Karuah East Quarry Project

Landscape and Rehabilitation Management Plan

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DOCUMENT CONTROL

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1 INTRODUCTION

SLR Consulting Australia Pty Ltd (SLR) has been engaged by Karuah East Quarry Pty Ltd (Karuah East) to prepare a Landscape and Rehabilitation Management Plan (this plan) to satisfy the requirements of the Project Approval (PA 09_0175) granted on 17 June 2014 for the Karuah East Quarry Project (the Project). Ecological consultants, Kleinfelder have completed sections relating to landscape and biodiversity management including Sections 4.3, 5.1, 6 and 12.

The Landscape and Rehabilitation Management Plan has been prepared with reference to the following documents:

- **Environmental Assessment Report – Proposed Karuah East Hard Rock Quarry** prepared by ADW Johnson Pty Ltd dated 31 January 2013 (hereafter referred to as the EA);
- **Preferred Project Report – Proposed Karuah East Quarry** prepared by ADW Johnson Pty Ltd dated 30 July 2013 (hereafter referred to as the PPR);
- **Proposed Karuah East Quarry Project, Pacify Highway, Karuah – Life of Project, Quarry Closure and Rehabilitation Plan** prepared by SLR dated November 2012;
- **Terrestrial Ecology Survey and Assessment Report – Karuah East Quarry** prepared by RPS Australia East Pty Ltd dated July 2013;
- **Biodiversity Offset Strategy – Karuah East Quarry** prepared by Eco Logical Australia Pty Ltd dated July 2013;
- **EPBC Act Assessment Report – Karuah East Quarry – EPBC 2014/7282** prepared by Eco Logical Australia Pty Ltd dated October 2014;
- **Biodiversity Offset Area Management Plan – Karuah East Quarry** prepared by Kleinfelder Australia dated July 2015;
- **Humane pest animal control: Codes of Practice. Department of Primary Industries (2014).** (Website: http://www.dpi.nsw.gov.au/agriculture/pests-weeds/vertebrate-pests);
- **EPBC Act Approval 2014/7282**;
- **Project Approval 09_0175**; and
- **Environment Protection Licence (EPL) 20611**.

1.1 Definitions

The following terms are referred to throughout this plan to describe particular geographic areas:

- **Project Approval Area** (or **Project Area**) – refers to the entirety of Lots 12 and 13 DP 1024564, and the road extension within Lots 16 and 17 DP 1024564 (see **Figure 1**);
- **Project Disturbance Area** – refers to the areas within the Project Approval Area that will be directly impacted by the project, including part Lots 12 and 13 DP 1024564 (see **Figure 1**); and
- **Biodiversity Offset Area** – refers to the areas of vegetation to be retained on part Lot 13 DP 1024564, and the entirety of Lot 14 DP 1024564 and Lot 5 DP 838128 which adjoin the eastern boundary of the Project Disturbance Area (see **Biodiversity Offset Area Management Plan** for further details (Kleinfelder, 2015).
1.2 Consultation for this Management Plan

A copy of the Landscape and Rehabilitation Management Plan was provided to Great Lakes Council and the Office of Environment and Heritage (OEH) for comment on 15 September 2015. The OEH responded to Karuah East in a letter dated 23 September 2015, but they did not have any comments relating to the Landscape and Rehabilitation Management Plan with all comments relating to the management of the offset area and Tetratheca juncea. A copy of the OEH response letter is attached as Appendix A1.

Mathew Bell from Great Lakes Council provided comments to Karuah East on 1 October 2015 regarding the Landscape and Rehabilitation Management Plan. The response is outlined in Table 1 below:

<table>
<thead>
<tr>
<th>Comment from Great Lakes Council</th>
<th>Response from Karuah East</th>
</tr>
</thead>
<tbody>
<tr>
<td>We are satisfied that the LRMP is suitably adequate and deals with the key issues associated with pre-clearing, clearing, weed and pest management and progressive and final rehabilitation. These are all significant site issues.</td>
<td>Karuah East will report on the implementation of the management plan in the Annual Review.</td>
</tr>
<tr>
<td>We are particularly satisfied that critical site resources such as hollow logs, hollow limbs, mulch from clearing, topsoil, etc, from approved clearing areas are proposed to be utilised as habitat furniture and site stabilisation and rehabilitation.</td>
<td></td>
</tr>
<tr>
<td>The LRMP does not deal with how the final rehabilitated landform would be secured (that is, that the restoration achieved would be consolidated in the long-term). Perhaps a s88B instrument or Conservation Agreement is required to ensure that the progressive and closure rehabilitation outcomes are secured.</td>
<td>Further details regarding conservation agreements and post mining management will be outlined in future updates to the Landscape and Rehabilitation Management Plan.</td>
</tr>
<tr>
<td>Further, there is no calculation of the quantum of a conservation bond to ensure that the rehabilitation is achieved in the event that the current or future registered proprietor fails to deliver on the outcomes. An adequate conservation bond is imperative to ensuring a suitable outcome. We understand that there is a separate process for the determination of this bond.</td>
<td>The Karuah East rehabilitation bond (Schedule 3 Condition 34) is required to be submitted to the DP&amp;E within six months of approval of this Plan. Initial calculations have been completed and the bond will be sent to the DP&amp;E prior to this timeframe.</td>
</tr>
<tr>
<td>Obviously, the Plan is only as good as its implementation. We would appreciate being provided copies of any implementation reports for progressive landscaping and rehabilitation of this landform.</td>
<td>Karuah East will report on the implementation of the management plan in the Annual Review.</td>
</tr>
</tbody>
</table>

A full copy of this response from Great Lakes Council is attached as Appendix A2.

The Landscape and Rehabilitation Management Plan was submitted to the DP&E for review on 16 October 2015. The Plan has been updated to incorporate all comments received. The DP&E’s review is attached as Appendix A3.
2 STATUTORY REQUIREMENTS AND GUIDELINES FOR REHABILITATION AND LANDSCAPE MANAGEMENT

2.1 Project Approval Requirements

Requirements of the Landscape and Rehabilitation Management Plan are provided in Schedule 3, Condition 32, and Schedule 5, Condition 3 of the Project Approval (see Table 2).

Table 2 Project Approval (PA 09_0175) Requirements

<table>
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<td>Schedule 3 Condition 31</td>
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<td>Schedule 3 Condition 32</td>
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</tbody>
</table>
(e) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, including triggers for any remedial action;

(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 preparation of the plan), including the procedures to be implemented for:

- Ensuring compliance with the rehabilitation objectives and progressive rehabilitation obligations of this approval;
- Enhancing the quality of remnant vegetation and fauna habitat;
- Restoring native endemic vegetation and fauna habitat within the rehabilitation area, including details of the target revegetation communities of the rehabilitated landform;
- Coordinating the relocation of native fauna to protected habitats associated with pre-clearing fauna surveys;
- 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 rehabilitation area;
- Collecting and propagating seed;
- Ensuring minimal environmental consequences for threatened species, populations and habitats;
- Minimising the impacts on native fauna on site, including the details and implementation of appropriate pre-clearance surveys;
- Minimising the impacts on fauna movement between undisturbed areas of the site and nearby vegetation (including potential fauna crossings);
- Controlling weeds and feral pests;
- Controlling erosion
- Controlling access and providing for management trails; and
- Bushfire management and implementation of ecologically appropriate bushfire intervals.

(g) include a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;

(h) identify the potential risks to successful implementation of the *Tetratheca juncea* Translocation Program and rehabilitation of the site, and include a description of the contingency measures that would be implemented to mitigate these risks;

(i) include details as to how the rehabilitated land would be permanently conserved and managed as part of the broader Biodiversity Offset Area approved in these conditions

(j) include details of who would be responsible for monitoring, reviewing, and implementing the plan; and

(k) include details as to the timing of actions set-out in plan

Schedule 3
Condition 34
Conservation & Rehabilitation

The Proponent shall lodge a Conservation and Rehabilitation Bond with DP&I within 6 months of the approval of the Landscape and Rehabilitation Management Plan, to ensure that the Biodiversity Offset Strategy and the rehabilitation of the site is implemented in accordance with the performance and completion criteria set out in the Landscape and Rehabilitation Management Plan. The sum of the bond shall be determined by:

Bond is outlined in Section 13
<table>
<thead>
<tr>
<th>Condition</th>
<th>Requirement</th>
<th>Relevant Section</th>
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</table>
| Bond      | (a) Calculating the cost of implementing the Biodiversity Offset Strategy over the next 3 years; (b) Calculating the cost of rehabilitation disturbed areas of the site, taking into account the likely surface disturbance over the next 3 years of quarrying operations; and (c) Employing a suitably qualified quantity surveyor or other expert to verify the calculated costs, to the satisfaction of the Secretary. Notes:  
  - If capital and other expenditure required by the Landscape and Rehabilitation Management Plan is largely complete, the Secretary may waive the requirement for the lodging of a bond in respect of the remaining expenditure.  
  - If the Biodiversity Offset Strategy and rehabilitation of the site area are completed to the satisfaction of the Secretary, then the Secretary will release the bond. If the Biodiversity Offset Strategy 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 site works. | |

The component of the bond relating to the implementation of the Biodiversity Offset Strategy may be waived, if a separate arrangement is entered between the Proponent and OEH which satisfactorily replaces that component, to the satisfaction of the Secretary.

Schedule 5 – Environmental Management, Reporting and Auditing

Management Plan Requirements

3 The Proponent shall ensure that the Management Plans required under this approval are prepared in accordance with any relevant guidelines, and include:

| 3(a) | Detailed baseline data | Whole of document |
| 3(b) | A description of:  
  - The relevant statutory requirements (including any relevant approval, licence or lease conditions);  
  - Any relevant limits or performance measures/criteria; and  
  - The specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; | Section 2 |
| 3(c) | A description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria; | Section 2 |
| 3(d) | A program to monitor and report on the:  
  - Impacts and environmental performance of the project; and  
  - Effectiveness of any management measures (see (c) above); | Section 12 |
| 3(e) | A contingency plan to manage any unpredicted impacts and their consequences; | Section 15 |
| 3(f) | A program to investigate and implement ways to improve the environmental performance of the project over time; | Section 12.3 |
| 3(g) | A protocol for managing and reporting any:  
  - Incidents;  
  - Complaints;  
  - Non-compliances with statutory requirements; and  
  - Exceedances of the impact assessment criteria and/or performance criteria; and | Section 12.4 |
| 3(h) | A protocol for periodic review of the plan. | Section 18 |
2.2 Environment Protection Licence Requirements

The Environment Protection Authority (EPA) regulates the operations conducted at the Project site through an Environment Protection Licence (EPL 20611) issued under the Protection of the Environment Operations Act 1997 (POEO Act). There are no specific EPL conditions relating to landscape or rehabilitation management.

2.3 Statement of Commitments

Section 11 of the Statement of Commitments refers to quarry closure and rehabilitation and Section 4 of the Statement of Commitments refers to biodiversity and conservation offsets. These aspects have been covered under this plan.

2.4 Key Legislation

2.4.1 Environmental Planning and Assessment Act 1979

The development assessment and approval system for NSW is outlined in Parts 4 and 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act). Objectives of the EP&A Act include:

“(a) to encourage:

(i) the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,

(ii) the promotion and co-ordination of the orderly and economic use and development of land,

(iii) the protection, provision and co-ordination of communication and utility services,

(iv) the provision of land for public purposes,

(v) the provision and co-ordination of community services and facilities, and

(vi) the protection of the environment, including the protection and conservation of native animals and plants, including threatened species, populations and ecological communities, and their habitats, and

(vii) ecological sustainable development ...”

This Plan has been prepared with consideration of the EP&A Act.

2.4.2 Protection of the Environment Operations Act 1979

The objectives of the Protection of the Environmental Operations Act 1997 (POEO Act) are outlined below:

(a) to protect, restore and enhance the quality of the environment in NSW, having regard to the need to maintain ecologically sustainable development,

(b) to provide increased opportunities for public involvement and participation in environment protection,
(c) to ensure that the community has access to relevant and meaningful information about pollution,

(d) to reduce risks to human health and prevent the degradation of the environment by the use of mechanisms that promote the following:

(i) pollution prevention and cleaner production,

(ii) the reduction to harmless levels of the discharge of substances likely to cause harm to the environment,

(iia) the elimination of harmful wastes,

(iii) the reduction in the use of materials and the re-use, recovery or recycling of materials,

(iv) the making of progressive environmental improvements, including the reduction of pollution at source,

(v) the monitoring and reporting of environmental quality on a regular basis,

(e) to rationalise, simplify and strengthen the regulatory framework for environment protection,

(f) to improve the efficiency of administration of the environment protection legislation,

(g) to assist in the achievement of the objectives of the Waste Avoidance and Resource Recovery Act 2001.

2.4.3 State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007

State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007 (Mining SEPP) applies to mining and quarrying related activities. Section 10 of the Mining SEPP describes various exempt developments that do not require approval under the EP&A Act.

The definition of “mining” set out in Clause 3 of the Mining SEPP includes “the stockpiling, processing, treatment and transportation of materials extracted”. Exempt development listed under the Mining SEPP which specifically relates to the decommissioning process includes the demolition of a building or structure that is carried out in accordance with Australian Standard AS2601-2001, Demolition of Structures, but only if the building or structure is not, or is not part of, a heritage item, or in a heritage conservation area, identified by an environmental planning instrument (Mining SEPP). Such demolition work is exempt from planning approvals provided it takes place on an approved site and is of minimal environmental impact.
3 PROJECT DESCRIPTION

3.1 Overview

Hunter Quarries currently extract hard black andesite material from the existing quarry operation on adjoining lands. Approval was granted for this designated development on the adjoining land (Lot 21 DP 1024341, Lot 11 DP 1024564 and Lot 12 DP 1024564) by the Minister as State Significant Development on 3 June 2005 (DA265/10/2004).

The existing Karuah Quarry currently operates under Development Consent (DA 265/2004) and is approved to extract up to 500,000 tonnes per annum (tpa) of ‘andesite’ basalt material suitable for use as road base, construction aggregate and concrete batching, among various other applications.

Following exploratory works adjacent to the existing approved quarry, additional resource has been identified to the east on land owned by the Proponent (Project site). On 17 June 2014, the approval (09_0175) was granted by the Planning Assessment Commission on behalf of the Minister for Planning and Environment for the extraction of this additional resource through the development of Karuah East, a stand-alone operation to the existing quarry. Federal Approval (EPBC 2014/7282) was granted for Karuah East under the Environment Protection and Biodiversity Conservation Act (EPBC Act 1999) on 20 March 2015.

3.2 Karuah East Project Site

The Project site is located on Lots 12 and 13 DP 1024564, off the Pacific Highway, approximately 3 km north of Karuah NSW.

