



**Hy-Tec Industries Pty Limited**

ABN: 90 070 100 702

# **Austen Quarry**

## **Landscape and Rehabilitation Management Plan**

August 2019

*Prepared by:*



**R.W. CORKERY & CO. PTY. LIMITED**



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ABN: 90 070 100 702

## Austen Quarry

# Landscape and Rehabilitation Management Plan

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## LIST OF ACRONYMS

ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AUSRIVAS	Australian River Assessment Scheme
BOA	Biodiversity Offset Area
BOMP	Biodiversity Offset Management Plan
BOS	Biodiversity Offset Strategy
DPIE	Department of Planning, Industry & Environment (NSW)
EIS	Environmental Impact Statement
EMSP	Environmental Management Strategy and Plan
EPL	Environment Protection Licence
LEP	Local Environmental Plan
LLS	Local Land Services
NCTA	National Conservation Trust Agreement
OEH	Office of Environment and Heritage (NSW)
RFS	Rural Fire Service
RWC	R.W. Corkery & Co. Pty Limited
SLMGMP	Silver-leaved Mountain Gum Management plan
SSD	State Significant Development

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## 1. INTRODUCTION

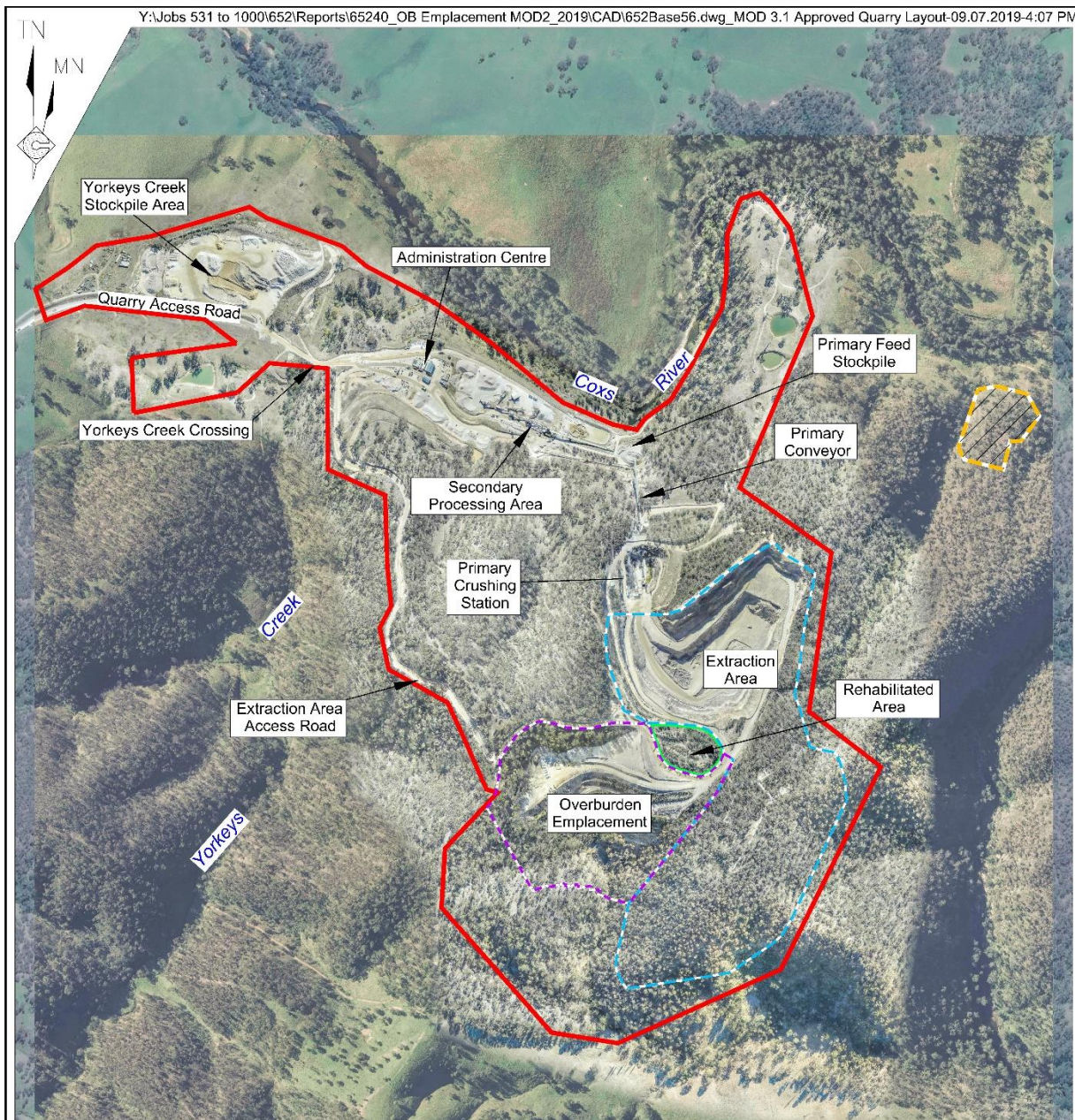
The Austen Quarry Landscape and Rehabilitation Management Plan (“the Plan”) has been prepared in satisfaction of *Condition 29* of Schedule 3 of Development Consent SSD 6084 (SSD-6084) and as an operational tool to assist in landscape management, rehabilitation and integration of a Biodiversity Offset Strategy (BOS) during the operation of the Austen Quarry (“the Quarry”). It will be used by Hy-Tec Industries Pty Limited (Hy-Tec) personnel as the first point of reference for landscape, rehabilitation and biodiversity management related issues.

This plan synthesises the recommendations made during the assessments undertaken for the Stage 2 development of the Quarry which was approved in July 2015 and a subsequent modification to SSD 6084 approved in August 2018. It is a practical guide for landscape, rehabilitation and biodiversity management of the Quarry Site.

The approved layout is displayed in **Figure 1**. The land within the approved site boundary is referred to as the Quarry Site. The construction and development of Stage 2 of the Quarry will involve an increase in depth and lateral extension of the extraction area along an adjacent southwest-northeast trending ridge and a lateral extension and elevation of the existing overburden emplacement. SSD 6084 was modified in August 2018 and in July 2019.

The management of rehabilitation and the landscape of the Quarry Site follows from commitments presented in the EIS (RWC, 2014) and SoEE (RWC,2018) to address impacts associated with visual impacts, local biodiversity and future land use. The management of biodiversity on and adjoining the Quarry Site follows from recommendations provided by a Biodiversity Impact Assessment prepared by Niche Environment and Heritage (Niche, 2014). A review of vegetation clearing and impact to native vegetation resulting from the Stage 2 Project was undertaken by Niche Environment and Heritage (2018) as a component of Modification 1 for SSD 6084.





Note: Some boundaries are coincident

- REFERENCE
- Quarry Site Boundary
  - - - Extraction Area Boundary
  - - - Overburden Emplacement Area Boundary
  - - - Rehabilitated Area (Offset for Clarity)
  - ▨▨▨▨ Conservation Area H

SCALE (A4)



Quarry Plan Source: Groundwork Plus - January 2019  
 Base Photograph Source: CEH Survey - May 2017 & Google Earth - October 2016 (surrounds)

Figure 1  
 APPROVED QUARRY SITE LAYOUT

The Stage 2 Project is a controlled activity under the Environmental Protection and Biodiversity Conservation (EPBC) Act 1999 due to impacts to the threatened Silver-leaved<sup>1</sup> Mountain Gum. As a result, approval was sought from the Federal Department of the Environment (now Department of the Environment and Energy) (DoEE) and was granted under EPBC 2013/6967 on 19 October

2015. Management of potential impacts to the threatened Silver-leaved Mountain Gum is required by both SSD 6084 and EPBC 2013/6967. Preparation of a specific *Silver-leaved Mountain Gum Management Plan* is a requirement of EPBC 2013/6967 to provide specific information on the management of this threatened species. The *Silver-leaved Mountain Gum Management Plan* forms an appendix to the Environmental Management Strategy (**Appendix O** of EMS) and is cross-referenced as required throughout this document. A Biodiversity Offset Management Plan (BOMP), required by *Condition 4* of EPBC 2013/6967 to provide for the establishment, management and monitoring of an offset for the Silver-leaved Mountain Gum, has also been prepared as a separate plan (**Appendix P** of EMS).

## 2. LEGISLATIVE REQUIREMENTS

### 2.1 DEVELOPMENT CONSENT SSD 6084

Landscape and rehabilitation management at the Quarry Site is guided by Conditions 25, and 27 to 32 of Schedule 3 of SSD 6084. More general requirements for the preparation of management plans are also provided by *Condition 2* of Schedule 5. **Table 1** identifies the landscape management and rehabilitation related conditional requirements and identifies where in the Plan individual requirements have been addressed.

**Table 1**  
**Landscape Management and Rehabilitation Related Approval Conditions Matrix of SSD-6084**

Page 1 of 5

Condition	Section															
<b>Schedule 3</b>																
Condition 25 – Biodiversity Credits Required Within 12 months of the approval of Modification 1, or other timeframe agreed by the Secretary, the Applicant must retire the biodiversity credits specified in Table 4A below.	7															
<b>Table 4A</b>																
<table border="1"> <thead> <tr> <th>Credit Type</th> <th>Offset Type</th> <th>Number of Credits</th> </tr> </thead> <tbody> <tr> <td>Ecosystem Credit</td> <td>PCT 1093 – Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion</td> <td>649</td> </tr> <tr> <td>Ecosystem Credit</td> <td>PCT 649 – Apple Box – Broad-leaved Peppermint dry open forest of the South Eastern Highlands Bioregion</td> <td>131</td> </tr> <tr> <td>Ecosystem Credit</td> <td>PCT 840 – Forest Red Gum – Yellow Box woodland of dry gorge slopes, southern Sydney Basin Bioregion and South-Eastern Highlands Bioregion</td> <td>60</td> </tr> <tr> <td>Species Credit</td> <td>Silver-leaved Mountain Gum (<i>Eucalyptus pulverulenta</i>)</td> <td>10,784</td> </tr> </tbody> </table>		Credit Type	Offset Type	Number of Credits	Ecosystem Credit	PCT 1093 – Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	649	Ecosystem Credit	PCT 649 – Apple Box – Broad-leaved Peppermint dry open forest of the South Eastern Highlands Bioregion	131	Ecosystem Credit	PCT 840 – Forest Red Gum – Yellow Box woodland of dry gorge slopes, southern Sydney Basin Bioregion and South-Eastern Highlands Bioregion	60	Species Credit	Silver-leaved Mountain Gum ( <i>Eucalyptus pulverulenta</i> )	10,784
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Species Credit	Silver-leaved Mountain Gum ( <i>Eucalyptus pulverulenta</i> )	10,784														

<sup>1</sup> *Eucalyptus pulverulenta* is referred to interchangeably within scientific documents, government policies and legislation as Silver-leaved / Silver-leafed Mountain Gum. The spelling of Silver-leaved Mountain Gum is used in the Plan.



**Table 1 (Cont'd)**  
**Landscape Management and Rehabilitation Related Approval Conditions Matrix of SSD-6084**

Page 2 of 5

Condition	Section												
<b>Schedule 3 (Cont'd)</b>													
<p>The retirement of the credits in Table 4A must be carried out in consultation with OEH and in accordance with the Biodiversity Offsets Scheme of the BC Act, to the satisfaction of the BCT</p> <p>Note: The credits in Table 4A were calculated in accordance with the Framework for Biodiversity Assessment of the NSW Biodiversity Offset Policy for Major Projects (OEH, 2014) and may need to be converted to reasonably equivalent 'biodiversity credits', within the meaning of the BC Act, to facilitate retirement.</p>													
<p>Condition 27 – Rehabilitation Objectives</p> <p>The Applicant shall rehabilitate the site to the satisfaction of the Secretary. This rehabilitation must be generally consistent with the rehabilitation strategy in the documents listed in condition 2 of Schedule 2 and the conceptual final landform in Appendix 4 and must comply with the objectives in Table 5.</p> <p><i>Table 5: Rehabilitation Objectives</i></p> <table border="1" data-bbox="153 770 1232 1151"> <thead> <tr> <th data-bbox="153 770 370 810">Feature</th> <th data-bbox="370 770 1232 810">Objective</th> </tr> </thead> <tbody> <tr> <td data-bbox="153 810 370 918">Site (as a whole)</td> <td data-bbox="370 810 1232 918"> <ul style="list-style-type: none"> <li>• Safe, stable and non-polluting.</li> <li>• Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimizing visual impacts when viewed from surrounding land.</li> </ul> </td> </tr> <tr> <td data-bbox="153 918 370 985">Surface Infrastructure</td> <td data-bbox="370 918 1232 985"> <ul style="list-style-type: none"> <li>• Decommissioned and removed, unless DRG agrees otherwise.</li> </ul> </td> </tr> <tr> <td data-bbox="153 985 370 1030">Quarry Benches</td> <td data-bbox="370 985 1232 1030"> <ul style="list-style-type: none"> <li>• Landscaped and vegetated using native tree and understorey species.</li> </ul> </td> </tr> <tr> <td data-bbox="153 1030 370 1075">Quarry Pit Floor</td> <td data-bbox="370 1030 1232 1075"> <ul style="list-style-type: none"> <li>• Landscaped and revegetated using native tree and understorey species.</li> </ul> </td> </tr> <tr> <td data-bbox="153 1075 370 1151">Final Void</td> <td data-bbox="370 1075 1232 1151"> <ul style="list-style-type: none"> <li>• Minimise the size, depth and slope of the batters of the final void.</li> <li>• Minimise the drainage catchment of the final void.</li> </ul> </td> </tr> </tbody> </table>	Feature	Objective	Site (as a whole)	<ul style="list-style-type: none"> <li>• Safe, stable and non-polluting.</li> <li>• Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimizing visual impacts when viewed from surrounding land.</li> </ul>	Surface Infrastructure	<ul style="list-style-type: none"> <li>• Decommissioned and removed, unless DRG agrees otherwise.</li> </ul>	Quarry Benches	<ul style="list-style-type: none"> <li>• Landscaped and vegetated using native tree and understorey species.</li> </ul>	Quarry Pit Floor	<ul style="list-style-type: none"> <li>• Landscaped and revegetated using native tree and understorey species.</li> </ul>	Final Void	<ul style="list-style-type: none"> <li>• Minimise the size, depth and slope of the batters of the final void.</li> <li>• Minimise the drainage catchment of the final void.</li> </ul>	3 and 8.5
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<p>Condition 28 – Progressive Rehabilitation</p> <p>The Applicant must rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim stabilisation measures must be implemented where reasonable and feasible to control dust emissions in disturbed areas that are not active and which are not ready for final rehabilitation.</p> <p><i>Note: It is accepted that parts of the site that are progressively rehabilitated may be subject to further disturbance in future.</i></p>	8.5 and 9.1												
<p>Condition 29 – Landscape and Rehabilitation Management Plan</p> <p>The Applicant must prepare and implement a Landscape and Rehabilitation Management Plan for the development to the satisfaction of the Secretary. This plan must:</p> <p>(a) be prepared in consultation with OEH and be submitted to the Secretary for approval at least 3 months prior to the commencement of quarrying operations under this consent, unless the Secretary agrees otherwise;</p> <p>(b) provide details of the conceptual final landform and associated land uses for the site;</p> <p>(c) describe how the implementation any land-based offset (including Conservation Area H, shown in Appendix 2) would be integrated with the overall rehabilitation of the site;</p> <p>(d) include detailed performance and completion criteria for evaluating the performance of any land-based offset and rehabilitation of the site, including triggers for any necessary remedial action;</p>	2.1 and 5 6 7.3 8 and 9												

**Table 1 (Cont'd)**  
**Landscape Management and Rehabilitation Related Approval Conditions Matrix of SSD-6084**

Page 3 of 5

Condition	Section
<b>Schedule 3 (Cont'd)</b>	
(e) describe the short, medium and long term measures that would be implemented to: <ul style="list-style-type: none"> <li>• manage remnant vegetation and habitat on site, including within the Biodiversity Offset Strategy area; and</li> <li>• ensure compliance with the rehabilitation objectives and progressive rehabilitation obligations in this consent;</li> </ul>	7, 8.6, 8.11 and App P <sup>2</sup>  8.5.2 and 9.1
(f) include a detailed description of the measures that would be implemented over the next 3 years (to be updated for each 3 year period following initial approval of the plan) including the procedures to be implemented for: <ul style="list-style-type: none"> <li>• maximising the salvage of environmental resources within the approved disturbance area, including tree hollows, vegetative and soil resources, for beneficial reuse in the enhancement of the offset area or site rehabilitation;</li> <li>• restoring and enhancing the quality of native vegetation and fauna habitat in the biodiversity and rehabilitation areas through assisted natural regeneration, targeted vegetation establishment and the introduction of fauna habitat features;</li> <li>• protect, conserve, propagate, plant and/or regenerate Silver-leaved Mountain Gum (<i>Eucalyptus pulverulenta</i>) (including the propagation and planting of at least 1,000 individuals of this species);</li> <li>• protecting vegetation and fauna habitat outside the approved disturbance area on-site;</li> <li>• minimising the impacts on native fauna, including undertaking pre-clearance surveys;</li> <li>• establishing vegetation screening to minimise the visual impacts of the site on surrounding receivers;</li> <li>• ensuring minimal environmental consequences for threatened species, populations and habitats;</li> <li>• collecting and propagating seed;</li> <li>• controlling weeds and feral pests;</li> <li>• controlling erosion;</li> <li>• controlling access; and</li> <li>• managing bushfire risk;</li> </ul>	   8.4  8.5 and 8.6  8.7, Apps O and P <sup>2</sup>  8.11  8.4.1.2  8.2.1.3  8.7 and App O <sup>2</sup>  8.4.1.3  8.8  8.9  8.3  8.10
(g) include a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria;	10
(h) identify the potential risks to the successful implementation of any land based offset, and include a description of the contingency measures that would be implemented to mitigate these risks; and	11
(i) include details of who would be responsible for monitoring, reviewing, and implementing the plan. The Applicant must implement the Landscape and Rehabilitation Management Plan as approved by the Secretary.	14 and 16

<sup>2</sup> Refers to Appendix of the EMSP.

