particular project could combine with those from other developments, and cumulatively have a significant adverse effect on a particular receptor.

The primary air pollutant arising from mining activities as a result of the proposed Riley mine will be dust.

The primary dust sources will be:

- Dust generation from clearing and preparation of the infrastructure site and opening up of the mining areas, including activities associated with movement of vehicles, machinery and excavation, and transportation and stockpiling of soil and vegetation for rehabilitation;
- Dust from extraction activities (including excavation, loading, transport and handling of materials); and
- Dust from the crushing and screening plant.

The following activities/areas in the wider local area will also likely generate dust at certain times of the year, for example during hot dry weather:

- Forestry activities in the State Forest in the Helilog and South Merton Rd areas. Light selective harvesting of 10,000 tonnes is planned in 2014 for coup MD102A in the South Merton Rd area immediately west of the proposed Riley mine site. Harvesting of approximately 6,000 tonnes from coup RO092C is planned for 2013, located east of the proposed Riley mine site in the Helilog area.\textsuperscript{108}
- Cleared areas, stockpiles and tailings dams associated with Rension Bell mine and Rosebery mine.

The prevailing winds at the proposed Riley mine site are north westerly to south westerly. The closest sensitive receptors are located in Rosebery, 10 km south east, and Tullah, 16 km east of the mine site.

Under certain conditions, e.g. hot dry conditions and westerly wind, dust generated from the Riley mine site and planned selective logging activities in coup MD102A, immediately to the west of the mine site, could result in a cumulative increase in dust emissions during 2014.

However, given the buffer distances and the existence of topographic high points between these two proposed activities and the sensitive receptors (topographic highs up to 920 metres between the proposed mine site and Tullah and 280 metres between the mine site and Rosebery), it is highly unlikely that any cumulative increase in dust emissions would result in an environmental nuisance.

\textsuperscript{108} Forestry Tasmania pers. comm. August 2012. Note the planned operations depend on the outcome of the TFIA process, and may change.
The harvesting of coup RO092C in conjunction with the proposed Riley mine is unlikely to result in a cumulative effect in dust emissions that would result in an environmental nuisance, due to the distance from the proposed mine, approximately 5 km to the east, and the buffer distances to the sensitive receptors.

Similarly, given the distances between the proposed Riley mine and Rension Bell mine, approximately 5 km south, and Rosebery mine, approximately 10 km south east, there are unlikely to be any cumulative dust effects that would result in an environmental nuisance.

Venture Minerals will also be putting in place appropriate mitigation measures, described in section 4.1.4, to minimize the risk of dust generated from the activity being carried from the proposed mine site, and hence minimize the risk of generating cumulative dust effects.

As there will be no overlap between the proposed Riley Mine, and Mt Lindsay and Livingstone mine operations (see Figure 27), there is no need to consider cumulative dust effects that may arise from these two operations.

Air emissions from the proposed Riley mine will also result from the operation of the diesel generators, equipment and vehicles. These emissions are expected to be insignificant in the context of the wider region, and are not expected to combine with those from current operations, such as Renison Bell tin mine and Rosebery base metal mine, to cumulatively have a significant adverse effect on sensitive receptors at Rosebery and Tullah.

4.22.2 Acid drainage, liquid waste and sediment loss to the environment

There are four main water drainage systems in the proposed Riley project area: Three Mile Creek, Riley Creek, and Trinder Creek, which combine to drain south directly into Lake Pieman, and the Gold and Sweeney Creek catchment which drains north to a tributary of the Huskisson River, which in turn drains into Lake Pieman.

Potential acid drainage cumulative and interactive effects: Lake Pieman

Lake Pieman has been designated as high Conservation Management Priority Potential\textsuperscript{109}. Conservation Management Priority Potential is an estimate of the relative priority for conservation management when a development is proposed (within the catchment of an ecosystem spatial unit) that may contribute to a change in aquatic ecological condition or status\textsuperscript{110}.

Lake Pieman is an artificial lake created by the damming of the Pieman River for the production of hydro-electricity. Flow through the lake is highly modified and controlled by inflows from the Bastyan Power Station at the upstream end of the impoundment, discharges via Reece Power Station at the downstream end of the lake, and by direct inflows from unregulated rivers in the catchment. The Huskisson and Wilson Rivers are the largest tributaries entering the lake, with the Huskisson providing approximately 13% of total flow, and the Wilson about 6%\textsuperscript{111}.

Water levels in Lake Pieman vary within a normal operating range of 4 m (AHD 92 – 96 m), with low levels generally occurring during late summer, and maximum lake levels coinciding with periods of high winter inflows.

Flow through the lake averages \(-147\) m\(^3\)/s. In the narrow and shallow upstream section of the lake, downstream of Bastyan Power Station, flow velocities are considerable,

\textsuperscript{109} Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIPWE

\textsuperscript{110} Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIPWE

and residence times for water are low when the power station is discharging. In the mid and lower section of the lake, such as where the Wilson and Stanley Rivers enter, the impoundment is deep and wide, flow velocities are very low, and the residence time of water is much longer.

Lake Pieman is modified with respect to water quality as well as hydrology, and is presently the receiving environment for several operational and decommissioned mine sites. Currently or recently operating mines include MMG Rosebery and MMG South Hercules, Bluestone Tin, and the Bass Metal sites of Que River and Fossey, which have recently been put into care and maintenance. Historic mining operations draining into Lake Pieman include MMG Hercules, the Chester mine, and numerous smaller workings in the Ring River valley. Several abandoned mines in the Rosebery mineral field area have been identified as potential as having acid drainage problems which are seriously impacting the Ring River.

The Pieman catchment drains a land mass of more than 4,100 km² (410,000 ha). It contains a high number of mineral activity sites, 558, with over 133 abandoned mines, many of which have had a history of acid drainage, and have had an impact on water quality in the catchment.

Water quality in the main body of Lake Pieman is strongly affected by the operation of the power stations, seasonal changes, and mining runoff and inputs from existing operations in the catchment. Monitoring in Lake Pieman has found that the dispersal of mining discharges, as indicated by elevated levels of zinc and/or sulfate, are affected by power station operation and thermal stratification, with lenses of mining affected water most often present in late summer or early autumn when thermal stratification is at a maximum.

The acid test work (see section 2.1.1), combined with the hydrological and geochemical modelling suggests that the discharge from the proposed Riley mine poses no risk to the water quality of Lake Pieman. Indeed, only one of the 42 samples tested showed a very low potential to be acid generating. All other samples were either classified as non-acid forming or acid consuming.

Due to the extremely low potential for acid drainage from the proposed Riley operations, the size of the receiving body (Lake Pieman) and fact that water quality in the main body of Lake Pieman is strongly affected by the operation of the power stations and seasonal changes, there is no risk of cumulative acid mine drainage impacts on Lake Pieman as a result of the Riley project.

**Potential liquid waste cumulative and interactive effects: Lake Pieman**

Venture Minerals will be implementing a number of best practice measures to store and manage oil, hydrocarbons and sewage on site, and ensure that any potential aqueous emissions during the construction and operation phases of the proposed mine are properly controlled, monitored and managed (see section 4.2.4).

Given the implementation of best practice management measures and the size and nature of the receiving environment, there is no risk of aqueous emissions from the mine combining with those from other activities to cumulatively have an adverse effect on Lake Pieman.

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112 Ibid
115 Ibid
Potential sediment loss cumulative and interactive effects: Lake Pieman

Due to the nature of the proposed mine and the high rainfall experienced on the west coast of Tasmania, there is a need to manage site runoff and erosion to stop sediment laden water from the mine site from entering the creek systems.

Venture Minerals will implement best management practices to manage all runoff from the mine site during construction and operation, see section 4.3.4. The risk of a large amount of sediment entering the mine site creek systems and reaching Lake Pieman is therefore considered to be low.

Venture Minerals will implement best management practices to manage all runoff from the proposed Mt Lindsay Tin-tungsten-magnetite mine and Livingstone DSO mine during construction and operation. These measures will be described in detail in the respective Development Proposal and Environment Management Plans (DPEMPs). The risk of a large amount of sediment reaching Lake Pieman from these two projects, via their respective river systems (Stanley River (Livingstone mine), and Salmon Creek, South East Creek and Tulloch Creek (Mt Lindsay mine)) is also considered to be low.

Given the implementation of best management practice measures, and the size and nature of the receiving environment (Lake Pieman catchment area 410,000 ha), there is no risk of sediment loss from the proposed Riley mine combining with that from other activities to cumulatively have a significant adverse effect on the Lake.

Indeed, the Sediment Input Index\textsuperscript{116} for the Pieman River indicates that 90.1\% of the river length (12,650 km) is unaffected or only minimally affected by human induced sediment input, and 100\% of the Lake Pieman catchment has had minimal or no anthropogenic induced changes to catchment sediment input \textsuperscript{117}. Sediment input into Lake Pieman from anthropogenic induced changes therefore does not likely represent a significant pressure on the system.

Cumulative and interactive effects: Three Mile Creek

Forestry Tasmania proposes to selectively log coup MD102A, immediately to the west of the proposed Riley mine site during 2014. This coup partly borders the lower section of Three Mile Creek before it enters Lake Pieman (Figure 28).

Without adequate mitigation, there is potential for sediment loss from the proposed Riley mine to combine with that from the proposed logging activities to cumulatively have an adverse effect on the lower sections of Three Mile Creek.

Venture Minerals will implement best management practice to manage all runoff from the mine site during construction and operation, see section 4.3.4. The potential risk of a large amount of sediment leaving the mine site is considered to be very low.

The planned selective logging of coup MD102A will be undertaken in compliance with the Forest Practices Code, 2000. A substantial stream side reserve along the majority of the lower sections of Three Mile Creek, over 100 metres between the creek and coup, is indicated on the Forest Plan (Figure 28). This is in excess of that recommended by the Code. Given the extent of the streamside buffer and the nature of the logging, light selective logging rather than clearfell, sediment input into the system is likely to be kept to a minimum.

The potential for sediment loss from the proposed Riley mine to combine with that from the proposed logging activities to cumulatively have an adverse effect on the lower sections of Three Mile Creek is therefore considered to be very low.

\textsuperscript{116} Conservation Freshwater Ecosystem Values (CFEV)

Due to the steep nature of the creek system in the lower sections, any sediment that does enter is expected to be routed quickly through the system, with no long lasting effects.

4.22.3 Noise

Noise emissions from the proposed Riley mine will be associated with the operation of earthmoving equipment, generators, crushers, screens, and trucks for the haulage and transport of ore. Noise will also result from the operation and running of the infrastructure area, including workshop and general mine site traffic.

No blasting will be undertaken on site.

The closest sensitive receptors are located in Rosebery, approximately 10 km south east, and Tullah, approximately 16 km east of the mine site.

Renison Bell is located approximately 5 km south but is not regarded as a sensitive receptor for noise emissions.

The Mt Lindsay tin-tungsten-magnetite mine project and the Livingstone DSO mine project are located further west of the proposed Riley mine, approximately 26 km and 28 km respectively from Tullah.

Due to the buffering distance of the sensitive receptors, noise emissions will not have any cumulative adverse effect on sensitive receptors.

4.22.4 Traffic

Product from the Riley mine will be transported along Pieman Road to the Bastyan rail loading facilities, approximately 12 km east of the mine by road, then railed to the port of Burnie.

During the operation of the Riley mine there will be approximately 148 truck movements each day on the Pieman Road, transporting ore from the mine site to the rail loading facility at Bastyan Dam. The transport of the ore will be over a 24 hour period, day and night, with approximately 1 truck every 19 minutes (~3 trucks per hour) in each direction (although if the rail facility is not available a lesser tonnage would be trucked all the way through to Burnie during daylight hours, approximately 1 truck every 12 minutes (~5 trucks per hour) in each direction).

There will also be approximately 4 bus movements each day from Tullah to the mine site for the transportation of mine workers. In addition to the truck and bus traffic generated by the mining operations, up to 30 light and medium vehicle traffic movements may be generated each day through maintenance activities, deliveries and professional staff such as geologists and the like travelling to the site for short stay inspections.

The cumulative impact of product transport for the Riley mine and the other two mines in the region proposed by Venture Minerals are discussed in section 4.22.

There will be no significant cumulative or interactive traffic effects associated with Rension Bell mine or Rosebery mine, as all ore transport from the proposed Riley mine will be restricted to between the mine and Bastyan rail loading facilities, along Pieman Road.

There may be some incidental overlap in traffic through Tullah and on the Murchison Highway associated with mine worker and professional staff movements from the

118 Conservation Freshwater Ecosystem Values (CFEV)
proposed Riley mine and Renison Bell and Rosebery mines but this is expected to be small and will present no cumulative impact.

Venture Minerals has undertaken a Traffic Impact Assessment (TIA) for the proposed Riley mine (see Appendix D) to assess the proposed cartage routes and to determine the traffic impact of the cartage of product to the Bastyan rail facilities.

The key findings from the TIA are summarised in section 4.23. Several upgrades to the route are recommended, which will also negate any potential cumulative impact of increased truck traffic along Pieman road and at the rail loading facilities.

Forestry Tasmania also has several coupes in State Forest in the Helilog and South Merton Rd areas along Pieman Road that are planned for harvesting operations in 2012, 2013 and 2014. Transport of logs from these coupes road will occur along Pieman periodically during 2012 (prior to Riley mine construction and operation), 2013 and 2014.

The following coupes are highlighted Figure 28:

- MD099F & G., harvest 2012 approximately 9,000 tonnes
- RO092C, harvest 2013, approximately 6,000 tonnes
- MD102B, light selective harvest 2014, approximately 10,000 tonnes.

Based on the use of 30 tonne log trucks\textsuperscript{119}, the logging of these coupes will result in the following increase in heavy vehicle traffic along Pieman Road:

- 2012 (prior to Riley mine construction and operation) - assumed 50
- 2013 - 200
- 2014 - 333.

It is likely that harvesting will be run on a campaign basis, and hence the log truck traffic will be concentrated during particular periods.

Future management of State Forest in the Helilog and South Merton Rd areas has been discussed by the TFIA round table group. Depending on the outcome of the TFIA, the planned operations in this area for 2012, 2013 and 2014 may change.

Furthermore, forestry market conditions may affect the total volumes of timber\textsuperscript{120}.

The cumulative impact of the increased truck usage on Pieman Road as a result of the addition of approximately 833 forestry trucks over a 3 year period is not considered to be significant.

The recommended upgrades to the route, as outlined in section 4.23, will also negate any potential cumulative impact of increased truck traffic at the mine access and Pieman road junction, as a result of logging coup MD102B.

4.22.5 Flora and fauna

The following discussion of the cumulative and inactive effects on flora and fauna is framed within the context of the wider regional area, encompassing the Huskisson River Forest Reserve, the Meredith Range Regional Reserve, and the Pieman Lake Forest Reserve. Together these reserves represent large tracts of unbroken habitat within an area of approximately 68,617 ha.

\textsuperscript{119} Forestry Tasmania, Pers. comm., September 2012

\textsuperscript{120} Forestry Tasmania, Pers. comm., September 2012
The John Lynch Forest Reserve borders the Meredith Range Regional Reserve to the east (see Figure 13). There are a number of smaller forest reserves east of the John Lynch Forest Reserve, including Burns Peak Forest Reserve, Sawmill Creek Forest Reserve, Mount Kershaw Forest Reserve, Boco Creek Forest Reserve and MacKintosh Forest Reserve, which together form a large continuous area of approximately 11,257 ha.

In total, there are large tracts of unbroken habitat within the wider area, totalling 79,874 ha.

The Riley project is located in the West Coast Municipal area on Crown Land, approximately 6 kilometres south west of the John Lynch Forest Reserve, 1.4 km from the Huskisson River Forest Reserve, 1.5 km from the Meredith Range Regional Reserve, and adjacent to the Pieman Lake Forest Reserve.