The approved Project includes the following key elements:

- Staged extraction of approximately 29 million tonnes of “andesite” over a 20 year timeframe;
- Extraction of up to 1.5 million tonnes of andesite material per year;
- Removal and stockpiling of an estimated 380,000 m$^3$ of overburden (approximately 750,000 tonnes) from the quarry extraction area in accordance with the Rehabilitation Plan prepared for the project. Removal of overburden is not included in the proposed extraction rate of 1.5 million tonnes of andesite annually;
- Haulage of up to 1.5 million tonnes of andesite per year from the site to market by 25 to 30 tonne haul trucks via the Pacific Highway;
- Up to 216 truck loads per day (at maximum production);
- Implementation of water management and erosion and sediment control works to ensure no loss of sediment, dust minimisation and to control discharges from the site to ensure that all discharges are within acceptable volumetric and water quality criteria;
- Employment of 28 on-site staff;
- Construction of new haul road and access through adjoining RMS land;
- Roadworks to secure access to the site including upgrade & extension of Blue Rock Lane, realignment of Andesite Drive & Blue Rock Lane intersection and adjust road markings at Branch Lane & Andesite Road intersection;
- Staged clearing;
- Drilling and blasting activities;
- Loading and hauling of extracted material;
- Crushing and screening of extracted material;
- Stockpiling of material on-site; and
• Location of plant on Lot 13 comprised of office buildings, workshops, parking areas, crushing plant, wash plant, weigh bridge and product storage areas.

**Figure 1** presents the Project site plan and layout. It should be noted that this Plan does not cover any offsets associated with Karuah East, with these being covered under a separate management plan (Schedule 3 Condition 33 – *Biodiversity Offset Area Management Plan*).
FIGURE 1
Karuah East Quarry - Site and Locality Plan

NOTE:
Data within this drawing was provided by ADW Johnson 2015 for use in SLR report. Some edits to original ADW drawing have been made by SLR for clarity. Background aerial photograph sourced from NearMap.

LEGEND
- PUBLIC ROAD ACCESS (THE BRANCH LANE)
- EXISTING QUARRY ACCESS (AUGERTS ROAD)
- EXISTING ACCESS ROAD (BLUE ROCK LANE)
- PROPOSED ACCESS ROAD (BLUE ROCK LANE EXTENSION)
- PROPOSED PRIVATE ACCESS WITHIN LOT 12
- PROJECT MILEAGE
- ADJACENCY LOT BOUNDARIES
- PROPOSED DISTURBANCE AREA

SUBJECT SITE
LOCALITY MAP
3.3 Operating Hours

In accordance with Schedule 2, Condition 7 of the PA, Karuah East will operate during the following hours:

**Table 3 Operating Hours**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Operating Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarrying Operations</td>
<td>7.00 am to 6.00 pm, Monday to Friday; and 7.00 am to 1.00 pm, Saturdays.</td>
</tr>
<tr>
<td></td>
<td>No quarrying operations on Sundays or Public Holidays</td>
</tr>
<tr>
<td>Construction activities</td>
<td>7.00 am to 6.00 pm, Monday to Friday; and 8.00 am to 1.00 pm, Saturdays.</td>
</tr>
<tr>
<td></td>
<td>Unless noise from the activities does not exceed 35 dB(A)<em>{L</em>{Aeq(15minute)}} at any privately-owned residence.</td>
</tr>
<tr>
<td>Maintenance activities</td>
<td>24 hours a day, 7 days per week, providing maintenance activities are inaudible at any privately-owned residence.</td>
</tr>
</tbody>
</table>

Note: This condition does not apply in the event of a direction from police or other relevant authority for safety or emergency reasons regarding works which may need to be undertaken to avoid loss of life, property loss and/or to prevent environmental harm.

4 EXISTING ENVIRONMENT

4.1 Land Use

**Pre Mining Land Use**

A description of the relevant land capability classes is provided in Table 4.

**Table 4 Pre-Mining Rural Land Capability Classes**

<table>
<thead>
<tr>
<th>Land Class</th>
<th>Pre-mining</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ha</td>
<td></td>
</tr>
<tr>
<td>Class IV</td>
<td>13.2</td>
<td>44</td>
</tr>
<tr>
<td>Class VII</td>
<td>16.4</td>
<td>56</td>
</tr>
<tr>
<td>Total</td>
<td>29.6</td>
<td>100</td>
</tr>
</tbody>
</table>

**Class IV Land**

Class IV land consists of Soil Type 1 and 2 (Brown Chromosol and Red Dermosol), and covers an area of 13.2 ha. This classification indicates that the land is suitable for grazing with only occasional cultivation and is the best class of grazing land. The majority of Class IV land occurs within the proposed infrastructure area.
Class VII Land

Class VII land consists of Soil Type 3 (Leptic Tenosol) and covers an area of 16.4 ha. This land is considered unsuitable for rural production and is best protected by green timber to control erosion. The majority of Class VII land occurs within the proposed quarry extraction area. Constraints associated with these soil types include its slope, heavy subsoil clay content, shallow topsoil depth and susceptibility to erosion.

4.2 Soil

GSS Environmental (GSSE) completed an assessment of soils as part of the Soil Survey and Land Resource Assessment for the Environmental Assessment in July 2011.

The soil landscapes within the Project Area have been mapped by the Land & Water Conservation incorporating the Soil Conservation Service of NSW at the scale of 1:100,000 by Matthei (1995). The soil landscape units described by these publications are “areas of land that have recognisable and specific topographies and soils that can be presented on maps and described by concise statements”. The soil landscape units that occur within the Project Area are as follows:

- North Arm Cove unit is the most common and is present extensively throughout the eastern and central areas of the Project Area;
- Gan Gan unit occurs in the north western area of the Project Area;
- Gan Gan variant A occurs small pocket in the project site north-west, and;
- Nungra unit small pockets in the Project Sites southern area.

The North Arm Cove soil landscape occurs as undulating to rolling rises on Nerong Volcanics in the Karuah Mountains and Medowie Lowlands, east of the Karuah River. Local relief up to 50m and slope gradient of <15%. Common soil occurrences of this landscape include a weakly structured light sandy clay loam, bleached hardsetting sandy clay loam and mottled blocky clay. Limitations include high erosion hazard and seasonal waterlogging on lower slopes.

The Gan Gan soil landscape occurs on the steep hills of the Nerong Volcanics on the Karuah Mountains. Slope gradients >25%, local relief 100-200m, elevation 60 – 260m. Common soil occurrences of this landscape include a stony brownish black weakly pedal sandy loam, bleached hardsetting light sandy clay loam, and whole coloured light clay.

Gan Gan variant A is found on lower footslopes and includes imperfectly drained soils that have sharp boundaries between soil materials and a depth of >200cm. Limitations include mass movement associated with steep slopes, shallow soils with rock outcrops and an extreme water erosion hazard.

The Nungra soil landscape occurs on widespread gently inclined footslopes and drainage plains of the Medowie Lowlands and Karuah Mountains physiographic regions. Slope gradient <3%, local relief <10m and elevation to 40m. Common soil occurrences include a greyish yellow brown weakly pedal silty clay loam, bleached hardsetting silty clay loam, greyish yellow brown mottled silty clay. Limitations include localised salinity, water erosion hazard, high run on, seasonal water logging and flood hazards.

4.3 Biodiversity

RPS Australia Pty Ltd (2013) conducted an Ecological Assessment of the proposed Karuah East Quarry Project Approval Area and adjoining lands (including Lots 12, 13 and 14 DP1024564) as part of the Environmental Assessment. Additional ecological surveys were also conducted by Eco Logical Australia (ELA) across Lots 12-14 and Lot 5 DP 838128 (Figure 2) to inform the preparation of the Biodiversity Offset Strategy (ELA 2013) and EPBC Act Assessment Report (ELA 2014). The following sections provide a summary of the biodiversity values identified within the Project Disturbance Area, and outline the potential biodiversity impacts of the development to be mitigated by measures detailed in this plan.
4.3.1 Vegetation

A total of three native vegetation communities were recorded and mapped within the Project Disturbance Area (RPS 2013). ELA (2013) identified and mapped five biometric vegetation types in the Biodiversity Offset Area, with this being managed under the Biodiversity Offset Area Management Plan. The area (ha) of each vegetation community recorded in the Project Disturbance Area is provided in Table 5. A summary of the structure and floristics of each vegetation type is also provided in Table 5. The distribution of these vegetation communities is shown in Figure 2. None of the vegetation types recorded in the Project Disturbance Area is listed as threatened ecological communities under the NSW Threatened Species Conservation Act (TSC Act) 1995 or the Commonwealth Environment Protection and Biodiversity Conservation Act (EPBC Act) 1999.

The construction and development of Karuah East Quarry and associated infrastructure would directly impact 31.63 ha of land. Of this, 28.09 ha consists of native vegetation. The biodiversity offset area, which is to be managed under the Biodiversity Offset Area Management Plan (Kleinfelder 2015), would protect and enhance at total of 129.32 ha of native vegetation.

Table 5 Vegetation communities within the Project Disturbance Area

<table>
<thead>
<tr>
<th>Vegetation Community (RPS 2013)</th>
<th>Description (ELA 2013; RPS 2013)</th>
<th>Project Disturbance Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spotted Gum-Grey Ironbark-Grey Gum-White Mahogany Moist Sclerophyll Forest</td>
<td>Remnant open forest, with a distinct sub-canopy and an understorey, scattered shrubs and predominantly native perennial grasses and forbs. <strong>Dominant species</strong> Canopy: Corymbia maculata (Spotted Gum), Eucalyptus paniculata subsp. paniculata (Grey Ironbark), Eucalyptus propinqua (Small-fruited Grey Gum) and Eucalyptus acmenoides (White Mahogany). Midstorey: Allocasuarina torulosa (Forest Oak). Groundcover: Imperata cylindrica (Blady Grass) and Themeda australis (Kangaroo Grass).</td>
<td>20.38</td>
</tr>
<tr>
<td>Smooth barked Apple – Red Bloodwood-Brown Stringybark Dry Sclerophyll Forest</td>
<td>Remnant open forest vegetation with a sparse sub-canopy. A distinct but variable shrub layer was present, sometimes moderately dense. The groundcover layer was generally dominated by native grass species. <strong>Dominant species</strong> Canopy: Angophora costata (Smooth-barked Apple), Corymbia gummifera (Red Bloodwood) and Eucalyptus piperita (Sydney Peppermint). Midstorey: Allocasuarina littoralis (Black She-oak). Groundcover: Imperata cylindrica (Blady Grass), Entolasia stricta (Wiry Panic) and Themeda australis (Kangaroo Grass).</td>
<td>7.31</td>
</tr>
<tr>
<td>Grey Myrtle Dry Rainforest</td>
<td>Remnant closed forest with a dense canopy layer and emergents. Contains a sparse shrub layer and groundcover is predominately comprised of ferns, grasses and forbs. <strong>Dominant species</strong> Canopy: Diospyros australis (Black Plum), Cryptocarya microneura (Murroogun) and Backhousia myrtifolia (Grey Myrtle). Midstorey: Ficus coronata (Sndpaper Fig) and Eupomatia laurina (Bolwarra). Groundcover: Imperata cylindrica (Blady Grass) and Themeda australis (Kangaroo Grass).</td>
<td>0.4</td>
</tr>
<tr>
<td>Cleared land</td>
<td>Highly disturbed, non-native community was recorded in the central portion of the subject site within an existing powerline easement, along vehicle access tracks and a small section of Yalimbah Creek. The community generally comprised a mosaic of exotic grasses and shrubs, 'garden plantings' and bare ground.</td>
<td>3.55</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>31.64</td>
</tr>
</tbody>
</table>
Figure 2  Vegetation Types and Threatened Species Records
4.3.2 Threatened and Migratory Species

A total of three threatened flora species listed as Vulnerable under both the TSC Act and EPBC Act were recorded during surveys of the study area: *Tetratheca juncea* (Black-eyed Susan), *Grevillea parviflora* subsp. *parviflora* and *Asperula asthenes* (Trailing Woodruff). A summary of the population sizes and habitats in which these species occur within the Project Disturbance Area and adjoining lands is provided in Table 6. The locations of these threatened flora species are provided in Figure 2.

A total of five threatened fauna species listed as Vulnerable under the TSC Act were recorded during surveys of the study area: Powerful Owl (*Ninox strenua*), Varied Sittella (*Daphoenositta chrysoptera*), Glossy Black-Cockatoo (*Calyptorhynchus lathami*), Eastern Freetail-bat (*Mormopterus norfolkensis*) and Eastern False Pipistrelle (*Falsistrellus tasmaniensis*). The locations of threatened fauna records within the Project Area are shown in Figure 2. An additional 15 threatened fauna species and four EPBC-listed migratory species were considered to potentially occur in the Project Area.

The ecological assessments concluded that the project is unlikely to have a significant impact on the above-mentioned threatened and migratory species provided appropriate mitigation measures are implemented.

<table>
<thead>
<tr>
<th>Species</th>
<th>Habitat</th>
<th>Population Size</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Tetratheca juncea</em></td>
<td>Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal</td>
<td>6,567 clumps across project area.</td>
</tr>
<tr>
<td></td>
<td>foothills of the central North Coast Smooth-barked Apple - Red Bloodwood</td>
<td>Of these, 243 clumps occur in the</td>
</tr>
<tr>
<td></td>
<td>open forest on coastal plains on the Central Coast, Sydney Basin.</td>
<td>project disturbance area, and 6,324 occur in the offset area.</td>
</tr>
<tr>
<td></td>
<td>Sydney Peppermint – Smooth barked Apple shrubby open forest on coastal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>hills and plains of the southern North Coast and northern Sydney Basin.</td>
<td></td>
</tr>
<tr>
<td><em>Grevillea parviflora</em></td>
<td>Smooth-barked Apple - Red Bloodwood open forest on coastal plains on the</td>
<td>At least 100 stems within the offset area.</td>
</tr>
<tr>
<td>subsp. <em>parviflora</em></td>
<td>Central Coast, Sydney Basin.</td>
<td>No stems occur within the project disturbance area.</td>
</tr>
<tr>
<td></td>
<td>Sydney Peppermint – Smooth barked Apple shrubby open forest on coastal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>hills and plains of the southern North Coast and northern Sydney Basin.</td>
<td></td>
</tr>
<tr>
<td><em>Asperula asthenes</em></td>
<td>Blackbutt - Turpentine - Tallowwood shrubby open forest of the coastal</td>
<td>60 individuals occur in the project disturbance area.</td>
</tr>
<tr>
<td></td>
<td>foothills of the central North Coast Spotted Gum – Grey Ironbark open</td>
<td>At least 120 individuals occur in the offset area, and 200+ individuals occur on Lot 12 outside the project disturbance area.</td>
</tr>
<tr>
<td></td>
<td>forest on the foothills of the Central Coast, Sydney Basin</td>
<td></td>
</tr>
</tbody>
</table>

4.3.3 Fauna Habitat

The majority of the Project Area consists of remnant native vegetation providing habitat for a range of fauna species. Key fauna habitat features present include multiple vegetation strata, hollow-bearing trees, flowering trees, fallen logs and timber, bush rock, and leaf litter; these resources offer sheltering, foraging, nesting and roosting habitat to a variety of fauna occurring within the locality.
The project would directly impact 28.09 ha (disturbance area) of forested habitat. The biodiversity offset area would protect and enhance at total of 129.32 ha of forested fauna habitat (see Biodiversity Offset Area Management Plan, Kleinfelder (2015)).

