Decommissioning & Rehabilitation Plan for the Riley Mine Project

Prepared for: Venture Minerals Limited

Date: March 2013
Rev 04
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Date: 15 March 2013

Reviewed by: Dr Ian Woodward  
Date: 15 March 2013

Authorised by: Dr Ian Woodward  
Date: 15 March 2013

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<th>Description</th>
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<td>00</td>
<td>Decommissioning &amp; Rehabilitation Plan for the Riley Mine Project</td>
<td>Dr David Oldmeadow</td>
<td>Dr David Oldmeadow</td>
<td>Dr Ian Woodward</td>
<td>05/10/12</td>
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<td>Decommissioning &amp; Rehabilitation Plan for the Riley Mine Project</td>
<td>Dr David Oldmeadow</td>
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<td>02</td>
<td>Decommissioning &amp; Rehabilitation Plan for the Riley Mine Project</td>
<td>Dr David Oldmeadow</td>
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<td>Dr Ian Woodward</td>
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<td>Dr Ian Woodward</td>
<td>Dr Ian Woodward</td>
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1. Introduction

A Decommissioning and Rehabilitation Plan (DRP) is necessarily a dynamic plan which changes with the project as it progresses, as ongoing rehabilitation is completed and as any new rehabilitation needs arise.

At this stage the DRP will cover two main areas: the infrastructure area, encompassing the mine offices and ore processing and stockpiling areas, and the resource mining areas, A, B, C and D.

This DRP will form the basis for providing management plans, including but not limited to those for rehabilitation, infrastructure removal, weeds, vegetation and Phytophthora cinnamomi, and surface and groundwater. At mine closure, each management plan will have clear commitments, which will be reported annually to the EPA.

The DRP may change over time if the requirements and expectations of the regulators, key stakeholders and interested parties change or if the project changes over time.

It will be reviewed at the same time as the EMP review to ensure that it is always current and reflects the expectations of all parties and is to the mutual satisfaction of all parties.

The DRP will be used by Venture Minerals Limited to guide its preparations for eventual closure of Riley DSO Hematite Mine.

The DRP has been prepared in accordance with the following documents:

- The booklet Best Practice Mine Decommissioning, one of the booklets in the Best Practice Environmental Management in Mining Series published by Environment Australia
- Decommissioning and Rehabilitation Plan (DRP) - a guide line for the Tasmanian Mining Industry, version 1, May 2006.
- The plan has been prepared in consultation with the specialist rehabilitation firm Land Management Rehabilitation Services Pty Ltd and Forestry Tasmania.

1.1 Objectives of Decommissioning and Rehabilitation Plan

Key objectives

The key objectives of the decommissioning and rehabilitation plan are to:

- Protect the environment and public health and safety by using safe and responsible closure practices
- Reduce or eliminate environmental effects once the mine ceases operations
- Establish conditions which are consistent with the pre-determined end land use objectives
- Reduce the need for long-term monitoring and maintenance by establishing effective physical stability of disturbed areas; and
- Comply with State legislative and policy requirements and public expectations.

---

1 Tim Duckett pers. comm., Feb 2013
2 Ian Brumby (Assistant District Forest Manager Murchison District) pers. comm., Feb 2013
Other objectives:

Compliance with legislative and regulatory requirements
- Identify the legal requirements in consultation with the relevant regulatory authorities.

Physical stability
- Identify any potential areas of mine instability so that risks can be identified and managed according to future land use.

Biological stability
- Ensure that sufficient mine site rehabilitation is undertaken to facilitate the long-term re-establishment of native flora across the site and re-introduction of fauna
- Improve physical and chemical conditions of the site to augment the succession and establishment of self-sustaining native vegetation communities.

Public expectations and site amenity potential
- Undertake a formal ongoing public consultation process.

Aboriginal cultural heritage values
- Identify and consult with relevant organisations
- Ensure the preservation and enhancement of identified Aboriginal cultural heritage values.

Heritage Values
- Identify and consult with relevant organisations
- Ensure the preservation and enhancement of identified site heritage values.

Aesthetics of the site
- Maintain the existing aesthetic appeal of the site, both in the immediate area and the wider area, after mine closure.

2. Policies, Permits, Standards and Legislation

2.1 Key Statutes and Regulations

The Legislation applicable to any current or future activity on the site includes the following:
- Mineral Resources Development Act 1995 (MRDA)
- Environmental Management and Pollution Control Act 1994 (EMPCA)
- Water Management Act 1999
- Workplace Health and Safety Act 1995 (WHSA)
- Threatened Species Protection Act 1995 (TSPA)
- Environment Protection and Biodiversity Conservation Act 1999 (EPBC)
- Weed Management Act 1999
- Land Use Planning and Approvals Act 1993 (LUPAA)
- Forest Practices Act 1985
- Forestry Act 1920
- Aboriginal Relics Act 1975

The Regulatory instruments applying to the site include:
- The State Policy on Water Quality Management 1997
- The Workplace Health and Safety Regulations 1998

2.2 Responsible Authority

The responsible authority for each of the individual key statutes and their roles in the decommissioning and rehabilitation of the Riley DSO Hematite Mine are summarised in Table 1.

<table>
<thead>
<tr>
<th>Legislation</th>
<th>Responsible Authority</th>
<th>Roles relevant to the DRP</th>
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<tbody>
<tr>
<td>Mineral Resources Development Act 1995 (MRDA)</td>
<td>Mineral Resources Tasmania</td>
<td>• Allocation of mineral exploration and mining leases</td>
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<td>• Crown custodian of minerals</td>
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<td></td>
<td></td>
<td>• Oversight and approval of mine site rehabilitation</td>
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<td>• Control of bonds for rehabilitation</td>
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<td>• Mining heritage</td>
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<td></td>
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<td>• Final approval for relinquishment of leases</td>
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<tr>
<td>Environmental Management and Pollution Control Act 1994 (EMPCA)</td>
<td>EPA, the Director of the Environment Protection Authority</td>
<td>• Environmental management &amp; environmental conditions on permit Approval of Closure Plans</td>
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<td></td>
<td></td>
<td>• Approval of Decommissioning and Rehabilitation Plans</td>
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<td></td>
<td>• Regulatory authority for environmental impact.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Oversight and approval of mine site rehabilitation</td>
</tr>
<tr>
<td>State Policy on Water Quality Management</td>
<td>EPA, the Director of the Environment Protection Authority and the local Councils</td>
<td>Protected Environmental Values (PEVs) and Water Quality Objectives (WQOs)</td>
</tr>
<tr>
<td>Land Use Planning and Approvals Act 1993 (LUPAA)</td>
<td>West Coast Council</td>
<td>Approval for any activity proposed for the site, if and as required by the West Coast Planning Scheme 2002</td>
</tr>
<tr>
<td>Water Management Act 1999</td>
<td>Department of Primary Industries, Parks, Water and the</td>
<td>Water allocation, use and environmental flows</td>
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</tbody>
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### Legislation