The proposed Mt Lindsay Tin-tungsten-magnetite mine, located approximately 10 km west of the Riley project, and the proposed Livingstone DSO mine, located approximately 2 km further west, are located within the Meredith Range Regional Reserve. Mineral prospectivity is a primary value of regional reserves.

Combined, the total area of habitat in the vicinity of the proposed Riley, Mt Lindsay and Livingstone mines is approximately 79,874 ha.

Large tracts of State Forest also exist within the vicinity of the proposed Riley mine, although Forestry Tasmania plans to log three coups in the area within State Forest over 2012, 2013 and 2014 (see Figure 28).

**Cumulative vegetation clearance**

Vegetation clearance from activities proposed within the wider regional area includes the following:

- Bastyan Dam rail loading facility - 2.3 ha
- Riley DSO Hematite mine - 119 ha
- Mt Lindsay Tin-tungsten-magnetite mine - 199 ha
- Livingstone DSO mine - 78 ha
- Forestry operations, coup RO092C, harvest 2013 - 46 ha
- Forestry operations, coup MD102B, light selective harvest, 2014 - 44.7 ha

The clearance of land for the development of proposed Riley mine takes into account the land clearance associated with the forestry operations from coups MD099F & G. Land clearance associated with these coups is not included in the list above.

No vegetation communities of national (*Environment Protection and Biodiversity Conservation Act 1999*) or State (*Nature Conservation Act 2002*) significance will be disturbed by the proposed Riley mine, Mt Lindsay mine, Livingstone mine or development at the Bastyan rail loading facilities.

The total cumulative land clearance associated with the proposed activities listed above is approximately 489 ha. This is less than 0.61% of the combined area of reserves listed above (e.g. Huskisson River Forest Reserve, Meredith Range Regional Reserve, Pieman Lake Forest Reserve, John Lynch Forest Reserve etc), and represents less than 0.12% of the Lake Pieman catchment.

The proposed Riley mine has a planned life of 2 years. There will be no overlap between the Riley mine and the proposed Livingstone mine operations. Rehabilitation

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121 Note the total area is approximately 149 ha, however light selective harvesting will remove less than 30% of the trees (Forestry Tasmania, pers comm.)

122 North Barker Ecosystem Services reports for each mine
of the Riley mine will be undertaken progressively as the resource is mined and will be completed on mine closure, prior to commencement of operations at the proposed Mt Livingstone mine.

There will be an operational overlap between Riley and Mt Lindsay mine (see Figure 27, page 151). Over the life of the Mt Lindsay mine, approximately 10 years, vegetation will establish at the Riley mine site, as well as within the forestry coups RO092C and MD102B, providing habitat and foraging opportunities.

See Appendix M for the Riley DSO Hematite Mine Decommissioning and Rehabilitation Plan.

The clearance of land and loss of vegetation at any one time will therefore be considerably less than 489 ha.

The proposed Riley, Livingstone and Mt Lindsay mine sites and also the Bastyan rail loading facility site all have a history of disturbance.

The cumulative loss of vegetation from the proposed developments and activities, at less than 0.61% of the Reserve areas in the vicinity of the proposed developments, and less than 0.15% of the Lake Pieman catchment, is not considered to be significant.

**Cumulative and interactive effects: Micrantheum serpentinum**

One threatened vascular plant species, *Micrantheum serpentinum* (western tridentbush) listed as Vulnerable under the schedule of the Threatened Species Protection Act 1995 (TSPA), was recorded on the proposed Riley mine site.

No *Micrantheum serpentinum* were recorded from surveys by North Barker Ecosystem Services of the proposed disturbance areas associated with the Livingstone mine, Mt Lindsay mine and Bastyan rail loading facilities123. These surveys were undertaken as a part of other projects. Details will be provided in the respective DPEDMPs.

The distribution of *Micrantheum serpentinum* within proposed logging coups RO092C and MD102B is unknown. It is highly unlikely, however, that the species is present within logging coup MD102B, as this coup does not occur on serpentinite (Geology 1:25,000 series map, The List) and is solely contained within the Crimson Creek Formation.

*Micrantheum serpentinum* is restricted to Cambrian serpentinite substrate124.

The majority of logging coup RO092C occurs on mafic volcaniclastics of the Cleveland-Waratah Association and correlates (Geology 1:25,000 series map, The List). The western border, however, appears to overlap (2.6 ha) with a small band of serpentinised peridotite and pyroxenite.

*Micrantheum serpentinum* may therefore be present at this location, although it lies outside the 8 to 9 populations of *Micrantheum serpentinum* that have been recorded125. If the species is found here, mitigation measures appropriate for the management of *Micrantheum serpentinum* will be implemented through the Forest Practices Plan process.

Only an extremely small fraction of *Micrantheum serpentinum* habitat present at the proposed Riley mine site will be disturbed (see section 4.9.3). The core area of *Micrantheum serpentinum* habitat, on the slope of Serpentine Ridge within the DNI community, lies outside the proposed development footprint.

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123 North Barker pers. comm.
124 *Micrantheum serpentinum* Tasmanian threatened flora listing statement.
125 *Micrantheum serpentinum* Tasmanian threatened flora listing statement.
In the context of wider potential disturbance, no *Micrantheum serpentinum* will be disturbed through the development of the Livingstone and Mt Lindsay mines or the Bastyan rail facility. The species is protected regionally with a population in the Heazlewood River Area, Duffs Hill. It also occurs in the Meredith Range Regional Reserve and at Nineteen Mile Creek in the Savage River Regional Reserve\(^\text{126}\). Other populations exist on State Forest from near Queenstown in the south to near Waratah in the north. The extent of the species is approximately 245 km\(^2\)\(^\text{127}\).

The cumulative effect of the proposed developments and activities will have no effect on local and or wider regional populations and status of this species.

**Cumulative and interactive effects: Tasmanian devils**

The cumulative and interactive effects on road kill are discussed in section 4.22.6.

The total cumulative land clearance associated with the proposed Riley mine, Mt Lindsay mine, Livingstone mine, Bastyan Dam rail loading facility and the logging activities listed above is approximately 489 ha.

Surveys of the proposed mining areas for Riley mine (see section 3.4.8), Mt Lindsay mine, Livingstone mine, and Bastyan Dam rail loading facility have been undertaken, with no active devil dens located in any of the surveys of the proposed development areas\(^\text{128}\).

The proposed Riley mine site is considered to support only minor habitat for denning. The forested environments generally offer low quality denning opportunities, largely restricted to the dry hollows of myrtle trees, the occasional rocky outcrop and wombat burrows (see section 3.4.8).

At the proposed Mt Lindsay mine site, the vegetation is generally not considered to be denning habitat, although areas of mature tall rainforest have the potential to support devil dens in the hollows at the bases of large myrtles or in shelters created under fallen logs (North Barker, pers comm.). Several surveys of the area found no active dens, and only one site was identified that showed evidence of prior use as a den\(^\text{129}\).

The majority of the disturbance area at the proposed Livingstone mine site is not considered to be denning habitat. Most of the potential denning habitat lies outside the bounds of the proposed disturbance area, within tall mature rainforest.

No evidence of Tasmanian devils (scats, layups or dens) was found from a survey of the proposed Bastyan rail loading facility site. The area does not contain any habitat of significance for any threatened fauna species.

While no active Tasmanian devil den sites where identified from surveys of the Riley, Mt Lindsay and Livingstone mine sites or the Bastyan rail facility site, some denning habitat of value for Tasmanian devils does occur, and it is possible that dens may exist within proposed disturbance sites.

Although devils change non-maternal dens often, female adults are thought to remain faithful to their maternal dens for life, so maternal den disturbance can be destabilising to populations\(^\text{130}\). The significance of any destabilisation that might be caused by vegetation clearance would be related to the number of maternal dens.

\(^{126}\) *Micrantheum serpentinum* Tasmanian threatened flora listing statement.

\(^{127}\) *Micrantheum serpentinum* Tasmanian threatened flora listing statement.

\(^{128}\) North Barker pers. comm.

\(^{129}\) North Barker, pers comm., Nick Mooney, pers comm.

disturbed or lost through vegetation clearance and the availability of replacement dens in surrounding areas.

Because of the possibility for the species to be occupying dens within vegetation to be cleared for the mine developments, Venture Minerals will commit to pre-clearing surveys for occupied dens prior to land disturbance. The appropriate time for these surveys is immediately before each stage of clearing to ensure the temporal relevance of the surveys to the clearing activity.

Any den opportunities lost through the vegetation clearing would be replaced by the creation of compensatory new opportunities (see section 4.10.4).

While no active dens were identified on any of the proposed development sites in the region, the proposed Riley, Mt Lindsay and Livingstone mine sites are potential foraging habitat for Tasmanian devils.

The cumulative effect of vegetation removal, up to 489 ha, will be to temporarily reduce the local foraging area for devils at five different locations. However, this does not directly equate to 489 ha of habitat removal and loss of foraging potential, as progressive rehabilitation undertaken at the proposed Riley mine will lead to the potential for vegetation growth and establishment of foraging habitat over the 10 year life of the proposed Mt Lindsay mine. Due to the timing of the proposed mine developments, the cumulative effect of loss of foraging habitat is therefore less than 489 ha.

Tasmanian devils may recolonise rehabilitated areas of the Riley mine site during the 2 year life of the mine. Similarly, the rehabilitated Forestry Tasmania coups in the area, post 2014, are also likely to be recolonised. During operation of the proposed Livingstone and Mt Lindsay mines, a more accurate estimate of the cumulative effect of loss of foraging habitat may actually be closer to 274 ha, the cumulative area of disturbance for Livingstone and Mt Lindsay mines and the Bastyan rail facility.

Nevertheless, vegetation removal will affect the carrying capacity of local areas to support devils; therefore there will be some localised impact on devils as a result of the proposed mine developments. However, because of the very large extent of continuous similar habitat in the wider area, over 79,390 ha, relative to the total proposed land clearance of all developments and activities, the impact on foraging habitat is likely to be insignificant. The proposed mining developments are very unlikely to affect the total carrying capacity of the wider region.

Indeed, the area of vegetation clearance required for each proposed mine development is likely to be only a small fraction of any individual devil’s home range (estimated to be 1,300 ha over a two to four week period).

Finally, the densities of Tasmanian devils within the proposed Riley, Mt Lindsay and Livingstone mine sites are considered to be low, for example at Riley as low as 0.2 devils/km². *Leptospermum* scrub is likely to contain approximately 1 devil per square kilometre, and the *Nothofagus* community is likely to contain approximately 0.5 devils per square kilometre. This compares with densities in open old growth eucalypt forest of between 2 and 3 per km².

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131 North Barker Ecosystem Services, 2012, Riley Iron Laterite Prospect Proposal Botanical Survey and Fauna Habitat Assessment.
133 Nick Mooney, pers comm.
Even at the higher densities of approximately 1 devil per square kilometre for *Leptospermum* scrub, which exists within the proposed mining developments, in an area of vegetation clearance approximately 489 ha in size, one might conservatively consider a displacement of between 4 to 5 devils.

Realistically, given the large extent of the *Nothofagus* community at the proposed Mt Lindsay site (North Barker, pers. comm.), the staged clearance of vegetation and progressive rehabilitation at the proposed Riley mine site, and the sequencing of the three Venture Minerals mine proposals, the cumulative effect of the mine proposals on devil displacement is likely to be much lower than 4 to 5.

**Devil facial tumour disease**

Like all devil populations, the local devils will be vulnerable to population loss due to DFTD.

The location of the proposed Riley, Mt Lindsay and Livingstone mines in the northwest is one of the only remaining regions supporting high densities of Tasmanian devil where DFTD has not yet become established.135

DFTD has not been recorded in the vicinity of the proposed mine developments despite regular local checks of road kills and trapping. The most recent reported trapping campaign by the Save the Tasmanian Devil Program (from 26/10/10 to 19/11/10) was a search for the disease front and found no disease west of the Murchison Highway (DPIPWE unpublished data), which is some 25 km east of the proposed Riley mine site.136

However, recently a diseased devil was found near Zeehan, approximately 15 km to the south.

The spread of DFTD is continuing, with the disease front moving 15 km west since 2008. It was once thought that DFTD will reach the northwest in 3-10 years but the recent finding of a diseased devil indicates that the rate of spread may have been underestimated.

It is not known whether mortality will be as high in the western populations or whether these populations will react to the disease in the same way that eastern ones have.137

Based on the understanding of DFTD, the three proposed mining projects, which lie within the north-western devil population, will not introduce any changes to the environment that would increase the risk of DFTD becoming established in the area or facilitate the intermixing of devil populations.

The wider area has long been an area of mineral prospecting since the late 1800s, and most recently forestry activity immediately to the north west of the proposed Riley mine site. Because the area has already been subject to a significant level of human activity for some time, including forestry, mining and hydro activity, it is unlikely that the three proposed mine developments could act to accelerate the spread of DFTD into the area.

Indeed, the only conceivable way in which this could occur was if diseased or dead individuals (for example, retrieved road kill), or equipment that has come in contact with diseased individuals, was brought into the site.138 The likelihood of this occurrence is negligible, as the disease front is east of the Bastyan rail facility site.

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136 Nick Mooney pers. comm.
137 Ibid
138 Nick Mooney pers. comm.
which would be the end point for all trucks delivering ore from the Riley and Livingstone mines.

As an added safeguard the issue of DFTD will be addressed during staff and contractor induction.

**Cumulative and interactive effects: spotted-tailed quolls**

The cumulative and interactive effects on road kill are discussed in section 4.22.6.

No evidence of spotted-tailed quoll was observed from any surveys of the proposed Riley, Mt Lindsay or Livingstone mine sites, except one scat that was considered likely to be from a spotted-tailed quoll at the proposed Livingstone mine site139.

The proposed mine sites are, however, likely to be part of a home range for this species, albeit outside of the core range.

The comments and discussion above on potential cumulative and interactive effects on denning and foraging habitat for Tasmanian devils is also applicable here.

**Connectivity**

The very small size and location of the Riley mine area relative to the very large areas of surrounding habitat means that loss of habitat connectivity is not a credible risk.

### 4.22.6 Road kill

The following section provides a summary of expected traffic volumes for the three Venture Minerals development proposals located on the Pieman Road. While these are separate developments, and subject to separate approvals, this will allow a full understanding of the cumulative changes to traffic volumes on the Pieman Road.

The planned sequencing of the three mines is shown in Figure 28 (page 151).

There will be no overlap between the Riley Mine and Livingstone Mine operations; they will operate consecutively. These two mines have the greatest transport task.

The proposed Mt Lindsay mine will overlap with the Riley and Livingstone operations. However, the Mt Lindsay mine has a much lesser transport task (20 trucks per day each way compared with 74 each way for Riley and Livingstone) and the Mt Lindsay product will be transported in daylight hours only. Mt Lindsay therefore does not add significantly to roadkill risk.

**Heavy vehicle movements**

While no recent traffic volume counts have been undertaken on the Pieman Road, the existing traffic volumes are expected to be very low. The introduction of the proposed development will constitute an increase in the vehicle numbers as follows:

- **Riley** - 1 truck every 19 minutes (≈3 trucks per hour) in each direction - total vehicle movements between mine site and rail siding approximately 148 per day
- **Livingstone** - 1 truck every 19 minutes (≈3 trucks per hour) in each direction - total vehicle movements between mine site and rail siding approximately 148 per day
- **Mt Lindsay** - 20 trucks per day during daylight hours.

For the Riley mine, the number of truck movements would be lower if the rail loading facility is not available (see **Product transport**, page 25), in which case ore will be trucked all the way to Burnie. This transport will be confined to daylight hours so as

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139 North Barker, pers comm.
not to significantly increase Tasmanian fauna roadkill risk along the transport route. The production rate in this circumstance would only be equivalent to about 600,000 tpa, meaning that there will be approximately 50 truck deliveries (ie. 100 movements) per 10 hour day, ie. 5 deliveries (10 movements) per hour. This restricted production rate would continue until the rail facility is available.