4.3.1 Indirect Impacts

In addition to the direct impacts described in the previous sections, the project also has the potential to have the following indirect impacts on retained and adjacent vegetation, threatened flora species and fauna habitats:

- Habitat fragmentation;
- Erosion and sedimentation;
- Use of herbicides/pesticides;
- Hydrocarbon/chemical spills;
- Dust impacts;
- Weed invasion (see Section 4.3.5) and edge effects;
- Inadvertent disturbance of vegetation; and
- Rubbish dumping and increased human activity.

These indirect impacts will be prevented and/or mitigated through implementation of the management actions detailed in this plan.

4.3.2 Weeds

RPS (2013) recorded a total of seven exotic species within the Project Area. Two of these species are listed as noxious under the Noxious Weeds Act 1993, one of which (Lantana camara (Lantana)) is applicable to the Great Lakes Council control area (Table 7). Lantana is also listed as a Weed of National Significance (WoNS). ELA (2013) recorded a number of other exotic species within the offset area which also have the potential to occur in the Project Area and are listed in Table 7; none of these species (with the exception of Lantana) are listed as noxious.

Table 7 Exotic species recorded in the study area (RPS 2013; ELA 2013)

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
<th>Control Class (NW Act 1993)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andropogon virginicus</td>
<td>Whisky Grass</td>
<td>-</td>
</tr>
<tr>
<td>Axonopus fissifolius</td>
<td>Narrow-leafed Carpet Grass</td>
<td>-</td>
</tr>
<tr>
<td>Bidens pilosa</td>
<td>Cobblers Pegs</td>
<td>-</td>
</tr>
<tr>
<td>Briza maxima</td>
<td>Quaking Grass</td>
<td>-</td>
</tr>
<tr>
<td>Hypochaeris radicata</td>
<td>Catsear</td>
<td>-</td>
</tr>
<tr>
<td>Lantana camara</td>
<td>Lantana</td>
<td>Class 4</td>
</tr>
<tr>
<td>Melinis repens</td>
<td>Red Natal Grass</td>
<td>-</td>
</tr>
<tr>
<td>Paspalum dilatatum</td>
<td>Paspalum</td>
<td>-</td>
</tr>
<tr>
<td>Pennisetum clandestinum</td>
<td>Kikuyu</td>
<td>-</td>
</tr>
<tr>
<td>Plantago lanceolata</td>
<td>Lamb’s Tongues</td>
<td>-</td>
</tr>
<tr>
<td>Senna pendula var. glabrata</td>
<td>Cassia</td>
<td>Class 4</td>
</tr>
<tr>
<td>Setaria sphacelata</td>
<td>South African Pigeon Grass</td>
<td>-</td>
</tr>
<tr>
<td>Solanum nigrum</td>
<td>Black-berry Nightshade</td>
<td>-</td>
</tr>
<tr>
<td>Stellaria media</td>
<td>Common Chickweed</td>
<td>-</td>
</tr>
</tbody>
</table>
4.4 Baseline Rehabilitation Data

Annual rehabilitation inspections commenced at the adjacent Karuah Quarry in 2014. These rehabilitation areas will continue to be inspected/monitored and will be used as analogue rehabilitation sites in the future for Karuah East.

5 OBJECTIVES OF THE LANDSCAPE AND REHABILITATION MANAGEMENT PLAN

5.1 Landscape Management Objectives

- Protect and enhance the quality of remnant vegetation and fauna habitat to be retained within the Project Area;
- Maximise the salvage of environmental resources within the approved disturbance area for beneficial reuse in the enhancement of the rehabilitation area;
- Minimise impacts on native fauna on site;
- Ensure minimal environmental consequences for threatened species and their habitats; and
- Minimise impacts on fauna movement between undisturbed areas of the site and nearby vegetation.

5.2 Rehabilitation Management Objectives

Schedule 3 Condition 30 of the Project Approval outlines the rehabilitation objectives for Karuah East Quarry. These are listed in Table 8 below:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site (as a whole)</td>
<td>Safe, stable &amp; non-polluting</td>
</tr>
<tr>
<td>Surface Infrastructure</td>
<td>To be decommissioned and removed, unless the secretary agrees otherwise</td>
</tr>
<tr>
<td>Quarry Wall Benches</td>
<td>Landscaped and revegetated utilising native tree and understorey species, ensuring that the tree canopy is restored and integrated with the surrounding tree canopy.</td>
</tr>
<tr>
<td>Quarry Pit Floor</td>
<td>Landscaped and revegetated with wetland vegetation</td>
</tr>
<tr>
<td>Other land affected by the project</td>
<td>Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems compromised of:</td>
</tr>
<tr>
<td>Community</td>
<td>Ensure public safety</td>
</tr>
<tr>
<td></td>
<td>Minimise the adverse socio-economic effects associated with quarry closure</td>
</tr>
</tbody>
</table>

Scientific Name | Common Name | Control Class (NW Act 1993)

| Verbena bonariensis | Purpletop | - |
Other key rehabilitation objectives include:

- Minimise the environmental impact of the operation during the development and operational phases, ensuring that protection of water quality and erosion control works are key priorities, and to ensure progressive rehabilitation is completed as soon as possible;
- Ensure that site drainage and sedimentation structures remain stable and functional;
- Ensure that vegetative matter and topsoil is made available for the site rehabilitation as required;
- Undertake rehabilitation in a manner consistent with that of the existing adjacent quarry;
- Guarantee that the resource is extracted and the site rehabilitated in a manner that will ensure the quality of surface runoff at all times;
- Produce a final landform that is geotechnically stable that blends aesthetically into the surrounding landforms, yet as far as possible does not limit possible future land uses; and
- Minimise visual impact of the operation during the operational phase as well as post-quarrying.

6 LANDSCAPE AND BIODIVERSITY MANAGEMENT

Note: the landscape and biodiversity management program provided in the following section only applies to the Karuah East Quarry and all perimeters lands (referred to as the Project Area) as specified in Schedule 3 Condition 32 of the project approval. A separate Biodiversity Offset Area Management Plan (BOAMP) has also been prepared as required under Schedule 3 Condition 33 of the Project Approval which applies to the Biodiversity Offset Area adjoining the eastern side of the Project Area. Section 6 has been prepared by Kleinfelder.

6.1 General Management Measures

6.1.1 Inductions

All persons must undergo a site specific induction before entering the site. Induction material relating to landscape and biodiversity management to be delivered as part of all site inductions will be prepared by a suitably qualified ecologist, and will generally include the following:

- All staff and contractors entering the site will be made aware of environmentally sensitive habitat and surrounding vegetation at the site, including threatened species;
- All site personnel will be made aware of vegetation clearing limits, signed ‘no-go areas’ and their purpose (i.e. protection of vegetation, fauna habitat and threatened species), and that access to any areas outside the project disturbance area is restricted to authorised persons only;
- All clearing contractors will be informed of clearing protocols outlined in this plan, including those relating hollow-bearing tree removal, resource salvage, and threatened species protection;
- Staff and contractors will be made aware of the possibility of encountering Koalas during work activities. All staff and contractors will be made aware of the identified Koala habitat within and adjacent to the project area, the locations of potential koala movement on the site, and the potential risk of Koala vehicle strike. This will be achieved through the site induction, and by placing a map of the identified Koala habitat at the site office in view of staff and contractors;
- Staff and contractors will be made aware of noxious weeds present on the site and procedures to reduce weed spread will be detailed; and
- Domestic fauna (i.e. dogs) will be prohibited from entering the subject site with staff or contractors.
6.1.2 Controlling Site Access

- Only authorised personnel are allowed to enter the site. All contractors must undergo a site induction prior to entering/working on the site;

- Road access to Karuah East Quarry will occur via a haul road to be constructed along the southern boundary of Lot 12 and western boundary of Lot 13 (Figure 1). Upon construction of this haul road, the private haul road access point on the south-west corner of Lot 12 shall be locked at all times when the quarry is not operating; and

- Unauthorised access outside the project disturbance areas will be prevented through installing permanent fencing around the perimeter of the project disturbance area and locked gates (or similar) at all access points. Any vegetation to be retained within the project disturbance area will be delineated and protected through installation of temporary fencing (see Section 6.2.1 for further details on fencing). Monitoring and maintenance of boundary fencing and gates will occur during regular inspections of the site (monitoring program, Section 12).

6.2 Pre-clearing Survey Protocol

Clearing of the project disturbance area may be conducted in stages (i.e. separated by more than one week). The following protocols must be undertaken for each stage/planned clearing area.

6.2.1 Protection of Vegetation and Threatened Flora

- The project disturbance area perimeter will first be delineated to protect retained bushland areas on Lot 12 and 13. To achieve this, the project disturbance area boundary will be surveyed and pegged by a Registered Surveyor prior to clearing operations. Plastic mesh fencing or star pickets and flagging tape will be installed along the project disturbance area boundary for use as exclusion fencing. The fencing will function as a clearly marked ‘exclusion’ boundary for clearing and machinery operations. ‘No go area’ signage will also be installed at regular intervals along the fencing. The purpose of the temporary fencing (i.e. delineating ‘no go areas’) must be communicated to all persons working onsite during site inductions.

- Permanent chain wire metal exclusion fencing will be installed around the entire perimeter of the quarry footprint prior to the commencement of quarrying operations. The Project Approval defines quarry operations as ‘the removal of overburden and extraction, processing, handling, storage and transportation of quarry products from the site’. The permanent perimeter fencing will be installed to the following specifications:
  - The fencing would be constructed from chain wire metal fencing. The top of the fence should not have sharp edges to avoid injury to wildlife (e.g. gliders).
  - ‘No-Go Area’ (or similar) signs shall also be installed at appropriate locations on the perimeter fencing such that they are visible to staff and contractors working onsite;
  - The fencing will also incorporate four ‘drop-out’ ramps (two on either side of the fencing at the aerial fauna crossing location along the new haul road). These ramps will deter animals from entering the site but will allow any trapped fauna to self-relocate from the project disturbance area; and
  - The perimeter fencing layout is shown in Figure 3.

- All machinery and vehicles are to be clean on entry of the site (i.e. free of soil, seeds or plant material) to reduce the potential for introduction or spread of noxious weeds and fungal pathogens.
Figure 3  Perimeter Fencing and Aerial Fauna Crossings
6.2.2 Fauna

- Approximately one week prior to any vegetation clearing, a survey of habitat trees will be conducted in the planned clearing area by a suitably qualified ecologist; and

- Habitat trees (containing hollows or nests) will be clearly marked using flagging tape or spray paint. The location of each habitat tree will also be recorded using a hand-held GPS, and a map showing these will be produced for each planned cleared area and provided to the supervising ecologist and clearing contractor.

**Targeted Surveys for Koalas**

- Within 48 hours prior to vegetation clearing, pre-clearing surveys must be undertaken by a suitably qualified ecologist to ensure the absence of Koalas within each planned clearing area. Any trees identified as containing Koalas will be clearly marked to indicate occupation so that this can be communicated to the tree felling operator and ecologist supervising their removal; and

- If any Koalas are found to be present within a planned clearing area during the pre-clearing surveys, the relevant steps detailed in Section 6.3.2 must be followed.

6.2.3 Weeds

- During pre-clearing surveys, areas of major weed infestation (including noxious species listed in Section 4.3.5) will be delineated with flagging tape to allow for separate stockpiling of this soil and vegetative material. This will reduce the spread and establishment of weed infestations in rehabilitated areas post construction.

6.2.4 Additional Pre-clearing Surveys

Where possible, vegetation clearing should be timed to avoid the following breeding periods for hollow-dependent fauna:

- October – February (microbats); and

- June – August (large forest owls; microbats in torpor).

If clearing is to occur within these periods the following additional pre-clearing surveys will be undertaken for each planned clearing area, in addition those detailed in Section 6.2.2:

- Within one week prior to vegetation clearing, searches for signs of threatened fauna species will be undertaken, including (but not limited to) searches for signs of roosting or nesting threatened raptors and forest owl species (e.g. Powerful Owl and Masked Owl) such as whitewash and owl pellets (regurgitated hair and bone);

- Within one week prior to vegetation clearing, stag watching and spotlighting of habitat trees will be conducted over a two night period to determine whether any of the hollows are in use by fauna. In particular, these surveys will be undertaken to identify potential microchiropteran bat roost trees;

- Should the above surveys identify any nesting or potentially roosting threatened species within the planned clearing area during their respective breeding period, no clearing will be undertaken within 50 m of the occupied tree(s) until the nest/roost sites are vacated or until after the breeding season is completed. Monitoring would be required to determine if fledglings or juveniles have vacated the nests or hollows through stag watching and/or physical inspection of the nests/hollows;

- Within one week prior to vegetation clearing, Elliot trapping will be undertaken over a four night period, targeting the Brush-tailed Phascogale (*Phascogale tapoatafa*) and Squirrel Glider (*Petaurus norfolcensis*). Any fauna captured during the pre-clearing trapping will be relocated to a suitable location within the biodiversity offset area. The following trapping effort will be conducted:
If the entirety of the project disturbance area is cleared (i.e. not staged) a total of four traps lines (equating to 160 arboreal Elliot trap nights and 400 terrestrial Elliot trap nights) will be undertaken across the project disturbance area; or

- Should the clearing be staged, a trapping effort of eight arboreal Elliot trap nights per hectare and 16 terrestrial Elliot trap nights per hectare shall be applied to each planned clearing area.

- Any trees identified as containing fauna (including threatened species) during the pre-clearing surveys will be clearly marked to indicate occupation so that this can be communicated to the clearing contractor and supervising ecologist.

### 6.2.5 *Tetratheca juncea* Translocation

- A *Tetratheca juncea* Translocation Program (TjTP) has been prepared for the project. All *Tetratheca juncea* clumps within the disturbance footprint will be translocated to the recipient site(s) within the biodiversity offset area prior to the commencement of clearing (see TjTP and BOAMP for further details).

### 6.3 Vegetation Clearing Protocol

#### 6.3.1 Clearing Protocol and Salvage of Resources

- A fully qualified and experienced ecologist will supervise vegetation clearing and encourage movement of any displaced animals into adjoining vegetation (see Section 6.3.4 below for the fauna displacement procedures);

- Prior to commencing of vegetation clearing, an allocated vet should be notified of the possibility of receiving injured animals;

- Clearing will be undertaken predominantly by bulldozer and excavator and may be conducted in conjunction with topsoil removal;

- Vegetation should be cleared in a way that maintains habitat linkages and allows fauna living in or near the clearing site to move safely from the site to adjacent areas without additional human intervention:
  - Clearing should occur towards connecting vegetation;
  - The direction of clearing should also ensure that fauna are directed away from threats such as roads and developed or disturbed areas (e.g. existing quarry to the west); and
  - Sequential clearing should not create an ‘island’ of habitat that is isolated from adjoining habitat by roads or cleared and disturbed areas.