**Table 1 (Cont'd)**  
**Landscape Management and Rehabilitation Related Approval Conditions Matrix of SSD-6084**

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Condition	Section
<b>Schedule 3 (Cont'd)</b>	
<p>Condition 30 – Conservation and Rehabilitation Bond</p> <p>Within 6 months of the approval of the Landscape Management Plan, the Applicant must lodge a Conservation and Rehabilitation Bond with the Department to ensure that any land based offset and rehabilitation of the site are implemented in accordance with the performance and completion criteria set out in the plan and relevant conditions of this consent. The sum of the bond must be determined by:</p> <ul style="list-style-type: none"> <li>(a) calculating the full cost of implementing any land based offset over the next 3 years;</li> <li>(b) calculating the cost of rehabilitating the site, taking into account the likely surface disturbance over the next 3 years of quarrying operations; and</li> <li>(c) employing a suitably qualified quantity surveyor or other expert to verify the calculated costs, to the satisfaction of the Secretary.</li> </ul> <p>Notes:</p> <ul style="list-style-type: none"> <li>• <i>Alternative funding arrangements for long term management of any land based offset, such as provision of capital and management funding as agreed by OEH as part of a Biobanking Agreement, or transfer to conservation reserve estate can be used to reduce the liability of the conservation and rehabilitation bond.</i></li> <li>• <i>If capital and other expenditure required by the Landscape Management Plan is largely complete, the Secretary may waive the requirement for lodgement of a bond in respect of the remaining expenditure.</i></li> <li>• <i>If any land based offset and rehabilitation of the site area are completed to the satisfaction of the Secretary, then the Secretary will release the bond. If any land based offset and rehabilitation of the site are not completed to the satisfaction of the Secretary, then the Secretary will call in all or part of the bond and arrange for the completion of the relevant works.</i></li> </ul>	<p>7.2.3 and 8.5.1.6</p>
<p>Condition 31</p> <p>Within 3 months of each Independent Environmental Audit (see condition 8 of Schedule 5), the Applicant must review, and if necessary, revise the sum of the Conservation and Rehabilitation Bond to the satisfaction of the Secretary. This review must consider the:</p> <ul style="list-style-type: none"> <li>(a) effects of inflation;</li> <li>(b) likely cost of implementing any land based offset and rehabilitating the site (taking into account the likely surface disturbance over the next 3 years of the development); and</li> <li>(c) performance of the implementation of any land based offset and rehabilitation of the site to date.</li> </ul>	<p>7.2.3 and 8.5.1.6</p>
<p>Condition 32 – Visual</p> <p>The Applicant must implement all reasonable and feasible measures to minimise the visual and off-site lighting impacts of the development to the satisfaction of the Secretary.</p>	<p>8.2.1</p>
<b>Schedule 5</b>	
<p>Condition 2 – Management Plan Requirements</p> <p>The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:</p> <ul style="list-style-type: none"> <li>a) a summary of relevant background or baseline data;</li> <li>b) a description of <ul style="list-style-type: none"> <li>• the relevant statutory requirements (including any relevant approval, licence or lease conditions);</li> <li>• any relevant limits or performance measures/criteria; and</li> <li>• the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;</li> </ul> </li> <li>c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</li> </ul>	<p>4</p> <p>3</p> <p>8</p> <p>9</p> <p>8</p>
<ul style="list-style-type: none"> <li>d) a program to monitor and report on the: <ul style="list-style-type: none"> <li>• impacts and environmental performance of the development; and</li> <li>• effectiveness of any management measures (see (c) above);</li> </ul> </li> </ul>	<p>10</p>



**Table 1 (Cont'd)**  
**Landscape Management and Rehabilitation Related Approval Conditions Matrix of SSD-6084**

Page 5 of 5

Condition	Section
<b>Schedule 5 (Cont'd)</b>	
<p>e) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;</p> <p>f) a program to investigate and implement ways to improve the environmental performance of the development over time;</p> <ul style="list-style-type: none"> <li>• a protocol for managing and reporting any:</li> <li>• incidents;</li> <li>• complaints;</li> <li>• non-compliances with statutory requirements; and</li> <li>• exceedances of the impact assessment criteria and/or performance criteria; and</li> </ul> <p>g) a protocol for periodic review of the plan.</p> <p><i>Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.</i></p>	<p>11</p> <p>12</p> <p>16</p>
<p>Condition 5 – Revisions of Strategies, Plans &amp; Programs</p> <p>Within 3 months of the submission of an:</p> <ul style="list-style-type: none"> <li>a) annual review under condition 4 above;</li> <li>b) incident report under condition 6 below;</li> <li>c) audit report under condition 8 below; and</li> <li>d) any modifications to this consent,</li> </ul> <p>the Applicant must review the strategies, plans and programs required under this consent, to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted for the approval of the Secretary.</p> <p><i>Note: The purpose of this condition is to ensure that strategies, plans and programs are regularly updated to incorporate any measures recommended to improve environmental performance of the development.</i></p>	<p>16</p>
<p>Condition 6 – Incident Reporting</p> <p>The Applicant must immediately notify the Secretary and any other relevant agencies of any incident. Within 7 days of the date of the incident, the Applicant must provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.</p>	<p>12</p>

## 2.2 STATEMENT OF COMMITMENTS

The final Statement of Commitments is included as *Appendix 3* of SSD-6084. Landscape management or rehabilitation related commitments have been identified in **Table 2**.

**Table 2**  
**Rehabilitation and Landscape Management Related Commitments of the Final Statement of Commitments**

Desired Outcome	Action	Section
The creation of a stable final landform, available for the proposed future use(s) of nature conservation and low intensity agriculture	3.1 Retain all soil and suitable cleared vegetation resources for use in rehabilitation of the final landform.	8.4.1
	3.2 Include <i>Eucalyptus pulverulenta</i> in the revegetation of the Stage 2 Site.	8.6.1, 8.7 and Apps O and P <sup>3</sup>
	3.3 Re-instate the pre-disturbance soil and land capability in the area used for the secondary processing area and Yorkeys Creek stockpile area.	8.4.1 and 8.5.1
Establish and manage a Biodiversity Offset Strategy	3.4 Mark and where appropriate fence, boundaries relevant to the Biodiversity Offset Area	7
Ensure sections of the Site with higher land capability are returned to agricultural use.	4.1 Provide for rehabilitation of the secondary processing area and Yorkeys Creek stockpile area back to agricultural land.	9

### 3. OBJECTIVES AND OUTCOMES

**Table 3** presents the objectives and outcomes with respect to landscape, rehabilitation and biodiversity management of the Quarry Site.

**Table 3**  
**Objectives and Outcomes**

Page 1 of 2

Objectives	Outcomes
<b>General</b>	
(a) To ensure compliance with the criteria of SSD-6084 and reasonable community expectations.	(i) Compliance with all relevant criteria and reasonable community expectations, as determined in consultation with the relevant government agencies.
(b) To implement appropriate landscape, rehabilitation and biodiversity management and mitigation measures during all stages of Quarry operation.	(ii) All identified management and mitigation measures implemented.
(c) To implement an appropriate monitoring program to demonstrate achievement of performance targets and criteria during all stages of Quarry operation.	(iii) All identified monitoring undertaken in accordance with the Plan.
(d) To implement an appropriate complaints handling and response protocol.	(iv) Complaints (if any) handled and responded to in an appropriate manner.
	(v) All complaints recorded and reported in accordance with annual reporting requirements.
(e) To implement appropriate corrective and preventative actions, if required.	(vi) Corrective and preventative actions implemented, if required.
(f) To implement an appropriate incident reporting program, if required.	(vii) Incidents (if any) reported in an appropriate manner.

<sup>3</sup> Refers to Appendices of the EMS.

**Table 3 (Cont'd)**  
**Objectives and Outcomes**

Page 2 of 2

Objectives	Outcomes
<b>Rehabilitation</b>	
(g) To minimise the areas of exposed surfaces that would otherwise be potential sources of windblown dust.	(viii) Interim stabilisation measures completed in accordance with an <i>Erosion and Sediment Control Plan</i> for the Quarry.
(h) To create a final landform that is safe, stable and non-polluting.	(ix) Performance criteria associated with all phases of rehabilitation achieved.
(i) To ensure that all surface infrastructure not required for approved post-Quarry land use is decommissioned and removed.	(x) Performance criteria associated with decommissioning phase of rehabilitation achieved.
(j) To minimise the size, depth, batter slope and drainage catchment of the final void.	(xi) Performance criteria associated with landform establishment phase of rehabilitation achieved.
(k) To conserve and maximise the use of soil resources.	(xii) Soil stockpiles established and managed in accordance with an <i>Erosion and Sediment Control Plan</i> for the Quarry. (xiii) Performance criteria associated with growth media development achieved.
(l) To produce a final landform that is integrated with surrounding natural landforms and minimises visual impacts when viewed from surrounding land.	(xiv) Performance criteria associated with landform establishment, growth media development and ecosystem and land use development phases of rehabilitation achieved.
(m) To establish vegetation over the final landform which incorporates native tree and understorey species.	(xv) Performance criteria associated with ecosystem and land use development and sustainability achieved.
(n) To integrate the rehabilitated landform with the Biodiversity Offset Area (BOA) and other local vegetation communities and land uses.	(xvi) Performance criteria associated with ecosystem and land use sustainability achieved. (xvii) Monitoring demonstrates no detrimental effects on local biodiversity.
<b>Landscape Management</b>	
(o) To minimise the visibility of extraction and overburden emplacement activities from surrounding properties, lookouts, roads and other vantage points.	(xviii) Plan and undertake Quarry extension to maximise natural screening of the extraction area by local topography and vegetation.
(p) To reduce the visibility of exposed areas of Quarry operations.	(xix) All identified visual mitigation measures implemented. (xx) Performance criteria for landscape management achieved.
(q) To provide landscaping within the Quarry Site which is sympathetic to surrounding landscape features.	(xxi) All identified landscaping is implemented and maintained. (xxii) Performance criteria for landscape management achieved.
<b>Biodiversity Offsetting</b>	
(r) To establish and secure a BOA.	(xxiii) BOA secured in accordance with the <i>Biodiversity Conservation Act 2016</i> .
(s) To maintain and where possible improve biodiversity values of the BOA.	(xxiv) Performance criteria associated with the BOA achieved.
(t) To improve the conservation security of the Silver-leaved Mountain Gum within the regions.	(xxv) Performance targets for establishment of Silver-leaved Mountain Gum in rehabilitation achieved. (xxvi) Performance criteria associated with the BOA achieved.
<b>Remnant Local Biodiversity</b>	
(u) To ensure no detrimental effects on local biodiversity as a consequence of the Quarry.	(xxvii) Monitoring illustrates no negative trends in results.

## 4. EXISTING BIODIVERSITY VALUES

### 4.1 LOCAL SETTING

The Austen Quarry is situated within the Bathurst sub-region of the South-eastern Highlands Bioregion (IBRA 7, Commonwealth of Australia 2012), adjacent to the Cocks River to the west of the Blue Mountains. Land to the south, east and west of the Quarry Site consists mainly of wooded ridges and predominantly cleared valleys. Land to the north is predominantly gently undulating grazing land. The vegetation on and surrounding the Quarry Site forms part of a larger patch of adjacent remnant vegetation of at least 500ha. This native vegetation remnant is in moderate to good condition and is connected to vegetation within the Blue Mountains Wilderness area to the east and partially fragmented vegetation in the Little Hartley area to the north (see **Figure 2**).

Niche Environment and Heritage (Niche) undertook field survey of the Quarry Site to identify the biodiversity setting and features (Niche, 2014).

- The vegetated areas along the mid-upper slopes and ridges of the Quarry Site are in good condition with little evidence of significant past disturbance, except for some tracks and edge disturbances, timber harvesting and light grazing. Fire seems to have been largely excluded. A high level of resilience is apparent throughout most of these areas, which is demonstrated by the diversity of native herbs and ground cover, negligible weed cover and an unaltered soil profile.
- The vegetation occurring on the mid-lower slopes of the Quarry Site has been historically cleared and thinned and has led to decreased diversity of understorey and ground cover species. Whilst grazing has continued under management by the landowner, stocking rates are likely to be much lighter than in the past leading to improvements in habitat quality within this area.
- The vegetation and overall aquatic habitat of the Cocks River, which bounds the Quarry Site to the north and east, is in good condition and plays an important role within the region as a vegetated corridor promoting connectivity. This notwithstanding, minor impacts on the riparian vegetation associated with previous clearing, flooding and weed invasion are evident.
- Vegetation on the lower lying areas and gentle slopes have been impacted by clearing, resulting in a sparse canopy, mid and lower strata layers.

The typical climate of the area features warm summers with cool winters and steady precipitation year-round. Average maximum temperatures range from 10.4° to 25.5° from July to January respectively. Average annual rainfall is 861.8mm, falling relatively consistently throughout the year though summer is the wettest season and winter the driest.

Additional information on the biodiversity of the Quarry Site and BOA are presented in the following sections.



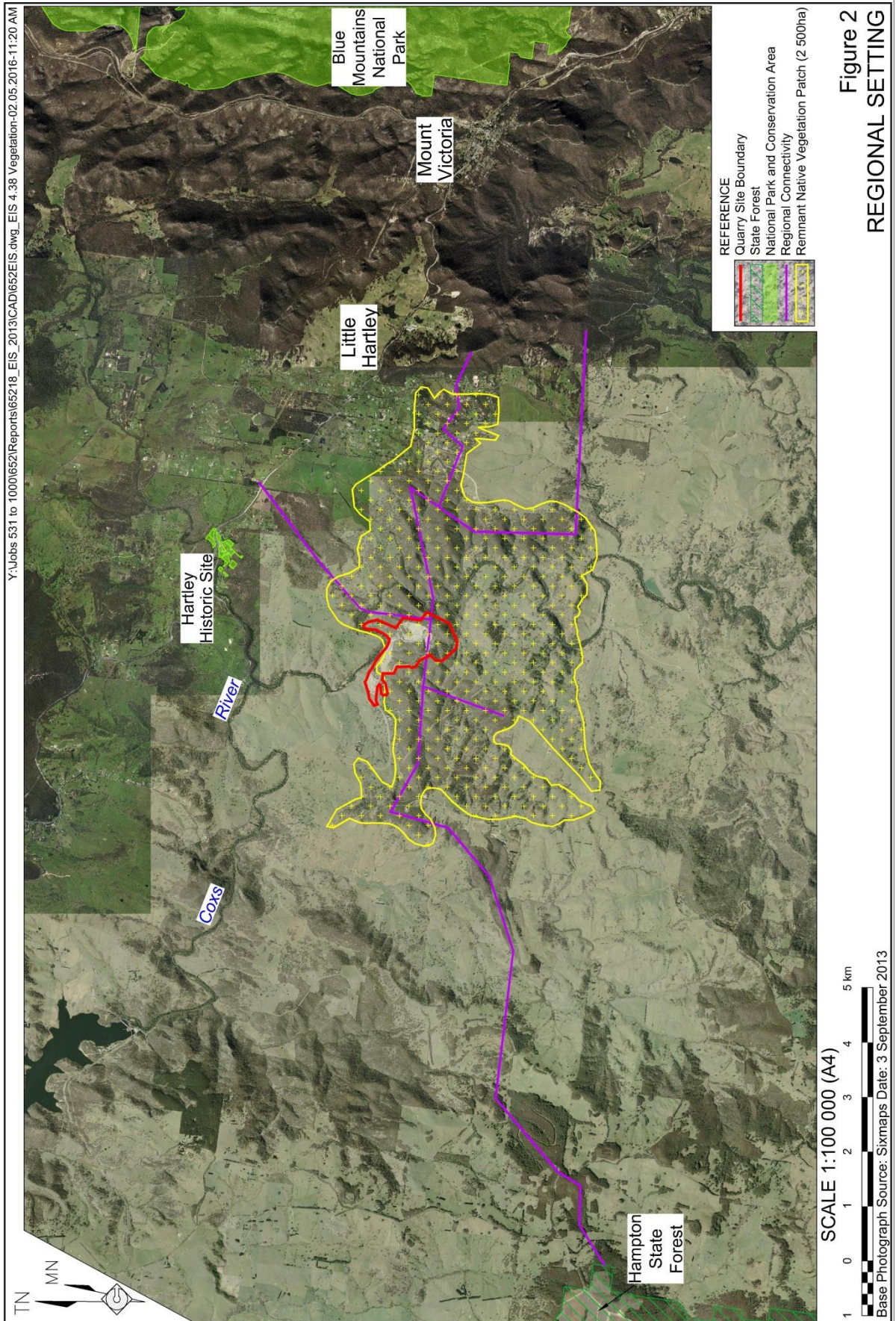


Figure 2  
REGIONAL SETTING

## 4.2 VEGETATION COMMUNITIES

Six vegetation communities (and two derived communities) have been mapped within the Quarry Site (see **Table 4**).

**Table 4**  
**Vegetation of the Quarry Site**

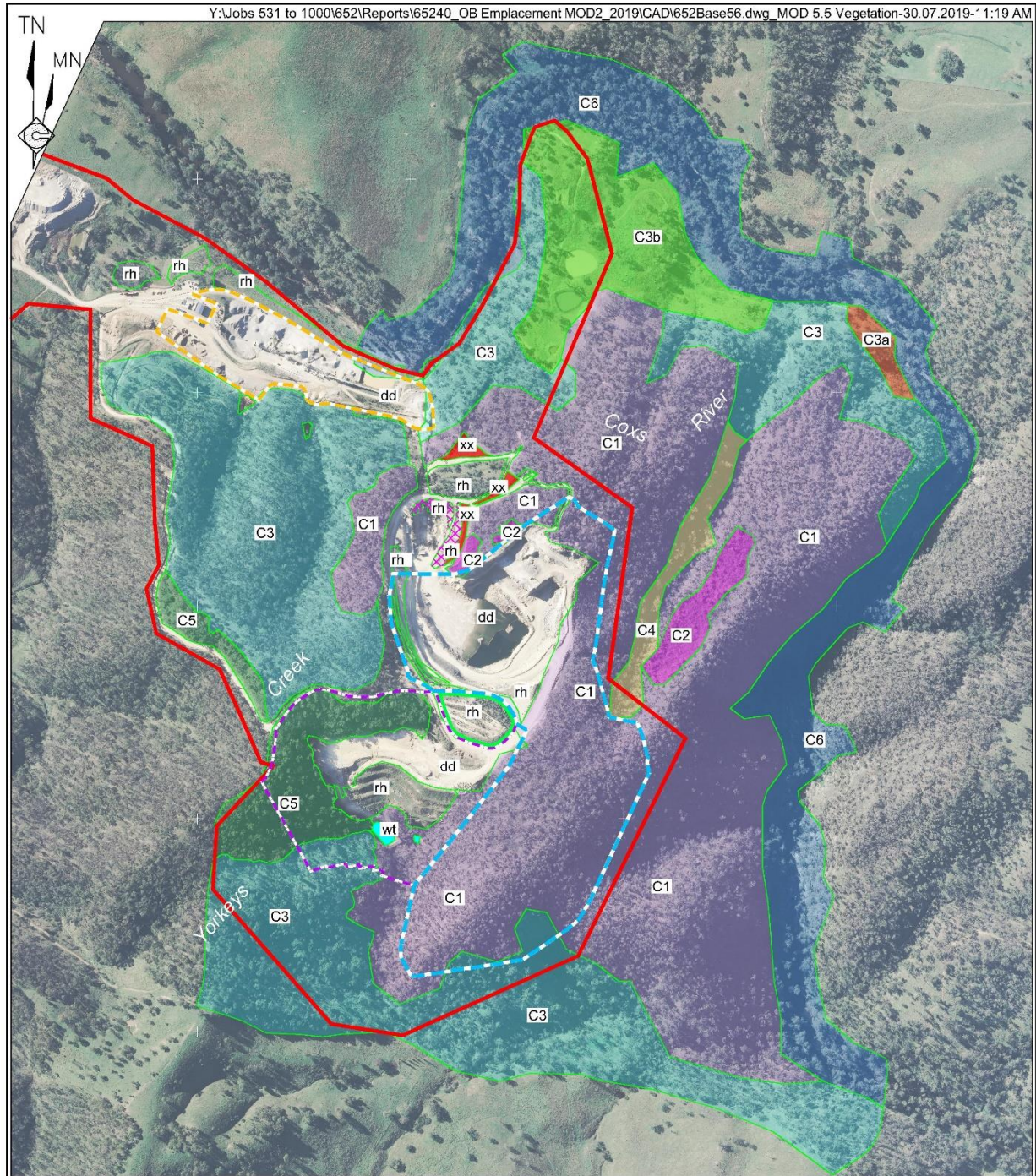
Vegetation Community	Revised Biometric Vegetation Type	Formation <sup>1</sup>	Class <sup>1</sup>	Conservation Status
C1: Brittle Gum – Broad-leaved Peppermint open forest	HN570 – Red Stringybark – Brittle Gum – Brittle Gum dry open forest of the tablelands, South Eastern Highlands.	Dry Sclerophyll Forests (Shrubby sub-formation).	Southern Tableland Dry Sclerophyll Forests.	Not an EEC.
C2: Silver-leafed Mountain Gum mallee woodland				Contains <i>Eucalyptus pulverulenta</i> (not an EEC).
C3: Forest Red Gum grassy open forest	HN527 – Forest Red Gum – Yellow Box woodland of dry gorge slopes, southern Sydney Basin and South Eastern Highlands.	Dry Sclerophyll Forests (Shrub/grass sub-formation).	Central Gorge Dry Sclerophyll Forests.	Not an EEC.
C4: Rough-barked Apple gully forest				Not an EEC.
C5: Stringybark – Apple Box open forest	HN501 – Apple Box – Broad-leaved Peppermint dry open forest of the Abercrombie – Tarlo area, South Eastern Highlands.	Grassy Woodlands.	Tableland Grassy Woodlands.	Not an EEC.
C6: River Oak riparian open forest	HN574 – River Oak open forest of major streams, Sydney Basin and South East Corner.	Forested Wetlands.	Eastern Riverine Forests.	Not an EEC.
Note 1:	after Keith (2004)			
Note 2:	Within Hawkesbury Nepean CMA Region			
Source:	Modified after Niche (2014) – Section 4.3.1			

The distribution of these communities on the Quarry Site is displayed on **Figure 3** and **Table 5** identifies the area of each to be disturbed by the Quarry.