**Staff movements**

Each shift will require the following staff:

- Riley - 30
- Livingstone - 40
- Mt Lindsay - 90.

Each site will have 2 x 12 hour shifts.

Venture Minerals will operate worker transport for each of the development sites from the Tullah worker camp to the mine sites. Venture Minerals will mandate as a condition of employment that all shift workers use the worker bus; the use of private vehicles will only be permitted in exceptional circumstances. Due to the requirements of their position, specialist staff (such as Mine Geologists and Environmental Staff) and senior management will not be subject to this requirement, as they will be required to move between the depot (at Tullah) and the mine sites freely. However, these staff are typically employed on 9 to 5 (or similar) shifts, and therefore not travelling between dusk to dawn.

The relevant traffic volume changes are those from dusk to dawn, as it is well documented that most animals are hit at night. The traffic numbers below are based on an expected worst case scenario during the dusk to dawn period.

During the summer period (when animals are more active) the shift changes will occur outside the dusk to dawn period and further reduce the higher risk traffic movements. An allowance has been made for contractors, deliveries and specialist staff during the dusk to dawn period but these trips will predominantly be during daylight hours due to the nature of their employment or contracts.

The total number of dusk to dawn vehicle movements expected is 107 vehicles or 8.9 vehicles per hour over the 12 hour period. This consists of:

- 74 truck movements (but none between dusk and dawn if the rail facility is not available when mine production commences, requiring product to be trucked all the way to Burnie, in which case transport will be confined to daylight hours only).
- 8 worker bus trips (although this will only be for the period when Livingstone and Mt Lindsay are operating at the same time. During other periods (before and after) this will reduce to 4 trips.
- 25 additional trips - made up of occasional contractors, deliveries, specialist staff and staff using private vehicles.

**Road kill mitigation experience on other projects**

**Cradle Mountain National Park**

In June 1991, 2 km of the access road into the northern end of the Cradle Mountain - Lake St Clair National Park was widened and sealed to carry an increasing volume of heavy traffic such as tourist coaches. This occurred part-way through an ecological

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141 The length of this period changes depending on the season but for the purposes of this calculation a nominal 12 hour period (7 pm to 7 am) has been assumed.
study of the dasyurid carnivore guild (which includes quolls and devils), during which local populations were being monitored.

The simultaneous occurrence of these two projects allowed assessment by Jones\textsuperscript{142} of:

- The factors that changed with the road upgrading that may have contributed to an increase in roadkills
- The road mortality patterns in relation to landscape features
- The success of measures implemented to reduce mortality.

Prior to the road upgrade, the local populations were estimated to be 19 eastern quolls and 39 devils. In the 12 months immediately following the road upgrade there was a marked increase in the number of road kills of eastern quolls and Tasmania devils recorded on the upgraded section of the road. Most of these were concentrated in three areas, which were identified as ‘black spots’. The eastern quoll population declined from 19 to 1 individual in 17 months, reaching zero after 22 months. The Tasmanian devil population declined from 39 to 20 individuals in 22 months.

There was no data on traffic speeds collected before the road was upgraded but comfortable maximum travelling speeds on the gravel roads at Cradle Mountain were estimated to be 40-60 km/h. Following widening and sealing, the median night-time traffic speeds ranged from about 45 km/h to 90 km/h along the road. Maximum speeds were much higher, with some vehicles travelling at over 130 km/h.

Several different measures designed to reduce road mortality of wildlife were implemented simultaneously on the Cradle Mountain Tourist Road. The measures can be divided into those directed at drivers - slowing traffic speed, increasing driver awareness - and those directed at wildlife - deterring wildlife from crossing when there is oncoming traffic, and allowing escape off the road.

**Slowing traffic speed**

Four ‘slow points’ were placed within flat sections of road where there were concentrations of roadkills. These consisted of barriers that constricted traffic to a single lane in the centre of the road. Vehicles were forced to slow down both to negotiate the tight curves and to give way to other traffic.

**Increasing driver awareness**

A 60 km/h speed sign and large, reflective signs alerting drivers to the ‘Cradle Wildlife Zone’ were erected at the northern (approach) end. At this point, rumble bars were also placed across the road to encourage a reduction in speed. An educational pamphlet and poster were released at the same time.

After installation of the slow points and other measures, the median speeds fell by approximately 20 km/h.

**Deterring wildlife from crossing when there is oncoming traffic**

Wildlife reflectors, which work by deflecting red light from vehicle headlights at 90° into the surrounding bush, creating an ‘optical fence’, were placed at 20 m intervals on both sides of the road. Their effectiveness was not able to be evaluated in the Jones study, however.

**Encouraging escape off the road**

Where there were deep table drains and steep batters, ramps connecting the road verge to the top of the embankment were constructed at approximately 25 m intervals. In addition, sections of drainage pipe (2 m long) were incorporated under the ramp to provide shelter next to the road.

The combined measures implemented on the 2 km section of the Cradle Mountain Tourist Road north of the National Park boundary appear to have been successful in reducing the roadkill rate to a level that natural population increase could sustain, allowing at least a partial recovery of the eastern quoll and perhaps also the devil population. Within 6 months, several eastern quolls, were living in the study area. After 2 years, a resident breeding population that was almost 50% of the size of the original, pre-upgrade population of 19 individuals had become established.

An increase in median traffic speed of about 20 km/h (the increase in maximum speeds was probably much greater) was the major change associated with the road upgrading that was likely to influence the rate of roadkill.

The change in road surface colour, from pale gravel to dark bitumen, may also have contributed to the increased roadkill. Animals are less visible against a dark surface. All of the measures designed to reduce road mortality were implemented simultaneously, so the effectiveness of individual measures was not assessed. However, the key success factor was probably the installation of the physical structures, the ‘slow points’ that reduced traffic speed. Signage and public education were an integral component of the roadkill management.

**Tarkine Forest Drive**
The Department of Infrastructure, Energy and Resources has recently completed a significant roadkill study of an area of road proposed to be resealed in Tasmania’s North West. The full report on these investigations has recently been advertised as part of their EPBC Act approval (ref EPBC 2011/6210). The following information is a summary of the findings.

**Roadkill Baseline Monitoring**
In October 2009, a 12 month study of the abundance of medium to large mammals on the road began, both as live animals and roadkill. The aim of the study was to collect baseline data needed to inform potential mitigation options. The study recorded the species, location and frequency of roadkill, describe the spatial and temporal patterns of roadkill distribution, identified when, where and at what scale roadkill hotspots occurred, and informed the development of roadkill mitigation strategies.

**Roadkill mitigation trials and monitoring**
Given the level of survey work undertaken for the project and a desire to develop additional simple cost effective mitigation measures, a roadkill mitigation trial was conducted.

The survey was designed specifically to test for the impact of the mitigation measures (the treatments) on roadkill rates. A paired before-after-control-impact survey was used, which required an equal number of control sites for each impact or treatment site.

The control sites had similar characteristics to the treatment sections, including similar:
- Traffic count and speed (before any treatment)
- Roadside vegetation type
- Road surface
- Road shoulder (slope, turning angle etc).

Seasonal differences (including transient effects such as response to a soaking rain) were therefore accommodated.
Roadkill hotspots identified during the analysis of the baseline data were used to inform the placement of on-ground roadkill mitigation trials. Three paired trial and control sites were selected: two along Roger River Road and the third on Blackwater Road. All sites were located on uniformly dark, sealed roads.

At the 3 trial sites the following mitigation works were implemented:

- Signage to alert drivers that they were entering a wildlife zone, including advisory signs to reduce dusk to dawn speed.
- Installation of audible rumble strips. These were trialled because, although there was little research available on their effectiveness, it was anticipated that the noise from them would provide a warning to wildlife on or adjacent to the road. This would provide a greater opportunity for animals to avoid collision. The strips would also alert drivers that they were entering a special zone.
- Roadside and table drain clearance to reduce animal foraging, shelter and improve visibility and to discourage wildlife lingering on the roadside. The clearance width matched the cross section and clearance width proposed for the Tarkine Forest Drive.

At the three control sites no physical works were implemented.

The three paired control and treatment sites were monitored daily for roadkill for a period of 8 weeks during February, March and April 2012.

The analysis concluded at a 99% confidence level that the treatment sites experienced greater than a 50% reduction in roadkill relative to the controls.

The results confirmed the use of the proposed road cross section (vegetation clearance zone) and rumble strips as an extremely effective tool for mitigating roadkill on the Tarkine Forest Drive.

**Roadkill mitigation for Pieman Road**

Using the knowledge gained from the previous studies and analysis of hotspot locations along other sections of road enables a targeting of the contributing factors to roadkill for this project. For example, vehicle-wildlife collisions can be mitigated by taking into account the following:

- Existing locations of roadkill
- Landscape patterns
- Animal distribution
- Movement patterns

The factors that influence roadkill are visibility, traffic speed, roadside barriers and escape routes. Roadkill often occurs in hot spots as a result of these factors combined with habitat and landscape features (such as streams and rivers) channelling wildlife movements.

The identification of features associated with roadkill sites is an important step toward implementing mitigating strategies and lessening road mortalities. However, it is also necessary to obtain high quality spatial and temporal data on animal abundance and roadkill for the specific project area to be confident of the mitigation strategy.

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Venture Minerals have undertaken a baseline roadkill and also animal abundance survey along the Pieman Road. The analysis of the roadkill data has determined the existing animal abundance and roadkill hotspots. The hotspots for headlight activity and roadkill occur around 7-10 km and 25 km west of the Murchison Highway junction.

This information will be used to educate staff and visitors on the high roadkill risk areas. However, the broader mitigation efforts described below will apply across the entire haulage route to ensure a comprehensive and robust response.

The following mitigation actions will be implemented:

- Slow the Venture Minerals traffic to give drivers a greater opportunity to avoid a collision with animals and also animals enough opportunity to escape;
- Improve visibility of animal on the road;
- Alert animals to approaching vehicles;
- Discourage Tasmanian devils and spotted-tailed quolls from scavenging on the roads, by removal of other roadkill;
- Educate staff and contractors; and
- On-going monitoring, analysis and adaptive management (where required).

Each of these is discussed below.

**Reduce traffic speed**

Vehicle speed and traffic volumes are recognised as probably the most important human factors explaining wildlife collisions. For logistical reasons it is not possible to reduce the traffic volumes proposed for this development but the elevated risk from night time traffic will only occur for a period of approximately 4 years (including Livingstone, which will follow after Riley); however, significant mitigation measures are proposed to ensure that vehicle speed is appropriately managed.

A reduction in the vehicle speed from 100 km/h to 80 km/h has been found to potentially decrease overall roadkill by up to 50% and that a safe driving speed for Tasmanian devil detection (with car lights on high beam) was 54 km/h. Reduced vehicle speed gives drivers and animals greater time to avoid collision.

The relatively low speed environment of the Pieman Road itself mitigates the risk of roadkill to a significant degree but there is some variability, with some sections allowing car traffic to reach speeds of greater than 90 km/h.

While the operating speed of the road is generally low, Venture Minerals will require all staff and contractors (including heavy vehicles and worker transport) to not exceed a maximum speed of 60 km/h along the entire length of the Pieman Road from dusk to dawn.

One of the challenges often experienced when trying to control speed is enforcement. In this case all of the additional traffic associated with the development will be

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151 Hobday & Minstrell 2008
Venture Minerals staff, contractors or suppliers. During the dusk to dawn period it is expected that there will be limited deliveries and the majority of the increase in traffic will be associated with haulage, with occasional staff/contractor journeys. 

All heavy vehicles (trucks and buses) will be fitted with appropriate trip computers to enable downloading of speed statistics. This will include average speed and maximum speed per trip.

There will be a zero tolerance principle to heavy vehicles exceeding the 60 km/h dusk to dawn speed limit. The heavy vehicle trip computer speed statistics will be analysed at the same time as the roadkill data (see further below), initially monthly, with review of the monitoring frequency after the first 12 months. Data will be reviewed to determine if the dusk to dawn speed limit has been maintained. Any instances of the vehicle exceeding the night time 60 km/h speed limit will be penalised. This will be enforced via a condition of contract.

**Improve visibility**

Night time detection distance is related to the headlight height, with 4WD vehicles having a greater projection distance for high beam than standard vehicles. The changes in vehicular traffic from dusk to dawn will be predominantly heavy vehicles. The height of truck headlights is generally greater than both 4WD and passenger vehicles. It has also been suggested that when driving lights are used on a vehicle they appear to result in fewer animals being hit. Venture Minerals will commit to having driving lights on all vehicles working at night, including trucks.

The result of this action will mean that the safe driving speeds (as determined by Hobday) are extremely conservative.

With a maximum speed of 60 km/h and extended detection distance (from higher headlights and driving lights), the risks associated with vehicle speed are diminished to negligible levels.

**Alerting animals**

As described above, deterring animals from crossing the road when vehicles are approaching was one of the success measures in reducing roadkill at Cradle Mountain. Various other methods, such as ultrasonic animal alert whistles attached to vehicles and wildlife reflectors, have been trialled elsewhere but have had mixed results. Nevertheless, while not conclusively shown to be effective, ultrasonic animal alert whistles are a low cost item that can easily be attached to all trucks and worker buses utilising the Pieman Road for Venture Minerals and will be installed on all mine vehicles.

The sounding of a car horn has been observed to have a positive response from wildlife in cases where there is enough time for the driver to respond to seeing an animal.

From the analysis of the roadkill and abundance data and the roadside and landscape survey, Venture Minerals will have a precise understanding of the existing roadkill hotspots and also high risk areas on the Pieman Road. The on-going monitoring will also ensure that any new or changed locations to the hotspots will be recorded.

All staff and contractors will be made aware of these areas. All project vehicles will be required to sound their horn when approaching these high risk areas from dusk to dawn. This will be supported by appropriate signage at the activity and roadkill...
hotspots to inform both Venture Minerals staff & contractors but also other road users to sound their horn, as they are entering a “wildlife zone”.

**Discourage animals from scavenging**

Tasmanian devils are mainly scavengers, often attracted to roads due to the presence of food sources, such as other animal roadkill. Any detected roadkill will be removed off the Pieman Road by appropriately authorized Venture Minerals staff daily. The carcasses will be relocated into thick vegetation away from the road, in the same location as it was found rather than in a centralized location(s), so as to avoid artificial concentrations of food sources for scavengers.

**Educate staff and contractors**

Public education (such as advisory signage) has been shown to have an effect on some individuals through increasing awareness of potential hazards and improving the ability of drivers to avoid fauna collision. Given the nature of the traffic changes on the Pieman Road (associated with Venture Minerals staff and contractors) a more targeted education program is proposed.

The advantage of the current proposal is that all of the additional traffic on the Pieman is associated with staff and contractors for Venture Minerals, providing a significant opportunity for education and enforcement actions to be more successful than would otherwise be the case with the general public.

All staff and contractors will be inducted to the development site; this induction will include a presentation on the following:

- Tasmanian devils and Tasmanian fauna more generally;
- Roadkill and its impacts;
- Roadkill hotspots;
- Mandated mitigation actions (such as speed reduction, driving lights and sounding of horns);
- Reporting roadkill sightings; and
- Roadkill monitoring and corrective actions for those staff not adhering mitigation requirements.

Venture Minerals will establish a strong culture of awareness and appropriate driver behaviour from management down. The education program will be annually updated in light of the results of the roadkill monitoring program. Staff found not to be adhering to the mitigation will be penalised. This will be reflected in conditions of employment.

**On-going monitoring and adaptive management**

The results of the baseline survey have been used to design an operational roadkill monitoring program covering the Pieman Road and also internal roads, which will be implemented when construction commences.

This operation roadkill monitoring will involve collection of roadkill data daily and monthly analysis to determine if roadkill levels are changing or hotspots are moving.