- Ideally, no clearing should occur during the early evening or at night (i.e. when most fauna species are active and likely to be on the move and are more vulnerable to injury);

- Trees shall be felled away from retained vegetation towards cleared areas where possible;

- The majority of vegetation to be cleared will be mulched on site with the exception of hollows, logs and large limbs that will be salvaged and incorporated into the rehabilitation or offset areas as fauna habitat where possible:
  - Native seed or plant material suitable for brush matting should be collected prior to or during clearing of the project disturbance area, stored, and spread over rehabilitation areas and/or utilised within the offset areas requiring revegetation (see BOAMP for further details);
  - Hollow logs and other large organic debris cleared from the project disturbance area will be stockpiled and either spread on rehabilitated areas immediately after re-distribution of topsoil, or reinstated within the adjacent offset area where possible. Logs and large debris should only be salvaged and redistributed into the adjoining offset area where the transfer process will have minimal disturbance to the recipient area (i.e. placed along the project disturbance area/offset area boundary, and where there are no threatened flora species present in the recipient area);
Where possible, hollows should be salvaged from felled habitat trees by cutting at least 100 mm beyond the deepest point of the hollow and then stored in a dry safe place, or transported directly to the offset areas for installation; and

Procedures for salvage and stockpiling of topsoil (including the native soil seedbank) are detailed in Section 9.3.

6.3.2 Protection of Threatened Fauna

The Project Area contains and/or adjoins known or potential habitat for a number of threatened fauna species as detailed in Section 4.3.2. The following measures will be implemented to minimise impacts to these species during vegetation clearing:

- During pre-clearing surveys, active searches for Koalas will be conducted and any trees containing Koalas will be marked (as described in Section 6.2.2). If prior to clearing commencing the Koala(s) have not self-relocated from the planned clearing area the following procedure will be followed:
  - A 30 m exclusion zone around occupied trees will be maintained during clearing. To encourage self-relocation all other surrounding vegetation, apart from that within 30 m of the occupied tree, will be cleared. No vegetation will be felled onto the occupied tree and where possible vegetation links to adjacent retained vegetation will be maintained;
  - The occupied tree (and vegetation within the 30 m exclusion zone) will be left standing for a minimum of two nights to encourage self-relocation to vegetation outside the project disturbance area;
  - If after this period the Koala(s) have not self-relocated, they may be retrieved from the tree by a suitably qualified ecologist prior to felling and relocated to a safe location within the adjacent biodiversity offset area. If it is not considered safe or practical to retrieve the Koala(s) from the tree, the occupied tree will be left standing until self-relocation occurs; and
  - Should injury to Koalas occur during clearing, advice from a wildlife expert (e.g. veterinarian) must be sought and action taken in accordance with that advice. Records of any Koala injury within the project area must be documented and maintained (Section 6.3.6).

- As stated in Section 6.2.4, where possible vegetation clearing should be timed to avoid breeding periods for hollow-dependent fauna (October-February and June-August);

- The habitat tree removal protocol (Section 6.3.3) will serve to mitigate impacts on other threatened fauna species (Microchiropteran bats, birds, and arboreal mammals) that may potentially occur within the project disturbance area; and

- While the number of hollows within the project disturbance area has not yet been quantified, based on the vegetation types present it is likely that >30 hollows would be removed. It is proposed that 30 nest boxes be installed within the offset area prior to commencement of vegetation clearing to provide sheltering/nesting habitat for displaced fauna (including threatened species). The remaining nest boxes required (determined as per Section 6.3.3) would be installed following completion of vegetation clearing.

6.3.3 Habitat Tree Removal Protocol

- Hollow-bearing trees identified during the pre-clearing surveys (Section 6.2.2) will be left standing for two nights after the surrounding vegetation has been cleared to encourage any native fauna species utilising the habitat hollows to self-relocate;

- The felling of all habitat trees will be attended by a suitably qualified and experienced ecologist in order to ensure the safety of any fauna found to be in the hollows;

- On all occasions, trees having potential habitat hollows or nests will be 'soft felled' by an experienced machine operator. The recommended soft felling procedure is as follows:
The hollow-bearing tree is given several moderate nudges with an excavator to give a warning to any occupying native fauna;

The hollow-bearing tree is then carefully watched and any native fauna present is given an opportunity to self-relocate before the tree is felled;

The hollow-bearing tree is soft felled with the rate of the trees fall controlled by the machinery operator to minimise impact; and

All hollows will be inspected for native fauna species and if any are found, the animal should be relocated at an appropriate time of day (i.e. dusk for nocturnal species). If the animal is injured, it should be taken to a local veterinarian (see Section 6.3.4).

The number of hollows present within each habitat tree will be counted and recorded once the tree has been felled. Unless the hollows are salvaged and erected within the offset area (as described in Section 6.3.1), a nest box will be installed for each hollow lost (1:1 ratio) within the offset areas in accordance with the Nest Box Installation and Monitoring Protocol detailed in the BOAMP (Kleinfelder 2015).

6.3.4 Fauna Displacement and Relocation Protocol

Displacement of fauna will occur as part of the clearing process. A fully qualified and experienced ecologist will supervise clearing and encourage movement of any displaced animals into adjoining vegetation. The following protocol should be followed to ensure minimal impacts to native fauna during clearing:

- If possible any fauna fleeing the clearing area should be directed to a safe area outside the project disturbance area, or captured and relocated if necessary;
- All fauna are to be handled in such a way as to prevent injury to the animal or the handler;
- Once the animal has been safely captured, it should be relocated or caged in a hessian bag or box and released at an appropriate time of day;
- All fauna that are captured during the clearing operations that are uninjured will be relocated to a safe and appropriate location within the adjacent biodiversity offset area on the same day as capture if possible;
- Any microbats or other nocturnal species captured during the tree removal process should be held in cotton or hessian bags and released at dusk if possible;
- If any animal is injured during the vegetation clearing works, a veterinarian should be contacted immediately for professional advice on the best course of action; and
- If any native animal is injured during other construction or operational processes while an ecologist, environmental representative or animal handler is not present, they must be contacted immediately. The procedure and relevant contacts for wildlife injuries will be communicated to all staff during the site induction.

6.3.5 Weed Management

- All noxious or environmental weed infestations will be delineated with flagging tape during the pre-clearing surveys (Section 6.2.3). All topsoil and vegetative material (excluding large trees and logs that can be salvaged) from within these delineated areas shall be either:
  - Immediately transported offsite and disposed of to a licenced landfill facility; or
  - Processed and stockpiled separately onsite. Separate stockpiling and storage will aim to prevent contamination and subsequent spread of weed propagules in topsoil or mulch to be used in rehabilitation areas within the project disturbance area and/or areas requiring revegetation in the biodiversity offset area. These separate stockpiles must be clearly signed as ‘weed contaminated’ to avoid mixing of clean and weed contaminated materials.
Stockpiled topsoil, mulch and other vegetative material will be routinely inspected for weed regrowth during the construction and operation phases. Any weed outbreaks will be treated through manual and/or chemical control methods (see Section 6.4.3 for further details).

6.3.6 Reporting

The following records will be maintained by the supervising ecologist(s) for each planned clearing area:

- Methods and results of pre-clearing surveys, including fauna surveys, habitat tree marking, and weed mapping;
- Dates and person hours spent undertaking clearing supervision;
- Area of vegetation cleared each day;
- Number of hollow-bearing trees, including number and size class of hollows removed each day;
- Number/quantity of hollows, logs or other habitat features salvaged for reuse;
- Number, species and release location of any fauna that required relocating;
- Any fauna injuries or deaths; and
- All other incidental fauna observations during clearing.

A Vegetation Clearing Completion Report containing all data/records specified above will be prepared and submitted to OEH within one month following completion of vegetation clearing.

6.4 Construction and Post-Construction Management

6.4.1 Aerial Fauna Crossing Installation

Two aerial fauna crossings will be installed within three months following construction of the haul road:

1. The western aerial fauna crossing is to be located at the existing quarry haul road approximately 250 metres north east from the existing quarry site office; and

2. The eastern aerial fauna crossing is proposed on Lot 13 along the north-south running access road.

The approximate locations and conceptual design of the aerial fauna crossings are shown on Figure 3. The crossings will be established as follows:

- The aerial fauna crossings must be supplied and installed by a suitably qualified contractor;
- The crossings will generally be consistent with the specifications of aerial crossings constructed as part of the Pacific Highway upgrade by the NSW Roads and Maritime Services (e.g. Karuah bypass) and will consist of the following:
  - The canopy bridges will consist of a flat rope ladder crossing design that will be suspended approximately 10 m above the road pavement across the entire width of the haul roads;
  - The crossings will be connected to two poles placed on opposite sides of the roads. The poles will be in accordance with AS2209-1994 (Timber – Poles for Overhead Lines) and consist of treated grade timber. Concrete anchor blocks or rock anchors (depending on subsurface conditions) will be installed to brace the poles; steel cable wire will be attached to the top of each pole and connected to the anchors located behind each pole. Anchors for the pole bracing may need to be located outside the project disturbance area boundary; should this be required, these works must be supervised by a suitably qualified ecologist to ensure no impacts to native vegetation or threatened species occur;
• The western canopy bridge will be approximately 40m in length and the eastern canopy bridge will be approximately 38 m in length (depending on final haul road design). Both canopy bridges will be 50 cm wide;

• The rope netting will consist of lattice-work configuration constructed from 20 mm external ropes with 12 mm silver rope weaved through; and

• Two strands of 25 mm silver rope will be installed from each pole to the canopy of adjacent trees to facilitate access by arboreal mammals.

• It is noted that the proposed aerial fauna crossing for the new haul road may potentially conflict with the existing powerline easement which currently runs through the site. Further consultation with the electricity service provider is required to determine the feasibility of installing an aerial fauna crossing at this location. Should an aerial fauna crossing not be feasible to install at this location, alternative locations and/or options to facilitate movement of arboreal mammals across the project disturbance area will be investigated (e.g. glider poles).

6.4.2 Seed Collection and Propagation

As progressive rehabilitation will be undertaken over the life of the quarry, native seed will also need to be collected progressively for revegetation works. It is proposed that seed will be collected from the adjoining biodiversity offset area to ensure local provenance of species used in rehabilitation. Seed collection and propagation will be undertaken through the following protocol:

• Revegetation methods and native species selected for the rehabilitation areas are detailed in Section 9.5;

• All seed collection must be undertaken by a suitably qualified and experienced bush regenerator or ecologist;

• Seed collection and storage should be undertaken in consideration of the relevant Florabank guidelines and codes of practice (available at https://www.florabank.org.au/);

• Seed collection will be undertaken in accordance with the following general principles:
  • Only the minimum quantity of seed or plant material required for rehabilitation will be collected;
  • A maximum of 20% of fruit and 10% of plant material will be collected from any one plant (i.e. larger seed quantities should be obtained by collecting from more plants);
  • No collection of seed or plant material from threatened flora species listed under the TSC Act or EPBC Act, or schedule 13 protected native plants under the National Parks and Wildlife Act 1974 will be undertaken unless the appropriate permits or licences have been secured; and
  • Records of all seed collection activities within the offset area, including dates, locations, species collected, and quantity of plant material/seed/fruit, will be maintained.

Where seed cannot be propagated from the adjoining offset area or only a small area of rehabilitation is required, a seed mix containing locally endemic species will be purchased from a local seed supplier.

6.4.3 Weed and Pest Control

Weed and pest management will be undertaken within the Project Area to minimise habitat degradation, encourage growth of native species, and protect native fauna within retained vegetation and rehabilitation areas in the project area through the following process:

• Inspections of the Project Area and adjoining vegetation will be undertaken during monitoring (Section 12) to identify weeds and evidence of pest species, focusing on rehabilitation areas and retained vegetation;

• The locations and specific methods for weed and pest management will be directed by monitoring inspections (i.e. recommendations from monitoring reports);
Weed control will generally be undertaken using a combination of manual removal and targeted chemical application using an appropriate herbicide. Chemical methods should only be used for larger weed outbreaks and/or where there is negligible risk for indirect impacts on native vegetation;

- Any vertebrate pest control will be conducted in accordance with *Humane Pest Animal Control: Codes of Practice* (DPI 2014);

- If pest control is required it would generally involve a routine (six monthly) baiting program. Other control methods such as shooting or trapping can also be used if deemed necessary or appropriate with advice from OEH or the Local Land Service; and

- All weed and pest control works will be undertaken by a suitably qualified contractor.

### 6.4.4 Additional Measures for Threatened Species and Fauna Protection

- Ensure vehicle and equipment parking areas and stockpile areas are identified and sited to avoid areas containing ecological value;

- A maximum speed limit of 40 km/hr will be signposted and adhered to in the vicinity of potential fauna crossing areas (Figure 3);

- Should any trenches be created during the construction phase (e.g. installation of underground services), minimise the length of time that trenches remain open to avoid fauna becoming trapped. Monitor open sections of trenches daily or as required for trapped animals, such as small ground-dwelling mammals. Where possible, ramps should be incorporated into open sections of trench to allow animals that have fallen into the trench to make their way out;

- The Construction Environmental Management Plan (CEMP) will include management strategies to mitigate work-site lighting, dust suppression and noise associated with the construction phase of the project that could impact on native flora and fauna;

- Potential impacts from erosion and sedimentation associated with clearing and disturbance of the project disturbance area will be mitigated through implementation of measures detailed in Section 9.4; and

- The use of herbicides, pesticides, insecticides and biocides will be limited within the project disturbance area so to reduce indirect impacts on threatened species and their habitats. When chemicals are to be used, techniques that limit the quantity being used will be utilised and less harmful chemicals will be preferred.

### 6.4.5 Bushfire Management

- A separation distance of at least 10 m will be maintained between stockpiles of combustible material (e.g. mulch) and remnant vegetation;

- An emergency action plan will be prepared prior to quarry operations and include procedures to be followed in the event of a bushfire;

- All earth moving machinery will be fitted with spark arresting mufflers and haul trucks will have serviceable exhaust systems to prevent accidental ignition of vegetation;

- The project disturbance area will be equipped with firefighting measures to assist in the management of any fires on site. All machinery, trucks and vehicles on site should be equipped with fire extinguishers;

- As the project disturbance area will be entirely or mostly cleared of native vegetation no ecological burning is considered necessary; and

- Any ecological burning undertaken within the adjoining offset area must be planned and approved in conjunction with the quarry operations (see BOAMP for further details).
6.5 Rehabilitation and Offset Area Management

Any rehabilitation undertaken at the Karuah East Quarry will be managed in accordance with the biodiversity offset areas associated with the project. Species found within the offset areas will be used in the rehabilitation mix for Karuah East. The goal of final rehabilitation will be to create a fauna corridor between rehabilitation and offset areas.

Once rehabilitation is established the rehabilitation and offset areas will be managed concurrently for land management (including pest and weed management).

A Biodiversity Offset Area Management Plan has been prepared by Kleinfelder (2015).

7 DECOMISSIONING AND DEMOLITION

7.1 Investigation of the Site and Structures

Prior to closure, Karuah East shall undertake an investigation into the types of structures at the site. This investigation will include:

- The type, location and extent of underground services such as conduits, cables and pipe work;
- The location, type and extent of overhead services and structures such as power cables, the plant, light poles and pipe work, etc;
- The location and condition of all tanks and vessels (with emphasis on remaining combustible materials and methods required for their removal);
- The presence of contaminated and hazardous materials and the classification and disposal of these materials;
- The general condition of adjacent structures; and
- Any infrastructure to remain (including roads and tracks) following decommissioning.