**Table 5**  
**Vegetation of the Quarry Site to be Disturbed**

Vegetation Community	Survey Area (ha)	Impact Area	
		Direct (ha)	Indirect <sup>1</sup> (ha)
C1: Brittle Gum – Broad-leaved Peppermint open forest	64.9	18.1	1.4
C3: Forest Red Gum grassy open forest	28.0	1.9	0.6
C5: Stringybark - Apple Box open forest	5.2	4.2	0.5
<b>Total Native Vegetation</b>	<b>98.1</b>	<b>24.2</b>	<b>2.5</b>
Note 1:	Indirect impacts relate to those contained within 10m of nominated disturbance areas		
Source:	Modified after Niche (2018) – Table 1		





Notes 1: Some boundaries are coincident and are offset for clarity  
2: The final site boundary is subject to modification following consultation with landowner (Hartley Pastoral Corporation Pty Limited)

- REFERENCE**
- Quarry Site Boundary
  - - - Extraction Area Boundary
  - - - Overburden Emplacement Area Boundary
  - Rehabilitated Area (Offset for Clarity)
  - - - Secondary processing Area

**VEGETATION COMMUNITIES \***

C1	Brittle Gum - Broad-leaved Peppermint open forest (HN570)
C2	Silver-leaved Mountain Gum mallee woodland (HN570)
C3	Yellow Box - Forest Red Gum grassy open forest (HN527)
C3a	Yellow Box - Forest Red Gum native grassland (HN527)
C3b	Yellow Box - Forest Red Gum exotic grassland (HN527)
C4	Rough-barked Apple gully forest (HN527)
C5	Stringybark - Apple Box open forest (HN501)
C6	River Oak riparian open forest (HN574)
dd	Disturbed or Excavated
rh	Rehabilitation Area
wt	Pond
xx	Exotic Grassland

\* Biometric Vegetation Type of Hawkesbury - Nepean Catchment

SCALE 1:12 000 (A4)

200 0 200 400 600 m

Source: Niche (2014a) - Figure 8

**Figure 3  
VEGETATION COMMUNITIES  
OF THE QUARRY SITE**



### 4.3 FLORA SPECIES

A total of 214 species were recorded, including 41 weeds (19%) and one threatened flora species, Silver-leaved Mountain Gum (*Eucalyptus pulverulenta*). This species, listed as vulnerable on both the *Biodiversity Conservation Act 2016* (BC Act) and EPBC Act, is a common to dominant species within the vegetation communities of the Quarry Site. Niche (2018) estimated that 701 Silver-leaved Mountain Gum individuals are located within the proposed disturbance areas of the Quarry Site. Over the life of the Quarry, Hy-Tec has successfully established close to 1 500 Silver-leaved Mountain Gum through planting of tube stock as part of an ongoing commitment to the conservation of this species. Approximately 87% of the biodiversity offsetting obligations for the Silver-leaved Mountain Gum under the Stage 2 Project are a result of planting activities at the Quarry. Surveys in 2014 undertaken by Niche Environment and Heritage identified approximately 4 000 individuals in the Study Area for the surveys. This represents more than double the population of Silver-leaved Mountain Gum identified by Lembit (1994) since Quarry operations commenced.

### 4.4 WEEDS

Under the *Biosecurity Act 2015*, all plants are regulated with a general biosecurity duty to prevent, eliminate or minimise any biosecurity risk they may pose. The following weeds of national significance have been identified within the Quarry Site.

- *Rubus fruticosus* agg. spp. (Blackberry);
- *Nassella trichotoma* (Serrated tussock);

Regional recommended measures for both of these species direct the protection of conservation areas, natural environments and primary production lands that are free of them. Other species of weed that have been identified at the Quarry Site include the following.

- *Eragrostis curvula* (African lovegrass).
- *Conium maculatum* (Hemlock).
- *Onopordum* spp. (Scotch, Stemless, Illyrian and Taurian thistles).
- *Hypericum perforatum* (St. John's wort).
- *Rosa rubiginosa* (Sweet briar).

### 4.5 FAUNA

A total of 89 vertebrate fauna species (86 native and 3 introduced) have been observed within the Quarry Site (Niche, 2014). Niche (2014) suggests that a low diversity and abundance of arboreal and small ground dwelling mammals is attributable to the low density or seasonal variability of foraging resources. Since 1994, 12 threatened fauna species listed on the BC and/or EPBC Acts have been identified, or are considered likely to occur, on or adjoining the Quarry Site, namely:

- Gang-gang Cockatoo.
- Powerful Owl.
- Satin Flycatcher.
- Eastern Bentwing-bat.



- Scarlet Robin.
- Flame Robin.
- Hooded Robin.
- Varied Sittella.
- Large-eared Pied Bat.
- Eastern False Pipistrelle.
- Eastern Freetail-bat.
- Greater Broad-nosed Bat.

#### **4.6 FERAL ANIMALS**

Three feral animal species were recorded by Niche (2014), red fox, wild dog and black rat. Feral cat and wild pig have the potential to be present.

### **5. STAKEHOLDER IDENTIFICATION AND CONSULTATION**

Stakeholders in the rehabilitation of the Quarry are those parties with the potential to be affected (positively or negatively) by landscape management of the Quarry Site, the final landform and land use, or operations associated with Quarry landscaping and/or rehabilitation. The stakeholders identified, and with whom consultation was undertaken during the preparation of an EIS for the Quarry, are broadly defined as follows.

- The landowner.
- The local community, i.e. those landowners and residents surrounding the Quarry Site who could be directly or indirectly affected by Quarry operations.
- Government stakeholders with an interest in the final land use and rehabilitation of the Site.

#### **5.1 THE LANDOWNER**

The Quarry is located on land owned by Hartley Pastoral Corporation (HPC) which operates an ongoing agricultural enterprise on surrounding land. Consultation with the landowner has been ongoing since the Applicant commenced the construction of the Austen Quarry in 2002.

The principal concerns of the landowner with respect to the rehabilitation of the quarry are as follows.

- To ensure compliance with the conditions of the development consent.
- To not restrict, or create hazards incompatible with, ongoing and continued agricultural operations of the property.
- To minimise the impact of the final landform on the visual amenity of the property by creating a final landform and vegetation community structure compatible with the surrounding topography and vegetation.

In addition, the landowner has requested that, where feasible, the Biodiversity Offset Area be located so that the long-term management of fencing and access can be undertaken with general management of the property and to avoid sterilization of resource for future generations.

## 5.2 THE COMMUNITY

Consultation with the local community with regards the Quarry extension and Modification 1 has included direct consultation with an invitation to raise specific issues of concern, community meetings and additional discussions have been held individually with surrounding landowners, either opportunistically or on request, either by phone or personal visit to their place of residence. Hy-Tec have also hosted open days in November 2014 and October 2018 for the local community (with invitations placed in over 800 letter boxes).

As a consequence of the discussions held, the issue of improved management of the visibility of the Quarry, in particular stockpiles to the west of Yorkeys Creek, was commonly raised.

## 5.3 GOVERNMENT STAKEHOLDERS

Government stakeholders considered as having a specific interest in the final land use and rehabilitation of the Site have been consulted during the preparation of the EIS and the SoEE for Modification 1 for the Quarry extension. The comments received with respect to landscape and rehabilitation management are summarised as follows.

### Department of Planning, Industry & Environment

DPIE have previously requested detailed descriptions of the likely components and staging of rehabilitation be provided.

### Department of Planning, Industry & Environment – Division of Resources & Geosciences

The Division of Resources & Geosciences (DRG) have acknowledged the need for the continued sustainable development of existing and new quarries to facilitate the ongoing supply of construction materials to support affordable housing and infrastructure development for the growth of NSW. DRG has requested that the location of any biodiversity offset area consider the potential consequent reduction in access to prospective land for mineral exploration, or potential for sterilisation of mineral or extractive resources.

### Lithgow City Council

Lithgow City Council has requested Hy-Tec provide a proposed timeline for Site landscaping in any management plan.

### Blue Mountains City Council

The Councils' key area of interest relates to the reduction and ultimate elimination of any adverse visual impacts when viewed from key vantage points in the Blue Mountains.

## Water NSW

The primary area of concern with respect to the final land use and rehabilitation of the Site for Water NSW is ensuring that this landform and land use provides for a neutral or beneficial effect on water quality and does not hinder the achievement of water quality objectives for the Sydney drinking water catchment.

## Department of Industry – Water

DoI – Water requires that the rehabilitated landform does not impact on local surface or groundwater resources.

## Department of Primary Industries – NSW Fisheries

NSW Fisheries' interest in the final land use and rehabilitation of the Site is to ensure that adverse impacts on the aquatic environment and fish habitat of the Cocks River are minimised.

## Department of Primary Industries – NSW Agriculture

NSW Agriculture requires that in rehabilitating the Site, any impact on the agricultural production is minimised.

## NSW Office of Environment and Heritage

OEH is primarily interested in maximising the biodiversity benefits that may be provided by the final landform through retention of key habitat features, re-establishment of native vegetation communities and fauna habitat, creation of linkages to remnant habitat and establishment of compensatory habitat. OEH also requested that a detailed list of the plant species to be used during rehabilitation be provided along with details as to how the rehabilitation would be appropriately managed and funded.

Specific requests regarding establishment of tree screening, the clearing protocols, revegetation to reach vegetation community benchmarks and controlled burns have been addressed in the final version of the document.

## 6. PROGRESSIVE QUARRY DEVELOPMENT

Quarry development has been separated into six stages as presented in **Figure 4** with the final stage representing the final landform. These stages are indicative, with timing for progression of development entirely dependent on client demand.

Development of the extraction area may be subject to minor modifications in response to localised geological conditions identified during development to ensure the stability of the extracted areas and the safety of Hy-Tec personnel. In addition, the development of the overburden emplacement would rely on overburden production for each stage (i.e. the volume of highly weathered material encountered) and the volume of material that may be sold during that stage.

Significant changes to the extraction schedule that may change potential environmental impacts (including the visual amenity for nearby vantage points) would be subject to review and approval by DPIE. Where necessary, the amendment may trigger a modification to SSD 6084.

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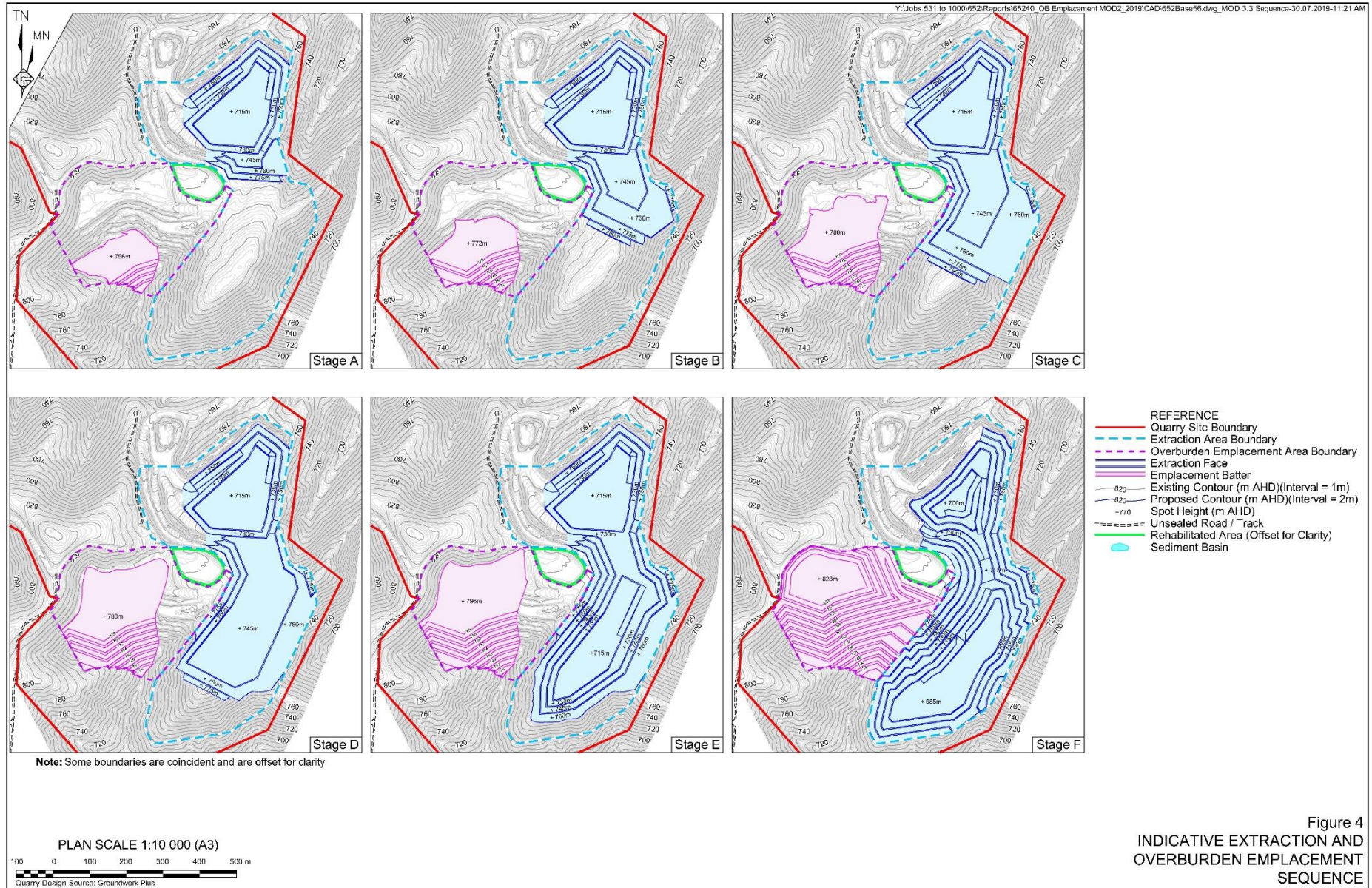


Figure 4  
INDICATIVE EXTRACTION AND  
OVERBURDEN EMPLACEMENT  
SEQUENCE

## 7. FINAL LANDFORM AND LAND USE

### 7.1 FINAL LAND USE

Considering the concerns and priorities of the various stakeholders (see Section 5), the priorities for final land uses are identified as follows.

- Minimising the visual impact of the Quarry from private and public vantage points.
- Maintaining and improving the biodiversity value of the local setting, as well as conserving threatened flora and fauna species. The Quarry Site provides connectivity between remnant vegetation and fauna habitat of the Coxs River and Yorkeys Creek with that of the larger (500ha) remnant described in Section 4.1.
- Low intensity agriculture. The property on which the Quarry is located is operated as an agricultural enterprise. While the majority of the land to be developed is of low land capability and of limited agricultural production value, the landowner and DPI are interested in maximising the potential use of the rehabilitated Site for future agricultural production.

On the basis of these stakeholder identified priorities, the primary land use for the rehabilitated landform will be passive biodiversity conservation, integrated with the Quarry Biodiversity Offset Area (refer to Section 8), and revegetated to minimise the visibility of extraction, overburden management and processing operations. This land use will focus on areas of the Quarry Site exposed to local and regional vantage points and/or which adjoin the Biodiversity Offset Area and other remnant native vegetation.

A secondary land use, to be integrated with the primary biodiversity land use on land with a higher land capability, will be agricultural grazing. The existing internal road network and Extraction Area Access Road will be retained to provide access to that area of the HPC property and for other existing road users in the vicinity.

### 7.2 CONCEPTUAL FINAL LANDFORM

**Figure 5** presents the concept for the final landform and identifies the selected cross-sections presented on **Figure 6**. In summary, the final landform will include the following components.

- Removal of all processing plant, office and ancillary infrastructure, including concrete pads (unless required for a future land use) with the remaining landform profiled to approximate that which existed prior to the establishment of the infrastructure. The vegetated bund along the Coxs River, as well as the various storage and sediment dams, will be retained.
- A final void with the perimeter secured with safety bunding, fencing and signage, where required, to reduce the risk to safety from human or fauna access. Terminal faces will be retained at 70° (or as near as possible) with overburden and previously cleared vegetation spread over the final benches where safe to do so and in a manner that ensures structural integrity.



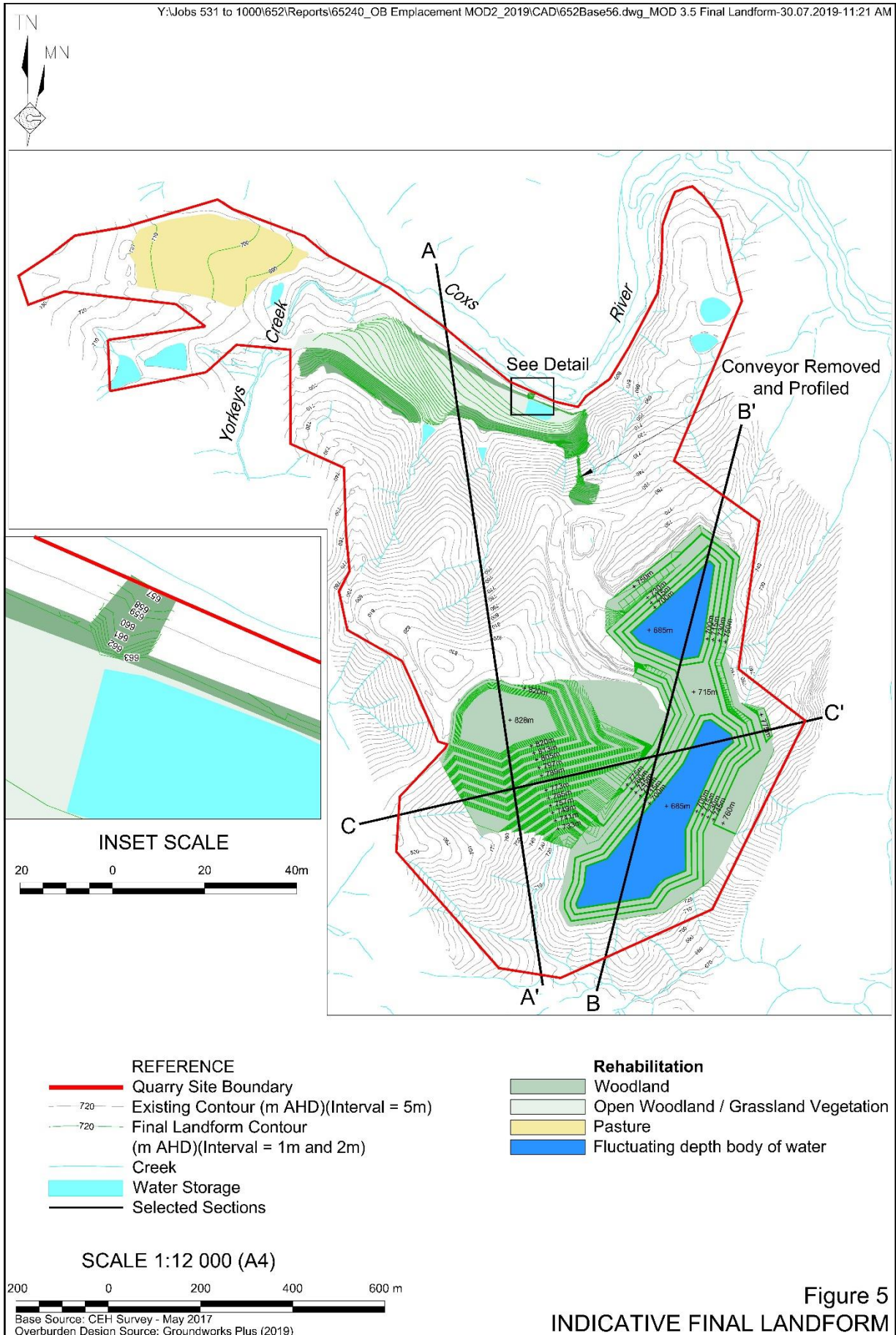
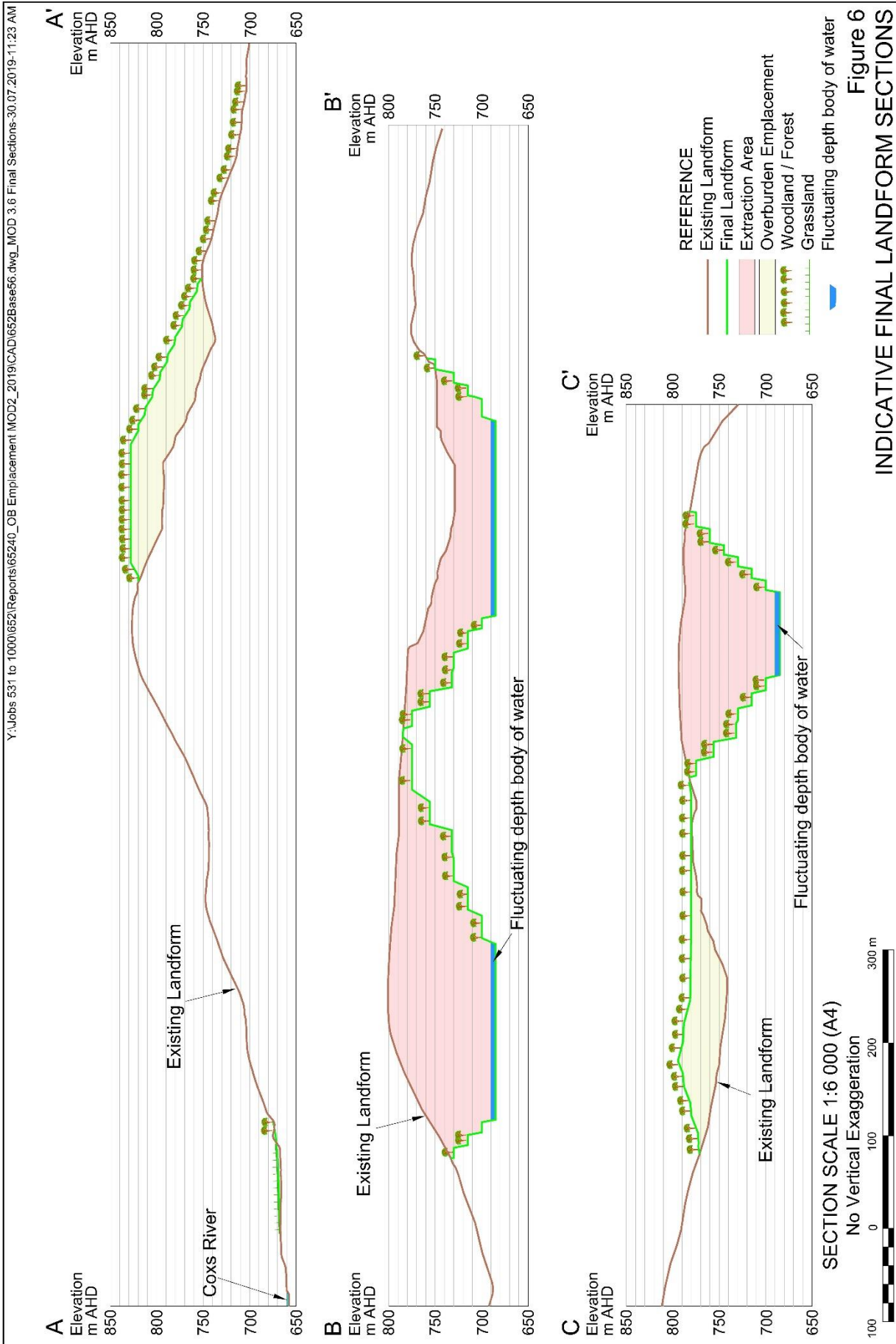