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156 Department of Sustainability, Environment, Water, Population and Community 2006
157 A Permit to Take from DPIPWE to remove threatened fauna carcasses will be required.
158 Magnus et al 2004
159 Thompson, C. (2011) Northern Beaches Roadkill - Advice on reduction options. *NSW Roads and Traffic Authority*
If the analysis shows an increase in threatened species roadkill rates, then further mitigation measures will be implemented. These measures will include, but will not be limited to:

- Further reduction of dawn to dusk speed limits (which will be enforced)
- Increase in enforcement penalties;
- Establishment of escape routes for animals;
- Establishment of on-road mitigation measures (such as rumble strips, slow points or similar);
- Establishment of vehicle operated roadside lighting.

The precise nature of the additional mitigation measures cannot be specified until the nature, location and extent of any changes to roadkill is established.

The frequency of analysis will be reviewed following the first 12 months of operation. If there are no increases in threatened species roadkill the frequency of analysis will be reduced to quarterly for the remainder of the mine’s operation.

**Conclusion**

The proposed development will change one roadkill risk factor - night time traffic volumes. The existing speed environment of the road is generally at levels below what is considered to be of risk. However, an extensive program of precautionary mitigation measures is proposed. The complementary mitigation actions will further reduce the risk of roadkill on the Pieman Road. There will be on-going roadkill data collection to allow further refinement of mitigation actions and/or locations should conditions change over time.

### 4.23 Traffic impacts

During the operation of the Riley mine there will be approximately 148 truck movements each day on the Pieman Road, transporting ore from the mine site to the rail loading facility at Bastyan Dam. There will also be approximately 4 bus movements each day from Tullah to the mine site for the transportation of mine workers.

The introduction of the proposed development will constitute an increase in the truck numbers on Pieman Road: 1 truck every 19 minutes (~3 trucks per hour) in each direction. However, if product transport commences before the rail loading facility is available, product will be trucked all the way to Burnie. In this case, transport would be confined to daylight hours only (to minimise Tasmanian fauna roadkill risks) and there would be approximately 1 truck every 12 minutes (~5 trucks per hour) in each direction but only during daylight hours.

In addition to the truck and bus traffic generated by the mining operations, up to 30 light and medium vehicle traffic movements may be generated each day through maintenance activities, deliveries and professional staff such as geologists and the like travelling to the site for short stay inspections.

**Venture Minerals engaged pitt&sherry to undertake a Traffic Impact Assessment (TIA) for the proposed Riley mine (see Appendix D).**

The objective of the TIA was to assess the proposed cartage routes and to determine the traffic impact of the cartage of product to the rail loading facility at Bastyan Dam.

The TIA was prepared in accordance with the Department of Infrastructure, Energy and Resources (DIER) publication *Traffic Impact Assessments (TIA) Guidelines September*.

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160 Subject to agreement with the road and adjacent land owner (Hydro Tasmania)
The key findings from the TIA are summarised below.

**Route capacity**

No recent traffic volume counts have been undertaken on Pieman Road. However, the DIER maintains records of traffic volumes on the Murchison Highway. Traffic data collected in 2003 indicates that north and south of the township of Tullah traffic volumes on the Murchison Highway are in the order of 600 to 700 vehicles per day with approximately 4% of these vehicles being heavy vehicles. Assuming a 2% compound growth rate, the current Murchison Highway traffic would be 720 to 840 per day.

If there is product transport prior to the rail loading facility being available, transport by truck to Burnie would add 50 trucks each way (100 movements) per day to this Murchison Highway volume, a 12 to 13% increase in traffic.

It can be assumed that existing traffic volumes on Pieman Road would only be a small fraction of that on the Murchison Highway, as the road is not a major tourist route and only serves the Reece Dam, current mineral exploration activities and some forestry. A nominal 50 vpd has been assumed.

Traffic volumes to be generated by the Riley mine are expected to have negligible impact on the operational performance of Pieman Road and the efficiency of road junctions associated with product transport.

**Tullah local road network**

As staff working at the Riley mine will be accommodated in Tullah and transported to the site via buses, the operation of the mine is not expected to generate traffic volumes that would result in a discernible reduction in the operational efficiency of the internal road network within Tullah.

**Site access – Pieman road/mine access road junction**

No details of the proposed cross section for the mine access road are currently available. Due to the estimated volumes of material that will be extracted in the life of the mine it is expected that the access road will need to be constructed to a Class 1 Road standard in accordance with the Forest Practices Code 2000.

The Forest Practices Code requires that Class 1 Roads have an all weather pavement width of between 5.5 m and 6.0 m and a shoulder width of between 0.6 m and 1.0 m.

The speed limit on Pieman Road is the default rural speed limit of 100 km/h. The West Coast Planning Scheme and *The Austroads Guide to Road Design* require that a Safe Intersection Sight Distance of approximately 250 m is provided for a design speed of 100 km/h.

The available site distance at the Pieman Road and proposed mine access road junction is in excess of 300 m to both the east and west.

Based on the traffic volumes that will be generated by the development and the intent of the West Coast Planning Scheme, it is considered that the junction between the mine access road and Pieman Road should be upgraded so that the geometry meets the requirements of the Austroads Guide - Part 4A: Unsignalised and Signalised Intersections for a Type BAR/BAL junction.
The mine site access road should be sealed for approximately 30 metres back from the edge of Pieman Road. This will provide vehicles exiting the site with suitable skid resistance to pull out and accelerate along Pieman Road safely.

This upgrade is only necessary for the left turn in movement and right turn out movement as these will be the movements predominantly made by the trucks transporting material to the Bastyan rail loading facility. For the purpose of the Type BAL geometry requirements the design vehicle should be a B-double.

**Pieman Road/Bastyan Dam access road junction**

The junction of Pieman Road and the Bastyan Dam access road is required to have sight distance that complies with the Safe Intersection Sight Distance requirements of the Austroads Guide. Due to the presence of horizontal curves on both the eastern and western approaches to the junction, the operating speed at the junction is estimated to be less than 90 km/h.

Currently, the available sight distance at the junction is approximately 120 m to the east and 110 m to the west. However, through the clearing of some vegetation either side of the junction the sight distances could be increased to 135 m to the east and 155 m to the west.

It is considered that the sight distance at this junction is adequate for the additional traffic movements associated with the proposed development of the Riley Mine and that the level of risk is acceptable in relation to the avoidance of collisions at this location.

**Road safety**

While the Pieman Road has a number of geometric elements which do not comply with the requirements of the Austroads Guide, due to the relatively low volumes of traffic that will be generated by the proposed Riley mine site, the increased traffic on Pieman Road is not expected to cause a significant decrease in the safety performance of the Road.

**Parking assessment**

As staff will be transported to the site via bus, parking facilities will only need to be provided which allow for the bus to pick up and drop off passengers and for short term visitors to the site. It is anticipated that approximately 10 light vehicle parking spaces would be sufficient for this demand.

**Summary**

- The Riley Mine is expected to have negligible impact on the operational performance of Pieman Road, the internal roads within Tullah, and the efficiency of road junctions associated with product transport.

- The mine access road will need to be constructed to a Class 1 Road standard in accordance with the Forest Practices Code 2000.

- The junction of the mine access road and Pieman Road should be upgraded so that the geometry meets the requirements of the Austroads Guide - Part 4A: Unsignalised and Signalised Intersections for a Type BAR/BAL junction.

- The available sight distance at the junction of the Bastyan Dam access road and Pieman Road needs to be increased to a minimum of 214 m in both the east and west directions. This could be achieved by clearing of vegetation.

- The junction of the Bastyan Dam access road and Pieman Road should be upgraded to meet the requirements of the Austroads Guide for a Type BAR/BAL junction for the turning movements that will be undertaken by B-double vehicles.
- It is anticipated that approximately 10 light vehicle parking spaces would be sufficient.

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<th>Responsible person</th>
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<td>Commitment 83: The available sight distance at the junction of the Bastyan Dam access road and Pieman Road will be increased through limited vegetation clearing in both the east and west directions.</td>
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<td>Commitment 84: The junction of the Bastyan Dam access road and Pieman Road will be upgraded to meet the requirements of the Austroads Guide for a Type BAR/BAL junction for the turning movements that will be undertaken by B-double vehicles.</td>
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5. **EPBC Act requirements**

A referral under the *Environment Protection Biodiversity Protection Act 1999* (EPBC Act) for the Venture Minerals, Riley DSO Hematite mine, North West Tasmania, was submitted to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC), in April 2012.

DSEWPC determined that the proposed action was a controlled action (EPBC 2012/6339) and therefore requires assessment and approval by the Commonwealth Minister. This decision was made as the proposed action has a potential to impact on the following matters protected by the EPBCA:

- Listed threatened species and ecological communities (sections 18 and 18a)
- Listed migratory species (sections 20 and 20A).

The project is to be assessed through the state assessment process under the Bilateral Agreement between the State and Commonwealth governments. The state environmental approval process requires the preparation of this Development Proposal and Environmental Management Plan (DPEMP). This DPEMP then becomes the consolidated document that the proponent uses to support applications for environmental approval from both jurisdictions.

The elements relevant to Part 3 and Part 4 of Schedule 4 of the Commonwealth *EPBC Regulations 2000* are provided below. Part 2 of the Schedule (Description) is provided in section 2.1.1 of this document. Other approvals and conditions that will apply to the project are outlined in both the Foreword and the Executive Summary.

Venture Minerals currently have no operational sites but the company has been undertaking its exploration work over several years in accordance with best practice environmental management.

This section addresses any relevant impacts on matters of national environmental significance that were identified through the EPBC Act Protected Matters Report\(^{161}\).

Cross-references to sections in this DPEMP against each of the EPBC Act requirements are provided in the following table to with the location of information relevant to DSEWPC’s assessment under the EPBC Act.

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\(^{161}\) EPBC Act Protected Matters Report, 05 March 2012.
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<th>Description</th>
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<td></td>
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<tr>
<td>(b) the precise location of any works to be undertaken, structures to be built or elements that may have relevant impacts</td>
<td>Appendix A (Mine layout)</td>
<td></td>
</tr>
<tr>
<td>(c) how the works are to be undertaken and design parameters for those aspects of the structures or elements of the action that may have relevant impact</td>
<td>Section 2.1.1 (General description), page 6 Section 2.1.2 (Water management), page 26 Section 2.1.3 (Construction), page 35 Section 2.1.4 (Commissioning), page 37</td>
<td></td>
</tr>
<tr>
<td>(d) relevant impacts of the action</td>
<td>Section 4 (Potential effects and their management), page 83 Section 5.1.1 (Description), page 179 Section 5.1.2 (Nature and extent of likely impact), page 181</td>
<td></td>
</tr>
<tr>
<td>(e) proposed safeguards and mitigation measures to deal with relevant impacts of the action</td>
<td>Section 4 (Potential effects and their management), page 83</td>
<td></td>
</tr>
<tr>
<td>(f) any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action</td>
<td>Section 1.2.2 (State legislation), page 2 Section 1.2.3 (Local government), page 5</td>
<td></td>
</tr>
<tr>
<td>(g) to the extent reasonably practicable, any feasible alternatives to the action</td>
<td>Section 3.6 (Alternatives), page 80</td>
<td></td>
</tr>
<tr>
<td>(i) if relevant, the alternative of taking no action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii) a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(iii) sufficient detail to make clear why any alternative is preferred to another</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(h) any consultation about the action, including:</td>
<td>Section 3.7 (Community consultation), page 81</td>
<td></td>
</tr>
<tr>
<td>(i) any consultation about relevant impacts of the action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(ii) proposed consultation about the proposed action - any documented response to, or results of, the consultation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(i) identification of affected parties, including a statement mentioning</td>
<td>Section 3.7 (Community consultation), page 81</td>
<td></td>
</tr>
<tr>
<td>Requirement</td>
<td>Description</td>
<td>Section number and/or page number (or comment)</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>any communities that may be affected and describing their views</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Relevant impacts**

3.01 Information given under paragraph 2.01(d) must include:

- (a) a description of the relevant impacts of the action
  - Section 4 (Potential effects and their management), page 83, and specifically sections 4.22.5 (Flora and fauna), page 157, and 4.22.6 (Road kill), page 163
  - Section 5.1.1 (Description), page 179
  - Section 5.1.2 (Nature and extent of likely impact), page 181

- (b) a detailed assessment of the nature and extent of the likely short term and long term relevant impacts
  - Appendix K (Potential impacts on Matters of National Environmental Significance, and avoidance and mitigation commitments)

- (c) a statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible
  - All credible foreseeable impacts have been identified and considered. None are considered to be unpredictable, within the reasonable and practicable bounds of scientific uncertainty. None are considered to be irreversible.

- (d) analysis of the significance of the relevant impacts
  - Appendix K (Potential impacts on Matters of National Environmental Significance, and avoidance and mitigation commitments)

- (e) any technical data and other information used or needed to make a detailed assessment of the relevant impacts
  - Appendix I (Pieman Road mortality analysis (fauna))
  - Appendix H (Flora and fauna reports)
  - Appendix K (Potential impacts on Matters of National Environmental Significance, and avoidance and mitigation commitments)

**Proposed safeguards and mitigation measures**

4.01 Information under paragraph 2.01(e) must include:

- (a) a description and an assessment of the expected or predicted effectiveness of the mitigation measures
  - Appendix K (Potential impacts on Matters of National Environmental Significance, and avoidance and mitigation commitments)
  - Section

- (b) statutory or policy basis for the mitigation measures
  - Section 1.2 (Environmental legislation), page 2

- (c) the cost of the mitigation measures
  - Section 5.1.4 (Cost of mitigation measures), page 187

- (d) an outline of an environmental management plan that sets out the framework for continuing management, mitigation and monitoring programs for the relevant impacts of the action, including any provisions for independent environmental auditing
  - The whole DPEMP and in particular section 4 (Potential effects and their management), page 83

- (e) the name of the agency responsible for endorsing or approving each mitigation measure or monitoring program
  - Tasmania: Board of the Environment Protection Authority
  - Commonwealth: Minister for Environment

- (f) a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action, including mitigation measures proposed to be taken by State governments, local governments or the proponent
  - Tasmanian jurisdiction: Table 29: Summary of commitments under the EMPCA process
  - Commonwealth jurisdiction: Table 30: Summary of commitments specific to the EPBC approval process
## Requirement Description

### Other approvals and conditions

**5.01** Information given under paragraph 2.01(f) must include:

- (a) details of any local or State government planning scheme, or plan or policy under any local or State government planning system that deals with the proposed action, including:
  - (i) what environmental assessment of the proposed action has been, or is being, carried out under the scheme, plan or policy;
  - (ii) how the scheme provides for the prevention, minimisation and management of relevant impacts

  - Section 3.1 *(Planning aspects)*, page 39
  - This DPEMP will be assessed by the Board of the Environment Protection Authority under the *Environmental Management and Pollution Control Act 1994*.
  - A land use planning permit must be approved under the *Land Use Planning and Approvals Act 1993*, which will include planning conditions to be set by the West Coast Council and environmental conditions to be set by the Board of the Environment Protection Authority.

- (b) a description of any approval that has been obtained from a State, Territory or Commonwealth agency or authority (other than an approval under the Act) including any conditions that apply to the action

  - No approvals have yet been obtained but a mining lease has been applied for.

- (c) a statement identifying any additional approval that is required

  - A land use planning permit must be approved under the *Land Use Planning and Approvals Act 1993*, which will include planning conditions to be set by the West Coast Council and environmental conditions to be set by the Board of the Environment Protection Authority.
  - A mining lease must be issued by the Minister for Mines under the *Mineral Resources Development Act 1995*.