7.2 Removal of Site Infrastructure and Services

Opportunities for the sale and/or re-use of assets and recycling of scrap steel will be maximised where possible.

Concrete footings and pads will be broken up to at least 0.5 m below the surface and removed. Options for the re-use of this material (for example, crushed and used for road and track stabilisation) will be investigated as the operation approaches closure. If re-use or recycling opportunities aren’t available or viable, all “non-contaminated” waste material will be disposed of at a suitable location on-site or taken off-site to an approved waste management facility. Once operations have ceased, all buildings and infrastructure will be removed from the hardstand.

7.3 Contamination and Hazardous Materials

Prior to final closure, a preliminary investigation into potential sources of contamination including additional Phase 1 sampling and analysis will be undertaken. This will be used to determine whether a detailed assessment (for example, Phase 2 sampling and analysis) should be conducted to quantify the amount of any contaminated material that may require remediation.

Where possible all identified sources of contamination will be remediated during the operational phase of the site. In some cases, this may not be possible and in these circumstances the remediation will be undertaken following closure and during the decommissioning phase.
8 MINIMISING SOCIO-ECONOMIC EFFECTS

A social impact assessment will be prepared as part of a detailed quarry closure plan at least three years prior to the planned closure date. Some issues that may be included within this assessment include the following:

- A detailed assessment of Karuah East’s contributions and expenditure within the community and local area; the location of staff residences; and local businesses and suppliers that are likely to be affected. The purpose of the assessment is to determine how dependent the local community is upon the operations of Karuah East;
- The level of dependence of the employees upon the local community and infrastructure, for example, whether their children attend local schools;
- The proportion of sales by local businesses and suppliers that is from Karuah East;
- Potential impacts on local services, such as schools and health facilities, as a result of quarry closure and possible relocation of staff;
- The views of the community and stakeholders on the closure options; and
- Identification of potential industries that will see future growth and thus, provide possible employment for staff upon closure.

Karuah East will use the results of this assessment to investigate whether there is potential to minimise the impacts of quarry closure upon employees and the local community.

9 REHABILITATION MANAGEMENT

9.1 Landform Design and Planning

Thorough site preparation will be undertaken to ensure rapid establishment and growth of seedlings. All areas proposed for seeding will be deep ripped to an approximate depth of 400 – 500mm.

Where ripping on slopes is required, the ripping will be undertaken around the contour of the land at right angles to water flow. Benches will be deep ripped to actively promote infiltration of water which will enhance soil moisture requirements for direct tree seeding and minimise surface runoff to underlying benches and the pit floor dirty water control system. Revegetation will also visually screen disturbed areas and will re-establish habitat for native fauna. The topography of the final landform will consist of a large number of stepped benches formed in an amphitheatre configuration, each with a revegetated bench (refer to Figure 4).

The area currently supports an open eucalyptus woodland forest. The broad rehabilitation objective for the post-quarry landform is to establish a similar land use on the disturbed areas, with the exception of the final void.

The void will be some approximately 3 hectares in area. Until such time that extraction has ceased, rehabilitation will occur around the perimeter of the pit only along the benches, and will not involve the pit floor. The primary purpose of rehabilitation during the operational phase is to mitigate any visual impacts.
An integrated and coordinated rehabilitation approach will be undertaken to ensure consistency with regards to rehabilitation of the Karuah East Quarry and the existing adjacent Karuah Quarry. The selection of species and timing of rehabilitation will be coordinated such that revegetation works will provide habitat value over a wider geographical area inclusive of both quarry sites.

The Rehabilitation Management Plan for the existing Karuah Quarry notes that the area surrounding the quarry consists of native forest vegetation, and proposes to re-establish a similar cover to the majority of the post-quarrying landform. The revegetation program of this quarry will therefore involve the re-establishment of native forest/shrub/ground cover on the stabilised benched areas of the quarry. This same approach will be applied to revegetation of the post-quarrying landform at Karuah East. In addition, given that the adjacent quarry is in close proximity to Karuah East, and consistent species will be used across both sites in re-establishing native forest vegetation across the area.
9.2 Progressive Rehabilitation

Disturbed areas which are not available for final rehabilitation will be temporarily rehabilitated where practical. Additional erosion control measures such as the application of hydromulch will be considered, particularly in drainage lines and areas of temporary rehabilitation. Sugar cane (or other) mulch as slurry provides cover for the soil to improve pasture growth and/or modifying the soil surface to control erosion. The mulch also has the effect of protecting the soil surface against raindrop impact, improving the micro-environment for seed, reducing evaporation losses and assisting in the control of surface erosion caused by overland water flow.

Where benches are not required for future operations (ie access or quarrying) then Karuah East will rehabilitate the benches. Disturbed areas which are no longer required for operational purposes will be progressively rehabilitated.

Opportunities for the use of potential soil ameliorants to accelerate the revegetation process will also be considered where appropriate.

9.3 Soil and Vegetation Management

Topsoil stripping within the disturbed area will be undertaken when the soil is in a slightly moist condition to reducing damage to soil structure. Where possible stripped material will be placed directly onto the disturbed areas and spread immediately if excavation sequences, equipment scheduling and weather conditions permit.

A maximum stockpile height of 3m will be maintained to preserve viability and reduce soil deterioration. Stockpiles will be protected with sediment fencing and planted with a sterile cover crop (annual species) to ensure stabilisation. Surface drainage in the vicinity of the stockpiles will be configured so as to direct any runoff around the stockpile.

Where the stockpile is not wholly contained within the “closed loop” water management system, temporary sediment control measures such as sand bags and silt fences will be used to prevent sediment from leaving the disturbed areas.

Topsoil will be re-spread in the reverse sequence to its removal, so that the organic layer, containing any seed or vegetation, is returned to the surface. Topsoil will be spread to a minimum depth of 50mm on 3:1 or steeper slopes and to a minimum depth of 150mm on flatter slopes. Re-spread topsoil will be levelled to achieve an even surface, avoiding a compacted or an over-smooth finish.

When topsoil is to be used for rehabilitation programs, soil testing will be undertaken to determine the quality of the soil for rehabilitation. The results will be used to determine specific ameliorant techniques that may be applied to the soil material in order for rehabilitation to be sustainable. Ameliorants may include gypsum, lime, fertiliser and biosolids. The use of soil ameliorants is designed to balance pH, prevent surface crusting, increase moisture and organic content, and buffer surface temperatures to improve germination.

9.4 Water Management and Erosion and Sediment Controls for Rehabilitation Areas

The following principles will be used for erosion and sediment control on site throughout the operation and during rehabilitation:

- Erosion and sediment controls as per the Water Management Plan;
- Key erosion and sediment and sediment controls at site in rehabilitation areas include:
  - Drainage channels;
  - Contour banks;
  - Sediment basins; and
• Sediment fencing.

Rehabilitated activities will be undertaken within the dirty water catchment, with water draining from rehabilitated areas to sediment dams onsite.

9.5 Species Selection

Section 6.4.2 outlines the potential for seed collection and propagation from the biodiversity offset area. Where seed cannot be propagated from the adjoining offset area or only a small area of rehabilitation is required, a seed mix containing locally endemic species will be purchased from a local seed supplier.

Direct seeding (via broadcasting) is preferred over tube stock planting as it enables a far greater success rate, limits the need for ongoing maintenance (e.g. watering) and is the most effective method in achieving a successful rehabilitation outcome. Notwithstanding this, tube stock will be utilised in landscape planting around the site if required. Not all native trees and shrubs are suited to direct seeding due to their innate germination requirements, therefore, it may be required to supplement with some tubestock to increase biodiversity.

Native Trees and Shrubs

Native open woodland currently occurs over most of the Project Approval Area. It is proposed to re-establish a similar cover to the majority of the post-quarrying landform (excluding the void). Native vegetation will largely be established using direct seeding and from the seed store within re-spread topsoil. Supplementary native pasture and/or tubestock seeding will be undertaken where specific species combinations are required.

Final rehabilitation of the site will be undertaken once extraction is complete. As the extraction progresses through the resource, 15 m wide benches will be left every 15 m of depth to provide a horizontal platform on which native flora species will be established.

A mixture of native trees and shrubs endemic to the area will be sown onto the majority of the reshaped and benched pit areas following topdressing and site preparation. This tree and shrub seed will complement natural regeneration from seed contained within the soil seed bank. The seed mix used for revegetation of the disturbed quarry area will include many of the major tree and shrub species shown in Table 9 below. This species list is consistent with the recommended species for rehabilitation presented in the Rehabilitation Management Plan for the existing adjacent quarry.
Table 9  Recommended Species Mix for Quarry Rehabilitation

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>Seeding Rate (kg/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia</td>
<td>Falcate</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Longifolia</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>Terminalis</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Ironata</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>Decurrens</td>
<td>0.4</td>
</tr>
<tr>
<td>Eucalyptus</td>
<td>Globoidea</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Resinifera</td>
<td>0.2</td>
</tr>
<tr>
<td></td>
<td>Paniculata</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Tereticomis</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>punctata/propinqua</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Moluccana</td>
<td>0.5</td>
</tr>
<tr>
<td></td>
<td>Crebra</td>
<td>0.3</td>
</tr>
<tr>
<td>Angophora</td>
<td>Costata</td>
<td>0.1</td>
</tr>
<tr>
<td>Allocasuria</td>
<td>Torulosa</td>
<td>0.1</td>
</tr>
<tr>
<td>Croymbia</td>
<td>Macultata</td>
<td>0.8</td>
</tr>
<tr>
<td></td>
<td>Gummifera</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>6.3</strong></td>
</tr>
</tbody>
</table>

The seed will be sourced from reputable seed supply agents or collected and propagated as per Section 6.4.2. Some native species have difficult dormancy mechanisms that need to be broken before germination can occur. Native seed for revegetation of the quarry will be appropriately pre-treated in order to break dormancy restrictions. Subject to sufficient follow up rain, high initial tree densities can be expected. These high densities will quickly help stabilise and screen the site and will result in healthy mature tree stands over time. It is intended to create, over time, a mosaic of variable native species and plant densities representative of that currently occurring in the area. Growth rates of between 1 and 2 metres per year can be initially expected for many of the more dominant trees and shrubs.

The correct treatment and application of seed in the appropriate ratios is important in controlling emerging weeds and in allowing the tree stand to develop in a positive direction. The native tree and shrub seed mix will be sown at a total combined rate of approximately 6.3 kg/ha. Seed will be broadcast evenly onto topdressed areas. Care will be taken to ensure it will not be buried. Seeding will be conducted in late spring, summer and early autumn giving superior results due to higher ground temperatures.
10 REHABILITATION AND CLOSURE BY DOMAINS

These domains have been based on construction being completed, with the site at full operational capacity.

10.1 Domain 1 – Undisturbed Woodland

A large section of the Project Approval area will continue to be managed as remnant woodland when the site is fully operational. Operations at the site will be managed to ensure the remnant woodland is not impacted. Exclusion fencing will be established to reduce access to remnant vegetation.

10.2 Domain 2 - Haul Road and Site Access Road

The site access road is the main route, where rock is hauled from the stockpile area to offsite for sale. This is an extension of the existing Blue Rock Lane. A haul road will be constructed from the intersection of the site access road to the top of the pit. Other smaller access roads will also be constructed around the quarry.

It is envisaged that the site access road and main haul road will remain post closure as they will be used for firefighting access. Rehabilitation will be completed to smaller access roads and the batters of the main haul road and site access road.

10.3 Domain 3 - Plant Area and Stockpiles

The plant and stockpile area will be constructed prior to the commencement of operations. At closure this area will not be required for post quarrying. All product in the stockpile area will be hauled offsite for sale. The plant area will be decommissioned and removed from site at closure. Where possible plant and machinery will be sold at closure.

Once all plant and stockpiles have been removed, the area will be shaped and rehabilitated with a woodland seed mix (See Section 9.5).

10.4 Domain 4 - Quarry Pit and Emplacement Areas

Areas around the quarry pit (including overburden) will be shaped, topsoiled and rehabilitated using a woodland seed mix. A section of the quarry pit will remain as the final void. The potential options for the management of the final void are listed below:

1. Water storage;
2. Wetlands or wildlife habitat;
3. Recreation;
4. Aquaculture;
5. Waste facility; and
6. Backfilling the void and woodland rehabilitation.

There are positives and negatives of all these final void options. At this stage it is likely that the final land use of the pit/void would be to return the site to a wetland, which is consistent with the existing Karuah Quarry.

The Australian Coal Association Research Program (ACARP, 2000) report titled Final Void Water Quality Enhancement outlines the use of final voids as wetlands. One successful example of the rehabilitation of mine sites using wetlands at Capel in Western Australia.
The benefits of a final void being used as a wetland or wildlife habitat includes:

- Potential enhancement of water quality (if required);
- Potential increase in habitat and a subsequent increase in local biodiversity values;
- Enhancement of environmental and community values;
- Potential location of long term environmental studies; and
- This has been completed successfully at other mines sites in Australia and internationally.

Currently this is the proposed final land use for the void. If this is chosen as a preferred option, a Plan will be developed by a specialist outlining the proposed layout of the wetland and outlining key requirements for management and maintenance. Section 11 of this Plan provides further detail regarding void management.

10.5 Domain 5 - Water Management

There will be three sediment dams constructed when the site is fully operational.

Sediment dams that are to remain after lease surrender will be reviewed and if necessary reshaped prior to quarry decommissioning. This will provide safe access for native fauna and to satisfy public safety requirements. Sediment will be removed from dams during operations and at closure to increase the storage capacity of dams. The smaller Dam 1 and 2 are likely to be filled with sediment over the years, following closure of the site and the discontinuing of dam maintenance.
11 FINAL VOID DESIGN AND MANAGEMENT

**Section 11.4** of this Plan outlines the management of the quarry pit following closure, with a section of the quarry pit to remain at closure as a final void. As previously outlined, at this stage it is likely that the final land use of the pit/void would be to turn the area into a wetland, which is consistent with the proposed final land use of the void at the existing Karuah Quarry. Key design and management of the final void is outlined in this section.

11.1 Void Water Quality

Water will only be permitted to accumulate in the void if it maintains a quality that does not compromise its intended final use or surrounding groundwater systems. The aim is to provide a biologically viable water resource for the surrounding environment. The following aspects need to be considered with respect to managing final void water quality:

- Concentration of elements resulting from the quarrying of material;
- Control of surface flow into the void; and
- Rainfall and evaporation.

Post closure a water monitoring program will need to remain in place to closely monitor any changes to chemistry within the void.

11.2 Void Slope Stability

To ensure the safety of the final void, the surrounding final slopes should be left in a condition where the risk of slope failure is minimised. This may require the benches to be battered back from the vertical to enable a stable overall slope angle.

The following will need to be considered when assessing the geotechnical stability of highwalls:

- Long term final void water levels;
- Height and inclination of slope and number and spacing of intermediate benches;
- Shear strength of the highwall soils and rocks;
- Density and orientation of fractures, faults, bedding planes, and any other discontinuities, and the strength along them; and
- The effects of the external factors, such as surface runoff.