Figure 5  
**INDICATIVE FINAL LANDFORM**





- Water is likely to accumulate within the void, primarily in response to local rainfall conditions with some minor contribution (<4MLpa) from groundwater. The depth of water within the void, primarily surface runoff from material with no acid generating potential, will fluctuate based on seasonal conditions but will provide habitat for native flora and fauna.
- A shaped and revegetated overburden emplacement with the following design parameters.
  - An overall landform shape that blends with the surrounding landforms.
  - Side slopes of approximately 26° with 5m wide, back-sloped benches every 10m to 15m vertically.
  - An upper surface with a maximum elevation of approximately 828m AHD which provides a very gentle concave profile to allow runoff to drain off the landform.
  - Suitable surface water control structures implemented to minimise the risk of erosion and sedimentation.

## 8. AUSTEN QUARRY BIODIVERSITY OFFSET STRATEGY

Modification 1 to SSD 6084 included an update to conditions relating to biodiversity offsetting obligations to reflect the options available under the Biodiversity Offsets Scheme of the *Biodiversity Conservation Act 2016*.

Condition 25 of Schedule 3 of SSD 6084 (as modified) includes a table of offsetting obligations that has been reproduced in **Table 6**.

**Table 6**  
**Biodiversity Credits to be Retired**

Credit Type	Offset Type	Number of Credits
Ecosystem Credit	PCT 1093 – Red Stringybark – Brittle Gum – Inland Scribbly Gum dry open forest of the tablelands, South Eastern Highlands Bioregion	649
Ecosystem Credit	PCT 649 – Apple Box – Broad-leaved Peppermint dry open forest of the South Eastern Highlands Bioregion	131
Ecosystem Credit	PCT 840 – Forest Red Gum – Yellow Box woodland of dry gorge slopes, southern Sydney Basin Bioregion and South-Eastern Highlands Bioregion	60
Species Credit	Silver-leaved Mountain Gum ( <i>Eucalyptus pulverulenta</i> )	10,784

In accordance with the Biodiversity Offsets Scheme, Hy-Tec will develop a Biodiversity Offset Strategy to meet offset obligations that applies one or more of the following options.

- Retiring credits based on the like-for-like rules.
- Funding a biodiversity conservation action that benefits the threatened entity impacted by the development.

- Committing to deliver ecological rehabilitation in accordance with the ancillary rules for ecological rehabilitation. This option is currently only available to State significant mining projects.
- Making a payment to the Biodiversity Conservation Fund calculated using the offset payments calculator.

It is noted that Hy-Tec is also required to satisfy the offsetting requirements of the DoEE, as expressed in EPBC 2013/6967, and that DoEE does not currently support payments to the Biodiversity Conservation Fund as an offset strategy. This preference will be considered in development of the strategy.

This Plan will be updated once this strategy has been finalised and approved by the relevant Government departments.

## **8.1 INTEGRATION WITH QUARRY REHABILITATION**

Quarry rehabilitation aims to reinstate, to the greatest extent practicable, the vegetation communities and fauna habitats which were present prior to disturbance. Quarry rehabilitation also aims to reinstate a population of Silver-leaved Mountain Gum on the rehabilitated landform. The Biodiversity Offset Strategy will conserve and improve the condition (and therefore biodiversity value) of vegetation communities equivalent to those disturbed and therefore rehabilitation will also reflect the vegetation communities in any land-based offset.

Given the equivalent objectives and aims for Quarry rehabilitation and BOA management, the measures to be implemented within these areas to achieve these will be largely common. That is, the management measures presented for the management of rehabilitation and any land-based offset will be similar and activities, where possible, will be integrated to ensure that Hy-Tec is being efficient with management. For example, it may be that campaigns for weed management would occur across both rehabilitated areas and a land-based offset at the same time.

## **9. LANDSCAPE AND REHABILITATION MANAGEMENT MEASURES**

### **9.1 INTRODUCTION**

Detailed descriptions of specific and targeted landscape and rehabilitation management measures on the Quarry Site are provided in the following sections. These measures are aimed at ensuring that the performance criteria nominated in Section 10 are achieved, with more specific performance measurement provided for each specific task to assist.

## 9.2 LANDSCAPE MANAGEMENT

### 9.2.1 Management Measures

#### 9.2.1.1 Measures to Reduce Areas of Exposure

##### Design Features

- The primary crushing station will remain in the current location.
- There are no plans currently for the secondary processing area to be expanded.
- Extraction and overburden placement will be restricted to that approved by SSD 6084. This allows for the topographic features identified as the Northern, Central and Southern Ridges to provide natural screening of activities.
- Survey markers will be installed to identify the limit of extraction and annual survey completed to confirm compliance with this measure.

##### Extraction Sequence

- Complete extraction and overburden placement generally in accordance with **Figure 4**. Alternative plans may be considered if they aid in the minimization of the visual elements of the future quarry footprint.

#### 9.2.1.2 Controls and Management to Reduce Impacts of Exposure

##### Secondary Processing Area (and Primary Conveyor)

- Profile, respread with soil and revegetate the slope between the main office and extraction area Access Road.

##### Yorkeys Creek Stockpile Area

- Short-term Impact Reduction Strategy.
  - Establish and maintain a cover of grassy vegetation on the outer slopes of the stockpiled material.
- Long-term Impact Reduction Strategy.
  - Reduce and ultimately have any stockpiled material shielded by landscaped areas of the Quarry Site.

##### Extraction Area

- Apply a bituminous film to exposed terminal west facing walls to reduce the contrast between the pale rhyolite and darker background vegetation, where possible and practicable to do so.
- Investigate and implement the use of spray (hydro) seed to the exposed walls, where possible and practicable to do so.

- Progressive rehabilitation of the completed benches of the extraction area. As the extraction area reaches the outer perimeter, a layer of overburden (for water retention) followed by soil will be placed on the final bench (where safe to do so). The bench will then be seeded with native groundcover, shrub and tree species.

### Overburden Emplacement

- On completion of successive lifts, seeding to achieve at least 70% perennial groundcover will be undertaken (to reduce the contrast between the overburden and surrounding vegetation).
- The initial revegetation will be followed by direct seeding or planting of tree and shrub species commensurate with those of the surrounding vegetation communities.

#### 9.2.1.3 Visual Screens

By restricting the disturbance area to that approved by SSD 6084, and undertaking extraction and overburden placement activities as nominated in **Figure 4** (or as revised to reduce visual impacts), the natural screening provided by local topography will be maximised.

Native vegetation, commensurate with surrounding native vegetation communities, will also be used to provide visual screens of Quarry operations where practical. The following are two such vegetation screens have been established and are now maintained.

- Rows of trees on the ridgeline to the immediate north of the Yorkeys Creek Stockpile Area.
- Tree plantings along Jenolan Caves Road that minimise views of operational areas.

All tree screening will be undertaken using tree and shrub species commensurate with those of the surrounding native vegetation communities. Tree screening is maintained in the same manner as rehabilitated areas with principal activities being weed management.

#### 9.2.1.4 General Landscape Management Measures

The following more general visual impact mitigation strategies would be implemented.

- Emissions of dust will be minimised through the application of water to trafficked areas, stockpiles and conveyor transfer points.
- The Quarry Site will be maintained in a tidy and orderly manner.
- Placement of overburden will be avoided after 6:00pm as far as practicable.
- Lighting plant (both permanent and temporary) will be selected and located such that the light:
  - is not directed towards Jenolan Caves Road;
  - is not directed to the south or east when placed within the extraction area or on the overburden emplacement; and
  - minimises the ‘lume’ created by the lights.

## 9.2.2 Performance Management

**Table 7** presents proposed performance, relevant to landscape management within the Quarry Site, over the next three years of operations against completion criteria.

**Table 7**  
**Performance Targets (Years 1 to 3) – Landscape Management**

Page 1 of 2

Action	Performance			Target
	Year 1	Year 2	Year 3	
<b>Reduce Areas of Exposure</b>				
Install survey markers at regular intervals around the extremity of the extraction area and overburden emplacement	Update to reflect SSD6084 (MOD 2)	Inspect, confirm and/or replace.	Inspect, confirm and/or replace.	Easily identifiable markers maintained for the life of the Quarry.
Survey to confirm extraction and overburden completed within approved footprint	Annual survey.	Annual survey.	Annual survey.	Report compliance within Annual Report.
Apply perennial groundcover seed to completed lifts of the overburden emplacement.	Within 6 months of final placement of overburden to lift.	Within 6 months of final placement of overburden to lift.	Within 6 months of final placement of overburden to lift.	Achieve 70% coverage.
<b>Reduce Impacts of Exposure</b>				
Profile, respread with soil and revegetate the slope between the main office and extraction area Access Road	Complete profiling, soil and seed application.	Reseed as necessary.		Achieve 70% sustainable groundcover.
Establish and maintain a cover of grassy vegetation on the outer slopes of the stockpiled material of the Yorkeys Creek Stockpile Area	Apply seed.	Reapply seed where coverage does not meet target.	Reapply seed where coverage does not meet target.	Achieve 70% coverage.
Apply a bituminous film to exposed terminal walls exposed to vantage points to the east and/or south.	Apply	Inspect (and reapply as required).	Apply	Visual contrast between exposed quarry walls and surrounding vegetated hills reduced.
Progressive rehabilitation of the completed benches of the extraction area.	Works completed as terminal faces become available for rehabilitation.			

**Table 7 (Cont'd)**  
**Performance Targets (Years 1 to 3) – Landscape Management**

Page 2 of 2

Action	Performance			Target
	Year 1	Year 2	Year 3	
<b>Visual Screens</b>				
Establish and maintain rows of trees on the ridgeline to the immediate north of the Yorkeys Creek Stockpile Area	Plant rows of fast growing evergreen species.	Water and apply fertiliser as required.	Water and apply fertiliser as required.	Establish visual screen.
Maintained tree plantings along Jenolan Caves Road	Inspect annually and apply water or fertiliser as required.			Sustainable tree screen established.
Note 1: Or subsequently revised extraction sequence				

### 9.3 CONTROLLING ACCESS

#### 9.3.1 Management Measures

##### 9.3.1.1 Fencing and Signage

The Quarry Site is adequately fenced and gated to prevent uncontrolled access of livestock, vehicles or people to areas of rehabilitation or the proposed BOA. This fencing will be maintained for the life of the Quarry.

The BOA will not be fenced where it adjoins the Coxs River to minimise obstacles for fauna access to this water source. It is assumed that livestock would not access the area via the river.

Signs will be placed on selected survey markers to highlight the ecological sensitivity of the BOA to contractors and staff. Gates will be strategically placed to allow fire-fighting and maintain access to the BOA.

##### 9.3.1.2 Access Tracks

Existing farm tracks will be maintained to provide access to the BOA. No degraded tracks that require rehabilitation are present within the BOA.

Existing tracks within the Quarry Site are well-graded and managed with cross banks, table and mitre drains. The widening of existing tracks will be avoided where potential impacts on planted Silver-leaved Mountain Gum may occur.

Activities such as thinning of regrowth vegetation and feral animal management may require vehicular access. In such cases, disturbance will be kept to a minimum and the access tracks closed and rehabilitated on completion of activities.

### 9.3.2 Performance Management

**Table 8** presents proposed performance over the initial three years of Quarry operations under SSD-6084, relevant to controlling access to and within the Quarry Site, against completion targets.

**Table 8**  
**Performance Targets (Years 1 to 3) – Controlling Access**

Action	Performance			Target
	Year 1	Year 2	Year 3	
<b>Fencing, Gates and Signage</b>				
Complete map identifying fence and gate types	Complete			Completed
Survey Marker installations (including signs)	Install BOA / Stage 2 Extension survey markers.			Maintain access control.
Monthly boundary inspections and any breaches rectified within 4 weeks	All monthly inspections completed and documented.			
<b>Access Tracks</b>				
Access track mapping	Map all existing tracks			Completed
Implement access track management strategy	Commence	Identify non-essential tracks.	Complete redundant track rehabilitation.	Complete rehabilitation of all non-essential tracks.
Inspect access tracks and rectify issues, e.g. erosion	Ad hoc inspections to be completed, log of results maintained and record of maintenance kept.			Actions to rectify identified issues completed within 4 weeks.

## 9.4 VEGETATION CLEARING AND ENVIRONMENTAL RESOURCE SALVAGE

### 9.4.1 Management Measures

#### 9.4.1.1 Impact Footprint

The disturbance area of the Quarry Site has been minimised to the greatest extent practicable. To avoid all unnecessary impacts and minimise necessary impacts, the following measures will be implemented

- Disturbance of vegetation will be restricted to the areas presented in **Figure 1**.
- Major clearing (exceeding 0.5ha) will be undertaken as a single campaign each year and in accordance with the native fauna protection measures presented in Section 9.4.1.2).
- Clearing will be restricted to that required for the ensuing 12 months operations (thereby retaining the biodiversity values of the Quarry Site for as long as possible).



#### 9.4.1.2 Native Fauna Protection

In addition to restricting disturbance to the active areas presented in **Figure 1**, the following measures will be implemented to reduce the potential for adverse impacts on native fauna.

- Vegetation clearing will be scheduled for April to September to limit adverse impacts on tree dependent avifauna and microchiropteran bats.
- Pre-clearance surveys of areas to be cleared will be undertaken as follows.
  - Pre-clearance surveys will be undertaken by a qualified and licensed ecologist or other person appropriately qualified or experienced to undertake such work.
  - The area to be cleared will be traversed in parallel linear transects approximately 20m apart.
  - Habitat features such as tree hollows, logs, rocky habitat, large bird nests and termite mounds will be recorded using a GPS.
  - Hollow bearing trees will be identified to species level and marked with pink spray-paint and flagging tape. Hollow bearing trees will only be marked if they are considered to contain hollows greater than five centimetres in diameter. The number of hollows will be recorded along with the height, position (branch or trunk) and diameter of each hollow. Additional comments will be made regarding the nature of the tree and its chances of acting as habitat.
  - Other general features of the site to be cleared will be documented and a list of incidental vertebrate fauna observations will be made (including a bird survey). No targeted threatened fauna survey will be conducted.
- All trees with hollows will be cleared in accordance with the following protocol
  - Vegetation clearing will be supervised by a qualified and licensed ecologist or other person appropriately qualified or experienced to undertake such work.
  - The area to be cleared will be checked for signs of fauna presence prior to commencement. Any fauna found will be safely relocated to nearby habitat.
  - All other non-hollow bearing vegetation is to be removed prior to the removal of hollow-bearing trees.
  - After clearing other non-hollow bearing vegetation, re-check to ensure no fauna have become trapped or injured during clearing operations. Any fauna found will be safely relocated to nearby habitat.
  - Leave hollow-bearing trees standing for at least one night after other clearing to allow any fauna the opportunity to remove themselves after site disturbance.
  - Before felling hollow-bearing trees, tap along trunk using an excavator or loader to scare fauna from the hollows. Repeat several times. The aim of this procedure is to ‘substantially’ shake the tree. The majority of fauna will exit the tree during this process.
  - Re-check after felling hollow-bearing trees to ensure no fauna have become trapped or injured during clearing operations. Any fauna found should be safely located to nearby habitat. Bats are unlikely to be roosting within the Site,



however, any bats found must only be handled by a person vaccinated for lyssavirus.

- If taking the hollow-bearing trees tree down in stages, the non-hollow-bearing branches should be removed before the hollow-bearing branches are removed.
- All tree clearing will be undertaken to ensure that damage to adjoining vegetation is minimised. This includes felling trees into the zone of disturbance and taking due care when moving equipment near vegetation to be retained.
- If native fauna is identified during clearing and does not relocate of its own volition, or has been injured as a result of clearing, a qualified ecologist or wildlife expert will be engaged to advise on or assist with relocation or fauna management.

#### 9.4.1.3 Seed Collection and Propagation

Mature Silver-leaved Mountain Gum and the shrub species proposed for use in rehabilitation (refer to Section 9.5.1.4 – **Table 10**) will be undertaken by a suitably qualified provider such that the genetic integrity, structure and composition of native vegetation within the locality is maintained.

Seed will be sourced from the Quarry Site where possible, with areas to be cleared inspected and targeted prior to clearing. Where insufficient seed is available from the Quarry Site, seed will be sourced from a target range of within 5km from the Quarry Site.

On collection, seed will be propagated off-site by a local supplier or nursery. A lag of between 12 and 18 months may be required between seed collection and availability of tube stock for use in rehabilitation. This is to allow the supplier adequate time to collect seed (depending on season of commencement), propagate and harden-off tube stock (up to six months).

#### 9.4.1.4 Cleared Vegetation Management

Vegetation will be cleared in a way that maximises the opportunity for recycling.

- Timber will be removed using a bulldozer with its blade positioned just above the surface. In the event tree removal by this method is not possible, the tree will be chainsaw felled, with the stump then pulled from the ground by the bulldozer.
- Felled timber will then be managed in the following order of priority.
  - i) Tree crowns with seed will be transferred to areas under rehabilitation or that have been profiled to a final landform, where regrowth of tree species will assist in achieving the final land use outcomes, and used to promote natural regeneration.
  - ii) Tree trunks and major limbs will be retained for future use in improving the habitat complexity of the final landform. If these materials are stockpiled, signs will be erected noting the significance and importance of this material for future rehabilitation and habitat creation.