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<tr>
<th>Legislation</th>
<th>Responsible Authority</th>
<th>Roles relevant to the DRP</th>
</tr>
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<tbody>
<tr>
<td><strong>Threatened Species Protection Act 1995</strong></td>
<td>Department of Primary Industries, Parks, Water and the Environment (DPIPWE)</td>
<td>Approval for any impact on species listed under the Act</td>
</tr>
<tr>
<td><strong>Environment Protection and Biodiversity Conservation Act 1999 (EPBC)</strong></td>
<td>Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC)</td>
<td>Approval for any impact on species listed under the Act</td>
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<tr>
<td><strong>Weed Management Act 1999</strong></td>
<td>Department of Primary Industries and Water (DPIPWE)</td>
<td>Weed management</td>
</tr>
<tr>
<td><strong>Workplace Health and Safety Act 1995 (WHSA)</strong></td>
<td>Workplace Standards Tasmania</td>
<td>Occupational health and safety for all rehabilitation operations</td>
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<tr>
<td><strong>Forestry Act 1920 Forest Practices Act 1985</strong></td>
<td>Forestry Tasmania</td>
<td>Management of State Forests, Land use on mine closure</td>
</tr>
<tr>
<td><strong>Aboriginal Relics Act 1975</strong></td>
<td>Department of Primary Industries, Parks, Water and the Environment (DPIPWE)</td>
<td>Management of Aboriginal cultural heritage issues</td>
</tr>
<tr>
<td><strong>Historic Cultural Heritage Act 1995</strong></td>
<td>Department of Primary Industries, Parks, Water and the Environment (DPIPWE)</td>
<td>Management of historic cultural heritage issues</td>
</tr>
</tbody>
</table>

### 2.3 Key Regulatory Instruments

#### 2.3.1 Municipality of West Coast Planning Scheme

Any proposed activity on the land will require planning approval in accordance with the Municipality of West Coast Planning Scheme (*West Coast Planning Scheme, 2002*) and LUPAA.

#### 2.3.2 Workplace Health and Safety

The DRP will be implemented in accordance with health and safety regulations.

#### 2.3.3 Exploration Licence EL45/2010

The DRP for the proposed operation in part of EL45/2010 will be implemented in consultation with the EPA, Mineral Resources Tasmania and Forestry Tasmania.
2.3.4 Mining Lease

An application for a mining lease over part of EL45/2010 under the Mineral Resources Development Act 1995 has been made to Mineral Resources Tasmania.

2.3.5 Land Use Planning Permit

The primary legislative instrument for the development and implementation of the DRP will be the land use planning permit issued by West Coast Council. This permit will include any environmental conditions placed on the proposed operation by the EPA. The DRP, including any modifications, will address the relevant requirements of this land use planning permit.

2.3.6 State Policy on Water Quality Management 1997

The aim of the State Policy on Water Quality Management 1997 (State Water Policy) is to maintain or enhance the quality of Tasmanian surface waters. The principal objectives of the Policy are:

- Move on from reliance on ‘end of pipe’ controls to take into consideration the number of discharges into a given water body, or the sensitivity or current condition of the water body
- Ensure that diffuse source and point source pollution does not endanger the achievement of water quality objectives, and that pollutants discharged to waterways are reduced as much as possible by the use of best practice environmental management
- Facilitate and promote integrated catchment management
- Focus on overall water quality management strategies by identifying those water quality values and uses that are considered worthy of protection.

This DRP aims to achieve compliance with the State Water Policy.

Protected Environmental Values (PEVs)

The Riley DSO Hematite Mine will be developed and operated to ensure that the PEVs are not compromised.

For the establishment of 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); and
- 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.

3. Stakeholder Consultation Process

The objective of stakeholder consultation is to enable all stakeholders to have their interests considered during the mine closure process, and to help define the future use of the mine site.

The stakeholder consultation process is based on the following five principles:

- **Identification** of stakeholders and interested parties is an important part of the closure process
- **Effective consultation** is an inclusive process, which encompasses all parties and should occur throughout the life of the mine
- A **targeted communication strategy** should reflect the needs of the stakeholder groups and interested parties
- **Adequate resources** should be allocated to ensure the effectiveness of the consultation process
- Wherever practical, **work with communities** to manage the potential impacts of mine closure.

3.1 Stakeholder Identification

Stakeholders have been identified as all those parties, whether companies, organizations or individuals, with the potential to be affected by, and or have an interest in, the operation of the mine, and hence the decommissioning and rehabilitation of the mine.

Key stakeholders were identified by:
- Consulting with known State and local government organisations; and
- Using professional knowledge of persons or organisations known to have an interest.
Key stakeholders so far identified include:

- **Municipal councils and organisations**
  - West Coast Council
  - Waratah-Wynyard Council
  - Burnie City Council
  - Tullah Progress Association
  - Cradle Coast Authority

- **State and Federal Members of Parliament**
  - State Government Departments
  - 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**
  - Hydro Tasmania
  - Transend
  - Tasrail
  - Tasports
  - Forestry Tasmania

- **Other mining companies**
  - Savage River
  - Rosebery
  - Shree Minerals
  - Bass Metals
  - Tasmanian Magnetite

- **Other organisations**
  - Save the Devil Program.

The identification of other interested parties and stakeholders will be further developed in the future by:

- Consulting with known community groups and non-government organisations; and
- Undertaking public consultation.
4. The Riley project

4.1 Mining Method

The Riley iron ore resource is a surface deposit of pisolithic 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 deposits are recognised. They are, from west to east then north, Areas A, B, C and D as shown in Figure 1. For a discussion of the transects shown on the figure, see the DPEMP.