Prior to closure, investigations will be undertaken to confirm the criteria above.
11.3 Safety

At quarry closure, one of the main priorities for the void will be to render it safe in terms of access by humans, livestock and wildlife. The following will be considered at the time of closure to ensure that the void is left in a safe manner. These include:

- Instability of the high wall can induce failures or mass movement. All high walls are to be left geotechnically stable;
- A barrier at a safe distance from the perimeter of the void to prevent human access will be constructed.
- Suitable signs, clearly stating the risk to public safety and prohibiting public access will be erected at 50 m intervals outside the safety fence;
- Surface runoff from land surrounding the void will be diverted from entering the void so as to prevent the instability of the walls; and
- Shrub and/or tree planting along the outside edge of the bund wall will be implemented where practicable to lessen the visual impact of the wall, and will be in accordance with the agreed post-mining rehabilitation criteria and land use.
12 MONITORING PROGRAM AND REPORTING

Section 12.1 of this Management Plan has been prepared by Kleinfelder.

12.1 Ecological Monitoring

The following key parameters will require monitoring within the Project Area to inform ongoing maintenance works:

- Weed regrowth and outbreaks;
- Vegetation protection measures, including perimeter fencing and erosion/sediment controls;
- Indirect impacts of the development on adjoining vegetation and threatened flora;
- Measures to facilitate fauna movement across the site (i.e. aerial fauna crossings); and
- Rehabilitation (Section 12.2).

12.1.1 Weeds

Target weed species will be mapped on an annual basis within the Project Disturbance Area and adjoining vegetation on Lots 12 and 13 (within 50 m of the project disturbance area boundary). Additionally, weed mapping along Yalimbah Creek will also be undertaken as part of the ecological monitoring program. This monitoring will assess the effectiveness of ongoing weed control works and whether the target weeds species are being eradicated and controlled at an appropriate rate. In addition, these monitoring events will identify any new significant weed species present on the site and recommend appropriate management procedures for these species.

Baseline weed mapping will be undertaken prior to the commencement of clearing.

12.1.2 Vegetation Protection Measures

Erosion and sediment control structures, perimeter fencing and any temporary fencing installed within the project disturbance area to protect retained vegetation will be inspected as part of annual ecological monitoring. These inspections will ensure vegetation protection measures are effective and comply with relevant management plans. Any necessary repairs or modifications will be detailed in the monitoring report.

12.1.3 Vegetation Condition and Threatened Flora Monitoring

Potential indirect impacts from the project (e.g. dust, stormwater run-off, weed invasion) may adversely affect the condition of retained and/or adjoining native vegetation (including threatened flora populations). A total of seven monitoring points will be permanently established (with a capped star picket) within 50 m of the project disturbance area in the retained vegetation on Lots 12 and 13; an additional three monitoring points will be established along Yalimbah Creek (Lot 12) (10 monitoring points in total). A qualitative assessment of vegetation condition and photo monitoring would be undertaken at each monitoring point. At each monitoring point, the following data would be collected:

- Vegetation type and structure, including dominant species in each stratum;
- General health of vegetation, including evidence of foliage die-off;
- Weed species and abundance; and
- Any management issues or indirect impacts from the project disturbance area.
It is also recommended that a minimum of three of these monitoring sites be established in areas where *Tetratheca juncea* occurs in close proximity to the project disturbance area. Additionally, at least two of the monitoring sites along Yalimbah Creek will be established where *Asperula asthenes* occurs. At these sites, all *Tetratheca juncea* and *Asperula asthenes* clumps within 20 m of the monitoring point will be recorded. The location of each clump would be recorded with a GPS and permanently marked with a steel peg (positioned 20 cm to the south of each clump to avoid damaging plants); a metal tag will be attached to each peg which provides a unique ID number. The size, number of stems, and presence of flowers/fruit will be recorded for each clump. Annual collection of these data will enable changes in population size and health to be assessed over time.

Baseline monitoring will be undertaken in September/October 2015 prior to the commencement of clearing. Vegetation condition and threatened flora monitoring would be conducted on an annual basis.

12.1.4 Aerial Fauna Crossings

A 12-month monitoring program of the two aerial fauna crossings will be undertaken using remote motion sensing cameras mounted on each pole (four cameras in total) once the crossings have been installed. Data will be collected from the cameras periodically, and the results will be presented in the annual monitoring report (Section 12.1.7). The monitoring will be used to evaluate the effectiveness of the crossings and to inform any modifications or improvements to the crossings.

12.1.5 Maintenance

Following completion of annual ecological monitoring, maintenance will be undertaken as directed in the monitoring reports. These reports will include information on the location, timing, species and preferred methods for weed management, and whether any repairs to vegetation protection measures are required (e.g. perimeter fencing). Maintenance would generally be undertaken on an annual basis unless otherwise specified in the monitoring reports or other management plans (e.g. BOAMP), and would generally entail:

- Control of weed regrowth and outbreaks;
- Maintaining and repairing fencing; and
- Maintaining and repairing erosion/sediment control structures.

12.1.6 Performance Criteria

Performance criteria are provided in Table 10 to measure the effectiveness of the ecological monitoring and maintenance program. Specific criteria are provided for each of the key monitoring parameters. Where performance criteria are not achieved, potential causes will be investigated; corrective actions required to achieve the criteria and/or justification why criteria have not been achieved must then be provided as part of annual reporting (Section 12.1.7).
Table 10  Performance criteria for the ecological monitoring program

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Monitoring method</th>
<th>Performance criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weed regrowth and outbreaks</td>
<td>Weed mapping; Qualitative assessment (monitoring points); and Photo monitoring.</td>
<td>Weed abundance equal to or less than baseline levels; and Any new noxious or environmental weed species recorded (as compared to the baseline) are eradicated within 12 months.</td>
</tr>
<tr>
<td>Vegetation protection</td>
<td>Inspection of fencing and erosion control structures; Qualitative assessment (monitoring points); and Photo monitoring.</td>
<td>No breaks in permanent or temporary fencing; No erosion or sedimentation outside the project disturbance area; and No evidence of human disturbance, unauthorised access or vegetation management outside of project disturbance area.</td>
</tr>
<tr>
<td>Vegetation condition</td>
<td>Qualitative assessment (monitoring points); and Photo monitoring.</td>
<td>No major changes in vegetation health or condition.</td>
</tr>
<tr>
<td>Threatened flora</td>
<td>Tetrapheca juncea and Asperula asthenes population monitoring (at monitoring points).</td>
<td>Less than 10% decline in Tetrapheca juncea and Asperula asthenes population sizes (at monitoring sites) within five years; and No significant decline in population health within five years.</td>
</tr>
</tbody>
</table>

12.1.7  Reporting

The findings of the ecological monitoring and subsequent recommended management actions will be documented through the preparation of annual reports. These reports will provide the basis for and guide future management and monitoring of the site.

The monitoring report should include:

- Results of the assessments, including comparison to baseline data and performance criteria;
- Weed mapping, including locations and extent of any new weed infestations;
- Effectiveness of any maintenance works conducted since the previous monitoring events;
- Recommendations and management actions required to address any management issues identified within the site; and
- A summary of ecological monitoring and performance will be provided in the Annual Review.

12.2  Rehabilitation Monitoring

Rehabilitation monitoring was outlined in the specialist Quarry Closure and Rehabilitation Plan prepared by GSSE (2012) for the Environmental Assessment.

Regular monitoring of the revegetated areas will be required to demonstrate that the objectives of the rehabilitation strategy are being achieved and that a sustainable, stable landform has been provided. Table 11 presents the monitoring program, including the specific aspects and elements to be monitored and frequencies for those various aspects. It should be noted that only ‘final rehabilitation’ will be monitored with temporary rehabilitation inspected for stabilisation.
Monitoring will be conducted periodically by independent, suitably skilled and qualified persons at locations which will be representative of the range of conditions on the rehabilitating areas. Annual rehabilitation will be conducted to assess trends and monitoring program effectiveness. The outcome of these reviews will be included in the Annual Review.

In addition to the rehabilitated areas, at least two reference sites will be monitored to allow a comparison of the development and success of the rehabilitation against a control. Reference sites indicate the condition of surrounding un-disturbed areas.

In developing the rehabilitation monitoring program, the following aspects will be taken into consideration.

- Sites should be monitored 12 months after establishment and then every 2 years.
- A standard monitoring plot design for areas rehabilitated with trees includes:
  - 2 m x 2 m quadrates – these will provide some estimate of statistical variance, so that if required, statistical analyses can be undertaken to objectively compare different rehabilitation treatments and changes over time;
  - a 20 m x 10 m plot overlying the 2 m quadrats and located 5 m either side of the centerline, for ease of monitoring; and
  - a 50 m erosion monitoring transect on contour, running through the centre of the plot.

Figure 6 shows the monitoring plot design that is to be adopted for the monitoring an area revegetated with trees.

The purpose of the monitoring during operation is so rehabilitation methods can be improved as additional knowledge develops from the monitoring data collected through these programs.

More specifically, monitoring of the key elements in Table 11 will be undertaken.
## Table 11  Proposed Rehabilitation Monitoring Program

<table>
<thead>
<tr>
<th>Aspect of Rehabilitation</th>
<th>Elements to be Monitored</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecosystem Establishment</td>
<td>• Describe the vegetation in general terms, e.g. mixed eucalypt woodland with grass understorey and scattered shrubs, dense Acacia scrub, etc.</td>
<td>12 months after establishment of final rehabilitation and then every 2 years</td>
</tr>
</tbody>
</table>
| General Description      | • Count the number of plants of all species, excluding grass  
• Measure live vegetation cover for understorey and grasses (separately) using a line intercept method  
• Record details of ground cover (litter, logs, rocks etc.)                                                                                                        | 12 months after establishment of final rehabilitation and then every 2 years          |
| 2m x 2m quadrats         | • Count, by species, all trees >1.6m tall.  
• Tag and measure DBH of trees >1.6m tall, to a maximum of 10 for any one species.  
• Record canopy cover over the whole 20m centreline when trees are tall enough  
• Subjectively describe tree health, by species if relevant, noting signs of drought stress, nutrient deficiencies, disease and severe insect attack. Where health problems are noted, record the percentage of unhealthy trees.  
• Record any new plant species not present in the smaller plots, including any problem and declared noxious weeds  
• Take five surface soil samples (e.g. at approx. 5m intervals along the centreline) and bulk these for analyses of: pH, EC, chloride and sulfate; exchangeable Ca/Mg/K/Na; cation exchange capacity; particle size analysis and R1 dispersion index; 15 bar and field capacity moisture content; organic carbon; total and nitrate nitrogen; total and extractable phosphorus; Cu, Mn and Zn. | 12 months after establishment of final rehabilitation and then every 2 years          |
| 20m x 10m plots          | • Along the 50m erosion monitoring transect, record the location, number and dimension of all gullies >30cm wide and/or 30cm deep.  
• Erosion pins may be established in plots located in newer rehabilitation to record sheet erosion if present                                                                 | 12 months after establishment of final rehabilitation and then every 2 years          |
| 50m transect             | • When traversing between monitoring plots, note the presence of species of interest not previously recorded (e.g. key functional or structural species, protected species, noxious weeds), as well as obvious problems including any extensive bare areas (e.g. those greater than 0.1ha).  
• Observations such as this can provide useful, broad scale information on rehabilitation success and problems.                                                                 | 12 months after establishment of final rehabilitation and then every 2 years          |
| Photographic record      | • For each 20m x 10m plot, a photograph should be taken at each end of the plot, along the centreline looking in.                                                                                                          | 12 months after establishment of final rehabilitation and then every 2 years          |
### Elements to be Monitored and Monitoring Frequency

<table>
<thead>
<tr>
<th>Aspect of Rehabilitation</th>
<th>Elements to be Monitored</th>
<th>Monitoring Frequency</th>
</tr>
</thead>
</table>
| Habitat                  | - General observations relating to the availability and variety of food sources (e.g. flowering/fruiting trees, presence of invertebrates etc).  
                          | - Availability and variety of shelter (e.g. depth of leaf litter, presence of logs, hollows etc).  
                          | - Presence/absence of free water in the rehabilitated areas                               | 12 months after establishment of final rehabilitation and then every 2 years          |
| Fauna                    | - General observations of vertebrate species (including species of conservation significance).  
                          | - Detailed fauna surveys including presence and approximate abundance and distribution of vertebrate species (focussing on species of conservation significance). | After final rehabilitation is three years old undertake monitoring in every 2 years after establishment in both Autumn and Spring |
| Weeds and pests          | - Species identity.  
                          | - Weed spraying and pest management.                                                       | Quarterly during the first two years of final rehabilitation and biennially after that. Inspections should be opportunistic after significant rainfall events. |
| Geotechnical Stability   | - Assessment of the stability of batters and also looking at surface settlements (sink holes). In particular where these features could impact on the performance of any surface water management system.  
                          | - Surface integrity of landform cover/capping (measurement of extent of integrity failure).  
                          | - Presence / absence of landform slumping.                                                 | Annually for final rehabilitation                                                    |
| Surface and Groundwater  | - Groundwater quality and depth.  
                          | - Efficiency of landform surface water drainage systems (integrity of banks and drains)  
                          | - Water quality including pH, EC and total suspended solids of water in water storages, and pits, sedimentation dams. | Quarterly or following rainfall events  
                          | Monitoring of receiving waters during a rainfall event which results in runoff            |
13 REHABILITATION SUCCESS CRITERIA

Rehabilitation success criteria have been developed to provide long-term performance goals for rehabilitation activities. The rehabilitation success criteria presented in this section are considered conceptual, and will be developed further following consultation with the relevant stakeholders during the detailed mine closure planning stage. Criteria will be reviewed during the updates to this management plan and will take into account rehabilitation performance at the site. Criteria which were outlined in the Quarry Closure and Rehabilitation Plan (GSSE, 2012) that was prepared for the EA are outlined in Table 12 below.