- (d) a description of the monitoring, enforcement and review procedures that apply or are proposed to apply to the action

  - Section 6 *(Monitoring)*, page 192

### Environmental record of person applying to take the action

**6.01** Details of any proceedings under a Commonwealth, State or territory law for the protection of the environment or the conservation and sustainable use of natural resources against:

- (a) the person proposing to take the action; and

  - None

- (b) for an action for which the person has applied for a permit, the person making the action

  - None

**6.02** If the person proposing to take the action is a corporation - details of the corporation’s policy and planning framework

- Section 1.1 *(Background)*, page 1

### Information sources

**7.01** For information given in a draft public environment report or environmental impact statement the draft must state:

- (a) the source of the information; and

  - Not applicable (Bilateral Assessment)

- (b) how recent the information is and;

  - Not applicable (Bilateral Assessment)

- (c) how the reliability of the information was tested; and

  - Not applicable (Bilateral Assessment)

- (d) what uncertainties (if any) are in the information.

  - Not applicable (Bilateral Assessment)
5.1.1 Description

A detailed description of possible matters of national environmental significance (MNES) species and communities and potential impacts, based on a protected matters tool search is provided in Appendix K.

A flora assessment of the proposed mining area was undertaken in late October early November in 2011 by North Barker Ecosystem Services. A targeted search for *Epacris glabella* occurred on the 2nd April 2002, following further definition of the mine areas at the northern end of the site.

A fauna habitat assessment of the proposed mining area was undertaken in late October early November in 2011 by North Barker Ecosystem Services. A helicopter search was undertaken on the 16th February 2012 targeting wedge-tailed eagle nests, and a survey for selected threatened fauna over part of the project area was completed in October 2011 by Nick Mooney.

The main findings of the flora and fauna surveys, including a description of the existing conditions, are provided in sections 3.4.7 and 3.4.8.

All flora and fauna reports are provided in Appendix H.

Vegetation

There are no vegetation communities of national (*Environment Protection and Biodiversity Conservation Act 1999*) significance within the proposed mine footprint nor within the wider mining lease.

The proposed mine will therefore have no significant impacts on vegetation communities listed under the EPBCA.

Flora

No threatened vascular plants species listed under the EPBCA were recorded from any of the proposed mine or associated infrastructure areas.

The proposed mine will therefore have no significant impacts on plant species listed under the EBCA.

*Epacris glabella* was listed on the EPBCA Protected Matters Report. No *Epacris glabella* plants have previously been recorded within 5 km of the study area.

Detailed searches did not find this species within the study area.

Fauna

Threatened fauna species, listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA) that have previously been recorded from, or which are considered to potentially occur in suitable habitat, within 5 km of the proposed development area, and/or that have been identified in the EPA DPEMP Project Specific Guidelines for Venture Minerals Limited, Riley’s Creek Hematite DSO Mine, 2012, under the section heading EPBC Act requirements, are listed in Table 24.

Table 24 also notes species recorded within a 5 km radius of the Bastyan rail loading facility site. This facility will be a separate project by others but is mentioned here because the facility is treated as a direct consequence of the Riley project under the

---


EPBC Act and needs to be considered by the Commonwealth under the Bilateral Assessment of this DPEMP.

Table 24: Threatened fauna species relevant to the proposed Riley DSO Hematite mine, listed on the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBCA)

<table>
<thead>
<tr>
<th>Species</th>
<th>Status</th>
<th>Likelihood of occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azure kingfisher <em>Ceyx azurea</em> subsp. <em>diemenensis</em></td>
<td>Endangered</td>
<td>LOW (mine site) NONE (rail site)</td>
</tr>
<tr>
<td>Swift parrot (<em>Lathamus discolor</em>)</td>
<td>Endangered</td>
<td>NIL (mine site) VERY LOW (rail site)</td>
</tr>
<tr>
<td>Wedge-tailed eagle (<em>Aquila audax</em> subsp. <em>fleayi</em>)</td>
<td>Endangered</td>
<td>LOW (mine site) VERY LOW (rail site)</td>
</tr>
<tr>
<td>Spotted-tailed quoll (<em>Dasyurus maculatus</em> subsp. <em>maculatus</em>)</td>
<td>Vulnerable</td>
<td>HIGH (mine site) LOW (rail site)</td>
</tr>
<tr>
<td>Tasmanian devil (<em>Sarcophilus harrisii</em>)</td>
<td>Endangered</td>
<td>HIGH (mine site) LOW (rail site)</td>
</tr>
<tr>
<td>Tasmanian masked owl (<em>Tyto novaehollandiae</em> subsp. <em>castanops</em>)</td>
<td>Endangered</td>
<td>VERY LOW (mine site) LOW (rail site)</td>
</tr>
<tr>
<td>Australian grayling (<em>Prototroctes maraena</em>)</td>
<td>Vulnerable</td>
<td>NONE (mine site) NONE (rail site)</td>
</tr>
<tr>
<td>White-bellied sea-eagle (<em>Haliaeetus leucogaster</em>)</td>
<td>Threatened</td>
<td>LOW (mine site) LOW (rail site)</td>
</tr>
<tr>
<td>Great egret, white egret (<em>Ardea alba</em>)</td>
<td>Migratory</td>
<td>NONE (mine site) NONE (rail site)</td>
</tr>
<tr>
<td>Latham’s snipe, Japanese snipe (<em>Gallinago hardwickii</em>)</td>
<td>Migratory</td>
<td>NONE (mine site) NONE (rail site)</td>
</tr>
</tbody>
</table>

There are only two listed fauna species for which the habitat at the site could be considered relevant; the Tasmanian devil and the spotted-tailed quoll. These are described below.

A description of the likely presence of suitable habitat of the other species listed in Table 24 is provided in Table 25 and Table 26.
**Tasmanian devil (Sarcophilus harrisii)**

The study area supports devils as evidenced by two fresh scats found in the study area. However, they are typically at low density where there is a predominance of wet sclerophyll/rainforest habitat with a low density of prey animals. The disturbance and opening in the forest associated with the numerous tracks, such as where the devil scats were found, provides more grazing and hence supports more herbivorous prey species. The scats were also observed in close proximity to Trinder Creek. This area also contained a high number of wombat scats, indicating that a grazing resource is available.

The mature tall rainforest has the greatest potential to support dens in the hollows at the bases of large myrtle or in shelters created under fallen logs. However, this type of den opportunity is not ideal for natal dens and is more often used as shelter. No rocky outcrops were seen during the extensive surveying of the various elements of the proposed mine. The regrowth blackwood forest has a lower potential for containing any dens as there are no mature trees present with hollow bases. Some areas of vegetation are too dense to search satisfactorily.

The Tasmanian devil is generally nocturnal and during the day it will retire to a cave/den, hollow log or thick scrub. At night it forages over a range of 10 to 20 hectares. The animal is solitary but not territorial and foraging areas may overlap considerably.

The species is not currently threatened by habitat loss and has proven to be tolerant of habitat modification by breeding successfully in human domestic environments, such as under houses and sheds. However, due to the reduction in numbers caused by devil facial tumour disease (DFTD), increasing importance is placed upon the protection of maternal dens so that breeding opportunities and successes are maximised.

**Spotted-tailed quoll (Dasyurus maculatus ssp. maculatus)**

The spotted-tailed quoll has not been recorded within 5 km of the study area. The quoll is most abundant in areas containing rainforest, wet forest and blackwood swamp forest. The core range for the quoll is lowland forested areas of the north bounded by Wynyard, Gladstone and the central and northeastern highlands. Lower densities of animals occur elsewhere in suitable habitat throughout Tasmania.

The study area is likely to be part of a home range for this species, albeit outside of the core range. However, the comments above about the low densities of devils apply similarly to quolls.

### 5.1.2 Nature and extent of likely impact

Appendix K provides a detailed assessment of the potential impacts on MNES threatened species and communities identified by the Protected Matters Search Tool. The findings of that assessment are summarised in Table 25.

#### Table 25: Summary of potential impacts on MNES species and communities (before avoidance and mitigation) - details are provided in Appendix K

<table>
<thead>
<tr>
<th>MNES matter</th>
<th>Summary of potential impacts before avoidance and mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birds</strong></td>
<td></td>
</tr>
<tr>
<td>Matter 1: Wedge-tailed eagle (<em>Aquila audax subsp. fleayi</em>)</td>
<td>One nest site record of this species has been recorded within 5 km of the study area, a little more than 1.5 km away on Lake Pieman.</td>
</tr>
<tr>
<td></td>
<td>Eagle habitat within the study area is considered marginal with the area likely to be utilised for foraging but not for breeding. A helicopter survey found no nests.</td>
</tr>
<tr>
<td>MNES matter</td>
<td>Summary of potential impacts before avoidance and mitigation</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Matter 2: Australasian Bittern</strong> <em>(Botaurus poiciloptilus)</em></td>
<td>No suitable habitat for the bittern occurs within the study area. There is no significant potential for direct, indirect or facilitated impacts on this species.</td>
</tr>
<tr>
<td><strong>Matter 3: Azure kingfisher</strong> <em>(Ceyx azureas diemenensis)</em></td>
<td>There is not considered to be any suitable habitat for the azure kingfisher within the project area. Creeks within the study area hold fast flowing water with banks that are generally unsuitable for nesting as they are predominantly sheer rock rather than sediments. Visual searches did not locate any azure kingfishers. There are no known nest sites or records within 5 km of the area. There is no significant potential for direct, indirect or facilitated impacts on this species.</td>
</tr>
<tr>
<td><strong>Matter 4: Swift parrot</strong> <em>(Lathamus discolor)</em></td>
<td>No records of this species have been recorded within 5 km of the study area. The area is not considered suitable nesting habitat, nor would it provide suitable foraging habitat during the species annual migration. There is no significant potential for direct, indirect or facilitated impacts on this species.</td>
</tr>
<tr>
<td><strong>Matter 5: Masked owl</strong> <em>(Tyto novaehollandiae castanops)</em></td>
<td>No suitable nesting habitat for this species occurs in the study area and foraging habitat, if any, would be considered low quality. There is no significant potential for direct, indirect or facilitated impacts on this species.</td>
</tr>
</tbody>
</table>

**Fish**

| **Matter 6: Australian grayling** *(Prototroctes maraena)* | The proposed mine project is above the Reece dam and so it is no longer possible for the sea dependent breeding cycle of this species to function. The species is therefore unlikely to be present within the project catchment. There are no potential direct, indirect or facilitated impacts on this species. |

**Mammals**

<p>| <strong>Matter 7: Tasmanian devil</strong> <em>(Sarcophilus harrisii)</em> | Removal of native vegetation (disturbance footprint approximately 119 ha) for the proposed mine development will reduce the local foraging area, although the vegetation is not considered to be denning habitat. The quantity of vegetation removal will affect the carrying capacity of the area to support devils; therefore there will be an impact on devils. However, because of the very large extent of continuous similar habitat in the immediate vicinity the impact is likely to be insignificant. The proposed mine area is potential foraging habitat and site surveys found 2 scats, which show that the area is used by devils. However, no active natal dens or lay-up was found or is likely to exist in the area of clearance. The indices of abundance of devils, their food and competitors within the study area suggests devils are |</p>
<table>
<thead>
<tr>
<th>MNES matter</th>
<th>Summary of potential impacts before avoidance and mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>at low densities, perhaps in the order of 0.2 devils per</td>
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<tr>
<td></td>
<td>square kilometre[164]. The area of vegetation to be</td>
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<tr>
<td></td>
<td>cleared is approximately 119 ha, which may support 1</td>
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<tr>
<td></td>
<td>devil or, more realistically, helping to support a few more.</td>
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<tr>
<td></td>
<td>DFTD has not been recorded in the vicinity of the</td>
</tr>
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<td></td>
<td>proposed mine despite regular local checks of road</td>
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<tr>
<td></td>
<td>kills and trapping. However, recently a diseased devil</td>
</tr>
<tr>
<td></td>
<td>was found near Zeehan, approximately 15 km to the south.</td>
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<tr>
<td></td>
<td>The project area has long been an area of mineral</td>
</tr>
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<td></td>
<td>prospecting with human activity in the project area</td>
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<tr>
<td></td>
<td>since the late 1800s. Because the area has already</td>
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<tr>
<td></td>
<td>been subject to a level of human activity in the past,</td>
</tr>
<tr>
<td></td>
<td>the mine proposal is considered unlikely to accelerate</td>
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<tr>
<td></td>
<td>the spread of DFTD into the area. There has been</td>
</tr>
<tr>
<td></td>
<td>recent Forestry activity in the area, with further areas</td>
</tr>
<tr>
<td></td>
<td>proposed for timber harvesting in 2012.</td>
</tr>
<tr>
<td></td>
<td>It is therefore very unlikely that the proposed mine</td>
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<td></td>
<td>could increase the risk of introduction of DFTD. An</td>
</tr>
<tr>
<td></td>
<td>increase in traffic volume to and from the site has the</td>
</tr>
<tr>
<td></td>
<td>potential to result in a higher incidence of road kill or</td>
</tr>
<tr>
<td></td>
<td>injury to the species. The scavenging diet of the species,</td>
</tr>
<tr>
<td></td>
<td>their occasional reluctance to leave food, and their dark</td>
</tr>
<tr>
<td></td>
<td>colour make them particularly vulnerable to being killed</td>
</tr>
<tr>
<td></td>
<td>on the road. As a source of carcasses, and as a means of</td>
</tr>
<tr>
<td></td>
<td>dispersion, roads attract the species and put them at risk</td>
</tr>
<tr>
<td></td>
<td>of being killed themselves.</td>
</tr>
</tbody>
</table>

Matter 8: Spotted-tailed quoll 
(Dasyurus maculatus subsp. maculatus)

The mine is likely to be part of a home range for this species, albeit outside of the core range. However, low prey densities in the project area mean that at most 1 individual is likely to be affected by vegetation clearing for the mine.

No active dens have been observed within the mine disturbance area. Although the mine area is suitable for foraging it does not support suitable den habitat.

Increased traffic to the site may increase the incidences of road mortality.

Plants

Matter 9: Funnel heath, Smooth heath (Epacris glabella)

The funnel heath is an endemic species known to occur near Savage River and Renison Bell with an outlier along the upper reaches of the Gordon River. The known populations predominately occur on Cambrian serpentinite in hilly terrain at elevations of 300-470 m asl. It occurs in heath, open-scrub or dry Eucalyptus nitida woodland.

No plants have previously been recorded within 5 km of the project area; however, Cambrian serpentinite occurs on Serpentine Ridge which trends to the north west from the site.

A targeted survey did not find this species within the disturbance footprint. It remains possible that it occurs in low numbers or in a restricted area outside the disturbance footprint.

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A number of migratory species are noted in the Protected Matters Search Tool but the project area does not contain suitable habitat for these species. Refer to Table 26.

Appendix K provides a detailed assessment of the potential impacts on MNES threatened species and communities. The findings of that assessment are summarised in Table 26.

<table>
<thead>
<tr>
<th>MNES matter</th>
<th>Summary of potential impacts before avoidance and mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matter 10: Fork-tailed Swift (<em>Apus pacificus</em>)</td>
<td>This species is predominantly an aerial bird with habitat on-site highly unlikely. The largely aerial life of the fork-tailed swift means that any ground based activities associated with the project are very unlikely to be able to impact on the species, if it visited the area. There are no significant potential direct, indirect or facilitated impacts on this species.</td>
</tr>
<tr>
<td>Matter 11: Great Egret, White Egret (<em>Ardea alba</em>)</td>
<td>The egrets depend on wetlands and in Australia the main threats are the drying of wetlands. The project will divert surface water around the mine workings. The project could not lead to a drying of any wetlands. There are no significant potential direct, indirect or facilitated impacts on this species.</td>
</tr>
<tr>
<td>Matter 12: Cattle Egret (<em>Ardea alba</em>)</td>
<td>The proposed mine area is not considered to include habitat for this species. There are no significant potential direct, indirect or facilitated impacts on this species.</td>
</tr>
<tr>
<td>Matter 13: White-bellied Sea-Eagle (<em>Haliaeetus leucogaster</em>)</td>
<td>The white-bellied sea-eagle is unlikely to forage within the project area. They predominantly feed at sea, along the coast, taking a variety of fish, birds, reptiles, mammals and crustaceans, and also carrion and offal. Any changes to vegetation within the project area as a result of the project would therefore have negligible impact on sea eagle foraging habitat. There are no significant potential direct, indirect or facilitated impacts on this species.</td>
</tr>
<tr>
<td>Matter 14: White-throated Needletail (<em>Hirundapus caudacutus</em>)</td>
<td>The largely aerial life of the white-throated needletail means that any ground based activities associated with the project area are very unlikely to be able to impact on the species, if it visited the area. There are no significant potential direct, indirect or facilitated impacts on this species.</td>
</tr>
<tr>
<td>Matter 15: Latham’s Snipe, Japanese Snipe (<em>Gallinago hardwickii</em>)</td>
<td>There is no suitable wetland habitat for the snipe within the project area. The project will divert surface water around the mine workings. The project could not lead to a drying of any wetlands. There are no significant potential direct, indirect or facilitated impacts on this species.</td>
</tr>
</tbody>
</table>

5.1.3 **Measures to avoid or reduce impacts**

The mine will be developed and operated in accordance with best practice environmental management principles.
Commitments to measures to avoid and mitigate potential impacts on MNES are described in detail in Appendix K and are summarised in Table 27.