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.

Figure 2 shows the location of the mine relative to Riley Creek and the surrounding catchment.

The area will be mined in 25 metre wide panels along the length of the resource in each area, using an excavator and trucks. As mining progresses along the panel, clearing of vegetation and topsoil will commence in the next panel. Stripped vegetation and topsoil will be windrowed separately.

Vegetation and topsoil will be spread across recently mined out areas (where contouring and ripping has occurred and fines from the screening process have been returned). Any large timber debris will be smashed and also spread across the recently mined area, providing habitat creation, browsing protection and erosion control.

The nature of the surficial deposit means that the maximum depth of excavation is expected to be 3 to 4 metres, so there will be no conventional open pit mine and associated benching. No blasting will be required.

The ore will be crushed and screened on site then transported off-site for sale to others for processing.

There will be no waste rock or overburden dump associated with the mine. Material not suitable for shipping will be transported back and placed in the mined out areas prior to being covered with vegetation and top soil.

As there will be no ore processing on site, there will be no tailings or need for a tailings dam, and hence no requirements for process water. However, water will be required for wet screening if this is used.
Figure 1: Riley mine layout
Figure 2: Surrounding catchment area
4.2 Planning

The proposed mine is situated 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, and lies within the Environmental Protection Zone of the West Coast Planning Scheme. The forest reserve is a dedicated formal reserve, approximately 1007 ha in area. Trinder Creek forms the northern boundary of the reserve.

Land parcel LPI JTN35 is located within the Natural Resources Zone of the West Coast Planning Scheme.

No land disturbance will be undertaken on Land parcel LPI GFZ63. 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.

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, hydroelectricity 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, requiring a permitted development application (subject to full compliance with the relevant acceptable solutions or performance criteria). 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.

4.3 Surface Water

The Riley DSO Hematite Mine project area straddles four surface drainage subcatchments (see Figure 1 and Figure 2):

- Trinder-Fowler Creeks, Class 2 stream (250 ha catchment above Three Mile Creek junction, draining into Lake Pieman)
- Riley Creek, Class 3 stream (100 ha catchment, draining into Lake Pieman)
- Three Mile Creek, Class 3 stream (60 ha catchment, draining into Lake Pieman)
- Sweeney-Gold Creeks, Class 3 stream (60 ha catchment above Pieman Road, draining into Huskisson River system).

A preliminary estimate of the annual discharge (for decile 9 rainfall) from the four subcatchments is approximately 4600 ML, with approximately 4000 ML draining into Lake Pieman (Trinder-Fowler Creeks, Riley Creek and Three mile Creek) and 600 ML draining into the Huskisson River system (Sweeney-Gold Creeks).

It is likely that the four creek systems, at least part thereof, are ephemeral in nature, with periods of no flow occurring during dry summer months.
Estimated peak flows for an assumed maximum rainfall event of 75 mm in one day range from 300 to 1,300 L/s.

A surface water quality monitoring program has been established at the following 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.

A full 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 (CO₃ and HCO₃), acidity
- Chloride, sulphate, ammonia, nitrate, nitrite, total N, dissolved P and total P
- Total heavy metals.

The water quality report is presented in Appendix G of the DPEMP.

The surface waters were slightly alkaline (average pH 7.6), very low salinity (average EC 203 µS/cm) waters of the magnesium bicarbonate type[^1]. 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 were elevated relative to surface waters in the wider district, reflecting the presence of soils derived from ultramafic bedrock.

### 4.4 Groundwater

A groundwater monitoring program has been established at the mine site, with boreholes at the following locations:

- **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.

A groundwater monitoring run has been completed, undertaken on 2 May 2012.

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 (RYWB02 and RYWB04). RYWB04 also had anomalously high sulphate content, suggesting that sources of sulphate (or sulphides) may be present. The outlining nature of this sample also suggests that RYWB04 may access a different aquifer to the other three bore holes, one which has limited association with surface waters.

All the bore holes within the lateritic area are located on or near interfluves on relatively high ground. The watertable in May 2012 was relatively close to the surface in bore holes RYWB01 and RYWB02, but deeper in bore hole RYWB04, located on the low saddle separating east and west flowing surface streams.

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.

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.

### 4.5 Acid Mine Drainage Potential

To determine the potential for acid and metalliferous drainage at the Riley DSO Hematite Mine site, 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 (submitted to ALS Environmental in Brisbane testing), representing all lithologies present in the deposit; lateritic gravel, cemented laterite, clay and serpentinite.

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.

All of the serpentinite samples are free of sulphur. The majority (14 samples) fall into the LAC (likely to be acid consuming) category, with the remaining 6 classified as unlikely to be acid generating, classified as NAF.

All ore samples (lateritic gravel and cemented laterite) were low NAPP, and classified as UAG (unlikely to be acid generating).

The clay samples have low total sulphur content, average 0.07% (<0.19% maximum), with no visible sulphides encountered during logging of the test pits. Only one of the 17 samples tested shows a very low potential to be acid generating, the remaining samples classified as UAG (unlikely to be acid generating).

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

### 4.6 Flora

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.

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The full North Barker Ecosystem Services report\(^5\) is provided in Appendix I of the DPEMP.

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 vegetation community type over the mine site and area of disturbance is shown in Table 2.

<table>
<thead>
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<th>Table 2: Vegetation community and area of disturbance</th>
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<tr>
<td><strong>Activity &amp; infrastructure</strong></td>
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<td>Mining resource area A</td>
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<td>Infrastructure area</td>
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Species diversity across the mine site is generally low.

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:

- Along the mine access road;
- Within the infrastructure area; and

• On the north western edge of resource area A, near Three Mile Creek.

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

Two declared weed species were recorded on the site or nearby, 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.

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

Symptomatic evidence of *Phytophthora cinnamomi* was observed within a buttongrass moorland community to the north east of the proposed mine site area. The mine site is marginal in terms of the potential establishment of *Phytophthora*, both in terms of conducive conditions and vegetation susceptibility.

Symptoms of myrtle wilt (*Chalara australis*) were not seen on the proposed mine site.