Table 12 Rehabilitation Success Criteria

<table>
<thead>
<tr>
<th>Rehabilitation Element</th>
<th>Indicator</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Void</td>
<td>Landform stability</td>
<td>High wall faces exhibit long-term geotechnical stability and a geotechnical report has been completed. Competent rock high wall to have slope of &lt;70° to the horizontal. Ramp walls not backfilled exhibit long-term geotechnical stability and a geotechnical report has been completed.</td>
</tr>
<tr>
<td></td>
<td>Slope gradient</td>
<td>Gully or tunnel erosion is less than 200mm.</td>
</tr>
<tr>
<td></td>
<td>Erosion control</td>
<td>Average soil loss per annum per domain unit is &lt;40 tonnes/ha/yr (sheet erosion). Erosion mitigation measures have been applied to ensure slope stability</td>
</tr>
<tr>
<td></td>
<td>Surface Water Drainage</td>
<td>Use of contour banks and diversion drains to direct water into stable areas, sediment control basins or final void.</td>
</tr>
<tr>
<td>Water quality</td>
<td>Salinity (electrical conductivity)</td>
<td>Electrical conductivity of any void water may not exceed 900 µS/cm</td>
</tr>
<tr>
<td>Topdressing material (including topsoil and clay)</td>
<td>Salinity (electrical conductivity)</td>
<td>Soil salinity content is &lt;0.6 dS/m.</td>
</tr>
<tr>
<td></td>
<td>pH</td>
<td>Soil pH is between 5.5 and 8.5.</td>
</tr>
<tr>
<td></td>
<td>Sodium content</td>
<td>Soil Exchange Sodium Percentage (ESP) is &lt;15%.</td>
</tr>
<tr>
<td></td>
<td>Nutrient cycling</td>
<td>Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Land use</td>
<td>Where in-pit spoil allows, area accomplishes and remains as a healthy working bushland ecosystem (although pasture grasses may be used as required).</td>
</tr>
<tr>
<td></td>
<td>Surface cover</td>
<td>Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces &gt;20 m² in area or &gt;10 m along the benches.</td>
</tr>
<tr>
<td></td>
<td>Species composition</td>
<td>Establishment of vegetation comprise a mixture grasses, shrubs / trees (where possible) suitable for establishment on steeper slopes.</td>
</tr>
<tr>
<td></td>
<td>Resilience to disturbance</td>
<td>Established species survive and/or regenerate after disturbance. Weeds do not dominate native species after disturbance or after rain. Pests do not occur in substantial numbers or visibly affect the development of native plant species.</td>
</tr>
<tr>
<td></td>
<td>Sustainability</td>
<td>More than 75% of individual grasses and shrubs/trees are healthy when ranked healthy, sick or dead.</td>
</tr>
<tr>
<td>Rehabilitation Element</td>
<td>Indicator</td>
<td>Criteria</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Safety</td>
<td>Risk Assessment</td>
<td>Risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected generally in accordance with relevant guidelines and Australian Standards.</td>
</tr>
</tbody>
</table>

### Quarry Plant/Industrial Areas/Stockpiling Areas

<table>
<thead>
<tr>
<th>Landform stability</th>
<th>Slope gradient</th>
<th>Areas have gradients of &lt;2°.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erosion control</td>
<td>Erosion mitigation measures have been applied. Average soil loss per annum per domain unit is &lt;40 tonnes/ha/yr (sheet erosion).</td>
<td></td>
</tr>
<tr>
<td>Surface Water</td>
<td>Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.</td>
<td></td>
</tr>
</tbody>
</table>

| Water quality       | As for 1.                                                                                          |
| Topsoil             | As for 1.                                                                                          |

<table>
<thead>
<tr>
<th>Vegetation</th>
<th>Land use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings, water</td>
<td>Buildings, water storage, roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Areas are readily accessible and conducive to safe management activities. Predicted economics and/or benefits have been defined and agreed by the stakeholders.</td>
</tr>
<tr>
<td>storage, roads</td>
<td></td>
</tr>
<tr>
<td>Other infrastructure</td>
<td></td>
</tr>
</tbody>
</table>

| Surface cover       | As for 1.                                                                                         |
| Species composition | Subject to proposed land use, comprise a mixture of native trees, shrubs and grasses representative of regionally occurring native woodland where possible. |

| Resilience to        | As for 1.                                                                                         |
| disturbance          |                                                                                                                                                          |

| Sustainability       | More than 75% of individual grasses and trees / shrubs are healthy when ranked healthy, sick or dead. |

<table>
<thead>
<tr>
<th>Fauna</th>
<th>Vertebrate species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representation of</td>
<td>Representation of a range of species characteristics from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem type, based on pre-quarry fauna lists and sighted within the three-year period preceding quarry closure. The number of vertebrate species does not show a decrease over a number of successive seasons prior to quarry closure.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Invertebrate species</th>
<th>Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.</th>
</tr>
</thead>
</table>

| Habitat structure    | Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, and logs and signs of natural generation of shelter sources including leaf litter. |

<table>
<thead>
<tr>
<th>Safety</th>
<th>Risk Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk assessment</td>
<td>Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders.</td>
</tr>
</tbody>
</table>

SLR Consulting Australia Pty Ltd
14  REHABILITATION BOND CALCULATION

Schedule 3 Condition 34 of the Project Approval requires the preparation of the Conservation and Rehabilitation Bond for the Project, with this to be lodged to the DP&E within 6 months of approval of the Landscape and Rehabilitation Management Plan.
15 CONTINGENCY PLAN (ADAPTIVE MANAGEMENT)

The table below refers to the Project Approval requirement (Schedule 5 Condition 3e) to prepare a contingency plan. Key triggers and response relating to rehabilitation are included in Table 13 below.

<table>
<thead>
<tr>
<th>Aspect/Category</th>
<th>Key Element</th>
<th>Trigger/Response</th>
<th>1st Level Trigger</th>
<th>2nd Level Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landform stability</td>
<td>Slope gradient</td>
<td>Trigger</td>
<td>Slopes &lt;1:3 V:H.</td>
<td>Slopes &gt;1:3 V:H, unless agreed by the Secretary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Response</td>
<td>No action.</td>
<td>Undertake a review of the landform design, including survey if required. Undertake re-grading and revegetation of the area, if required.</td>
</tr>
<tr>
<td>Erosion control</td>
<td></td>
<td>Trigger</td>
<td>Minor gully or tunnel erosion present and/or minor rilling (rilling up to 200 mm).</td>
<td>Slumping and/or significant gully or tunnel erosion present and/or significant rilling.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Response</td>
<td>An inspection of the site will be undertaken by a suitably trained person. Investigate opportunities to install water management infrastructure to address erosion. Remediate as appropriate.</td>
<td>Engage a specialist to assist with the management of erosion and sedimentation at the site and provide recommendations to appropriately remediate the erosion. Remediate as soon as practicable. Review, and update the Erosion and Sediment Control Plan where required.</td>
</tr>
<tr>
<td>Free Draining Landforms</td>
<td></td>
<td>Trigger</td>
<td>Landforms exhibiting minor ponding.</td>
<td>Landforms exhibiting significant drainage issues.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Response</td>
<td>An inspection of the site will be undertaken by a suitably trained person. Investigate opportunities to address issues. Remediate as required.</td>
<td>Undertake a review of the landform design, including survey if required. Undertake re-grading</td>
</tr>
</tbody>
</table>

Table 13 Rehabilitation Contingency Plan
<table>
<thead>
<tr>
<th>Aspect/Category</th>
<th>Key Element</th>
<th>Trigger/Response</th>
<th>1st Level Trigger</th>
<th>2nd Level Trigger</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Management Structures</td>
<td>Trigger</td>
<td>Water management structures in rehabilitation areas (sediment dams, channels, contour banks) minor erosion and/or scouring.</td>
<td>Water management structures in rehabilitation areas fail or display significant scouring / erosion.</td>
<td>Engage specialist consultant to develop a site specific remediation plan and review water management structure design criteria.</td>
</tr>
<tr>
<td>Response</td>
<td>An inspection of the site will be undertaken by a suitably trained person. Identify remedial actions such as amelioration, re-vegetation or alternative scour protection.</td>
<td>Engage specialist consultant to develop a site specific remediation plan and review water management structure design criteria.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Material Quality</td>
<td>Salinity</td>
<td>Increasing salinity levels in material used in rehabilitation (overburden material).</td>
<td>Presence of salt scalds in rehabilitation.</td>
<td>Engage a specialist consultant to develop a site specific management report to be implemented to remediate salinity scalds.</td>
</tr>
<tr>
<td>Chemical characteristics</td>
<td>Trigger</td>
<td>Increasing trend in soil dispersivity.</td>
<td>Soil is moderately to highly dispersive.</td>
<td>Ameliorate dispersive spoils (for example with coarse gypsum). Re-vegetate if required.</td>
</tr>
<tr>
<td>Response</td>
<td>Undertake testing to determine required amelioration and undertake amelioration as required.</td>
<td>Ameliorate dispersive spoils (for example with coarse gypsum). Re-vegetate if required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stockpile Height</td>
<td>Trigger</td>
<td>Stockpile height greater than 2 metres (m) and not set out in windrows.</td>
<td>Stockpile height greater than 3 metres (m) and not set out in windrows.</td>
<td>Reshape topsoil stockpiles.</td>
</tr>
<tr>
<td>Response</td>
<td>If required, reshape topsoil stockpiles.</td>
<td>Reshape topsoil stockpiles.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aspect/Category</td>
<td>Key Element</td>
<td>Trigger/Response</td>
<td>1st Level Trigger</td>
<td>2nd Level Trigger</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>------------------------------------</td>
<td>------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Soil pH in rehabilitation</td>
<td>Trigger</td>
<td>Soil pH &lt;5.5 but &gt;4.5 or &gt;8.5 but &lt;9.5.</td>
<td>Soil pH is &lt;4.5 or &gt; 9.5.</td>
<td>Engage a specialist to recommend appropriate measures to increase/reduce pH to within rehabilitation guidelines. Consider undertaking consultant recommendations. Engage a specialist to recommend appropriate measures to increase/reduce pH to within rehabilitation guidelines. Undertake consultant recommendations to achieve soil pH within appropriate range.</td>
</tr>
<tr>
<td></td>
<td>Response</td>
<td></td>
<td></td>
<td>Engage a specialist to recommend appropriate measures to increase/reduce pH to within rehabilitation guidelines. Consider undertaking consultant recommendations. Engage a specialist to recommend appropriate measures to increase/reduce pH to within rehabilitation guidelines. Undertake consultant recommendations to achieve soil pH within appropriate range.</td>
</tr>
<tr>
<td>Soil depth in rehabilitation</td>
<td>Trigger</td>
<td>Soil depth (topsoil and ameliorates) is less than 100mm in rehabilitation areas.</td>
<td>Soil depth (topsoil and ameliorates) in rehabilitation areas is less than 50mm in the rehabilitation areas.</td>
<td>Assess revegetation growth. Undertake a review of the topsoil balance to confirm sufficient material to meet minimum depth requirements. Investigate suitable topsoil resource substitutes (ameliorates) if required. Additional topsoil may be required.</td>
</tr>
<tr>
<td></td>
<td>Response</td>
<td></td>
<td></td>
<td>Assess revegetation growth. Undertake a review of the topsoil balance to confirm sufficient material to meet minimum depth requirements. Investigate suitable topsoil resource substitutes (ameliorates) if required. Additional topsoil may be required.</td>
</tr>
<tr>
<td>Rehabilitation success</td>
<td>Trigger</td>
<td>&lt;75% but &gt;55% of shrubs and/or trees are healthy when ranked healthy, sick or dead during rehabilitation inspections in rehabilitation areas.</td>
<td>&lt;55% of shrubs and/or trees are healthy when ranked healthy, sick or dead during rehabilitation inspections in rehabilitation areas.</td>
<td>Undertake a field survey to identify likely causes of vegetation sickness and/or death rates. Re-seed or re-plant tube stock in areas with high sickness or death. Engage a suitably qualified specialist to investigate causes for vegetation sickness and death. Implement appropriate management actions.</td>
</tr>
<tr>
<td>Aspect/Category</td>
<td>Key Element</td>
<td>Trigger/Response</td>
<td>1st Level Trigger</td>
<td>2nd Level Trigger</td>
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<td>rates. Review seeding and/or planting procedures.</td>
<td></td>
</tr>
<tr>
<td>Weed Presence</td>
<td>Trigger</td>
<td>&gt; 10% but &lt;25%</td>
<td>Coverage of undesirable species present in rehabilitation areas.</td>
<td>&gt;25% cover of undesirable species present in rehabilitation areas.</td>
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<td>cover of</td>
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<td>undesirable</td>
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<td>species present</td>
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<td>in rehabilitation</td>
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<td>areas.</td>
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<tr>
<td></td>
<td>Response</td>
<td>Review and manage</td>
<td>Review and manage the presence of weeds.</td>
<td>Engage weed management contractor to remove introduced weed species. Investigate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the presence</td>
<td></td>
<td>management measures to reduce weeds including additional soil amelioration,</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of weeds.</td>
<td></td>
<td>establishment and retention of cover crops until weed presence is at acceptable</td>
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<td>levels. Implement recommendations as appropriate.</td>
</tr>
<tr>
<td>Temporary Rehabilitation</td>
<td>Trigger</td>
<td>&lt;70% but &gt;55%</td>
<td>Coverage of vegetation cover is present on areas where hydromulching has been</td>
<td>&lt;55% of vegetation cover is present on areas where hydromulching has been applied</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of vegetation</td>
<td>applied within 6 months.</td>
<td>within 6 months.</td>
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<td>cover is present</td>
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<td>on areas where</td>
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<td>hydromulching</td>
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<td>has been applied</td>
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<td>within 6 months.</td>
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<td></td>
<td>Response</td>
<td>An inspection of</td>
<td>An inspection of the site will be undertaken by a suitably trained person.</td>
<td>Engage a specialist consultant to develop a site specific plan to improve temporary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the site will be</td>
<td>Investigate opportunities to address issues. Revegetate as appropriate. Review</td>
<td>rehabilitation success. Revegetate site as appropriate.</td>
</tr>
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<td></td>
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<td>undertaken by a</td>
<td>seed mix and application rates.</td>
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<td></td>
<td></td>
<td>suitably trained</td>
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<td>person.</td>
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<tr>
<td>Pest animal species presence</td>
<td>Trigger</td>
<td>Pest animal</td>
<td>Significant numbers of pest animals causing widespread damage to rehabilitation.</td>
<td>Consult with relevant government agencies (including OEH) to recommend and implement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>species presence</td>
<td></td>
<td>appropriate pest animal control</td>
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<td>and density</td>
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<td>increased in</td>
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<td>annual monitoring</td>
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<td>events.</td>
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<td></td>
<td>Response</td>
<td>Consult with</td>
<td>Consult with relevant government agencies (including OEH) to recommend and</td>
<td>Consult with relevant government agencies (including OEH) to recommend and</td>
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<td>relevant</td>
<td>implement appropriate pest animal control</td>
<td>implement appropriate pest animal control</td>
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<td>to recommend and</td>
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<td>pest animal</td>
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<td>control</td>
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<td>Aspect/Category</td>
<td>Key Element</td>
<td>Trigger/Response</td>
<td>1st Level Trigger</td>
<td>2nd Level Trigger</td>
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<tr>
<td>Void Water Quality</td>
<td>Void Water Quality</td>
<td>Trigger</td>
<td>Electrical conductivity in the void water exceeds 600 µS/cm</td>
<td>Electrical conductivity in the void water exceeds 900 µS/cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Response</td>
<td>Additional water testing.</td>
<td>Additional water testing. Liaison with specialist to reduce EC levels.</td>
</tr>
</tbody>
</table>
16 INDICATIVE CLOSURE TIMEFRAME

Rehabilitation work will be undertaken progressively as soon as reshaped, benched and topsoiled areas become available. Where possible seeding will be undertaken during spring where the best possible rehabilitation result can be expected.

As outlined earlier, minimal rehabilitation can be completed at the quarry until the operation ceases, as the current disturbed areas are required for safe and efficient operation. Most rehabilitation undertaken at the site during operations will be temporary rehabilitation for stabilisation. Table 14 outlines the conceptual rehabilitation schedule. The site still has approval to operate until 31 December, 2034.