- iii) Chipping of off cuts, crowns and smaller limbs, following harvest of seed for use in rehabilitation, and either use on rehabilitated land or sale.
- iv) Cutting and sale of suitable species, e.g. for fence posts, fire wood.
- Grass, bark and other detritus will be stripped along with available soil to maximise the organic content of soils to be respread over the final landform.

#### 9.4.1.5 Soil Management

In order to ensure the value of the soils to be disturbed is maximised, the following management measures will be implemented.

##### Soil Stripping

- Available soil will be stripped to the depth where bedrock is encountered (600mm to 1 000mm) in all areas to be disturbed by extraction and overburden placement.
- Operators will be instructed to handle soils as little as possible, i.e. avoid double handling.
- Unless unavoidable, soil stripping on land with slope gradients exceeding 20% will not be undertaken between December and February each year.
- Soils will not be stripped or replaced during extremely wet or dry conditions.

##### Stockpile Management

- Operators will be instructed to place soil neatly and uniformly so the stockpile does not require further forming prior to establishment of vegetation cover.
- Driving of machinery on the soil stockpiles will be prohibited once the stockpiles are created to minimise compaction and further degradation of soil structure.
- Soil stockpiles will not exceed 2m in height.
- Stockpiles will be seeded and fertilised as soon as possible after emplacement, using a mix of sterile annual groundcover or native grasses.

##### Soil Respreading

- Prior to respreading, the soil will be sprayed with a herbicide to prevent the relocation of weed species from stockpile to rehabilitation.
- Sampling and analysis of the soil will be completed (for selected campaigns) to assess potential constraints on revegetation (e.g. low pH, low organic concentration, high dispersibility) and identify soil ameliorants.
- Soil resources will be replaced as a single blended topsoil / subsoil unit with the depth of respread soil to vary between 300mm and 600mm in depth (deeper on flatter areas and shallower on steeper areas).

- Slow-release fertilisers will be used but in conjunction with organic matter (mulch from previously cleared vegetation) to increase the Cation Exchange Capacity (CEC) and longer retention of nutrients.
- Modifications to the low pH of the soil will only be undertaken following consideration of the preferred vegetation communities on the final landform.
- The surface of the shaped landform will be left even but slightly scarified. This will assist in maintaining soil stability, maximising seed retention and germination and minimising erosion.
- Artificial covers such as bitumen impregnated straw or mulches will be used as required to stabilise the soils on the shaped landform.

#### 9.4.2 Performance Management

**Table 9** presents proposed performance over the next three years of Quarry operations under SSD-6084, relevant to vegetation clearing and environmental resource salvage, against completion targets.

**Table 9**  
**Performance Targets (Years 1 to 3) – Vegetation Clearing and Environmental Resource Salvage**

Action	Performance			Target
	Year 1	Year 2	Year 3	
<b>Impact Footprint</b>				
Disturbance of vegetation will be restricted to the areas presented in Figure 1	Review of annual disturbance to be included in the Annual Review.			Surveys completed, annual reports submitted and confirmation of compliance.
Vegetation Clearing	Completed as single campaign between April and September.	Completed as single campaign between April and September.	Completed as single campaign between April and September.	
<b>Native Fauna Protection</b>				
Habitat Clearing	Completed as single campaign between April and September.	Completed as single campaign between April and September.	Completed as single campaign between April and September.	No clearing (of area exceeding 0.5ha) undertaken October to March (without adequate review / assessment).
Pre-clearance Surveys	Completed prior to clearing.	Completed prior to clearing.	Completed prior to clearing.	No clearing (of area exceeding 0.5ha) undertaken without pre-clearance survey.
	Management of identified habitat features.	Management of identified habitat features.	Management of identified habitat features.	All recommendations re: habitat features followed and reported.
Fauna Injury				No avoidable fauna injury.

**Table 10**  
**Performance Targets (Years 1 to 3) – Vegetation Clearing and Environmental Resource Salvage**

Action	Performance			Target
	Year 1	Year 2	Year 3	
<b>Seed Collection and Propagation</b>				
Establish supplier / nursery	Complete			Contract established between Hy-Tec and supplier.
Provenance seed collection	Seed collection completed prior to clearing.	Seed collection completed prior to clearing.	Seed collection completed prior to clearing.	Sufficient seed collected for rehabilitation activities.
Seed propagation				Sufficient provenance seed and tube stock available for rehabilitation.
<b>Cleared Vegetation Management</b>				
Implement timber management strategy	Implement	Implement	Implement	Felled timber and cleared vegetation replaced within rehabilitation zone in accordance with published benchmarks for the target community type.
<b>Soil Management</b>				
Soil Stripping	Completed as single campaign between April and September.	Completed as single campaign between April and September.	Completed as single campaign between April and September.	No soil stripping undertaken December to February on steeply sloping land.
	Implement management as described in Section 9.4.1.5.			Sufficient resources available for rehabilitation.
Soil Stockpiling	Implement management as described in Section 9.4.1.5.			No erosion.
Soil Respreading	Implement management as described in Section 9.4.1.5.			Physical and chemical parameters of soil suitable for establishment and survival of vegetation.

## 9.5 REHABILITATION

### 9.5.1 Implementation and Management

#### 9.5.1.1 Overview

The performance indicators and completion criteria for rehabilitation have been developed to achieve the objectives and outcomes identified in **Table 3**. As rehabilitation is a progressive exercise, with future success influenced by achievement of specific interim goals throughout the process, performance targets are established for the various phases of rehabilitation. Furthermore, performance targets are influenced by the Quarry activity requiring rehabilitation, referred to as ‘domains’.

Section 9.5.1.2 describes the individual phases of rehabilitation and Section 9.5.1.3 the rehabilitation measures to be implemented within each domain.

### 9.5.1.2 Rehabilitation Phases

A hierarchical approach to the rehabilitation of the Quarry Site, modelled on the approach recommended by DRG (2013), has been adopted by Hy-Tec. Rehabilitation is considered as progressive phases, each with its own objectives, criteria for completion and indicators of performance against these criteria.

#### Decommissioning

The decommissioning phase involves the cessation of infrastructure usage, dismantling or demolition, removal and remediation of the land on which the infrastructure was located.

The objectives associated with this phase of rehabilitation are as follows.

- To maximise the re-use or recycling of materials.
- To stabilise the area surrounding the infrastructure to be decommissioned in order to prevent pollution to air, land or water.
- To remediate any contamination and ensure the area is non-polluting prior to commencement of the landform establishment phase.

Unless future use of the Quarry for industrial or similar purpose is approved, decommissioning activities will be undertaken as follows.

1. The processing plant will be dismantled and useful components sold for re-use whilst all remaining steel will be removed for recycling. Unless required for approved future land use, power infrastructure will also be removed. Only pumps and pipelines required by the landowner will be retained.
2. Surface water dams constructed and/or managed during the life of the Quarry will be retained for the subsequent land use.
3. Concrete foundations will be broken up and removed from site for recycling, unless otherwise agreed with the land owner to be left in place.
4. Any areas that display an accumulation of hydrocarbons will be remediated.
5. All mobile equipment will be progressively removed from the Quarry.

#### Landform Establishment

The landform establishment phase involves the earthworks required to construct the planned final landform, i.e. suitable for the planned final land use and which blends with the adjacent topography. This stage will also include the construction of any drainage structures.

The objectives associated with this phase of rehabilitation are as follows.

- To stabilise all disturbed areas and minimise erosion and dust generation.
- To provide a low maintenance, geotechnically stable and safe landform suitable for the intended final land use.
- To achieve the nominated design for each landform.
- To blend the created landform with the surrounding topography.



### **Growth Media Development**

The growth media development phase involves the replacement of soil over disturbed areas and preparation of the soil for revegetation including fertiliser or ameliorant application, and ripping or scarifying the soil.

The objectives associated with this phase of rehabilitation are as follows.

- To achieve a soil profile capable of sustaining the specified final land use.
- To minimise the potential for erosion, sedimentation and dust generation prior to establishment of vegetation.

### **Ecosystem and Land Use Establishment**

The ecosystem and land use establishment phase involves the revegetation of the rehabilitated landform with species commensurate with the targeted final land use.

The objectives associated with this phase of rehabilitation are as follows.

- To reduce the visual impact upon surrounding residents by early establishment of vegetation in areas where operations have been completed, i.e. on the external face of visibility bunds, exposed terminal faces of the extraction area and completed lifts of the overburden emplacement.
- To select and establish vegetation with the species diversity commensurate to the relevant ecological community or agricultural land use.

### **Ecosystem and Land Use Sustainability**

The ecosystem and land use sustainability phase involves the management and maintenance of the revegetated landform whilst completion criteria for the nominated landform and land use are achieved. This phase may be ongoing for a long period of time, depending on the final land use outcome required, and will include any remedial works or revegetation deemed necessary to achieve the final completion criteria.

The objectives associated with this phase of rehabilitation are as follows.

- To re-instate ecological communities with biodiversity commensurate with or greater than those communities disturbed by the Stage 2 Project and previous quarry operations.
- To ensure that the ongoing viability of these ecological communities are sustainable following the active management by the Applicant.
- To integrate the rehabilitated ecological communities with those incorporated into and protected by a Biodiversity Offset Strategy for the Proposal (see also Section 8.2).
- To retain areas on the Site amenable to future agricultural activities.

Specific activities undertaken within each rehabilitation phase will vary between domains (refer to Section 9.5.1.3).

### 9.5.1.3 Rehabilitation Domains

Rehabilitation domains refer to areas of related disturbance based on processes and use prior to rehabilitation and for which decommissioning and rehabilitation activities would be similar. Indicative rehabilitation domains for the Quarry are displayed on **Figure 7** and specific rehabilitation activities for these domains described in the following subsection.

#### Domain 1 – Extraction Area (D1)

The extraction area also includes the Primary Crushing Station, earth embankment constructed to screen the extraction area from the north and associated roads and ramps.

Terminal faces of the extraction area will approximate 70° (unless not practical for geotechnical reasons) with a coating of bitumen sprayed over the faces visible from vantage points to the north and northeast. The long-term visual impact of the terminal faces will be progressively reduced by the establishment of vegetation on the final benches (refer to Section 9.2).

A layer of weathered overburden will be placed over the final extraction area floor to create a water holding substrate. As the proposed final land use is for passive biodiversity conservation, there is no need to retain a water holding / watering point within the extraction area domain and overburden will be used to backfill the sump before soil is respread and revegetation with endemic grass and tree species is undertaken.

Previously excavated and stockpiled soil will then be placed on the shaped landform in accordance with the management measures presented in Section 9.4.1.5.

#### Domain 2 – Overburden Emplacement Areas (D2)

This domain includes the main and ancillary overburden emplacement areas and soil stockpile locations.

The outer batters of the overburden emplacement will be profiled to create an average slope of approximately 1:3(V:H) (~18°) (see **Figure 6**) with the surface ripped to allow for the keying of soil spread over the slopes.

Contour banks will be constructed as benches at 10m to 15m vertical intervals to direct water at non-erosive velocities from the emplacement to the adjacent natural landform into which the emplacement is blended or to high-slope, drop-down structures such as flumes. The drop-down structures will direct the surface water flows collected by the contour banks initially to the dirty water management system and then, following completion of rehabilitation operations, to natural drainage lines.

#### Domain 3 – Processing Area, Quarry Infrastructure and Services (D3)

This domain includes the secondary processing area, main administration area, Quarry Access Road and any other miscellaneous buildings or roads.

The Site Access Road and Yorkeys Creek Crossing will be retained to allow for continued access to this part of the property.

The bund wall within the riparian zone of the Coxs River, which is likely to have an established riparian vegetation cover, will be retained with a small channel excavated from the sediment

basin (following rehabilitation of the remaining Processing area) to allow for natural drainage of water to the Coxs River.

The hardstand surface be ripped and covered with a layer of weathered overburden followed by available soil and previously cleared vegetation. The final landform will then be seeded with endemic grass, shrub and tree species (predominantly those associated with the Coxs River riparian zone).

#### **Domain 4 – Surface Water Management Structures (D4)**

This domain includes all clean and dirty water dams, diversion drains and associated infrastructure.

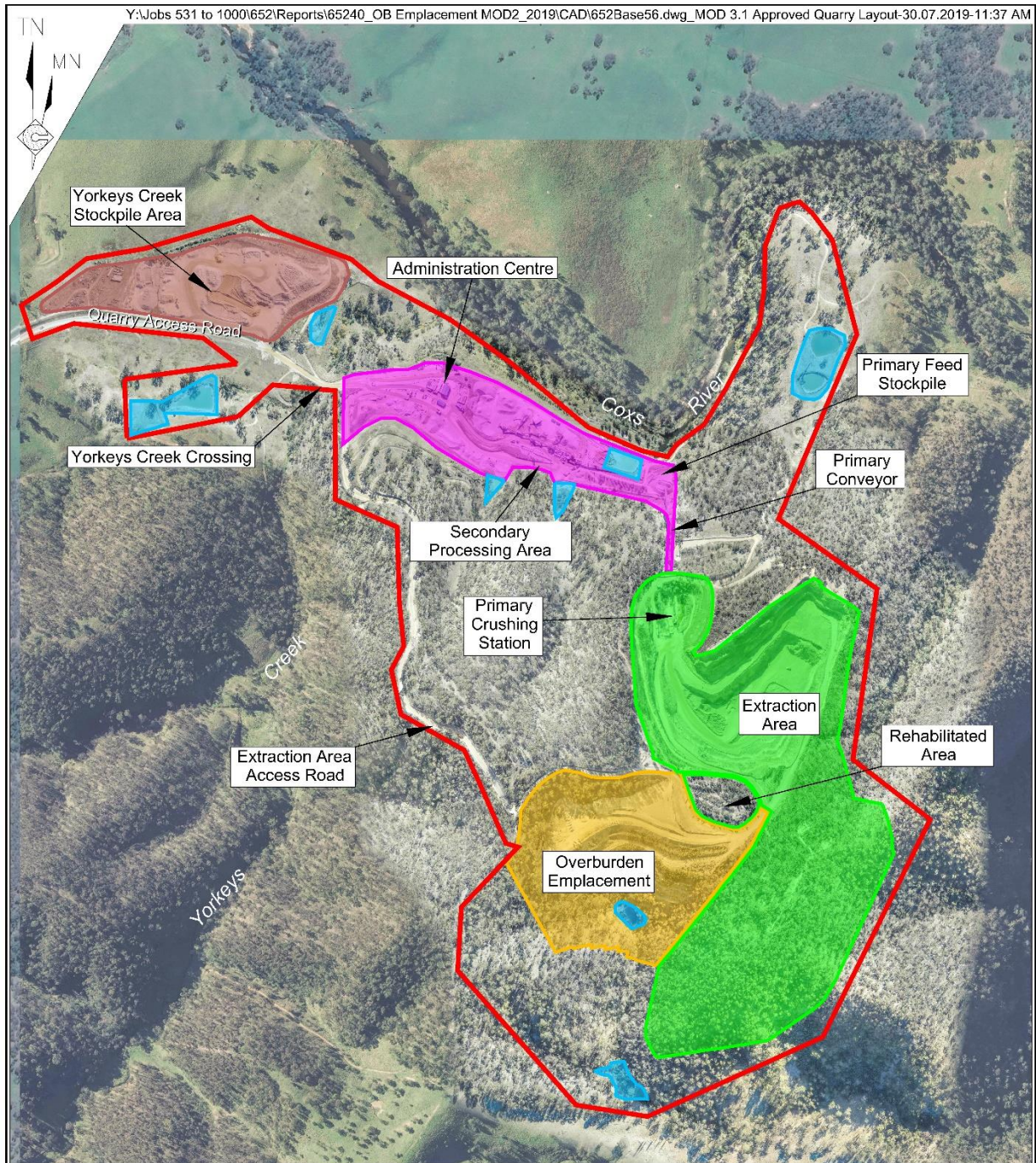
All infrastructure associated with water management will be removed with the storage and sediment dams retained as their use is consistent with the final land use described in Section 7.1.

#### **Domain 5 – Yorkeys Creek Stockpile Area (D5)**

This domain includes the stockpile area located to the north of Yorkeys Creek where the bulk of the road pavement materials, manufactured sands, select fills, drainage materials and road construction materials are stockpiled prior to sale.

The Yorkeys Creek Stockpile Area will be profiled in sympathy with the surrounding paddocks with soil applied. Gypsum or lime will be added to the soil as required to increase the pH to >6.0 before being reseeded with pasture species and fertilised (with slow-release fertiliser) in consultation with the landowner.





**Note:** Some boundaries are coincident and are offset for clarity

- REFERENCE**
- Quarry Site Boundary
- Rehabilitation Domains**
- Domain 1 - Extraction Area
  - Domain 2 - Overburden Emplacement Area
  - Domain 3 - Processing Area, Quarry Infrastructure and Services)
  - Domain 4 - Surface Water Management Structures
  - Domain 5 - Yorkeys Creek Stockpile Area

SCALE 1:12 000 (A4)



Base Photograph Source: CEH Survey - May 2017 & Google Earth - October 2016 (surrounds)

Figure 7  
INDICATIVE  
REHABILITATION DOMAINS



#### 9.5.1.4 Revegetation Strategy

The approach to the revegetation will vary depending on the intended final land use, i.e. either low intensity agricultural production or passive biodiversity conservation (see **Figure 5**). The following provides a summary of the revegetation strategy in each case.

##### Agricultural Production

Limited to Domain 5 (Yorkeys Creek Stockpile Area), restricted areas of Domain 3 (Processing Area, Quarry Infrastructure and Services) and those surface water management structures (Domain 4) associated with these areas, the revegetation strategy of these sections of the final landform will be sown with a mixture of pasture species appropriate to the season. The seed mixture will be determined, in consultation with the landowner, by the intended crop or agricultural activities proposed for the land.

Fertiliser may be applied depending on soil conditions (as determined following soil sampling and analysis – see Section 9.4.1.5) and intended crop or pasture. Contour banks may be constructed as required over this landform, in particular the profiled paddocks of Domain 5, to assist in surface runoff retention and prevention of erosion.

##### Passive Biodiversity Conservation

Over the remaining areas of the final landform (Domains 1, 2, the remaining area of 3 and relevant structures of 4) a mixture of native and introduced species of grasses and legumes will be used for rapid stabilisation of batters.

Following stabilisation, the Applicant will commence a program of revegetation, using both tube stock planting and direct seeding techniques, to create native open forest and grassy woodland communities. **Table 10** presents the initial planting schedule and target density, with this to be modified over the life of the Quarry in response to factors such as the success of individual species and availability of provenance seed.

**Table 11**  
**Revegetation Species**

Family	Species	Common name
<b>Trees (1 plant per 25 m<sup>2</sup> – 5m x 5m)</b>		
Myrtaceae	<i>Eucalyptus pulverulenta</i>	Silver-leaved mountain gum
<b>Shrubs (1 plant per 1m<sup>2</sup>)</b>		
Fabaceae (Faboideae)	<i>Daviesia acicularis</i>	
Fabaceae (Faboideae)	<i>Hovea linearis</i>	
Fabaceae (Mimosoideae)	<i>Acacia buxifolia</i>	Box-leaved wattle
Asteraceae	<i>Ozothamnus diosmifolius</i>	White dogwood
<b>Ground covers and grasses (2 per 1m<sup>2</sup>)</b>		
Chenopodiaceae	<i>Einadia hastata</i>	Berry saltbush
Cyperaceae	<i>Carex appressa</i>	Tall sedge
Cyperaceae	<i>Lepidosperma laterale</i>	Variable sword-sedge
Geraniaceae	<i>Geranium homeanum</i>	
Geraniaceae	<i>Geranium solanderi</i>	Native geranium
Haloragaceae	<i>Gonocarpus teucrioides</i>	Germander raspwort



**Table 12**  
**Revegetation Species**

Family	Species	Common name
<b>Ground covers and grasses (2 per 1m<sup>2</sup>) (Cont'd)</b>		
Juncaceae	<i>Juncus usitatus</i>	
Lamiaceae	<i>Plectranthus parviflorus</i>	
Lomandraceae	<i>Lomandra longifolia</i>	Spiny-headed mat-rush
Phormiaceae	<i>Dianella caerulea</i> var. <i>producta</i>	Blue flax-lily
Poaceae	<i>Austrodanthonia tenuior</i>	A wallaby grass
Poaceae	<i>Austrostipa scabra</i>	Speargrass
Poaceae	<i>Bothriochloa macra</i>	Red grass
Poaceae	<i>Cymbopogon refractus</i>	Barbed wire grass
Poaceae	<i>Imperata cylindrica</i>	Blady grass
Poaceae	<i>Microlaena stipoides</i>	Weeping grass
Poaceae	<i>Poa sieberiana</i>	Snowgrass
Poaceae	<i>Themeda australis</i>	Kangaroo grass
Source: Niche (2016a) – Appendix A		

Acknowledging the conservation status of *Eucalyptus pulverulenta* (Silver-leaved Mountain Gum), the propagation and re-establishment of this threatened tree species on the slopes of the final landform will be prioritised. Hy-Tec aims to successfully establish at least an additional 1 000 individual stems of this species within the Quarry Site and BOA. Replanting Areas to be allocated for revegetation of this species are identified within the SLMGMP (refer to **Appendix O** of EMSP).