### 4.7 Fauna

A fauna habitat assessment of the proposed mining area was undertaken in late October early November in 2011 by North Barker Ecosystem Services⁶. A helicopter search was undertaken on the 16th February 2012 targeting edge-tailed eagle nests. A survey for selected threatened fauna over some of the proposed mine site was also completed in October 2011 by Nick Mooney⁷.

The reports provided by Nick Mooney and North Barker Ecosystem Services are provided in Appendix I of the DPEMP.

There are two listed fauna species for which the habitat at the mine site could be considered relevant. These are the Tasmanian devil and the spotted-tailed quoll.

**Tasmanian devil**

The proposed mine site is potential foraging habitat for Tasmanian devils, as evidenced by recent scats found at four locations over the mine site.

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; however, these were considered low quality denning/lay-up habitat.

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Any devil den opportunities lost through the vegetation clearing will be replaced by the creation of compensatory new opportunities.

Like all devil populations, the local devils will be vulnerable to population loss due to Devil Facial Tumour Disease (DFTD). The location of the proposed mine site in the northwest is one of the only remaining regions supporting high densities of Tasmanian devil where DFTD has not yet been detected.\textsuperscript{8}

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) which is some 25 km east of the proposed mine site.\textsuperscript{9}

**Spotted-tailed quoll**

Although 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, it is highly likely to be present.

Indeed, the proposed Riley mine site is likely to be part of a home range for this species, albeit outside of the core range. 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.

Any quoll den opportunities lost through the vegetation clearing will be replaced by the creation of compensatory new opportunities.

**Wedge-tailed eagle**

While there was no evidence of wedge-tailed eagle nests over the mine site, one nest site has been recorded within 5 km, approximately 2.5 km to the west of the proposed mine site, on the western shore of Lake Pieman.

The proposed Riley mine site contains marginal habitat for nesting, with potential old growth trees that may offer some suitability for nesting.

The mine site is likely to be used for foraging.

### 4.8 Aboriginal Heritage

An Aboriginal heritage survey and assessment of the proposed Riley mine site was undertaken by Cultural Heritage Management Australia\textsuperscript{10}.

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 survey led to the identification of one Aboriginal heritage site, identified is an isolated artefact located on the south western edge of the study area, outside the

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\textsuperscript{8} Department of Primary Industries, Parks, Water and Environment, 2010, *Recovery Plan for the Tasmanian devil (Sarcophilus harrisii)*. Department
\textsuperscript{9} Nick Mooney pers. comm.
mine disturbance area. The site is assessed as being of low-moderate archaeological significance.

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

### 4.9 Historic Heritage

Austral Tasmania undertook a desk top assessment of historic heritage of the proposed Riley mine site in March 2012, with two field surveys of the proposed mine site undertaken in March 2012 and April 2012, to record and assess sites of potential heritage significance.

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 mine site.

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

A number of heritage findings in relation to the former Wilson River osmiridium field were identified including the following:

- 54 sites or features relating to historic alluvial osmiridium mining from the former Wilson River osmiridium field were identified
- 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; and
- 33 sites or features were found that are indicative of exploration works carried out in the 1980s, such as costeans and test pits.

Two aspects of the history of the Wilson River osmiridium field are noteworthy:

- As 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.

In general, the mine site has some representative value for its ability to demonstrate small-scale alluvial osmiridium production from the early twentieth century. 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.

The area therefore has some limited research potential as one of the less important osmiridium fields in Tasmania.

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5. **Environmental Management Strategies**

The main areas of the Riley mine site for decommissioning and rehabilitation can be grouped as following:

- The infrastructure area located in the north of the mine site; and
- The resource areas referred to as area A, B, C and D.

The wider infrastructure area comprises the following:

- Offices, car park and ablutions
- Laydown area
- Workshop and hydrocarbon storage area
- Re-fuelling facilities
- Ore stockpile area
- Portable dryer (if dry screening is used)
- Wet screener (if wet screening is used)
- Crushing and screening circuit
- Water tanks (potable and non-potable)
- ROM pad (high grade ore and low grade ore); and
- Cut off drains and sediment basin.

The resource areas and mining method are briefly described in section 4.1 (and in more detail in the DPEMP).

Decommissioning of the infrastructure area is described in section 6.1.

Rehabilitation of the infrastructure area and resource areas A, B, C and D will follow the same guiding principles, which are:

- Rehabilitate land disturbed by operations in accordance with appropriate post-mining land uses;
- Consult relevant stakeholders and develop a closure plan that clearly defines the post-closure land use;
- Where appropriate, rehabilitate progressively over the life of the operation.
- Monitor success criteria agreed with relevant stakeholders;
- Use appropriate technologies/methods to reduce environmental impacts and improve site rehabilitation techniques;
- Develop designs for appropriate landforms for the mine site that will behave and evolve in a predictable manner, according to the design principles established;
- Establish appropriate sustainable ecosystems; and
- Manage and, where appropriate, rehabilitate historical disturbances to an appropriate standard.

5.1 **Land Use**

The mine sites is situated on two land parcels managed by Forestry Tasmania: PID 2531948 (LPI JTN35); and LPI GFZ63.
All mining and related activities will be restricted to Land parcel LPI JTN35, wholly located within the Natural Resources Zone of the West Coast Planning Scheme.

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.

A small area on the western side of Three Mile Creek, outside the bounds of the proposed mining area, 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).

On closure of the mine, the land will be returned to Forestry Tasmania.

Rehabilitation of the mine site will be finalised in consultation with Forestry Tasmania.

It is expected to take the form of native forest regeneration, with the establishment of communities similar to those that currently exist.

The general approach to native forest regeneration is described in section 6.

5.2 Final Land Form

Landform design for rehabilitation generally requires a holistic view of mining operations, where each operational stage and each component of the mine is part of a plan which considers the full life cycle of a mine.

The Riley mine has a proposed life of 2 years, and is relatively simple in terms of operational stages and components. It does not have a tailings dam or rock dump, and as the resource is a surface deposit with depth of only 3 to 4 metres, the mining method does not involve a conventional open cut pit or mining by digging a shaft. The resource will be easily won from the surface by using an excavator.

There will be very little alteration to the landform through the mining of the surficial resource. As the proposed mine varies in altitude from approximately 140 metres above sea level to 260 metres above sea level, a variation of 120 metres, the removal of the top 3 to 4 metres will have little effect on the overall topography of the site.