There are considered to be no significant residual impacts on MNES.

Table 27: Summary of avoidance and mitigation commitments to protect MNES migratory species - details are provided in Appendix K

<table>
<thead>
<tr>
<th>MNES matter</th>
<th>Commitments</th>
</tr>
</thead>
<tbody>
<tr>
<td>General – construction management</td>
<td>Commitment EPBC 1: The construction of the Riley Project will be undertaken in accordance with a Construction Environmental Management Plan (CEMP) that will be prepared to ensure that Matters of National Environmental Significance (MNES) are protected.</td>
</tr>
<tr>
<td></td>
<td>Commitment EPBC 2: CEMP maps will note the location of all MNES within and adjacent to the project’s disturbance area, together with protective no-go buffer zones, and CEMP guidance instructions will describe MNES protection, avoidance and monitoring measures that must be implemented during construction.</td>
</tr>
<tr>
<td>Birds</td>
<td></td>
</tr>
<tr>
<td>Matter 1: Wedge-tailed eagle (Aquila audax subsp. fleayi)</td>
<td>No specific avoidance or mitigation commitments are warranted.</td>
</tr>
<tr>
<td>Matter 2: Australasian Bittern (Botaurus poiciloptilus)</td>
<td>No specific avoidance or mitigation commitments are warranted.</td>
</tr>
<tr>
<td>Matter 3: Azure kingfisher (Ceyx azureas diemenensis)</td>
<td>No specific avoidance or mitigation commitments are warranted.</td>
</tr>
<tr>
<td>Matter 4: Swift parrot (Lathamus discolor)</td>
<td>No specific avoidance or mitigation commitments are warranted.</td>
</tr>
<tr>
<td>Matter 5: Masked owl (Tyto novaehollandiae castanops)</td>
<td>No specific avoidance or mitigation commitments are warranted.</td>
</tr>
<tr>
<td>Fish</td>
<td></td>
</tr>
<tr>
<td>Matter 6: Australian grayling (Prototroctes maraena)</td>
<td>No specific avoidance or mitigation commitments are warranted.</td>
</tr>
<tr>
<td>Mammals</td>
<td></td>
</tr>
<tr>
<td>Matter 7: Tasmanian devil (Sarcophilus harrisii)</td>
<td>Commitment EPBC 3: Preclearance surveys for devil dens will be undertaken immediately before each stage of clearing to identify any occupied dens. The surveys will be conducted by a suitably qualified person. Commitment EPBC 4: During vegetation clearing operations, a temporary 50 m buffer will be established around any occupied natal devil dens found in the pre-clearance surveys. The buffer will encompass all structural elements of the surrounding forest and will remain until the den has been confirmed to have been vacated. Only after the den has been confirmed to be vacated will the vegetation clearing be completed. Commitment EPBC 5: Additional devil denning opportunities will be created as part of the vegetation clearing activities.</td>
</tr>
<tr>
<td>MNES matter</td>
<td>Commitments</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Commitment EPBC 6: Monitoring of the effectiveness of the establishment of suitable devil denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations. Commitment EPBC 7: A roadkill minimisation strategy will be implemented for the Tasmanian devil, including the provision of workers transport (bus) to and from the site, reducing traffic speed, improving visibility by use of driving lights, acoustically alerting animals, discouraging animals from scavenging and educating staff and contractors. Commitment EPBC 8: If product transport is required before the rail loading facility is available, product will be trucked to Burnie via the Murchison Highway in daylight hours only. Commitment EPBC 9: Staff and contractor inductions will include education about Devil Facial Tumour Disease, its significance and measures to avoid contributing to its spread. Commitment EPBC 10: Preclearance surveys for spotted-tail quoll dens will be undertaken immediately before each stage of clearing to identify any occupied dens. The surveys will be conducted by a suitably qualified person. Commitment EPBC 11: During vegetation clearing operations, a temporary 50 m buffer will be established around any occupied natal spotted-tail quoll dens found in the pre-clearance surveys. The buffer will encompass all structural elements of the surrounding forest and will remain until the den has been confirmed to have been vacated. Only after the den has been confirmed to be vacated will the vegetation clearing be completed. Commitment EPBC 12: Additional spotted-tail quoll denning opportunities will be created as part of the vegetation clearing activities. Commitment EPBC 13: Monitoring of the effectiveness of the establishment of suitable spotted-tail quoll denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations. Commitment EPBC 14: A roadkill minimisation strategy will be implemented for the spotted-tailed quoll, including the provision of workers transport (bus) to and from the site, reducing traffic speed, improving visibility by use of driving lights, acoustically alerting animals, discouraging animals from scavenging and educating staff and contractors. Commitment EPBC 15: If product transport is required before the rail loading facility is available, product will be trucked to Burnie via the Murchison Highway in daylight hours only. Commitment EPBC 16: Site operators and contractors will be provided with quoll protection and management guidance before site work commences and as part of the induction of new workers.</td>
<td></td>
</tr>
</tbody>
</table>

Matter 8: Spotted-tailed quoll (*Dasyurus maculatus subsp. maculatus*) Commitment EPBC 10: Preclearance surveys for spotted-tail quoll dens will be undertaken immediately before each stage of clearing to identify any occupied dens. The surveys will be conducted by a suitably qualified person. Commitment EPBC 11: During vegetation clearing operations, a temporary 50 m buffer will be established around any occupied natal spotted-tail quoll dens found in the pre-clearance surveys. The buffer will encompass all structural elements of the surrounding forest and will remain until the den has been confirmed to have been vacated. Only after the den has been confirmed to be vacated will the vegetation clearing be completed. Commitment EPBC 12: Additional spotted-tail quoll denning opportunities will be created as part of the vegetation clearing activities. Commitment EPBC 13: Monitoring of the effectiveness of the establishment of suitable spotted-tail quoll denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations. Commitment EPBC 14: A roadkill minimisation strategy will be implemented for the spotted-tailed quoll, including the provision of workers transport (bus) to and from the site, reducing traffic speed, improving visibility by use of driving lights, acoustically alerting animals, discouraging animals from scavenging and educating staff and contractors. Commitment EPBC 15: If product transport is required before the rail loading facility is available, product will be trucked to Burnie via the Murchison Highway in daylight hours only. Commitment EPBC 16: Site operators and contractors will be provided with quoll protection and management guidance before site work commences and as part of the induction of new workers.
5.1.4 Cost of mitigation measures

The costs of mitigation measures specific to the EPBC Act commitments are provided in Table 28. Note that these costings are only for those commitments for which costs are readily separately identifiable from general environmental management costs, and they therefore underestimate the total cost of the environmental management measures relevant to EPBC Act requirements.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>Cost estimate basis</th>
<th>Cost estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preclearance surveys for quolls and devils (Commitment EPBC 3 and Commitment EPBC 10)</td>
<td>Assume 2 rounds of surveys over a 6 month denning season for 2 years @ $3,500 per survey</td>
<td>$14,000</td>
</tr>
<tr>
<td>Creation of new denning opportunities for quolls and devils (Commitment EPBC 4 and Commitment EPBC 12)</td>
<td>Assume 16 hours of additional excavator time per 2.8 ha panel @ $120/hr across total mine resource area of 114 ha (40 panels)</td>
<td>$77,000</td>
</tr>
<tr>
<td>Monitoring of the effectiveness of new denning habitat for quolls and devils (Commitment EPBC 6 and Commitment EPBC 13)</td>
<td>Assume 10 cameras @ $900 per camera; and 4 hours per week downloading and photo inspections @ $65/hr over 104 weeks of mine life</td>
<td>$9,000 $27,000</td>
</tr>
<tr>
<td>Roadkill minimisation strategy for quolls and devils (Commitment EPBC 7 and Commitment EPBC 14)</td>
<td>Provision of workers bus @ $200,000 per year for 2 years For product transport, a speed limit of 80 km/h would mean an average travel speed of 45 km/h. Reducing the speed limit to 60 km/h would mean an average travel speed of 40 km/h, giving an increase in travel time of 12.5%. Assuming a transport cost per tonne of $5, the reduction in speed is a 12.5% loss in transport efficiency, so the cost</td>
<td>$400,000 $1,260,000</td>
</tr>
</tbody>
</table>
Commitment | Cost estimate basis | Cost estimate
--- | --- | ---
| Increase is $0.63 per tonne for 1 million tonnes per year, so annual cost is $630,000 per year and $1.26 million over the life of the mine. Remote cameras for devil roadkill circumstances confirmation (see section 5.1.6). Assume 20 cameras at $900 per camera. Specialist statistical analysis of roadkill data at end of mine life | | $18,000

Daylight only transport for trucking to Burnie contingency
(Commitment EPBC 8 and Commitment EPBC 15) | Reduced productivity due to reduction in production to satisfy daylight only transport restriction. A minimum production rate of 600,000 tonnes per annum (equivalent) over this period would be required to satisfy anticipated supply contracts. This is equivalent to 600,000/365 = 1,650 tonnes per day. A round trip from Riley to Burnie would take about 5 hours. If 24 hour trucking to Burnie was allowed, each truck could do 4 round trips per day over two 10 hour shifts to transport 4 x 37 tonnes = 148 tonnes per day so 1,650/148 = 12 trucks would be required. Restricting trucking to daylight hours only would mean that each truck could only do 2 round trips per day over one 10 hour shift so 24 trucks would be required. The addition of extra trucks adds $0.35 per tonne for each additional truck to the transport cost and 12 additional trucks would be needed. Daylight only transport therefore adds 12 x $0.35 x 1,650 = $6,930 per day. Assuming the contingency is required for 6 months, the mitigation cost is therefore 180 x $6,930 = $1.25 million. | $1,250,000

Total | $3,070,000

5.1.5 Voluntary ‘offsets’
As described above (section 5.1.3), the proposed mitigation measures will reduce the residual impacts to levels of non-significance.

However, Venture Minerals is very keen to take advantage of the opportunities that its proposed mining operations provide for supporting environmental initiatives in the community. These are not formal EPBC Act offsets because they are not offsetting any significant residual impacts but they do nevertheless provide support to relevant MNES.

To this end, Venture has already provided the following voluntary support to community ventures that are responding to problems of the Devil Facial Tumour Disease.
Devils@Cradle

Venture has donated $33,650 to the Devils@Cradle Tasmanian Devil Park at Cradle Mountain for the construction of an enclosure to house between seven and ten virus free devils (a cost of approximately $3,000 - $5,000 per devil). This has now been completed and has an area of 600 m².

Devils@Cradle is widely considered as Tasmania’s premier privately owned Tasmanian devil facility, whose core principles are based on the conservation of devils, together with other native species and Tasmanian ecology in general.

Devils@Cradle is a key stakeholder in the Tasmanian Government’s Save the Tasmanian Devil Program (STDP) and is a registered member of the Zoological and Aquariums Association (ZAA) of Australasia. It is one of the only two Tasmanian Institutions associated with the STDP/ZAA’s nationwide “Insurance Population” breeding program for the species and it also provides orphan rehabilitation, field monitoring and education for visitors to the sanctuary.

Save the Tasmanian Devil Appeal University of Tasmania Foundation.

Venture has donated $7,000 to the Save the Tasmanian Devil Appeal Fund for an Honours scholarship grant to carry out research into Tasmanian devil dens and maternal dens. This was carried out by Honours student (Jillian Smith) and has now been completed.

Venture is currently in discussions with the Fund to sponsor further research work into the Tasmanian devil.

5.1.6 Offset contingencies

As described above (section 5.1.3), the proposed mitigation measures will reduce the residual impacts to levels of non-significance.

Nevertheless, the following contingency offsets are proposed. These would be triggered in the event that this non-significance expectation is not achieved. These offsets have been developed in the light of DSEWPC’s Environmental Offsets Policy (October 2012).

Offsets are not considered warranted for habitat loss. The total disturbance area is unlikely to hold more than 1 devil (see section 3.4.8, page 72) and with the progressive rehabilitation only a maximum of 2.8 ha will be being actively mined at one time (section 4.3.4) - the remainder will be undisturbed or under revegetation. The potential exclusion of devils from habitat at any one time will therefore only be a few hectares and the entire mining will be completed within approximately two years. The potential impacts on the species due to very short term, small area loss of habitat is therefore inconsequential and offsets are not warranted.

The contingency offsets relate to roadkill for the MNES relevant listed fauna species: quolls and devils.

Because 24 hour transport of product on Pieman Road will be undertaken between the mine and the rail loading facility, transport trucks will be on the Pieman Road between dusk and dawn, the time of significant roadkill risk. The offset contingencies therefore relate to product transport on the Pieman Road.

If the truck to Burnie contingency needs to be invoked because the rail loading facility (by others) is not available when mine operations commence, that transport will only occur during daylight hours, a time of low roadkill risk, and offset contingencies for travel on the Murchison Highway are not warranted.
The baseline roadkill monitoring of a 55 km section of Pieman Road roadkill found 1 devil roadkill (and no quoll roadkill) over 52 nights of observations.

The long term proportion of devil kills relative to other road kill species on Pieman Road can be assumed to be the statistically robust 1.5 percent (see section 4.10.3) determined from major independent roadkill studies (having only a single devil kill in the Pieman Road baseline survey prevents any valid statistical proportion being inferred from that data). Over extended periods, such as 12 months, if there is any devil roadkill on Pieman Road the proportion of devils out of the total kill should be 1.5%.

The total number of roadkill observed in the baseline survey for Pieman Road was 33 over 52 nights (see section 3.4.8). Assuming that this total roadkill rate applies throughout the year, a total roadkill (all species) of $\frac{365}{52} \times 33 = 231$ would be expected on the 55 km stretch of surveyed road. Assuming devils will be 1.5% of this, 4 devils would be expected to be killed (3.5 rounded up).

The section of the road between the mine and the rail loading facility is 11.5 km, one fifth of the total survey section. The pro rata background devil roadkill rate on this section would therefore be 1 per year ($\frac{11.5}{55} \times 4 = 0.8$ rounded up to 1).

Venture Minerals’ proposed mining operations are the only known new activities that will add to road traffic on the Pieman Road. Devil roadkill rates above 1 per year between the mine and the rail loading facility could therefore be taken to be a consequence of Venture’s activities for the Riley mine.

Venture therefore propose that the offset contingency for devil roadkill be triggered if devil roadkill counts between the Riley mine and the Bastyan rail loading facility exceed 1 in any 12 month period.

Venture will install a network of remote sensing infrared cameras along the road between the mine and the rail loading facility and also on product transport trucks. If a road killed devil is found during the daily inspections of this section of road, the previous night’s images from these cameras will be examined to try to determine the circumstances of the roadkill occurring. If there is photographic evidence that shows how the roadkill occurred and demonstrates that it was not due to a mine vehicle, the offset contingency will not apply; otherwise it will.