#### 9.5.1.5 Tube Stock Planting

##### Preparation

- Planting to be undertaken preferentially in March / April, to allow good bedding of the root system over the ensuing winter and minimise watering needs, or September / October to coincide with warmer weather.
- Holes will be dug on the day of installation to a depth appropriate to the size of the tube stock being installed, i.e. hiko-cell or tube.
- Watering of the hole will be undertaken if soil moisture is low, or prevailing conditions are hot and dry.
- Tube stock will be delivered to the Quarry daily to allow for immediate planting (on day of delivery).

##### Placing

- Plants will be installed in a small dish-shaped depression, i.e. not flush with but just below the surface of the topsoil, such that any subsequent rains result in a temporary pooling of water around the root-ball.

### Watering

- Plants will be watered-in on the day of planting to the rim-level of the dish around each plant and then twice a week for the ensuing month if dry weather prevails, i.e. if weekly rainfall drops below 10mm during that period.

### Fertilising

- No fertiliser will be required.
- Water crystals will be used if planting must occur in very dry and hot conditions.
- The application of trace elements such as iron chelates may be undertaken where clear deficiencies are present.

### Mulch, Tree Guards and other Amelioration

- No mulching will be required.
- Pinned coir-fibre organic mesh will be installed if the gradient is steeper than 1V:5H.
- Tree guards (for tree and shrub species) will be used to protect the tube stock if seasonal conditions are favourable to the clear presence of herbivores that may pose a threat to the plantings.
- Damaged tree guards will be replaced as required.
- Tree guards will be removed 18 months after placement or earlier where the plant is deemed to be sufficiently well established.

#### 9.5.1.6 Rehabilitation Funding

Hy-Tec would fund all rehabilitation activities as nominated in Sections 9.5.1.2 to 9.5.1.5, as well as any remedial activities required in response to the nominated performance criteria not being met.

In order to ensure that sufficient funds are available to complete the nominated rehabilitation activities, Hy-Tec will establish a Conservation and Rehabilitation Bond (“the Bond”), to be held by the DPIE (or a financial institution approved by the DPIE).

- The Bond will hold and quarantine funds sufficient to complete the nominated rehabilitation activities over the next three years (refer to Section 9.5.2).
- The Bond will be confirmed within 6 months of the approval of the Plan, with the value verified by a suitably qualified quantity surveyor or another expert (approved by the DPIE).
- The value of the Bond will be reviewed every three years for the life of the Quarry, validated each time by a suitably qualified quantity surveyor or other expert (approved by the DPIE).

As rehabilitation is successfully completed, Hy-Tec will recover this portion of the Bond (noting that until the Quarry approaches completion any reduction in the Bond related to successfully completed rehabilitation is likely to be retained for new disturbance requiring rehabilitation).

### 9.5.2 Performance Management

**Table 11** presents proposed performance over the initial three years of Quarry operations under SSD-6084, relevant to vegetation clearing and environmental resource salvage, against completion targets.

**Table 13**  
**Performance Targets (Years 1 to 3) – Rehabilitation**

Action	Performance			Target
	Year 1	Year 2	Year 3	
<b>Decommissioning</b>				
Infrastructure decommissioning and removal	-	-	-	Infrastructure not required for future land use removed.
Contaminated land identification and remediation	-	-	-	Contamination is identified and remediated.
<b>Landform Establishment</b>				
Landform construction	-	-	-	The final landform equivalent to <b>Figure 4</b> .
<b>Growth Medium Development</b>				
Soil Management	Soil stockpiles are surveyed annually and information retained as part of soil inventory.			Soil is stockpiled in accordance with the management measures described in Section 8.4.1.5.
	-	-	-	Soil is spread to a depth of 30cm on sloped surfaces ( $\geq 10^\circ$ ) and 60cm on flat surfaces ( $< 10^\circ$ ).
	-	-	-	Soil condition does not limit growth medium development and seed application success.
	Inspections of stockpiles and respread soil completed at least quarterly.			Erosion of soil is minimised. Results of inspections reported annually.
<b>Ecosystem and Land Use Development / Sustainability</b>				
Vegetation establishment				The established land form and vegetation is sustainable and consistent with the intended land use.
Planting Silver-leaved Mountain Gum	Plant 500 individuals on non-rehabilitation area.	Plant 500 individuals on non-rehabilitation area.	Complete supplementary planting to replace unsuccessful planting.	1 000 additional plants established on the rehabilitation.

## 9.6 VEGETATION AND FAUNA HABITAT ENHANCEMENT

### 9.6.1 Management Measures

#### Biodiversity Offset Area

No additional vegetation and/or fauna habitat enhancement will be undertaken within the BOA as:

- The area has an ample and sustainable supply of logs and other micro-habitat features; and
- Additional transfer of materials risks the spread of soil pathogens or weed propagules from adjacent lands (for not real increase in biodiversity value).

The critical measures for enhancing vegetation and habitat within the BOA revolve around access control (Section 9.3), managing weeds and feral pest (Section 9.10) and ensuring an appropriate fire regime (Section 9.12).

#### Rehabilitation

In addition to the proposed revegetation of the disturbed areas of the Quarry, and in line with the cleared vegetation management described in Section 9.4.1.4, logs, rocks and fallen trees salvaged during clearing will be placed on the slopes of the overburden emplacement to assist in the protection of tube stock and create micro habitat for fauna species.

These materials will be placed on the advice of a suitably qualified and experienced ecologist, following monitoring of rehabilitation, and will be guided by published benchmarks regarding the amount of material/resources to be placed, e.g. the benchmarks for the length of fallen logs per 1 000 square metres in the NSW Plant Community Types database.

### 9.6.2 Performance Management

**Table 12** presents proposed performance over the next three years of Quarry operations under SSD-6084, relevant to vegetation and fauna habitat enhancement, against completion targets.

**Table 14**  
**Performance Targets (Years 1 to 3) – Vegetation and Fauna Habitat Enhancement**

Action	Performance			Target
	Year 1	Year 2	Year 3	
Placement of salvaged logs, large trees, rocks and other resources on rehabilitation areas	Implemented	Implemented	Implemented	Benchmarks for the length of fallen logs per 1 000 square metres will be based on re-establishing the three disturbed PCTs (see Table 4 and Table 5 in Section 4.2). <ul style="list-style-type: none"> <li>• PCT 1093 (HN570) – 105m/1,000m<sup>2</sup>.</li> <li>• PCT 649 (HN501) – 105m/1,000m<sup>2</sup>.</li> <li>• PCT 840 (HN527) – 105m/1,000m<sup>2</sup>.</li> </ul>

## 9.7 THREATENED SPECIES, POPULATION AND HABITATS

The threatened species identified on, or considered likely to occur at the Quarry are identified in Sections 4.3 and 4.4. With the exception of the Silver-leaved Mountain Gum, the Biodiversity Impact Assessment completed by Niche (2014) for the Stage 2 Extension of the Quarry did not identify any impacts on these species likely to increase the risk of local extinction.

The measures discussed in previous sections with respect to impact minimisation, establishment of a BOA, control of access, management of vegetation clearing (including native fauna protection), site rehabilitation and vegetation and faunal habitat enhancement within the rehabilitation area will all contribute to ensuring minimal environmental consequences to these threatened species and their habitats.

Management measures and performance criteria for the Silver-leaved Mountain Gum are presented in the SLMGMP (refer to *Appendix O* of EMSP).

## 9.8 WEED AND FERAL PESTS

### 9.8.1 Management Measures

#### Weed Management

Spot spraying sweeps through the BOA will be completed at a minimum of biannual intervals by a trained bush regenerator skilled at native and exotic plant identification. A survey of weed foliage cover in all structural layers will be undertaken annually to assess weed presence and inform weed management planning for the following year.

Key target species will include the weeds of national significance that have been identified within the Quarry Site as well as other weeds known to be present.

- *Rubus fruticosus* agg. spp. (Blackberry);
- *Nassella trichotoma* (Serrated tussock);
- *Eragrostis curvula* (African lovegrass).
- *Conium maculatum* (Hemlock).
- *Onopordum* spp. (Scotch, Stemless, Illyrian and Taurian thistles).
- *Hypericum perforatum* (St. John's wort).
- *Rosa rubiginosa* (Sweet briar).

Regular maintenance weeding activities (once a month through late winter, spring and wet summers) will be undertaken by Quarry personnel for the first three years after installation of tubestock in rehabilitation areas. After this time the rehabilitation areas would be incorporated into the biannual program of maintenance weed management.

*Appendix C* of the BOMP (*Appendix P* of EMSP) presents the standard weed treatments to be applied.



## Feral Pest Management

Hy-Tec will consult with the land owner and as required with Central Tablelands Local Land Services or OEH in regards to how Hy-Tec will best be able to contribute to a regional vertebrate pest management strategy or priority, e.g. fox and feral cat baiting, and feral goat and pig trapping / eradication.

### 9.8.2 Performance Management

**Table 13** presents proposed performance over the next three years of Quarry operations under SSD 6084, relevant to weed and feral pest management, against completion targets.

**Table 15**  
**Performance Targets (Years 1 to 3) – Weed and Feral Pest Management**

Action	Performance			Target
	Year 1	Year 2	Year 3	
Weed Control – BOA	Spot spraying undertaken biannually.	Spot spraying undertaken biannually.	Spot spraying undertaken biannually.	Noxious or environmental weeds suppressed to less than 5% of percentage foliage cover (PFC) in all structural layers.
Weed Control – revegetated areas	Maintenance weeding once a month through late winter, spring and wet summers) for the first three years and biannual treatment after this time.	Maintenance weeding once a month through late winter, spring and wet summers) for the first three years and biannual treatment after this time.	Maintenance weeding once a month through late winter, spring and wet summers) for the first three years and biannual treatment after this time.	Environmental weeds do not establish. Environmental weeds suppressed to less than 5% of percentage foliage cover (PFC) in all structural layers.
Feral pest management	Undertaken in consultation with OEH/LLS.			The Quarry Site or BOA does not become a harbor for feral pest species. Herbivory activities impact on plant success and germination/ recruitment

## 9.9 EROSION AND SEDIMENT CONTROL

The Quarry will operate in accordance with a Water Management Plan.

## 9.10 BUSHFIRE

### 9.10.1 Management Measures

Fire is an inherent and natural ecological process within the locality. NPWS (2004) prescribes a fire interval of five to 40 years for grassy woodlands and five to 50 years for dry sclerophyll forests.

With respect to Silver-leaved Mountain Gum, the NSW Threatened Species Hazard Reduction list (RFS, 2004) indicates this species as not requiring fire more than once every fifteen years.

Hy-Tec will manage the remnant vegetation of the Quarry Site and BOA such that it will be subject to fire at an interval exceeding every 15 years but less than 40 years, from the previous fire event in that particular area. Fire management will be implemented as follows.

- The first managed fire event for the Quarry will be undertaken, at a time determined in consultation with OEH and RFS. Hy-Tec has commenced plans for a controlled burn in the first half of 2019, however this will be subject to consultation outcomes with the relevant authorities and confirmation that a suitable fuel load is present to support a controlled burn.
- Controlled burns will take place in late summer or early autumn (to allow regeneration prior to the next spring flowering season).
- A baseline survey of the area to be subject to the controlled burn will be undertaken so that the baseline results can be compared to monitoring results in the burnt area.
- No more than a third of the extent of Silver-leaved Mountain Gum core areas will be burnt at any one time, and no more than one third within the same 15 year timeframe.
- Monitoring in the area subject to the prescribed burn will be undertaken once during the 12 months following the activity. The outcomes of monitoring will be used to inform subsequent fire regimes. Additional monitoring will be subject to the outcomes of each monitoring campaign and the recommendations of the ecologist commissioned to undertake the works.
- Subsequent managed burns within adjacent areas will not be burnt less than five years from the previous managed event in the adjacent area, and will only be prescribed where monitoring of the Silver-leaved Mountain Gum population has demonstrated a clear positive outcome as a result of fire from the first managed burn.

Managed burning will be excluded from all rehabilitation areas. Where senescence of mature planted Silver-leaved Mountain Gum within the rehabilitation areas is detected, affected plants will be pruned back to ground level and the subsequent vegetative response monitored. Pruning to ground level is an established method in fire prone areas to rejuvenate and extend the life of senescing plants with a lignotuber.

### 9.10.2 Performance Management

**Table 14** presents proposed performance over the next three years of Quarry operations under SSD 6084, relevant to fire management, against completion targets.

**Table 16**  
**Performance Targets (Years 1 to 3) – Fire Management**

Action	Performance			Target
	Year 1	Year 2	Year 3	
Controlled Burn				Managed fire events to be undertaken within the BOA at approximately 15 to 40 year intervals.

## 9.11 LOCAL VEGETATION AND FAUNA HABITAT PROTECTION

### 9.11.1 Management Measures

The following describes the measures that would be implemented to protect vegetation and fauna habitat outside the approved disturbance area on-site.

- **Impact Minimisation.** The measures described in Section 9.4.1.1 (Impact Footprint) will ensure that disturbance is restricted to approved areas only.
- **Controlling Access.** The measures described in Section 9.3.1.1 will ensure that access is restricted to nominated areas of the Quarry Site.
- **Access Track Management.** Section 9.3.1.2 describes the measures to ensure access tracks through the Quarry Site and surrounding lands are minimised and maintained to reduce impact.
- **Weed and Feral Pest Controls.** The measures presented in Section 9.8.1 will reduce the occurrence and spread of weeds and feral pests locally, thereby improving the condition of surrounding vegetation and habitat.
- **Erosion and Sediment Control.** By reducing the potential for erosion on the Quarry Site, surrounding land will be protected from sedimentation which could affect surrounding vegetation and waterways.
- **Disease Management.** Plants for rehabilitation will be delivered free from pests or disease. Where attack is evident, plant supply will be restricted to those specimens with evidence of attack to less than 15% of the foliage and ensure absence of actively feeding insects.

Should a disease or pest problem be identified, the affected plants will be treated as soon as possible to prevent spread to surrounding remnant vegetation. Treatment will continue until the problem has been eliminated. Should the use of chemical spray be required, strict adherence to the manufacturer's recommended rates and handling will be followed.

It is also noted that Hy-Tec undertakes annual monitoring of flora and fauna on and surrounding the Quarry. This will be used as an indicator of any adverse effects on local vegetation.

### 9.11.2 Performance Management

**Table 15** presents proposed performance over the next three years of Quarry operations under SSD-6084, relevant to local vegetation and fauna habitat protection, against completion targets.

**Table 17**  
**Performance Targets (Years 1 to 3) – Local Vegetation and Fauna Habitat Protection**

Action	Performance			Target
	Year 1	Year 2	Year 3	
Impact Minimisation	Refer to Table 8.			
Controlling Access	Refer to Table 7.			
Access Track Management	Refer to Table 7.			
Weed and Feral Pest Controls	Refer to Table 12.			
Erosion and Sediment Control	Implemented	Implemented	Implemented	Implement Water Management Plan.
Disease Management	Tube stock received free of pest and disease.	Tube stock received free of pest and disease.	Tube stock received free of pest and disease.	No spread of disease or pest from rehabilitation to surrounding local vegetation.
	Disease treatment completed as required.	Disease treatment completed as required.	Disease treatment completed as required.	
Flora and Fauna Monitoring	Annual monitoring and analysis (refer to Section 11.3).	Annual monitoring and analysis (refer to Section 11.3).	Annual monitoring and analysis (refer to Section 11.3).	No detrimental trends observed.

## 10. PERFORMANCE INDICATORS AND COMPLETION CRITERIA

### 10.1 REHABILITATION

The strategic rehabilitation completion criteria, associated performance indicators and monitoring strategy for rehabilitation are summarised in **Table 16** to align with the rehabilitation hierarchy and objectives outlined in Section 9.5.1.

**Table 18**  
**Completion Criteria, Performance Indicators and Monitoring Strategy**

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Objectives	Completion Criteria	Domain	Performance Indicator	Monitoring Strategy
<b>Decommissioning</b>				
<ul style="list-style-type: none"> <li>To maximise the re-use or recycling of materials.</li> <li>To stabilise the area surrounding the infrastructure to be decommissioned in order to prevent pollution to air, land or water.</li> </ul>	Final land use is defined and agreed by relevant stakeholders.	1 to 5	Final land use agreed and formalised in Rehabilitation Plan.	(This Document).
	Services are isolated, disconnected, removed and terminated.	3	Completed to the satisfaction of Council.	Survey of services to be completed.
	Infrastructure and associated buildings not required are demolished and removed.	3	Completed to the satisfaction of Council.	Survey of infrastructure to be completed.

**Table 16 (Cont'd)**  
**Completion Criteria, Performance Indicators and Monitoring Strategy**

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Objectives	Completion Criteria	Domain	Performance Indicator	Monitoring Strategy	
	All internal roads, car parks and hardstands not required for the end land use/user are ripped and profiled.	3	Completed to the satisfaction of Council.	Survey of infrastructure to be completed.	
<ul style="list-style-type: none"> <li>To remediate any contamination and ensure the area is non-polluting prior to commencement of the landform establishment phase.</li> </ul>	Contaminated sites are identified for remediation.	1 to 5	Contaminated Sites Report (or equivalent) completed.	Soils tested and analysed as part of Contaminated Sites Report (or equivalent).	
	Contaminated land is remediated.	1 to 5	Site free of contaminants.		
	Identified heritage sites are retained.	1 to 5	No damage to known sites.	Sites resurveyed prior to relocation of previously removed artefacts.	
				Bitumen application complete.	
		2	Slopes approximate 26°.		
		3 and 5	Ripped and profiled surface accommodates surrounding topography.		
<b>Landform Establishment</b>					
<ul style="list-style-type: none"> <li>To stabilise all disturbed areas and minimise erosion and dust generation.</li> <li>To provide a low maintenance, geotechnically stable and safe landform suitable for the intended final land use.</li> </ul>	The final landform achieves the nominated design of the EIS or subsequent Rehabilitation Plan.	1	Terminal faces and benches are geotechnically stable.	Survey following completion of landform establishment activities.	
					Bitumen application complete.
		2	Slopes approximate 26°.		
		3 and 5	Ripped and profiled surface accommodates surrounding topography.		
<ul style="list-style-type: none"> <li>To achieve the nominated design for each landform.</li> <li>To blend the created landform with the surrounding.</li> </ul>	Final landform does not pose a security or safety risk	1	Safety bund is extended across entry ramps.	Inspection by Site Manager.	
					Signage erected identifying 'deep void – no access'.
	The rehabilitated area does not represent an erosion hazard.	1 to 5	Erosion does not exceed 0.3m (gully) deep.	Visual inspection.	
		2	Banks are constructed at 10m vertical intervals with a back-slope of <5% (3°) and longitudinal slope of <2% (1.5°).	Survey following completion of landform establishment activities.	
<b>Growth Medium Development</b>					
<ul style="list-style-type: none"> <li>To achieve a soil profile capable of sustaining the specified final land use.</li> </ul>	Soil is stockpiled in accordance with the management measures described in Section 9.4.1.5.	1 and 2	Soil stockpiles do not exceed 2m in height.	Survey of stockpiles completed.	