No open pits, rock dumps, dams or shafts will be created.

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.

A minimum width of 15 m buffer strips will be implemented for both Riley and Three Mile Creeks. Trinder Creek will have a minimum 30 m buffer.

The Forest Practices Code and Quarry Code of Practice, both recommend 20 m protection zone for class 3 streams. However, both of these are generic documents and the buffers they recommend are generic buffers.
The proposed buffers at the Riley mine have been determined from a specific field geomorphological analysis of the site, described in the DPEMP.

At Riley, creeks run through the ore body itself and arguably all that resource could be extracted without any buffers being left. However, buffers are nevertheless proposed for erosion control purposes and with a view to the post-mining stability of the land surface so as to leave stable watercourses and to avoid stream perching.

The buffers have a different basis and purpose to the generic buffers of the referenced guidelines.

Detailed erosion management prescriptions are described in detail in the DPEMP (pages 30 to 34). Measures to control the final landform are also described (page 35).

These site specific details and consequential 15 m buffer widths for Riley and Three Mile Creeks take precedence over the generic buffer widths of the Practices Code and Quarry Code of Practice.

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

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.

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 4).
Figure 3: Ponded area in upper Riley catchment where water intersects the surface (due to thick vegetation it is difficult to take fully representative photographs)

Figure 4: Schematic of creek re-grading on mine closure

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\(^{12}\)) and a mined depth of 2 m, the maximum length of channel that could be regraded is approximately 65 m (‘Regraded section of creek’ shown in Figure 4). 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.

\(^{12}\) Conservation of Freshwater Ecosystem Values database, Water Assessment Branch, DPIPWE
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 of the DPEMP provides an overview of the historic heritage and mining history of the area).

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.

The following measures will be undertaken to ensure perching of the creek 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 channel 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. 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.

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.

5.3 Resource Sterilisation

The DSO Hematite resource is a surficial deposit, largely restricted to topographic highs. It is underlain by ferruginous clay to a depth of up to 17 m beneath the surface. The clays commonly grade down into greenish and cream coloured clays and ultimately the ultramafic serpentinite basement.

Resource sterilisation will not be an issue. The lateritic deposits will be mined to depth, approximately 3 to 4 metres. There will be no conventional open pit or shaft, and no overburden or underground water ingress that may result in resource sterilisation.

5.4 Hydrology

Mining will be undertaken to ensure that ponding of water does not occur on closure and that the creek systems within the Riley DSO Hematite mine site do not become perched.

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 would potentially lead to channel avulsion.

The mining of the resource to depth at the topographic low points in the creek catchments could result in the ponding of water. This has the potential to alter the local hydrology during operation. Groundwater ingress is also expected at the topographic low points.

If the morphology of the creeks systems was not appropriately managed, ponding of water could become a permanent feature in the headwaters of Riley Creek and Gold Creek.

The hydrology of the creek systems as a whole, however, will not be substantially altered, as ponded water will be discharged to the creek systems downstream via sediment basins during mining. On closure the natural course of the creek system will be re-established.

6. Environmental Management Plans

Environmental management plans will be developed in accordance with the management strategies, decommissioning and rehabilitation objectives, and information from monitoring and background studies.

The stakeholder consultation process, described in section 3, will inform the preparation of management plans, and enable stakeholders to have their interests considered during the mine closure process.
Consultation has only been partially completed at this stage, and is ongoing.

This document is a living document, which will be updated during the life of the mine.

The following issues have been identified for rehabilitation:

- Vegetation windrows
- Stockpiling of topsoil
- Erosion
- Revegetation
- Weeds and *Phytophthora cinnamomi*
- Establishment of suitable denning opportunities for Tasmanian devil and spotted-tailed quoll
- Contouring and ripping
- Water management.

**Vegetation windrows**

The vegetation and topsoil in the footprint of the infrastructure area will be removed and windrowed during the construction phase. Vegetation and topsoil will be stockpiled separately.

The vegetation will be stripped from the surface and stockpiled on the lower side of any disturbance as a windrow.

Up to 150 mm of topsoil will then be stripped and windrowed immediately on the inside of the previously stripped vegetation. Soil and vegetation stockpiles will not be mixed.

During operation of the mine, the resource areas will be progressively rehabilitated as each 25 metre panel is mined.

Following extraction, the final landform surface will be contoured, ripped, fines returned and topsoil respread prior to the smashing and track rolling of windrowed vegetation. This vegetation will be used for habitat creation, browsing protection and erosion control of the final panel mined in each resource area.

Vegetation cleared from each subsequent 25 metre panel will be used to cover recently mined out panels, following contouring, ripping of the final landform surface and respreading of topsoil, and hence will not be windrowed.

**Stockpiling of topsoil**

As stated above, topsoil will stripped and windrowed separately.

Topsoil typically contains an important seed load as well as a range of micro-organisms that can improve plant growth and stabilise soils.

The stockpiles will be constructed to minimise deterioration of seed loads, nutrients and soil biota, by avoiding topsoil collection when saturated (this will promote composting), and by creating stockpiles of lower height (one to three metres). The duration of stockpiling will also be kept to minimum, with rehabilitation of the infrastructure site undertaken where and when possible.

Seeding of the stockpile with a native nitrogen-fixing species will be considered in order to assist in erosion control and reduce the loss of beneficial soil micro-organisms.
**Erosion**

Erosion prevention measures will be implemented during the operation of the mine. These are described in section 4.3 of the DPEMP.

The infrastructure drainage system used for during operation of the mine will be removed and in filled as part of the rehabilitation process, to ensure natural drainage patterns are maintained.