An appropriate offset for roadkill above the threshold would be a financial contribution to Devils@Cradle to supplement the voluntary contributions that Venture has already made to that organisation (section 5.1.5) to assist the maintenance of devils in DFTD free refuges. The quantum of offset will be equivalent to the $5,000 per devil cost for the enclosure already funded (section 5.1.5).

This would be an appropriate offset because devil roadkill is only a potentially significant threat due to the overriding threat to the species from DFTD. In proposing this offset contingency, Venture notes that it is a very protective offer because DFTD has not yet even reached the Pieman Road area and at the known rate of spread (see section 3.4.8), it is unlikely to do so within the 2 year life of the Riley mine.

Nevertheless, to offset potential devil roadkill impacts, Venture propose that the primary offset contingency for devil roadkill will be that Venture will contribute $5,000 in support funding to Devils@Cradle for each devil roadkill above a threshold of 1 observed between the Riley mine and the Bastyan rail loading facility in any 12 month period, unless monitoring evidence demonstrates that the kill was not due to mine vehicles.

If, however, the above devil roadkill threshold is exceeded but the proportion of devils out of the total roadkill over the road survey section in that 12 month period exceeds 1.5% (the proportion expected based on multiple roadkill surveys in
northwest Tasmania) an alternative offset contingency will be applied instead. The alternative contingency will be that Venture will fund further investigations into the Pieman Road roadkill to attempt to determine why the Pieman Road proportion for devil roadkill is different than elsewhere in Tasmania. The quantum of the fund applied to these investigations will be negotiated with DSEWPC at the time according to the particular circumstances.

No quoll roadkill were observed during the baseline studies and there have been no records of this species within 5 km of the mine site (Table 20, page 69). It is therefore not possible to specify a baseline roadkill rate. Choosing zero as the baseline would be unreasonably arbitrary because the very low population densities of quolls mean that the baseline monitoring period may not have been long enough to provide a statistically relevant period.

Accordingly, Venture propose that the first 12 months of roadkill monitoring will be used to determine a quoll roadkill rate on road sections outside the Riley mine to Bastyan rail loading facility section (as shown in Figure 21 on page 74, the monitoring road section extends from the Murchison Highway junction almost out to the Reece Dam). That rate will then be adopted as the quoll roadkill threshold for the second year of mining.

If that quoll roadkill threshold rate is exceeded between the Riley mine and the Bastyan rail loading facility in the second year of operations (again other than if monitoring demonstrates that the roadkill was not due to a mine vehicle), Venture would fund a feral cat and dog culling program in the area surrounding Tullah. This is considered to be an appropriate offset because feral dogs and cats are one of the most significant threatening processes for quolls.
6. Monitoring

**Surface water and groundwater monitoring**

The current programs of surface water and groundwater monitoring will be continued during operation and at mine closure.

Details of the sites are:

**Surface water monitoring sites**
- RYSW1: 367010E 5376770N: on Three Mile Creek, 20 m north of its confluence with Trinder Creek, downstream from proposed mining operations in Area A
- RYSW2: 367470E 5376550N: at the base of Riley Creek, 50 m north of its confluence with Trinder Creek, downstream from proposed mining operations in Areas A, B and C
- RYSW3: 367445E 5376510N: on Trinder Creek, 20 m upstream from its confluence with Riley Creek, downstream from proposed mining operations in Area C
- RYSW4: 368730E 5379000N: on Sweeney Creek downstream from the Sweeney-Gold Creek confluence, where it crosses under Pieman road, downstream from mining operations in Area D
- RYSW5: 368940E 5376755N: on Trinder Creek upstream from proposed mining operations in Area C

**Groundwater monitoring sites**
- RYWB001: 368532E 5378761N: in the Sweeney Creek catchment
- RYWB002: 367708E 5377096N: along the watershed divide between Riley Creek and Three Mile Creek
- RYWB003: 367706E 5377096N: along the watershed divide between Riley Creek and Three Mile Creek
- RYWB004: 368283E 5377671N: at the head of the watershed divide between Riley Creek and Trinder Creek
- RYWB005: 367380E 5376828N: downstream end of the watershed divide between Riley Creek and Trinder Creek.

Monitoring will be conducted at three monthly intervals.

The following field parameters will be measured:
- Discharge
- pH
- EC
- Eh
- DO
- Temperature.

The following laboratory testing will be undertaken:
- pH, EC, TDS, TSS, colour
- Alkalinity (CO$_3$ and HCO$_3$), acidity
- Chloride, sulphate, ammonia, nitrate, nitrite, total N, dissolved P and total P
- Metals.
Groundwater levels and surface water discharge will also be measured during sampling runs.

Monitoring of the sediment basin water will also be undertaken during mining operations for turbidity and AMD precursors. The sediment basins will be located downstream from the infrastructure and ore crushing, screening and stockpile area, and resource areas B and D. The infrastructure basin water will be sampled monthly for laboratory analysis of total petroleum hydrocarbons and oil and grease.

Run-off from the sediment basins will be field-monitored weekly for turbidity, pH and dissolved oxygen.

**Biological monitoring**

Pre-disturbance macroinvertebrate monitoring surveys of the creek systems within the mine site will be undertaken at appropriate strategic locations in accordance with the Tasmanian River Condition Index protocol, an accepted methodology for monitoring changes to river ecosystems.

The results of the pre-disturbance surveys will provide a baseline against which to compare surveys undertaken when the mine is operating. A survey will be undertaken downstream of the mine prior to construction commencing.

Sentinel Monitoring Stations will be established to monitor the effectiveness of the creation of additional denning habitat for Tasmanian devils and spotted-tailed quolls. These stations will comprise an infrared camera designed specifically for the detection of wildlife.

Records will be maintained of roadkill removed from Pieman Road and from within the mine site.

A system of remote cameras will be set up to monitor roadkill circumstances on Pieman Road between the mine and the Bastyan rail loading facility.
7. **Decommissioning and rehabilitation**

The decommissioning and rehabilitation plan (DRP) is a dynamic plan which changes with the project as it progresses, as ongoing rehabilitation is completed and as new rehabilitation needs arise.

At this stage the DRP will cover two main areas:

- The mine resource area (resource areas A, B, C & D)
- The mine infrastructure area.

The DRP may change over time if the requirements and expectations of the regulators, key stakeholders and interested parties changes or if the project changes over time.

The DRP is provided in Appendix M.
8. **Commitments**

A summary of commitments is provided in Table 29. A summary of commitments specifically relevant to the EPBC approval process are provided in Table 30.

<table>
<thead>
<tr>
<th>Commitment</th>
<th>When</th>
<th>Responsible person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment 1: Haul roads, ore dumps, crusher and conveyor drop points, and earth stockpiles will be kept watered in dry windy conditions to reduce the potential for dust generation.</td>
<td>Ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 2: Construction phase dust impacts will be minimised by road tanker watering as required.</td>
<td>During construction</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 3: All mining and processing equipment, including trucks, excavators, crushers and generators, will be operated appropriately, in accordance with design specifications, and regularly maintained.</td>
<td>Ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 4: The extent of exposed bare land will be kept to a minimum at any one time, thereby reducing the risk of aeolian sediment loss.</td>
<td>Ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 5: The fuel tanker used during construction will be located in a bunded area with 110% capacity of the tanker. The fuel tanks during operation will be located in a facility in a bunded area with 110% capacity of the tanks.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 6: Fuel cleanup equipment will be stored in readily accessible sites, including the fuel tanker during construction.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 7: In the event of a spill, appropriate absorption materials will be used immediately, and any hydrocarbon contaminated soil will be removed and taken to an appropriate authorised disposal or treatment facility. The Director, Environment Protection Authority, will be notified immediately.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 8: All equipment will be properly maintained and serviced regularly.</td>
<td>During operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 9: A package sewage treatment system using UV disinfection will be installed on site. The system will be regularly maintained.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 10: Surface water monitoring will be conducted at three monthly intervals at all five surface water sampling sites.</td>
<td>During construction and operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 11: Runoff from the settlement basins will be field-monitored weekly for turbidity, pH and dissolved oxygen.</td>
<td>During operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 12: The infrastructure area settlement basin will be sampled monthly for laboratory analysis of total petroleum hydrocarbons and oil and grease. All sediment basin water will be sampled for AMD precursors.</td>
<td>During operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 13: An AMD contingency plan will be developed, which will incorporate dosing the sediment basins with lime or another appropriate medium.</td>
<td>During operation</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 14: Overland drainage flow from the infrastructure area will be directed via a series of drains to a sediment basin established in Sweeney Creek prior to discharge to the receiving environment.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 15: Temporary silt stop fencing will be utilised where appropriate to prevent transport of any eroded material</td>
<td>During</td>
<td>Relevant</td>
</tr>
<tr>
<td>Commitment</td>
<td>When</td>
<td>Responsible person</td>
</tr>
<tr>
<td>------------</td>
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</tr>
<tr>
<td>into the Sweeney Creek channel during construction.</td>
<td>construction</td>
<td>contractor</td>
</tr>
<tr>
<td>Commitment 16: Erosion and sedimentation controls will be established prior to the commencement of the works during construction.</td>
<td>During construction</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 17: All drainage systems and cut-off drains will be designed to provide adequate capacity for heavy rainfall events, and will incorporate energy dissipation structures and erosion control measures as necessary.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 18: The headwaters of Sweeney Creek will be diverted around the infrastructure area to connect back with the natural system downstream of the sediment basin.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 19: A 15 m minimum buffer strip will be maintained between the up slope mined areas of resource areas A and C and Three Mile Creek and Riley Creek. A 30 meter buffer strip will be maintained between the up slope mined area of resource area C and Trinder Creek.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 20: The extent of land exposed to the elements will be kept to a minimum with no more than the equivalent of one mined panel per resource area of land cleared and exposed at any one time during mining operations.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 21: Silt fences will be used at the base (downslope) of each cleared and mined 25 m panel in resource areas A and C.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 22: An off-line sediment basin will be established downslope from resource area B to collect any water that ponds within the topographic low point during mining, including groundwater ingress, prior to discharge.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 23: An on-line sediment basin will be constructed on Gold Creek downstream of all mining activities from resource area D.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 24: Cut-off drains will be established (see Appendix C) between the resource and the infrastructure area to divert flow to the on-line sediment basin on Sweeney Creek.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 25: Temporary silt fences will be placed downstream of areas where fines are being returned from the screening process to allow the fines to drain without causing significant suspended sediment loss and the fines will also be covered with mulch to protect them from rain erosion.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 26: A buffer width will be maintained along Riley Creek and Three Mile Creek between the creek channel and resource areas A and C such that the depth of the mining activity will not extend below the level of the top of the creek bank</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 27: If the final rehabilitated surface level of the mined out sections in the upper catchment of Riley Creek and Gold Creek results in ponding of water, then the channel bed will be re-graded and or channel created to ensure no ponding of water on mine closure.</td>
<td>Ongoing</td>
<td>Relevant contractor</td>
</tr>
<tr>
<td>Commitment 28: No ‘benches’ will be left around the edges of the mined out sections upslope that may promote ponding of water.</td>
<td>Ongoing</td>
<td>Mine Manager / Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 29: On closure the natural course of Sweeney Creek will be re-established.</td>
<td>Closure</td>
<td>Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 30: Where practicable, all mining and works at</td>
<td>Ongoing</td>
<td>Mine Manager</td>
</tr>
<tr>
<td>Commitment</td>
<td>When</td>
<td>Responsible person</td>
</tr>
<tr>
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</tr>
<tr>
<td>the low topographic points within the upper catchment areas of Riley Creek and Gold Creek will be undertaken during summer at times of no flow.</td>
<td>/Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment 31: Groundwater intercept collected within mined out panels of areas B and D will be pumped to a sediment basin prior to discharge to the receiving environment.</td>
<td>Ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 32: Groundwater monitoring, which commenced in May 2012, will continue during the operation of the mine at three monthly intervals.</td>
<td>Ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 33: All equipment and vehicles will be fitted with manufacturer’s silencing equipment, operated appropriately and regularly maintained.</td>
<td>Ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 34: Use of appropriate hearing protection equipment will be mandatory in all relevant areas.</td>
<td>Ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 35: Rubbish bins will be provided with lids at appropriate locations around the site and all staff will be required to avoid littering and to collect and bin any rubbish and litter that they observe on site.</td>
<td>Construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 36: Refuse will be periodically taken to an approved waste disposal facility.</td>
<td>Construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 37: Any hydrocarbon contaminated soil will be removed to an appropriate disposal site or treatment facility.</td>
<td>Construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 38: Any mined material that is not of sufficient grade for blending and shipment will be replaced back into the mined out strips prior to cover with topsoil and vegetation.</td>
<td>Ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 39: The extent of clearance required for the project will be clearly defined; appropriate measures (including marking tape, signs, site plans, site inductions, tool box talks and work inspections) will be undertaken to ensure that no additional clearance occurs.</td>
<td>Construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 40: All works, vehicles and materials will be confined to the designated works areas.</td>
<td>Construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 41: The limits of the allowable disturbance will be marked on mine plans and in the field by permanent signage.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 42: The reason for disturbance restrictions and the importance of staying within the limits of the disturbance footprint will form part of employee and site visitor induction information.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 43: A Phytophthora quarantine protocol will be developed, focusing on washdown of all machinery and equipment coming onto the site from other earthwork areas.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 44: All machinery and vehicles undertaking earthwork activities will be cleaned prior to leaving the mining lease for work at other premises.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 45: Any areas that become infected with Phytophthora cinnamomi will be managed in accordance with DPIW ‘Interim Phytophthora cinnamomi Management Guidelines’.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 46: Phytophthora cinnamomi, Myrtle wilt, English</td>
<td>During</td>
<td>Mine Manager</td>
</tr>
<tr>
<td>Commitment</td>
<td>When</td>
<td>Responsible person</td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td>--------------------</td>
</tr>
<tr>
<td>broom and Spanish heath signs and symptoms will form part of employee induction information.</td>
<td>construction and ongoing</td>
<td>/Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 47: A Devil Management Plan will be prepared, which will include preclearance surveys for devil dens to be undertaken immediately before each stage of clearing to identify any occupied dens. The surveys will be conducted by a suitably qualified person.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 48: During vegetation clearing operations, a temporary 50 m buffer will be established around any occupied natal dens found in the pre-clearance surveys. The buffer will encompass all structural elements of the surrounding forest and will remain until the den has been confirmed to have been vacated. Only after the den has been confirmed to be vacated will the vegetation clearing be completed.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 49: Additional devil denning opportunities will be created as part of the vegetation clearing activities.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 50: Monitoring of the effectiveness of the establishment of suitable devil denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 51: A road kill minimisation strategy will be implemented for the Tasmanian devil, including the provision of workers transport (bus) to and from the site, reducing traffic speed, improving visibility by use of driving lights, acoustically alerting animals, discouraging animals from scavenging and educating staff and contractors.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 52: If product transport is required prior to the rail loading facility being operational, product will be trucked to Burnie via the Murchison Highway but during daylight hours only.</td>
<td>During operations</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 53: Staff and contractor inductions will include education about Devil Facial Tumour Disease, its significance and measures to avoid contributing to its spread.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 54: Road kill monitoring will be on going and will continue during construction and operation of the mine.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 55: Preclearance surveys for spotted-tailed quoll dens will be undertaken immediately before each stage of clearing to identify any occupied dens. The surveys will be conducted by a suitably qualified person.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 56: During vegetation clearing operations, a temporary 50 m buffer will be established around any occupied natal spotted-tailed quoll dens found in the pre-clearance surveys. The buffer will encompass all structural elements of the surrounding forest and will remain until the den has been confirmed to have been vacated. Only after the den has been confirmed to be vacated will the vegetation clearing be completed.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 57: Additional spotted-tailed quoll denning opportunities will be created as part of the vegetation clearing activities.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment 58: Monitoring of the effectiveness of the establishment of suitable spotted-tailed quoll denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations.</td>
<td>During construction and ongoing</td>
<td>Mine Manager /Relevant Contractor</td>
</tr>
<tr>
<td>Commitment</td>
<td>When</td>
<td>Responsible person</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>Commitment 59: A road kill minimisation strategy will be implemented for</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>the spotted-tailed quoll, including the provision of workers transport (</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bus) to and from the site, reducing traffic speed, improving visibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>by use of driving lights, acoustically alerting animals, discouraging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>animals from scavenging and educating staff and contractors.</td>
<td></td>
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</tr>
<tr>
<td>Commitment 60: If product transport is required prior to the rail</td>
<td>During operations</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>loading facility being operational, product will be trucked to Burnie</td>
<td></td>
<td></td>
</tr>
<tr>
<td>via the Murchison Highway during daylight hours only.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 61: Staff and contractors will be provided with quoll</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>protection and management guidance before site work commences and as</td>
<td></td>
<td></td>
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<tr>
<td>part of the induction of new workers.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 62: Road kill monitoring program will be on going and will</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>continue during construction and operation of the mine.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 63: Preclearance surveys for wedge-tailed eagle nest sites</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>will be undertaken immediately before each stage of clearing. DPIPWE will</td>
<td></td>
<td></td>
</tr>
<tr>
<td>be notified and advice sought if nest sites are observed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 64: The construction of the Riley project will be undertaken</td>
<td>During construction</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>in accordance with a Construction Environmental Management Plan (CEMP)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>that will be prepared to ensure that Matters and National Environmental</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Significance (MNES) are protected.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 65: CEMP maps will note the location of all MNES within and</td>
<td>During construction</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>adjacent to the project’s disturbance area, together with protective</td>
<td></td>
<td></td>
</tr>
<tr>
<td>no-go buffer zones, and CEMP guidance instructions will describe MNES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>protection, avoidance and monitoring measures that must be implemented</td>
<td></td>
<td></td>
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<tr>
<td>during construction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 70: Mining and associated infrastructure will not be located</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>within a 50 m radius of the identified site.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 71: The location and grid coordinates of the identified site</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>will be checked against the finalised mining plan prior to construction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 72: In the event that previously unrecorded cultural material</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>is discovered during construction of the mine, the Unanticipated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discovery Plan (Section 11.0 of the CHMA report, Appendix J confidential)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>will be followed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 73: All operations, maintenance, health and safety management</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>on the mine site will be compliant with the Workplace Health and Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 74: A detailed risk (hazard) assessment will be undertaken</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>prior to commencement of construction activities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 75: A Fire Management Plan for the mine site will be</td>
<td>During construction</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>developed and finalised in consultation with the appropriate authorities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 76: The project site clearance, construction,</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>commissioning and operations will be conducted in accordance with the</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fire Management Plan.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 77: The Fire Management Plan will be reviewed.</td>
<td>During construction</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>Commitment</td>
<td>When</td>
<td>Responsible person</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>and updated as part of any EMP review.</td>
<td>and ongoing</td>
<td>Contractor</td>
</tr>
<tr>
<td>Commitment 78: Facilities in the infrastructure area will be designed in</td>
<td>Prior to construction</td>
<td>Mine Manager / Relevant</td>
</tr>
<tr>
<td>accordance with all relevant standards to ensure fire protection systems</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>and equipment are installed and operational at all times.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 79: A Mine Environmental Management System will be developed</td>
<td>Prior to construction</td>
<td>Mine Manager / Relevant</td>
</tr>
<tr>
<td>in accordance with EPA requirements.</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>Commitment 80: Operation of the mine and processing facilities will be</td>
<td>During construction and</td>
<td>Mine Manager / Relevant</td>
</tr>
<tr>
<td>undertaken in accordance with the Mine Environmental Management System.</td>
<td>ongoing</td>
<td>Contractor</td>
</tr>
<tr>
<td>Commitment 81: The mine access road, if not already, will be</td>
<td>During construction</td>
<td>Mine Manager / Relevant</td>
</tr>
<tr>
<td>constructed to a Class 1 Road standard in accordance with the Forest</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>Commitment 82: The junction of the mine access road and Pieman Road will</td>
<td>Prior to construction</td>
<td>Mine Manager / Relevant</td>
</tr>
<tr>
<td>be upgraded so that the geometry meets the requirements of the Austroads</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>Guide - Part 4A: Unsignalised and Signalised Intersections for a Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAR/BAL junction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 83: The available sight distance at the junction of the Bastyan</td>
<td>Prior to construction</td>
<td>Mine Manager / Relevant</td>
</tr>
<tr>
<td>Dam access road and Pieman Road will be increased through limited</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>vegetation clearing in both the east and west directions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment 84: The junction of the Bastyan Dam access road and Pieman</td>
<td>During construction</td>
<td>Mine Manager / Relevant</td>
</tr>
<tr>
<td>Road will be upgraded to meet the requirements of the Austroads Guide for</td>
<td></td>
<td>Contractor</td>
</tr>
<tr>
<td>a Type BAR/BAL junction for the turning movements that will be</td>
<td></td>
<td></td>
</tr>
<tr>
<td>undertaken by B-double vehicles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commitment</td>
<td>When</td>
<td>Responsible person</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Commitment EPBC 1: The construction of the Riley Project will be undertaken in accordance with a Construction Environmental Management Plan (CEMP) that will be prepared to ensure that Matters of National Environmental Significance (MNES) are protected.</td>
<td>During construction Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 2: CEMP maps will note the location of all MNES within and adjacent to the project’s disturbance area, together with protective no-go buffer zones, and CEMP guidance instructions will describe MNES protection, avoidance and monitoring measures that must be implemented during construction.</td>
<td>During construction Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 3: Preclearance surveys for devil dens will be undertaken immediately before each stage of clearing to identify any occupied dens. The surveys will be conducted by a suitably qualified person.</td>
<td>Prior to construction Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 4: During vegetation clearing operations, a temporary 50 m buffer will be established around any occupied natal devil dens found in the pre-clearance surveys. The buffer will encompass all structural elements of the surrounding forest and will remain until the den has been confirmed to have been vacated. Only after the den has been confirmed to be vacated will the vegetation clearing be completed.</td>
<td>During construction Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 5: Additional devil denning opportunities will be created as part of the vegetation clearing activities.</td>
<td>During construction Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 6: Monitoring of the effectiveness of the establishment of suitable devil denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations.</td>
<td>During operations Mine Manager</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 7: A roadkill minimisation strategy will be implemented for the Tasmanian devil, including the provision of workers transport (bus) to and from the site, reducing traffic speed, improving visibility by use of driving lights, acoustically alerting animals, discouraging animals from scavenging and educating staff and contractors.</td>
<td>During construction and ongoing Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 8: If product transport is required before the rail loading facility is available, product will be trucked to Burnie via the Murchison Highway in daylight hours only.</td>
<td>During operations Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 9: Staff and contractor inductions will include education about Devil Facial Tumour Disease, its significance and measures to avoid contributing to its spread.</td>
<td>During construction and ongoing Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 10: Preclearance surveys for spotted-tail quoll dens will be undertaken immediately before each stage of clearing to identify any occupied dens. The surveys will be conducted by a suitably qualified person.</td>
<td>Prior to construction Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment EPBC 11: During vegetation clearing operations, a temporary 50 m buffer will be established around any occupied natal spotted-tail quoll dens found in the pre-clearance surveys. The buffer will encompass all structural elements of the surrounding forest and will remain until the den has been confirmed to have been vacated. Only after the den has been confirmed to be vacated will the vegetation clearing be completed.</td>
<td>During construction Mine Manager / Relevant Contractor</td>
<td></td>
</tr>
<tr>
<td>Commitment</td>
<td>When</td>
<td>Responsible person</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
<td>-----------------------------</td>
<td>-----------------------------------------</td>
</tr>
<tr>
<td>Commitment EPBC 12: Additional spotted-tail quoll denning opportunities will be created as part of the vegetation clearing activities.</td>
<td>During construction</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>Commitment EPBC 13: Monitoring of the effectiveness of the establishment of suitable spotted-tail quoll denning habitat as a mitigation measure will be implemented by using sentinel camera monitoring stations.</td>
<td>During operations</td>
<td>Mine Manager</td>
</tr>
<tr>
<td>Commitment EPBC 14: A roadkill minimisation strategy will be implemented for the spotted-tailed quoll, including the provision of workers transport (bus) to and from the site, reducing traffic speed, improving visibility by use of driving lights, acoustically alerting animals, discouraging animals from scavenging and educating staff and contractors.</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>Commitment EPBC 15: If product transport is required before the rail loading facility is available, product will be trucked to Burnie via the Murchison Highway in daylight hours only.</td>
<td>During operations</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
<tr>
<td>Commitment EPBC 16: Site operators and contractors will be provided with quoll protection and management guidance before site work commences and as part of the induction of new workers.</td>
<td>During construction and ongoing</td>
<td>Mine Manager/Relevant Contractor</td>
</tr>
</tbody>
</table>
9. Summary of key risks