**Table 16 (Cont'd)**  
**Completion Criteria, Performance Indicators and Monitoring Strategy**

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Objectives	Completion Criteria	Domain	Performance Indicator	Monitoring Strategy
	Soil is spread to a depth of 30cm on sloped surfaces ( $\geq 10^\circ$ ) and 60cm on flat surfaces ( $< 10^\circ$ ).	1-3 and 5	Soil depths as nominated.	Maintenance of soil inventory (comparison of soil excavated to that spread over landform). Survey of treated areas completed annually and included in Annual Review.
	Soil condition does not limit growth medium development and seed application success.	1 and 3-5	pH levels are equivalent to that of the local setting (4.5 to 6.0).	Soil analyses.
<ul style="list-style-type: none"> <li>To minimise the potential for erosion, sedimentation and dust generation prior to establishment of vegetation.</li> </ul>	Erosion of soil is minimised.	1 to 5	Erosion does not exceed 0.3m (gully) deep.	Visual inspection.
		1 to 5	Average soil loss per annum is $< 40$ tonnes/ha/year.	Inspection of sediment basins and calculation of sedimentation.
	Placement of mulch of woody debris on rehabilitated areas.	1-3 and 5	Native fauna observed utilising habitat provided by woody debris.	General observation.
<b>Ecosystem and Land Use Development</b>				
<ul style="list-style-type: none"> <li>To reduce the visual impact upon surrounding residents by early establishment of vegetation in areas where operations have been completed, i.e. on the external face of visibility bunds, exposed terminal faces of the extraction area and completed lifts of the overburden emplacement.</li> <li>To select and establish vegetation with the species diversity commensurate to the relevant ecological community or agricultural land use.</li> </ul>	Appropriate native plant species used in rehabilitation.	1-3	Species used are consistent with those of the disturbed vegetation communities.	Review against species list provided by ecologist or rehabilitation specialist.
		1-3	<i>E. pulverulenta</i> included in revegetation.	
	Appropriate pasture species used in rehabilitation.	5	Species used are consistent with those nominated by landowner.	Monitoring by ecologist or rehabilitation specialist.
	Appropriate native plant species richness is present for the restored ecological community.	1-3	At least 80% of species planted present (including Silver-leaved Mountain Gum).	
	Appropriate density/structure of native overstorey species.	1-3	Overstorey projected foliage cover (PFC) = 10% – 20% approximates that of target community <sup>1</sup> .	
Appropriate density/structure of native lower storey.	1-3	Lower storey PFC = 10% – 20%.		
<ul style="list-style-type: none"> <li>To select and establish vegetation with the species diversity commensurate to the relevant ecological community or agricultural land use.</li> </ul>	Appropriate native groundcover coverage.	1-3	Groundcover PFC = 55% – 65%.	Monitoring by ecologist or rehabilitation specialist.

**Table 16 (Cont'd)**  
**Completion Criteria, Performance Indicators and Monitoring Strategy**

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Objectives	Completion Criteria	Domain	Performance Indicator	Monitoring Strategy
<b>Ecosystem and Land Use Sustainability</b>				
<ul style="list-style-type: none"> <li>To re-instate ecological communities with biodiversity commensurate with or greater than those communities disturbed by the Proposal and previous quarry operations.</li> </ul>	The established land form and vegetation is sustainable and consistent with the intended land use.	1 to 5	Establish areas of rehabilitation consistent approval conditions. Land use classifications to include: <ul style="list-style-type: none"> <li>Rehabilitation of Woodland Ecological Communities;</li> <li>Agricultural land; and</li> <li>Biodiversity Offset Area.</li> </ul>	Monitoring by ecologist or rehabilitation specialist.
<ul style="list-style-type: none"> <li>To ensure that the ongoing viability of these ecological communities are sustainable following the active management by the Applicant.</li> </ul>	There are no potential hazards that are not consistent with the intended land use.	1 to 5	The site is free of safety or environmental hazards including: <ul style="list-style-type: none"> <li>holes, tunnels or unstable areas;</li> <li>quarry infrastructure or debris; or</li> <li>hazardous materials.</li> </ul>	Visual inspection.
	The soil pH is representative of the intended land use.	1 to 5	pH levels are equivalent to that of the local setting (4.5 to 6.0).	Soil analyses.
<ul style="list-style-type: none"> <li>To integrate the rehabilitated ecological communities with those incorporated into and protected by a Biodiversity Offset Strategy for the Proposal (refer to Section 2.14).</li> <li>To retain areas on the Site amenable to future agricultural or industrial activities.</li> </ul>	Surface runoff from rehabilitated areas does not result in downstream pollution.	1 to 5	Receiving waters affected by surface water runoff from rehabilitated areas have EC<1500µS/cm and a pH between 5.5 and 8.5.	Monitoring of water quality contained with sediment basins and receiving waters.
	Exotic weeds or vegetation is not competing or impacting on the intended land use.	1 to 5	Weed coverage within rehabilitation or biodiversity offset areas is less than 5% PFC, until data from analogue sites is available.	Monitoring by ecologist or rehabilitation specialist.
	Feral pests are not competing or impacting on the intended land use.	1 to 5	Feral pests are not present within rehabilitation or biodiversity offset areas until data from analogue sites is available.	Inspection by local personnel.
Note 1: Based on pre-disturbance communities for the Site (refer to Section 4.2)				

The monitoring referenced in **Table 16** is described in Section 11.1. The rehabilitation criteria will be continually reviewed and refined as a result of the results of monitoring, with any updated Plans provided to DPIE for approval.

## 10.2 LANDSCAPE MANAGEMENT

The strategic landscape management completion criteria, associated performance indicators and monitoring strategy for landscape management are summarised in **Table 17** to align with the objectives outlined in **Table 3** of Section 3. Where relevant, i.e. where specific performance management is required / proposed, the rehabilitation domains nominated in Section 9.5.1.3 are referenced.

### 10.3 BIODIVERSITY OFFSET AREA

The strategic completion criteria, associated performance indicators and monitoring strategy for the BOA are summarised in **Table 18** to align with the objectives outlined in **Table 3** of Section 3.

**Table 19**  
**Completion Criteria, Performance Indicators and Monitoring Strategy – Landscape Management**

Objectives	Completion Criteria	Domain	Performance Measurement / Indicator	Monitoring Strategy
<ul style="list-style-type: none"> <li>Minimise the visibility of extraction and overburden emplacement activities from surrounding properties, lookouts, roads and other vantage points.</li> </ul>	Primary Crushing Station remains unsighted from external vantage points.	1	Northern Ridge to remain undisturbed.	Visual
	Extraction area does not extend beyond the approved limit of extraction.	1	Survey markers established at limit of extraction area.	Quarterly inspection.
			Quarry survey confirms extraction within limit of extraction area.	Annual survey.
	Extraction sequence reduces the area exposed to external vantage points.	1	Extraction follows the sequence nominated by <b>Figure 6</b> (Stage A to G) <sup>1</sup> .	Annual review.
	Overburden emplacement does not extend beyond the approved limit of extraction.	2	Survey markers established at limit of extraction area.	Quarterly inspection.
			Quarry survey confirms extraction within limit of extraction area.	Annual survey.
Overburden placement sequence reduces the area exposed to external vantage points.	2	Extraction follows the sequence nominated by <b>Figure 6</b> (Stage A to G).	Annual review.	
<ul style="list-style-type: none"> <li>To reduce the visibility of exposed areas of Quarry operations.</li> </ul>	Bituminous film applied to the terminal western faces.	1	Completed at least bi-annually (every two years) or as assessed.	Annual visual inspection (photo record).
	Establish initial groundcover on completed lifts.	2	70% coverage achieved within 6 months of completion.	Annual visual inspection (photo record).
<ul style="list-style-type: none"> <li>To reduce the visibility of exposed areas of Quarry operations (Cont'd).</li> </ul>	Visual screen of Yorkeys Creek Stockpile Area established.	5	Tree screen established to the north.	Annual visual inspection (photo record).
	Minimise the 'lume' created by the lights.	1, 2, 3 and 5	Lights directed away from Jenolan Caves Road.  Lights not directed to south or east when placed within the extraction area or on the overburden emplacement.	Visual Inspection.
<ul style="list-style-type: none"> <li>To provide landscaping within the Quarry Site which is sympathetic to surrounding landscape features.</li> </ul>	Rehabilitation and revegetation of each domain (refer to <b>Table 6</b> ).			
Note 1: or subsequently revised extraction sequence				

**Table 20**  
**Completion Criteria, Performance Indicators and Monitoring Strategy – BOA**

Objectives	Completion Criteria	Performance Measurement / Indicator	Monitoring Strategy
<ul style="list-style-type: none"> <li>To establish and secure a BOA.</li> </ul>	BOA secured.	Biodiversity offset strategy implemented within 12 months of approved Modification 1 (15 August 2019)	-
<ul style="list-style-type: none"> <li>To maintain and improve biodiversity values of the BOA.</li> </ul>	Controlled access to the BOA achieved and maintained.	Livestock excluded from the BOA.	Fortnightly inspection, Annual review (refer to Section 11.2).
	Access tracks restricted to minimum.	No degraded tracks requiring rehabilitation.	-
	No weeds of national or regional significance. Density of environmental weeds no greater than surrounding vegetation.	Suppression of weeds of national or regional significance and perennial exotic grasses on an on-going basis to less than 5% of percentage foliage cover (PFC) in all structural layers.	Annual survey (refer to Section 11.2).
	Negligible impacts from feral herbivores on native vegetation Silver-leaved Mountain Gum.		Fortnightly inspection. Annual survey (refer to Section 11.2).
<ul style="list-style-type: none"> <li>To improve the conservation security of the Silver-leaved Mountain Gum within the regions.</li> </ul>	Sustainable habitat for Silver-leaved Mountain Gum maintained.	No decline in number of individuals or area of coverage.	Annual survey (refer to Section 11.2).

The BOMP also includes performance targets for the BOA.

#### 10.4 LOCAL BIODIVERSITY

As noted in Section 4.1, the Quarry Site occurs within a larger ~500ha remnant which provides a wildlife corridor between the National Park estate to the east and vegetated ridge lines and State Forests to the west. The completion criteria, performance indicators and monitoring strategy for remnant local biodiversity are summarised in **Table 19** to align with the objectives outlined in **Table 3** of Section 3.

**Table 21**  
**Completion Criteria, Performance Indicators and Monitoring Strategy – Local Biodiversity**

Objectives	Completion Criteria	Performance Measurement / Indicator	Monitoring Strategy
<ul style="list-style-type: none"> <li>No detrimental effects on local biodiversity as a consequence of the Quarry.</li> </ul>	No significant decrease in the habitat value provided by vegetation surrounding the Quarry.	No reduction in the proportion of native to introduced flora species.	Annual flora survey (refer to Section 11.3).
	Fauna diversity exhibits no negative trends attributable to the Quarry over the life of the Quarry.	Negligible <sup>1</sup> impact, reduction and differences attributable to the Quarry.	Annual fauna survey (refer to Section 11.3).
	Macroinvertebrate diversity of the Coxs River exhibits no evidence of Quarry-related impacts.	Negligible <sup>1</sup> impact, reduction and differences between control and impact sites noted. Negligible <sup>1</sup> impact, reduction and differences between annual sampling events.	Annual monitoring undertaken in accordance with AUSRIVAS (refer to Section 11.3).
Note 1: Negligible is defined in this context as small and unimportant, such as to be not worth considering			

## 11. MONITORING

### 11.1 REHABILITATION

The objective of rehabilitation monitoring is to evaluate progress towards fulfilling ecological community land use objectives and closure criteria.

The purpose of monitoring activities will be to ensure the sustainable re-colonisation and ongoing management of native flora and fauna, and to guide continual improvement of rehabilitation practices.

Rehabilitation will be monitored on an annual basis for the first five years and every two years thereafter by a qualified ecologist who will measure / monitor the following.

- The condition of planted tube stock including Silver-leaved Mountain Gum stems.
- Species diversity.
- Percentage foliage cover by canopy, lower-storey and groundcover.
- Weed species.
- Soil condition (and erosion).

The results will be compared against the performance indicators nominated for rehabilitation activities in Section 9.5.2 and **Table 11** and for the performance indicators nominated for the Ecosystem and Land Use Sustainability phase of rehabilitation described in **Table 16**.

### 11.2 BIODIVERSITY OFFSET AREA

Monitoring within the BOA will be directed towards the condition of vegetation as well as the health and population size of the Silver-leaved Mountain Gum.

Occurrences of Silver-leaved Mountain Gum within the BOA will be subject to a simple yet rigorous monitoring system. Annual monitoring will be undertaken by a qualified ecologist to



assess the health of Silver-leaved Mountain Gum within the BOA and to survey percentage foliage cover of weed species. The baseline population of the Silver-leaved Mountain Gum will be recorded in an initial monitoring event following approval of the offset area and be repeated every second year thereafter for the life of the quarry.

The monitoring program will involve five key components:

1. An assessment of the condition of the conservation exclusion measures, i.e. gates and signage and whether access tracks have been widened or new disturbance occurred (quarterly inspections by Quarry staff).
2. An assessment of Silver-leaved Mountain Gum health including the following attributes at predefined and fixed locations (once a year).
  - A qualitative assessment of condition of plants, e.g. good/moderate/poor (including observations of senescence or disease).
  - Evidence of herbivory or other physical disturbance and an assessment of the severity of such where it occurs.
  - Evidence of recruitment, i.e. naturally occurring saplings.
  - Percent foliage cover within core areas, at 10 locations along a 50 metre transect as per OEH (2014b).
  - The percentage of fruiting plants within the BOA.
  - Seed viability, i.e. from trials of collected seed.
3. Mapping of the distribution and extent of the populations using a differential GPS (every second year).
4. Silver-leaved Mountain Gum population estimates (every second year).
5. Photographs of specimen plants of Silver-leaved Mountain Gum at each of the predefined locations (every second year).

The monitoring program will be adapted as the fire management regime is implemented to suitably record and track the response of Silver-leaved Mountain Gum to burning, and provide a base-line, post-fire assessment of the condition of the areas and specimens affected.

In addition to monitoring of the Silver-leaved Mountain Gum within the BOA, a performance evaluation program will be implemented to:

- ensure the actions as prescribed in the BOMP are monitored against known triggers;
- outline adaptive and remedial actions should the triggers not be met; and
- provide details of who will be responsible for implementing and reviewing the actions and monitoring program.

Table 8 of the BOMP (Appendix P of the EMSP) describes the proposed management actions, performance targets, triggers and remedial actions that will be applied to management of the BOA. General monitoring of fencing, track management, weed coverage and feral animal presence will encompass the entire BOA.

### 11.3 FLORA AND FAUNA MONITORING

Flora and fauna surveys have been undertaken at control and impacts sites (for ridge and riverine environments) on and surrounding the Quarry since 2006 (monitoring locations are displayed in **Figure 8**) It is proposed that these surveys would be continued on an annual basis for the life of the Quarry. Surveys would be conducted by a suitably experienced ecologist and generally occur in spring. The monitoring results are to be reported in the Annual Review.

#### Fauna Survey

Fauna surveys are conducted using point census methods for diurnal species and spotlight transects for nocturnal species.

Diurnal fauna survey include the following.

- 15 minute bird census periods at discrete points along flora transects.
- 15 minute reptile searches beneath logs and rocks at bird census points.
- Opportunistic survey along flora transects.

Nocturnal fauna survey include the following.

- Spotlight transects in all vegetation communities over two nights.
- Call playback and listening for threatened fauna species from elevated positions.
- Amphibian call detection and spotlight searches where calls were detected.

The results are compared between the impact and control sites and between years to identify any trends in species diversity and/or density.

#### Flora Survey

Flora surveys are conducted using 200m transects at the locations identified on **Figure 8**. Within each transect at 20m intervals a 10m x 10m area was searched to identify all species present.

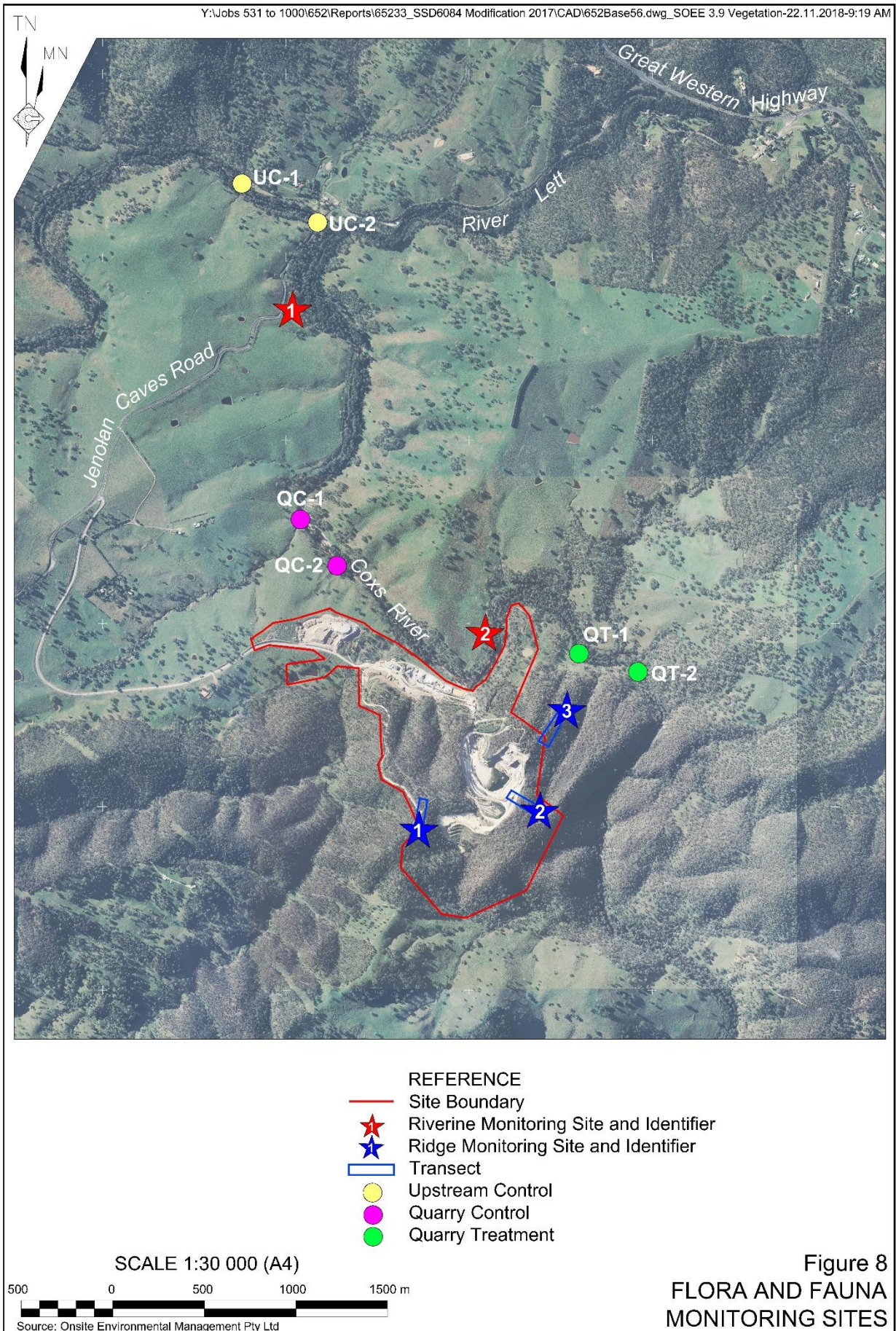
Plant species are identified and compared between sites and between years to identify any trends in species diversity and proportion of native vs exotic species.

### 11.4 COXS RIVER MONITORING

Sampling of water quality and macroinvertebrate assemblages is undertaken from the Coxs River on an annual basis at paired sites upstream and downstream of the Quarry. These sites, which are identified on **Figure 8**, are identified as:

- Upstream Control: located approximately 4km upstream of the Quarry and upstream of the confluence of the River Lett with the Coxs River;
- Quarry Control: located immediately upstream of the Quarry; and
- Quarry Treatment: located downstream of the Quarry.







The following sampling and analyses are completed by an external consultant (generally during Spring). The monitoring results are reported in the Annual Review.