The following erosion prevention measures will be employed during the mine decommissioning and rehabilitation period:

- No clearance or major site removal works will be undertaken during high rainfall conditions that may present an unacceptable risk of sediment loss to the environment.
- Rehabilitation of the infrastructure area will be undertaken progressively where possible, and where not possible it will be undertaken as soon as possible on mine closure.
- Where appropriate, silt fences will be established along recently rehabilitated sections where there is a risk of erosion and sediment loss to the environment.
- The sediment basin in Sweeney Creek will be maintained during the infrastructure site decommissioning period.
- Bank side vegetation will be maintained where possible along Sweeney Creek channel in the infrastructure site during mining operations. This will help to act as a buffer during the infrastructure site decommissioning and rehabilitation phase. The bank side vegetation and channel will only be disturbed in two places where infrastructure site roads cross the creek channel.
- A vegetated zone will be maintained between all creek channels and resource areas during mining operations. This will help to act as a buffer during the rehabilitation of the mined out areas.
- A rehabilitation monitoring program will be established to monitor vegetation growth and identify potential erosion problems.
- The fines returned from the wet screening process will be spread across the contoured and ripped surface prior to respreading topsoil and smashed vegetation to minimise erosion of fines.
- Prior to return, the fines will be thickened by dewatering to 65% moisture content and the clay fraction will be flocculated. The bulk of the fines will be between 0.1 and 1 mm; clays (<0.1 mm) will only be a small faction and will be in flocculated granules interspersed amongst the coarse grains. The fines will have the consistency and properties of coarse sand, and will be readily manageable. They will be able to stand in high angles of repose, in the order of 45°.

**Revegetation**

Rehabilitation and future land use of the site will be finalised in consultation with Forestry Tasmania.

It is expected that the site will be returned to native forest, with a species composition consistent with current vegetation communities.

As the soil profile will be significantly disturbed, the most appropriate vegetation community will be based on those local primary colonisers that will establish readily and will encourage (protect) a succession toward the original forested community.
The colonisers will include the following:

- *Acacia dealbata*
- *Acacia mucronata*
- *Acacia verticillata*
- *Leptospermum scoparium*
- *Leptospermum lanigerum*
- *Melaleuca squarrosa*
- *Melaleuca squamea*
- *Oxylobium ellipticum*
- *Eucalyptus nitida* (including a small proportion of production Eucalyptus such as E. Delegatensis and E. obliqua)

The local provenance seed will be applied by hand and nutrients will be applied to account for nutrient loss during disturbance and during the periods of stockpiling. The nutrients will be applied based on analysis.

Forestry Tasmania will collect seeds from the area prior to harvesting. These will be stored and supplemented with seeds of local providence if required.

The application of seeding will be discussed in consultation with Forestry Tasmania.

Based on Forestry Tasmania experience\(^{13}\), the understorey species should revegetate successfully from seed stored in the soil and branches that will be re-spread over the area. It will be important that there are enough areas of clear soil that do not have a dense cover of vegetation material to allow the eucalypts to germinate and grow. Increasing the amount of seed sown per hectare will increase the chance of successful eucalypt regeneration. If monitoring reveals that eucalypts have not regenerated from seed, then eucalypt seedlings would be planted.

Browsing monitoring and control may be needed to ensure the eucalypts get established. However, the use of slash cover rather than mulch should provide an effective barrier to browsing animals\(^{14}\), negating the need for more active control measures.

It is expected some level of natural growth will establish through the use of vegetation and respreading topsoil and previously stripped vegetation as part of the progressive rehabilitation strategy.

It is recognised that in places where the resource is removed to a clay base, a different vegetation community will likely establish to what current exists in the area. The species and seeding requirements will be determined in consultation with Forestry Tasmania.

Monitoring will be undertaken to measure the success of vegetation establishment and the revegetation process. A monitoring program will be developed to address revegetation success, weed colonisation and landform stability. The following measures will be included:

- Annual inspection in late Spring to identify any further remedial measures to be implemented
- A photographic folio with GPS points will be established
- An estimate of vegetation coverage combined with the photographic folio is expected to be sufficient to determine revegetation success.

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\(^{13}\) Ian Brumby (Assistant District Forest Manager Murchison District) pers. comm., Feb 2013

\(^{14}\) Tim Duckett pers. comm. Feb 2013
Plant density is not necessarily a good indicator for rehabilitation success, as success can vary based on community type and as a forested community establishes, the density can decrease in time following competition.\(^1\)

**Weeds and Phytophthora cinnamomi**

The spread of weeds and diseases such as *Phytophthora cinnamomi* is highly undesirable.

Active weed and disease management measures have already been implemented at the proposed Riley DSO Hematite mine site during the exploration phase, and will continue during the operation of the mine, as described in section 4.9.4 of the Riley DSO Hematite mine DPEMP.

The following measures will be implemented during the decommissioning and rehabilitation of the mine:

- Appropriate hygiene protocols, including washdown procedures, will be maintained on the site during the decommissioning and rehabilitation of the mine.
- These protocols, which will be consistent with the recommendations of the DPIWE Biodiversity Conservation Branch report: Rudman T (2005). *Interim Phytophthora cinnamomi Management Guidelines*. Nature Conservation Report 05/7, Biodiversity Conservation Branch, Department of Primary Industries, Water and Environment, Hobart.
- *Phytophthora cinnamomi*, Myrtle wilt, English broom and Spanish heath signs and symptoms will form part of all 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.
- Inclusion of weed and *Phytophthora cinnamomi* management as a key component of the revegetation program.
- Implementation of the weed and *Phytophthora cinnamomi* management plan. This plan will be developed consistent with the wider community weed management plans and requirements of the Weed Management Act 1999.

Myrtle wilt should not be an issue for the decommissioning and rehabilitation phase of the Riley mine project, as any risk of the spread of Myrtle wilt will occur during the vegetation clearance prior to construction. Measures to mitigate against myrtle wilt are covered in the Construction Environmental Management Plan (CEMP).

**Establishment of suitable denning opportunities for Tasmanian devil and spotted-tailed quoll**

The decommissioning and rehabilitation phase will:

- Establish denning and refugia opportunities for Tasmanian devils and Spotted-tailed quolls; and
- Monitoring devil and quolls using camera traps.

The creation of new denning opportunities for devils and quolls will achieve at least the quantum and quality of the pre-existing natural opportunities identified during the pre-clearance surveys.

Denning and shelter opportunities for quolls and devils will be created by the establishment of windrows (piles of soil, green timber and other vegetation).

The design and establishment of windrows will be coordinated by a suitably qualified person.

As a general guide, at a well-drained site 3 m 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.

Materials for the creation of windrows will be sourced from the forest materials cleared. The amount of material required will be guided by the occurrence of dens during pre-clearance surveys.

Monitoring of the effectiveness any dens created will be undertaken using camera traps.

These stations will comprise an infrared camera designed specifically for the detection of wildlife.

Information from the camera stations will used to monitor occurrences of devils and quolls 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).