A summary of the key risks assessed for the mine proposal is provided in Table 31. As shown in the table, avoidance and mitigation measures reduce all potential impacts to a level of non-significance. A preliminary risk assessment is provided in Appendix L. This will be updated following detailed design.

Table 31: Summary of key risks

<table>
<thead>
<tr>
<th>Matter</th>
<th>Risk assessed</th>
<th>Residual significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface and groundwater</td>
<td>Construction and operation of the mine could impact on the quality of surface water through sediment laden run-off. During construction, temporary settlement basins and silt fencing will be used and final runoff will be directed to naturally vegetated gently sloping land to natural drainage lines. During operations there will be no direct discharges from the mine to any of the creek systems. All discharge will be managed. Buffer strips will be maintained between the mining areas and all creek systems. Returned fines will be covered with mulch and bordered by silt fences down-gradient to prevent sediment loss. A range of best practice mitigation and management strategies will be employed to manage erosion potential and sediment loss to the creek systems, including progressively rehabilitating the areas as soon as possible to reduce exposure of bare ground, stage clearing of land in preparation for mining, and using cut-off drains, sediment basins and silt fences to manage and control any sediment laden run-off. Revegetation will therefore progress alongside the mining of each panel. The extent of exposed bare land will be kept to a minimum at any one time, thereby reducing the risk of surface erosion.</td>
<td>Not significant</td>
</tr>
<tr>
<td>Impact on quality from sediment input</td>
<td>There will be no liquid emissions from the mine site other than managed run-off. Neither fuels nor oils will be stored in bulk on site in any permanent facility during the construction phase. Fuel and oil will be brought onto the site as required in a mobile tanker for the construction activities. The tanker will be parked away from the class 1 and 2 drainage lines in a secure area for refuelling activity. Fuels and oils will be stored on site in a permanent facility once the mine moves to the operation phase. This facility will be located in an appropriately designed and operated bunded area. Refuelling and repairs of plant and equipment will be undertaken on site within a bunded area. These operations will be performed in appropriately designed and operated workshop facilities equipped with measures to contain and clean up any spills that might occur. A package sewage treatment system will be installed on site. The system will use UV disinfection, and will be regularly maintained.</td>
<td>Not significant</td>
</tr>
<tr>
<td>Impact on quality from emissions</td>
<td>While the acid mine drainage potential of the</td>
<td>Not significant</td>
</tr>
</tbody>
</table>

203
<table>
<thead>
<tr>
<th>Matter</th>
<th>Risk assessed</th>
<th>Residual significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>quality from acid mine drainage</td>
<td>proposed Riley mine site is considered extremely low, the measures will be undertaken to reduce the potential for acid mine drainage development, and assist in managing any AMD that may be formed. Water collected in the sediment basins will be monitored for pH and AMD precursors.</td>
<td></td>
</tr>
</tbody>
</table>

### Impact on creek systems

| Direct impact on creek habitat | Sediment loss to creeks could result in loss of habitat, displacement of aquatic animals and impact on fish gills and respiration. The use of temporary settlement basins and silt fencing during construction and permanent settlement basins and water recycling will ensure that there is no sediment loss to creeks. | Not significant |

### Impact on *Micrantheum serpentinum*

| Direct impact | While some *Micrantheum serpentinum* plants will be disturbed by the proposed activity, the core area of the *Micrantheum serpentinum* population in this area, on the slope of Serpentine Ridge within the DNI community, lies outside the proposed development footprint, except for a very small area along the western boundary of the infrastructure. The number of *Micrantheum serpentinum* plants that will be affected by the proposed mining activity would represent only a very minor proportion of the total Serpine Ridge population, and would certainly not affect the capacity of this population to continue. While the proposed mining activity will directly impact some plants, the mine will not affect the capacity of the local Serpentine Ridge population to continue nor will it affect wider populations or the status of this species. | Not significant |
| Indirect impact | *Micrantheum serpentinum* occupies a small area in total, approximately 50 ha, and is therefore at risk of stochastic disturbances, for example two wildfires in quick succession. A Fire Management Plan will be implemented to reduce the risk of fire resulting from the mining activities. The proposed mining activities will themselves will not impact the local or wider population of *Micrantheum serpentinum*. | Not significant |

### Spotted-tailed quoll

<p>| Den loss due to vegetation clearing | There is a potential impact on quolls from vegetation clearing if any maternal dens are present and occupied and clearing occurs during the denning season. However, preclearance surveys will take place immediately before each stage of clearing to identify any maternal dens currently in use by quoll. A temporary 50 metre buffer will be established around any such dens during the clearing operations. Only after the den has been confirmed to be vacated will the vegetation clearing be completed. New denning opportunities will be created by constructing windrows of cleared vegetation piles. Materials for the creation of the windrows will be | Not significant |</p>
<table>
<thead>
<tr>
<th>Matter</th>
<th>Risk assessed</th>
<th>Residual significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadkill</td>
<td>sourced from the forest materials cleared for the mining and will include large trees placed specifically to create suitable denning hollows and to create good fauna shelter.</td>
<td>Not significant</td>
</tr>
<tr>
<td>Tasmanian devils</td>
<td></td>
<td>Not significant</td>
</tr>
<tr>
<td>Den loss due to vegetation clearing</td>
<td>There is a potential impact on devils from vegetation clearing if any maternal dens are present and occupied and clearing occurs during the denning season. However, preclearance surveys will take place immediately before each stage of clearing to identify any maternal dens currently in use by devils. A temporary 50 metre buffer will be established around any such dens during the clearing operations. Only after the den has been confirmed to be vacated will the vegetation clearing be completed. New denning opportunities will be created by constructing windrows of cleared vegetation piles. Materials for the creation of the windrows will be sourced from the forest materials cleared for the mining and will include large trees placed specifically to create suitable denning hollows and to create good fauna shelter.</td>
<td>Not significant</td>
</tr>
<tr>
<td>Roadkill</td>
<td>A road kill minimisation strategy will be implemented for the Tasmanian devil, including the provision of workers transport (bus) to and from the site, reducing traffic speed, improving visibility by use of driving lights, acoustically alerting animals, discouraging animals from scavenging and educating staff and contractors.</td>
<td>Not significant</td>
</tr>
</tbody>
</table>
10. Conclusions

This Development Proposal and Environmental Management Plan (DPEMP) has been developed in accordance with the EPA Division’s generic DPEMP guidelines and the site specific guidelines from the Board of the Tasmanian Environment Protection Authority issued on 8 October 2012, titled: Development Proposal and Environmental Management Plan Project Specific Guidelines for Venture Minerals Limited Riley’s Creek Hematite DSO Mine, off Pieman Road, West Coast, Tasmania.

The DPEMP has identified and assessed the potential impacts associated with the proposed project.

The specific commitments contained in the DPEMP demonstrate that appropriate operational and management measures will be in place to minimise any potential impacts and to minimise any risks to the environment and human health. With these measures in place, there are no significant risks of significant residual environmental impacts.

The DPEMP demonstrates that the proposal will be compliant with applicable Commonwealth and Tasmanian policies, legislation and regulations.