### Macroinvertebrates

Samples of aquatic macroinvertebrates are collected at ‘edge’ and ‘riffle’ habitat at each site using the NSW AUSRIVAS method (Turak et al. 2004). Samples are taken collected with dip nets (250µm mesh) over a period of 3 to 5 minutes from a 10m length of both habitats at each site. Each sample is rinsed from the net onto a white sorting tray from which animals are picked using forceps and pipettes. Each tray is picked for a minimum period of 40 minutes, after which each is picked at 10 minute intervals for a total of one hour or until no new specimens are found. Care is taken to collect cryptic and fast moving animals in addition to those that are conspicuous or slow. The animals collected at each site are placed into a labelled jar containing 70% alcohol.

The collected macroinvertebrates are then identified to family or sub-family level using a binocular microscope and counted to a maximum of ten animals, as per the Australian River Assessment Scheme (AUSRIVAS) protocol.

The collected data on the macroinvertebrate assemblage is then analysed using the AUSRIVAS software package to determine the environmental condition of a waterway based on predictive models of the distribution of aquatic macroinvertebrates. These predictive models are derived from samples collected at reference sites (i.e. those considered to be unaffected or little affected by human activities) distributed over broad geographic regions and from major types of rivers. The spring season predictive model compares the macroinvertebrate fauna collected at each site with that predicted to occur in spring at undisturbed sites with similar physical and chemical characteristics (Coysh et al. 2000).

Analysis of Variance (ANOVA) is used to assess variation between years and between locations (Quarry Treatment vs Quarry Control vs Upstream Control).

## 11.5 WATER QUALITY

The following water quality parameters are measured in situ using a water quality probe, fully calibrated for all parameters before deployment.

- Temperature (°C);
- Electrical Conductivity (EC) (µs/cm);
- pH (pH units);
- Dissolved Oxygen (DO) (mg/L and % saturation); and
- Turbidity (NTU).

The total alkalinity (mg/L CaCO<sub>3</sub>) of the water at each site is measured ex-situ by field titration.

The water quality data for each site are compared between sites, between years and with the ANZECC/ARMCANZ (2000) default trigger values for upland rivers in south-east Australia.

## 12. THREATS TO LANDSCAPE AND REHABILITATION MANAGEMENT AND CONTINGENCY PLANS

### 12.1 THREAT IDENTIFICATION

#### 12.1.1 Rehabilitation

The primary threats to the achievement of the nominated landscape management objectives and outcomes (of **Table 16**), through the implementation of the management measures described in Sections 9.3.1, 9.4.1, 9.5.1, 9.6.1, 9.8.1, 9.9 and 9.10.1 are as follows.

- Uncontrolled access to rehabilitation sites by livestock resulting in over grazing.
- Reduced availability of provenance seed reducing the diversity of the vegetation established on the final landform.
- Reduced availability of growth media and micro-habitat features reducing the species composition of the final ecosystem.
- Over grazing by feral (or overabundant native) herbivores, e.g. rabbits, goats, kangaroos.
- Competition by invasive weed species.
- Erosion leading to reduced growth media and / or loss of seed and tube stock.
- Drought affecting establishment or growth of planted and/or seeded vegetation.
- Disease affecting survival of planted or establishing, or established vegetation.
- Bush fire resulting in the loss of key species and altered composition or formation of the final vegetation community.

Section 12.2 reviews each threat with respect to the achievement of specific performance criteria, and the contingency measures to be applied in each case.

#### 12.1.2 Landscape Management

The primary threats to the achievement of the nominated landscape management objectives and outcomes (of **Table 17**), through the implementation of the management measures described in Section 9.2.1, are as follows.

- Reduced market for Quarry scalps and fines resulting in retention of or increase to stockpiles within the Yorkeys Creek Stockpile Area.
- Reduced effectiveness of visual impact reduction measures, i.e. bituminous material application to the exposed extraction area.
- Unsuccessful initial rehabilitation (groundcover) on overburden emplacement lifts.
- Drought, disease or over-grazing which affects the survival and/or growth of tree screens.
- Ineffective or incomplete rehabilitation<sup>4</sup>.

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<sup>4</sup> Section 12.1.1 reviews the individual threats to successful rehabilitation.



Section 12.2 reviews each threat with respect to the achievement of specific performance criteria, and the contingency measures to be applied in each case.

### 12.1.3 Local Biodiversity

The primary threats to the achievement of the nominated biodiversity (offset and local remnant) objectives and outcomes (of **Tables 18** and **19**), through the implementation of the management measures described in Sections 9.3.1, 9.4.1, 9.6.1, 9.7, 9.8.1, 9.9, 9.10.1 and 9.11.1 are as follows.

- Uncontrolled access to the BOA by livestock resulting in over grazing and reduced biodiversity value.
- Uncontrolled access by Quarry personnel, land owner or visitors resulting in erosion, weed dispersion or disease.
- Establishment of unnecessary access tracks, degradation and/or erosion.
- Over grazing by feral (or overabundant native) herbivores, e.g. rabbits, goats, kangaroos.
- Competition by invasive weed species.
- Erosion leading to reduced growth media and / or loss of seed and tube stock.
- Disease affecting survival of remnant vegetation.
- Fire frequency outside of target range resulting in the loss of key species and altered composition or formation of the final vegetation community.
- Quarry emissions (noise, air) or discharges (water) resulting in a reduction in local habitat value.

Section 12.2 reviews each threat with respect to the achievement of specific performance criteria, and the contingency measures to be applied in each case.

## 12.2 CONTINGENCY MANAGEMENT

**Table 20** reviews each threat to rehabilitation, landscape management and local biodiversity, identifies the relevant performance criteria which could be affected, and nominates contingency management strategies for implementation where performance falls below the nominated measure or indicator (of **Tables 16** to **19**).

**Table 22**  
**Threats, Performance Criteria and Contingency Management**

Page 1 of 4

Threat	Performance Criteria	Contingency Management
<b>Rehabilitation</b>		
Uncontrolled access to rehabilitation sites by livestock resulting in over grazing	At least 80% of species planted present (including Silver-leaved Mountain Gum).	<ul style="list-style-type: none"> <li>– Install, repair or reinstate fencing to prevent livestock access.</li> <li>– Review species diversity (as part of next scheduled monitoring) and provide for supplementary seeding / planting.</li> </ul>

**Table 23 (Cont'd)**  
**Threats, Performance Criteria and Contingency Management**

Page 2 of 4

Threat	Performance Criteria	Contingency Management
<b>Rehabilitation (Cont'd)</b>		
Reduced availability of provenance seed reducing the diversity of the vegetation established on the final landform	Species used are consistent with those of the disturbed vegetation communities.	<ul style="list-style-type: none"> <li>– Commission targeted seed collection for specific species. Or</li> <li>– Identify source of required seed from local nursery and establish local provenance.</li> <li>– Include identified seed in next revegetation campaign.</li> </ul>
Reduced availability of growth media and micro-habitat features reducing the species composition of the final ecosystem	Soil depths as nominated.	– Commence trials of alternate growth media or rehabilitation methods to increase the diversity of species which colonise the rehabilitation.
	Native fauna observed utilising habitat provided by woody debris.	<ul style="list-style-type: none"> <li>– Increase the number of microhabitat features, e.g. woody debris, rocks, hollows, placed on the final landform.</li> <li>– Commence trials of alternative artificial habitat features.</li> </ul>
Over grazing by feral (or overabundant native) herbivores, e.g. rabbits, goats, kangaroos	Feral pests are not present within rehabilitation.	<ul style="list-style-type: none"> <li>– Commence feral or pest management strategies (in consultation with LLS and/or OEH personnel).</li> <li>– Review species diversity (as part of next scheduled monitoring) and provide for supplementary seeding / planting.</li> </ul>
	At least 80% of species planted present (including Silver-leaved Mountain Gum).	
	Overstorey projected foliage cover (PFC) = 10% – 20%. Lower storey PFC = 10% – 20%. Groundcover PFC = 55% – 65%.	
Competition by invasive weed species	Suppression of invasive weeds and perennial exotic grasses to less than 5% of percentage foliage cover (PFC) in all structural layers.	<ul style="list-style-type: none"> <li>– Consult local weed control specialist, Council weeds officer or other qualified professional to develop alternative weed control strategy(ies).</li> <li>– Implement alternative weed control strategy(ies) under appropriate supervision.</li> </ul>
Erosion leading to reduced growth media and / or loss of seed and tube stock	Erosion does not exceed 0.3m (gully) deep.	<ul style="list-style-type: none"> <li>– Source of high velocity flows to be identified and water management corrected.</li> <li>– Identify appropriate access point and walk backhoe or other suitable equipment to location of erosion.</li> <li>– Fill the gully with rock and or soil, recover with topsoil and replant tube stock or reseed with groundcover species.</li> </ul>
	Average soil loss per annum is <40 tonnes/ha/year.	
Drought affecting establishment or growth of planted and/or seeded vegetation	At least 80% of species planted present (including Silver-leaved Mountain Gum).	<ul style="list-style-type: none"> <li>– Undertake supplementary watering of rehabilitation.</li> <li>– Review species diversity (as part of next scheduled monitoring) and provide for supplementary seeding / planting.</li> </ul>
Disease affecting survival of planted or establishing, or established vegetation	Overstorey projected foliage cover (PFC) = 10% – 20%. Lower storey PFC = 10% – 20%. Groundcover PFC = 55% – 65%.	<ul style="list-style-type: none"> <li>– Review species diversity (as part of annual monitoring).</li> <li>– Provide for supplementary seeding / planting of species lost following fire.</li> </ul>

**Table 24 (Cont'd)**  
**Threats, Performance Criteria and Contingency Management**

Page 3 of 4

Threat	Performance Criteria	Contingency Management
Bush fire resulting in the loss of key species and altered composition or formation of the final vegetation community		
<b>Landscape Management</b>		
Reduced market for Quarry scalps and fines resulting in retention of or increase to stockpiles within the Yorkeys Creek Stockpile Area	Stockpiled material removed and rehabilitation complete.	<ul style="list-style-type: none"> <li>– Final landform modified (in consultation with relevant stakeholders).</li> <li>– Outer slopes of the stockpile battered to angle of 18° or less.</li> <li>– Soil applied to profiled slope.</li> <li>– Initial groundcover established (65% coverage within 6 months).</li> <li>– Sustainable coverage of pasture established.</li> </ul>
Reduced effectiveness of visual impact reduction measures, i.e. bituminous material application to the exposed extraction area	Bituminous film applied to the terminal western faces at least every two years. or as assessed	<ul style="list-style-type: none"> <li>– Trials of alternative visual mitigation methods identified and trialled.</li> <li>– Successful methods then implemented.</li> </ul>
Unsuccessful initial rehabilitation (groundcover) on overburden emplacement lifts	70% coverage achieved within 6 months of completion.	<ul style="list-style-type: none"> <li>– Re-profile the soil layer and re-apply seed (by hydro-seed methods).</li> </ul>
Drought, disease or over-grazing which affects the survival and/or growth of tree screens	Tree screen established.	<ul style="list-style-type: none"> <li>– Commission an appropriately qualified horticulturalist to advise on disease treatment / prevention.</li> <li>– Commence a supplementary watering strategy (unless contrary to advice of horticulturalist).</li> <li>– Complete in-fill or replacement planting of tube stock to replace dead trees or supplement slow growing trees.</li> </ul>
Ineffective or incomplete rehabilitation	Completion of rehabilitation criteria.	See contingency management for 'Rehabilitation'.
<b>Local Biodiversity</b>		
Uncontrolled access to the BOA by livestock resulting in over grazing and reduced biodiversity value	Livestock excluded from the BOA.	<ul style="list-style-type: none"> <li>– Install, repair or reinstate fencing to prevent livestock access.</li> <li>– Review species diversity (as part of next scheduled monitoring) and provide for supplementary seeding / planting.</li> </ul>
	No significant decrease in the habitat value provided by vegetation surrounding the Quarry.	
Uncontrolled access by Quarry personnel, land owner or visitors resulting in erosion, weed dispersion or disease	Suppression of invasive weeds and perennial exotic grasses to less than 5% of percentage foliage cover (PFC) in all structural layers.	<ul style="list-style-type: none"> <li>– Consult local weed control specialist, Council weeds officer or other qualified professional to develop alternative weed control strategy(ies).</li> <li>– Implement alternative weed control strategy(ies) under appropriate supervision.</li> </ul>
Competition by invasive weed species		

**Table 25 (Cont'd)**  
**Threats, Performance Criteria and Contingency Management**

Page 4 of 4

Threat	Performance Criteria	Contingency Management
Over grazing by feral (or overabundant native) herbivores, e.g. rabbits, goats, kangaroos	Negligible impacts from feral herbivores on native vegetation Silver-leaved Mountain Gum.	<ul style="list-style-type: none"> <li>– Commence feral or pest management strategies (in consultation with LLS and/or OEH personnel).</li> <li>– Review species diversity (as part of next scheduled monitoring) and provide for supplementary seeding / planting.</li> </ul>
Establishment of unnecessary access tracks, degradation and/or erosion	No degraded tracks requiring rehabilitation.	<ul style="list-style-type: none"> <li>– Close any unnecessary track and install physical barriers.</li> <li>– Rip tracks parallel to local contours and allow to revegetate naturally.</li> </ul>
Disease affecting survival of remnant vegetation	No significant decrease in the habitat value provided by vegetation surrounding the Quarry.	<ul style="list-style-type: none"> <li>– Commission an appropriately qualified horticulturalist to advise on disease treatment / prevention.</li> <li>– Commence a supplementary watering strategy (unless contrary to advice of horticulturalist).</li> <li>– Complete in-fill or replacement planting of tube stock to replace dead trees or supplement slow growing trees.</li> </ul>
Fire frequency outside of target range resulting in the loss of key species and altered composition or formation of the final vegetation community	Sustainable habitat for Silver-leaved Mountain Gum maintained with no decline in local species diversity or altered community composition.	<ul style="list-style-type: none"> <li>– Commission specialist bush regeneration specialist or appropriately qualified ecologist to inspect after fire.</li> <li>– Review species diversity (as part of annual monitoring).</li> <li>– Provide for supplementary seeding / planting of species lost following fire (or as advised by bush regeneration specialist or appropriately qualified ecologist).</li> </ul>
Quarry emissions (noise, air) or discharges (water) resulting in a reduction in local habitat value	<p>No reduction in the proportion of native to introduced flora species.</p> <p>No significant reduction in amphibian, reptiles, birds and mammals.</p> <p>No significant (negative) impacts between control and impact sites noted.</p> <p>No significant (negative) differences between annual sampling events.</p>	<ul style="list-style-type: none"> <li>– Commission ecological consultancy to complete a review of any noted declines or impacts.</li> <li>– Review and implement, as practicable, recommendations provided.</li> </ul>

## 13. INCIDENT MANAGEMENT, NOTIFICATION AND REPORTING

### 13.1 LANDSCAPE MANAGEMENT AND REHABILITATION INCIDENTS

SSD 6084 defines an incident as:

*“An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance”*

Further to this, SSD 6084 defines material harm as follows.

*Material harm.....Is harm that:*

- *involves actual or potential harm to the health or safety of human beings or to the environment that is not trivial, or*
- *results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$10,000, (such loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment)*

*This definition excludes “harm” that is authorised under either this consent or any other statutory approval’*

With respect to landscape and rehabilitation management, an incident is most likely to occur as a result of the following.

1. Clearing beyond the approved limit nominated by SSD 6084.
2. Direct harm to native fauna which could have been avoided (through implementation of the native fauna protection measures of Section 9.4.1.2); or
3. Triggering of contingency measures as a result of failure to achieve the nominated performance (refer to Section 12).

### 13.2 INCIDENT MANAGEMENT AND NOTIFICATION

On identification of an incident, by inspection, monitoring or annual review, the Quarry Manager will be notified and an investigation commenced. As far as practical, the activity resulting in the incident will be ceased or modified to prevent occurrence of further harm. Records relating to the method by which the incident was identified, details of the incident and corrective or preventative measures taken on identification will be kept.

The following provides the details of further notification and management for the incident types noted in Section 13.1.



### **Clearing Incidents**

In the event of clearing beyond the nominated and approved impact footprint, the DPIE will be informed with details as to the location, area and significance / sensitivity of the non-compliant disturbance.

In the event the non-compliant clearing includes Silver-leaved Mountain Gum, the DoEE and OEHL will also be informed. As part of the notification, Hy-Tec will provide a summary of the cause of the incident, measures taken to prevent further impact, and proposed corrective and/or preventative measures.

### **Native Fauna Related Incidents**

In the event of direct impacts to native wildlife, Hy-Tec will inform OEHL and follow any instructions provided. As noted for clearing incidents, a summary of the cause of the incident, measures taken to prevent further impact, and proposed corrective and/or preventative measures will be prepared and provided.

### **Performance Criteria-related Incidents**

Generally identified as a result of monitoring or prior to preparation of the Annual Review (in accordance with *Condition 5(4)*), notification of incidents related to a failure to achieve the relevant performance criteria will be provided to the DPIE and other stakeholders within the Annual Review.

## **13.3 INCIDENT REPORTING**

Following implementation and review of the corrective measures, a short description of the incident, actions taken and results of the corrective actions will be documented by the Quarry Manager.

A summary of all incidents, including dates of occurrence, corrective measures taken and success of these measures will be compiled and reported in the Annual Review to the DPIE.

## **14. DOCUMENTATION AND PUBLICATION OF MONITORING INFORMATION AND REPORTING**

Hy-Tec will retain records of monitoring for a minimum period of four years. Monitoring records will be made available to relevant government authorities following a written request.

Hy-Tec will include all monitoring reports as appendices to the Annual Review. That document, once approved by the relevant government agencies, will be published on the Company's website.

A summary of the results of Silver-leaved Mountain Gum monitoring will be provided to OEHL for its records on an annual basis, at the same time that this information is compiled for the Annual Review.

## 15. ROLES AND RESPONSIBILITIES

**Table 21** outlines the roles and responsibilities of personnel with reference to management of rehabilitation and landscape management.

**Table 26**  
**Roles and Responsibilities of Personnel**

<b>Role</b>	<b>Responsibilities</b>
NSW Quarry Operations Manager	Ensure compliance with the Plan. Ensure adequate resources are available to implement the Plan. Ensure suitably trained personnel are available to implement the responsibilities of the Quarry Production Manager during any time of the Quarry Production Manager's absence from site. Coordinate the review of the Plan (see Section 17).
Quarry Production Manager, or his/her nominee	Ensure the implementation of the Plan. Ensure quarry scheduling accounts for the measures nominated in the Plan. Ensure pre-clearing surveys are undertaken. Ensure all monitoring referenced in the Plan is completed. Ensure employees are competent through training and awareness programs.
All On-site Personnel	Operate in a manner that minimises risks of incidents to themselves, fellow workers or the surrounding environment. Fully implement the relevant control measures within the Plan. Report any unidentifiable clearing or unplanned clearing to the Quarry Production Manager. Follow any instructions provided by the Quarry Production Manager.
All Truck Drivers	Drive to conditions and to avoid interaction with wildlife.

## 16. COMPETENCE TRAINING AND AWARENESS

All personnel and contractors working at the Quarry undergo a preliminary and then annual induction. This induction includes information on the management of landscaping and rehabilitation while working on site.

After completing the induction, workers are required to sign the induction form and a record of this is kept in the administration office.

Monthly toolbox meetings are held to discuss whole-of-site production, management, safety and environmental issues. Matters relating to landscaping and rehabilitation are raised during these meetings, when necessary.

## 17. PLAN REVIEW AND CONTINUAL IMPROVEMENT PROTOCOL

In accordance with *Condition 5* of Schedule 5 of SSD 6084, the Plan will be internally reviewed within 3 months of submission of an Annual Review, each independent environmental audit and any modification to SSD 6084 to address feedback from these processes. Should changes to the Plan be required, approval for the modified plan would be sought from DPIE.

A comprehensive review of all management plans will take place every three years and include review of all management measures to ensure these remain within best practice management. This will ensure the adequacy of the Plan and allow for opportunities of adaptive management and continual improvement. This will include a review of landscaping and rehabilitation processes, the overall effectiveness of the Landscape and Rehabilitation Management Plan and whether it should be modified or scaled back.

## 18. REFERENCES

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