**Contouring and ripping**

The final landform will be constructed to match the natural terrain while also limiting rapid run-off and subsequent erosion. Diversion structures will be considered such as contour embankment and diversion mounds in order to reduce run-off.

Ripping will assist to ‘key in’ the topsoil and reduce the likelihood of it being lost through erosion, and may assist in the preparation of seed beds.

Where mechanical scarification is used:
- care will be taken so that scarification does not result in unacceptable erosion;
- compaction, rutting or mixing of the soil;
- streamside vegetation will be protected; and
- scarification will only be done in dry weather.

**Water management**

There will be no conventional open pits, shafts, water storage dams or tailings dams.

There are hence no issues of long term stability and safety requirements associated with any dams, pits, shafts or water storage facilities. The following aspects of water management of the mine will need to be considered during decommissioning and rehabilitation:
- Sediment basins
- Sweeney Creek diversion
- Infrastructure drainage features
- Infrastructure site creek crossings
- Creek perching; and
- Ponding on site.

**Sediment basins**
All sediment basins will be retained during the decommissioning and rehabilitation phases.

On completion of this phase, the on line sediment basin will be removed and the creek channel restored, and all off line sediment basins will be in filled.

**Sweeney Creek diversion**
The upper most parts of Sweeney Creek will be diverted around the mine infrastructure site.

On closure, after the decommissioning of the infrastructure site, the natural course of the creek system will be re-established.

**Infrastructure drainage features**
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 infrastructure site. This will ensure the natural drainage patterns are returned on mine closure.

All scour protection, pipelines and culverts associated with infrastructure site drainage system will be removed prior to in-filling.

**Infrastructure site creek crossings**
All culverts associated with infrastructure site roads will be removed as a part of infrastructure site road rehabilitation.

Where roads will be retained, see below, any associated culverts will also be retained.

**Creek perching on site**
Mining will be undertaken to ensure the creek systems within the Riley DSO Hematite mine site do not become perched.

**Ponding of water on site**
The local topography and creek systems will managed to ensure no permanent ponding of water will occur on closure of the mine site.

Surface water quality and groundwater monitoring will continue on closure (see section 0).

**Other site issues**

**Historic Heritage**
Consultation will be undertaken with Forestry Tasmania and relevant organisations, for example the West Coast Pioneers Memorial Museum, to determine what opportunities exist to present and interpret the history and heritage of mining on the Wilson River Osmiridium field for the public benefit on closure of the mine.

**Aboriginal Heritage**
Consultation will be undertaken with Forestry Tasmania and Aboriginal Heritage, DPIPWE, to determine if there are any issues that need to the considered during the decommissioning and rehabilitation of the mine for the preservation and protection of the identified Aboriginal heritage site.
6.1 Infrastructure Decommissioning

Ongoing consultation with key stakeholders, MRT, the EPA and the community will be required for future DRP reviews.

The preliminary DRP elements for the infrastructure area are:

- Decommissioning of crushing and screening plant (and drier if dry screening is used)
- Clean-out of water tanks (potable and non-potable) and removal
- Sale of cleaned equipment
- Demolition/removal of buildings and structures
- Recycle reusable waste
- Disposal of intractable wastes
- Decontamination of site (potential workshop and hydrocarbon storage area and re-fuelling area)
- Remediation
- Validation
- Erosion mitigation
- Site physical stability
- Post closure monitoring and maintenance
- Completion and regulatory sign off.

Removal of the following elements will be considered in the decommissioning process:

- Offices, car park and ablutions;
- Hard stand and foundations;
- Laydown area;
- Workshop and hydrocarbon storage area;
- Re-fuelling facilities;
- Ore stockpile area;
- Drying, crushing and screening circuit;
- Water tanks (potable and non-potable);
- ROM pad (high grade ore and low grade ore); and
- Cut off drains and sediment basin.

On closure, the infrastructure site will be returned to Forestry Tasmania.

Rehabilitation and future land use of the site will be finalised in consultation with Forestry Tasmania. It is expected, however, that the site will be returned to native forest.
6.1.1 Infrastructure Decommissioning Options

The options available with regard to the infrastructure area:

a) Do nothing, leaving all infrastructure where it is on mine closure: this is not considered to be an acceptable solution
b) Remove and dispose of all hazardous material
c) Selectively remove infrastructure
d) Remove all infrastructure
e) Make safe and stable.

The preferred options are b), d) and e):
- Remove and dispose of all hazardous material
- Remove all infrastructure
- Ensure the safety and stability of the site.

Following closure of the mine:
- The crushing and screening plant (and drier, if dry screening is used) may operate until all stockpiled ore material is processed.
- All foundations and structures associated with the crushing and screening plant, offices, and buildings will be removed, unless there is adequate reason to retain them for future use/asset.

In order to adequately assess options for the drying, crushing and screening plant and other equipment, the following investigations are required:
- Consultation with key stakeholders and interested parties to identify future uses
- A survey that identifies equipment that is to be
  - Retained for future community benefit
  - Recycled
  - Sold
  - Otherwise disposed of to appropriate standards
- A contaminated site assessment of the infrastructure area completed in accordance with Australian Standard AS 4482.1-2005 Guide to the investigation and sampling of sites with potentially contaminated soil.

6.1.2 Roads

Riley mine will use the existing road and track network to access the resource and for ore haulage between the mining areas and the infrastructure site.

A small road network, however, will be established within the infrastructure area

The options available with regard to the infrastructure road network are:
- Do nothing, leaving the road network
- Remove and rehabilitate the road areas; and
- Make safe and stable and maintain road network, or part thereof, for maintenance.

It will not be necessary to maintain any infrastructure road network for service requirements or maintenance beyond the closure of the mine.
On closure, the site will be returned to Forestry Tasmania. The future use of the road network, or part thereof, will be finalised in consultation with Forestry Tasmania. It is expected that all roads within the infrastructure area will be rehabilitated and returned to native forest.

Removal of roads will be the final aspect of mine closure and will only be undertaken if no future uses for the roads have been identified at that time or as part of the consultative process.

If the road has to be removed the following procedure will be followed as required:

- Remove road base
- Scarify all compacted soil areas to promote natural vegetation regrowth within the roadway
- Remove any supplementary drainage features such as culverts and drainage pipes
- Re-profile and compact to create a final landform with sustainable grades and no pooled areas, as close as possible to the original topography and/or consistent with the surrounding area
- Topsoil and revegetate as required to meeting relevant stakeholder requirements and be consistent with the surrounding areas.

### 6.2 Infrastructure Area Rehabilitation

During construction of the infrastructure site, progressive rehabilitation of any areas of land not necessary for the operation of the mine will be undertaken.

This includes any building material storage and temporary equipment storage areas, and any temporary construction demountable buildings or sheds.

On mine closure the infrastructure site will be returned to Forestry Tasmania.

Rehabilitation and future land use of the infrastructure site will be finalised in consultation with Forestry Tasmania.

It is expected that the infrastructure site will be returned to native forest, with a species composition consistent with current vegetation communities.

Seeds are likely to be collected from the area prior to the harvesting that will precede mine development. These would be stored and supplemented with seeds of local providence if required.

The application of seeding will be discussed in consultation with Forestry Tasmania, including options such as nursery establishment.

Monitoring will be undertaken to measure the success of vegetation establishment and the revegetation process.

The extent and scope of final rehabilitation/closure works will be more clearly defined closer to the end of the operation phase of the mine. This is because there are a number of factors that may influence final closure requirements and timing. While unlikely, these may include:

- Contamination issues being identified on site
- Additional rehabilitation expectations from government agencies and the community
- Changes to land zoning and potential future land uses
- Final land use, timing and staging of closure
- Changes to the legislative framework surrounding closure and rehabilitation; and
- Any additional projects that may occur on the site in future.

**Rehabilitation of Sweeney Creek**

The vegetation along the banks and channel of Sweeney Creek will be retained along the majority of its length through the infrastructure area to reduce disturbance to the system and the need to rehabilitate.

It is likely that the creek channel will only be disturbed at two locations, where infrastructure site roads cross the channel. The crossing structures, such as culverts, will be removed during the decommissioning and rehabilitation phase and the channel banks re-established.

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 that the natural drainage patterns are returned on mine closure.

The temporary diversion of Sweeney Creek will be removed and the flow in the Sweeney Creek channel restored only after the Sweeney Creek channel through the infrastructure site has been rehabilitated.

### 6.3 Rehabilitation of Mine Resource Areas

Rehabilitation of the resource areas will be undertaken progressively, as described in the DPEMP.

All mined out areas will be rehabilitated on mine closure.

Rehabilitation and future land use of the site will be finalised in consultation with Forestry Tasmania.

It is expected that the site will be returned to native forest. It is recognised, however, that the resource may be removed to the clay base layer. Under such conditions a different vegetation community to what currently exists in the area is likely to establish.

This may differ from that of the infrastructure area, where the main soil base can be retained.

The species and seeding requirements in the resource area will be determined in consultation with Forestry Tasmania.

Seeds are likely to be collected from the area prior to the harvesting that will precede mine development.

The application of seeding will be discussed in consultation with Forestry Tasmania.

It is expected some level of natural growth will establish through the respreading of topsoil and previously stripped vegetation as part of the progressive rehabilitation strategy.

Monitoring will be undertaken to measure the success of vegetation establishment and the revegetation process.
7. Monitoring and Reporting

Monitoring will continue post-closure until disturbed areas have stabilised and achieved a permanent vegetation cover.

Revegetation

Vegetation establishment, regrowth and erosion problems will be monitored across all rehabilitated areas, with a monitoring program to include:

- Annual inspection in late Spring to identify any further remedial measures to be implemented
- A photographic folio with GPS points will be established
- An estimate of coverage combined with the photographic folio is expected to sufficient to determine revegetation success.

Plant density is not necessarily a good indicator for rehabilitation success, as success can vary based on community type, and as a forested community establishes, the density can decrease in time following competition\(^\text{16}\).

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:

- RYGW1: 368532E 5378761N: in the Sweeney Creek catchment
- RYGW2: 367708E 5377096N: along the watershed divide between Riley Creek and Three Mile Creek
- RYGW3: 367706E 5377096N: along the watershed divide between Riley Creek and Three Mile Creek
- RYGW4: 368283E 5377671N: at the head of the watershed divide between Riley Creek and Trinder Creek
- RYGW5: 367380E 5376828N: downstream end of the watershed divide between Riley Creek and Trinder Creek.

\(^{16}\) Pers. comm. Tim Duckett, Feb 2013.
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$_2$ 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. In addition, 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 Riley 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 monitoring of the effectiveness of the establishment of suitable denning habitat for Tasmanian devils and spotted-tailed quolls. These stations will comprise an infrared camera designed specifically for the detection of wildlife.

The following monitoring of denning habitat 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.

Records will be maintained of roadkill removed from Pieman Road and from within the mine site.

8. **Timetable**

Key rehabilitation steps are shown in Table 3.

**Table 3: Anticipated timing of key rehabilitation steps**

<table>
<thead>
<tr>
<th>Step</th>
<th>Anticipated timing</th>
<th>Approximate months since mining commencement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commencement of mining area rehabilitation</td>
<td>Following vegetation removal from second panel - vegetation will be laid over the mined-out first panel</td>
<td>2</td>
</tr>
<tr>
<td>Ongoing mining area rehabilitation</td>
<td>Following removal of each successive panel’s vegetation - vegetation will be laid over the mined-out previous panel</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Completion of mining area rehabilitation</td>
<td>Following completion of mining of the last panel - windrowed vegetation from the first panel will be laid over the mined-out last panel</td>
<td>24</td>
</tr>
<tr>
<td>Commencement of removal of infrastructure</td>
<td>Following completion of mining (approximately 2-3 years after commencement) and exhaustion of the ROM stockpile.</td>
<td>26</td>
</tr>
<tr>
<td>Commencement of infrastructure area rehabilitation</td>
<td>Following removal of infrastructure</td>
<td>28</td>
</tr>
<tr>
<td>Completion of infrastructure area rehabilitation</td>
<td>All infrastructure removed and haul roads ripped</td>
<td>32</td>
</tr>
<tr>
<td>Completion of post-rehabilitation monitoring</td>
<td>Post-closure monitoring for at least 2 years and until confirmation of revegetation success.</td>
<td>56</td>
</tr>
</tbody>
</table>