This timeframe is assuming that once closure occurs, all infrastructure not required for the post closure land use will be removed, with rehabilitation of the site being undertaken in the first year of closure. Following rehabilitation, the site will be managed through a series of rehabilitation phases.

Specific timings for biodiversity management are set out in the Biodiversity Offset Area Management Plan.
### Table 14  Proposed Rehabilitation and Closure Schedule

<table>
<thead>
<tr>
<th>Years From Closure</th>
<th>Closure Planning</th>
<th>Decommissioning and Rehabilitation</th>
<th>Monitoring and Maintenance</th>
<th>Rehab approval and bond return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-5</td>
<td>-4</td>
<td>-3</td>
<td>-2</td>
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<tr>
<td>Closure Planning</td>
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<td>Stakeholder</td>
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<td>consultation</td>
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<td>regarding closure</td>
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<td>Agreed final</td>
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<td>Detailed</td>
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<td>Rehabilitation</td>
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<tr>
<td>and Closure Plan</td>
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<td>Develop an</td>
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<td>infrastructure</td>
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<td>demolition plan</td>
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<td>Rehabilitation</td>
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<tr>
<td>and Closure Activities</td>
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<tr>
<td>Decommissioning</td>
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<td>Landform</td>
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<td>establishment</td>
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<td>Growth media</td>
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<td>establishment</td>
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<td>Ecosystem</td>
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<td>establishment</td>
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<td>Ecosystem</td>
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<td>development</td>
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<td>Relinquished Land</td>
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<td>Post Closure Activities</td>
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<tr>
<td>Maintenance of Rehabilitated Areas</td>
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<tr>
<td>Monitoring and Inspections</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
17 ROLES AND RESPONSIBILITIES

It is the responsibility of Quarry Manager for the implementation of the Landscape and Rehabilitation Management Plan. Table 15 outlines the responsible positions and accountable tasks.

Table 15 Roles and Responsibilities

<table>
<thead>
<tr>
<th>Position</th>
<th>Accountable Task</th>
</tr>
</thead>
</table>
| Quarry Manager| – Ensure all relevant personnel are aware of rehabilitation procedures.  
– Ensure all rehabilitation procedures are followed.  
– Ensure sufficient resources are available to meet rehabilitation criteria and schedule.  
– Coordinate progressive rehabilitation.  
– Provide advice and support for the Manager in relation to this Plan.  
– Ensure all rehabilitation is undertaken in accordance with the rehabilitation procedures presented in this Plan.  
– Review and analyse rehabilitation monitoring and advise on rehabilitation maintenance.  
– Conduct regular review of this Plan.  
– Advise on Best Management Practice mitigation techniques for the site. |
| Equipment Operators | – Ensure clearing remains within the area nominated by the Manager and identified on plans.  
– Vehicles to remain on established roads and tracks unless otherwise authorised.  
– Notify Quarry Manager of any disturbance in native vegetation or rehabilitated sites. |
18 PERIODIC REVIEW

The *Landscape and Rehabilitation Management Plan* shall be reviewed and revised and/or updated, in accordance with Schedule 5 Condition 5 of the PA, within three (3) months of any of the following:

- The submission of an annual review;
- The submission of an incident report;
- The submission of an audit; and
- Any modification to the conditions of the PA.

Review of the *Landscape and Rehabilitation Management Plan* will also take place if monitoring records indicate that it is warranted or in the event of any significant change to operations or air quality management procedures at the quarry.

The Karuah East management team will discuss and review the status of all management plans on an annual basis, but unless required all site environmental management plans will be reviewed and updated every three years.

Any modifications to the *Landscape and Rehabilitation Management Plan* will be undertaken in consultation with the appropriate government agencies.
APPENDIX A1

CONSULTATION WITH OEH
Dear Mr Almond

RE: HUNTER QUARRIES MANAGEMENT PLANS AND BIODIVERSITY OFFSET STRATEGY – KARUAH EAST QUARRY SITE

Thank you for forwarding the Management Plans and Biodiversity Offset Strategy for the Karuah East Quarry project (MP09-0175) for our records; specifically the following plans:

- Landscape and Rehabilitation Management Plan
- Heritage Management Plan
- Biodiversity Offset Area Management Plan
- Biodiversity Offset Strategy – Finalisation Letter

The Office of Environment and Heritage (OEH) understands that it was a requirement of the project approval issued by the Department of Planning and Environment (DPE) to produce the above documents in consultation with OEH. OEH encourages the development of such plans to ensure that proponents have determined how they will meet their statutory obligations and designated environmental objectives. However, OEH typically does not extensively review environmental management plans nor approve or endorse these documents. OEH's role is to set environmental objectives for environmental/conservation management, not to be directly involved in the development of strategies to achieve those objectives. However, in this instance OEH offers the following brief comments on the following management plans:

**Biodiversity Offset Strategy – Finalisation Letter**

As part of the review of the Preferred Project Report for Karuah East Quarry, OEH provided comment on the proposed biodiversity offset strategy - 'Karuah East Quarry Biodiversity Offset Strategy' (EcoLogical July 2013), which used the BioBanking Assessment Methodology (BBAM) to test its adequacy. OEH noted that the proposed offset contained 129.3 hectares of remnant vegetation in moderate to good condition, that included 'Spotted Gum-Grey Ironbark foothills forest', 'Smooth-barked Apple-Red Bloodwood Forest', 'Blackbutt-Turpentine-Tallowwood sheltered forest', 'Sydney Peppermint-Smooth-barked Apple shrubby Forest' and 'Brush Box-Tallowwood wet forest'. The proposed offsets would include three lots; Part Lot 13 DP 1024564 and Lot 14 DP 1024564, which are currently owned by Hunter Quarries, and an adjacent lot, Lot 5 DP 838128 which was under negotiation for purchase. Under BBAM, OEH acknowledged that the proposed offset generally compensated for most of the affected ecosystem and species credits, except for the 0.4 hectares of Dry Rainforest. However, in terms of the overall adequacy of the offset proposal for the three lots combined, OEH noted an overall 4.1 offset ratio and that the lack of dry rainforest in the offset is to
a certain extent offset by the presence of 30 hectares of moist forest of other types in the offset lands. As such, OEH supported the proposed biodiversity offset strategy presented in the PPR, providing that Lot 5 was included in the proposal.

The project was approved by DPE on the 17 June 2014 subject to a number of conditions as set out in Schedules 2 to 5 of the Project Approval. Condition 28, which deals with the biodiversity offset strategy, specifically states that "The Proponent shall, prior to the commencement of vegetation clearing activities, finalise and implement the Biodiversity Offset Strategy, as described in the EA, summarised in Table 10 [shown below] and shown conceptually in Figure 1 of Appendix 4, in consultation with OEH and Council, and to the satisfaction of the Secretary".

Table 10: Biodiversity Offset Strategy

<table>
<thead>
<tr>
<th>Area Offset Type</th>
<th>Minimum Size (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset Area</td>
<td>129.32 ha</td>
</tr>
<tr>
<td>Existing vegetation to be managed and enhanced</td>
<td></td>
</tr>
</tbody>
</table>

*Note: The Biodiversity Offset Strategy shall direct that the land proposed as the Biodiversity Offset shall be free of any dwelling-houses and associated sheds, bushfire asset protection zones and other related utilities or structures so as to preserve the integrity and function of that offset area. The Biodiversity Offset Strategy shall also provide details of the revegetation of any parts of the offset area that are cleared of native vegetation or are in an otherwise substantially modified state, other than required management trails and boundary fencing buffer distances.*

Correspondence titled ‘Finalisation of Biodiversity Offset Strategy for the Karuah East Quarry Project (09_0175)’ by Kleinfeld Australia Pty Ltd (dated 13 July 2015), indicates that Lot 5 (as per above) has now been purchased by Hunter Quarries. This correspondence states the proponent has exchanged contracts with the vendor and that settlement of the transaction will occur on 19 December 2015. As such OEH concurs with this letter that the purchase of Lot 5 DP 838128, along with Part Lot 13 DP 1024564 and Lot 14 DP 1024564 now effectively finalises the Biodiversity Offset Strategy as per Condition 28. Kleinfelders have also confirmed that the biodiversity offset is free of dwellings, asset protection zones and other infrastructure, as required under Condition 28.

OEH notes that the proponent intends to secure the biodiversity offset via a Conservation Agreement, under Part 4, Division 12 of the National Parks and Wildlife Act 1974, which will be done in consultation of OEH. OEH confirms that this meets the ‘long term security’ obligations as set out in Condition 29 of the Project Approval.

Biodiversity Offset Management Plan

OEH has briefly reviewed the ‘Biodiversity Offset Plan’ (prepared by Kleinfelders and dated September 2015). In general, this plan generally address the appropriate management strategies, performance criteria and reporting requirements OEH would expect from such a document. However, OEH notes that this plan will be subject to the management requirement and expectations required for a Conservation Agreement, which is the mechanism the proponent is utilising to secure the offset in the long-term. As such, OEH’s Conservation Partnership staff will review this document in detail as part of the Conservation Agreement application and process. Ultimately, this plan will need to be compliant with their requirements.

*Tetrapheca juncea* Translocation Management Plan

Generally, OEH is not supportive of translocation programs given the uncertainty of their effectiveness, with respect to securing and/or maintaining the long-term conservation of the species being impacted upon. However, in this instance, OEH notes that biodiversity offset area (discussed above) adequately compensates for the impacts of the proposed quarry on *Tetrapheca juncea* (i.e. the proposed offset area contains *Tetrapheca juncea* ‘species credits’ commensurate with that required under BBAM) and the proposed translocation program is essentially targeting plants that would have been cleared under the proposal. Therefore, OEH sees some merit in the project particularly from view of testing current translocation techniques and strategies for the species. As such, OEH would like to be kept informed of the progress of the translocation project, receive updates and be sent a copy of the final report.
OEH has briefly reviewed the 'Tetrapheca juncea Translocation Management Plan' (prepared by Firebird and dated August 2015) and is of the opinion it adequately details the proposal. OEH notes that Firebird state that OEH gave an undertaking we would review the plan and sign-off on the report, as stated in Table 2-1 of the plan, however, OEH does not have a sign-off role as we are not the consent authority for the project. OEH is content with providing consultative advice.

If you require any further information regarding this matter please contact Steve Lewer, Regional Biodiversity Conservation Officer, on 4927 3158.

Yours sincerely

[Signature] 2 3 SEP 2015

RICHARD BATH
Senior Team Leader Planning, Hunter Central Coast Region
Regional Operations
APPENDIX A2

GREAT LAKES COUNCIL COMMENTS
Wayne,

Certain conditions (namely Schedule 3; Conditions 28, 29, 32 and 33) have been applied to the consent for the Karuah East Quarry that requires Council input from a biodiversity and landscape/rehabilitation perspective.

I have been referred the following documents:

- **Finalisation of Biodiversity Offset Strategy for the Karuah East Quarry** - letter from Kleinfelder, dated 13 July 2015
- **Biodiversity Offset Area Management Plan** by Kleinfelder, dated September 2015
- **Karuah East Quarry Project Landscape and Rehabilitation Management Plan** by SLR, dated September 2015

I have reviewed these documents and provide the following commentary:

- **Finalisation of Biodiversity Offset Strategy for the Karuah East Quarry** - letter from Kleinfelder, dated 13 July 2015

  We recognise that evidence has been presented that the foreshadowed acquisition of Lot 5 DP838128 is being progressed. This, with land on part Lot 13 DP1024564 and 14 DP1024564, combines to achieve the minimum size of the offset area required for the approved development (>129.32-ha) and which is set-out in Condition 28. We understand that the offset will be secured by a Conservation Agreement pursuant to the NP&W Act 1979. Whilst we would have preferred dedication to a public authority for in-perpetuity conservation management, the proposed mechanism is a satisfactory, permanent protection mechanism, in our opinion.

  Kleinfelder notes in their report, that: "The purchase of Lot 5 DP838128 thus provides an offset consistent with that assessed in the Biodiversity Offset Strategy (ELA 2013) and as required in the Project Approval. As such, this purchase of Lot 5 is considered to effectively finalise the Biodiversity Offset Strategy for the project and satisfy Schedule 3 Condition 28 of the Project Approval."

  We concur that the requirements of Schedule 3 Condition 28 are in the process of being completed to our satisfaction. The offset area for the approved development will comprise all of Lot 5 DP838128, all of Lot 14 DP1024564 and certain nominated parts of Lot 13 DP1024564.

  I would note that it should be recognised that Council will seek to rezone the offset area to the highest level of environmental conservation zoning (E2) at the first available opportunity to recognise the use of the offset lands for biodiversity protection in the applicable Local Environmental Plan (Great Lakes LEP 2014).

- **Biodiversity Offset Area Management Plan** by Kleinfelder, dated September 2015

  Table 8 in the **Biodiversity Offset Area Management Plan [BOAMP]** by Kleinfelder, dated September 2015, notes that: **Management Zone 8 Excluded dwellings and access tracks** (2.14-ha) is to be excluded from the BOA. This is appropriate.

  Further, the **Management Zone 7 powerline easement** (2.93-ha) is a permanently altered and maintained landscape and should also be excluded from the BOA.
Management Zones 7 and 8 do not contribute to biodiversity conservation. In fact, Management Zone 7 (and its occupation) represent a long-term threat potentially to biodiversity conservation of the offset area.

Thus, the effective BOA is **130.5-hectares** not the 135.57-hectares as reported in the BOAMP. The excluded Management Zones should not form part of the calculation of the area of the BOA. The BOAMP should be amended in this regard.

The Management Strategies set-out in the BOAMP seem appropriate.

Further, the Performance and Completion Criteria in the BOAMP seem appropriate.

As mentioned above, Council will seek to rezone the BOA to E2 under the Great Lakes LEP to recognise the offset area in our planning scheme. We would also appreciate the provision of any copies of implementation reports and the outcomes of any three-yearly reviews of BOAMP.

We have no further comments to the BOAMP and are content that the relevant condition has been satisfied (subject to amending the BOAMP to reflect the Management Zones 7 and 8 do not form part of the offset area calculations).

- **Karuah East Quarry Project Landscape and Rehabilitation Management Plan** by SLR, dated September 2015

We are satisfied that the LRMP is suitably adequate and deals with the key issues associated with pre-clearing, clearing, weed and pest management and progressive and final rehabilitation. These are all significant site issues.

We are particularly satisfied that critical site resources such as hollow logs, hollow limbs, mulch from clearing, topsoil, etc, from approved clearing areas are proposed to be utilised as habitat furniture and site stabilisation and rehabilitation.

The LRMP does not deal with how the final rehabilitated landform would be secured (that is, that the restoration achieved would be consolidated in the long-term). Perhaps a s88B instrument or Conservation Agreement is required to ensure that the progressive and closure rehabilitation outcomes are secured.

Further, there is no calculation of the quantum of a conservation bond to ensure that the rehabilitation is achieved in the event that the current or future registered proprietor fails to deliver on the outcomes. An adequate conservation bond is imperative to ensuring a suitable outcome. We understand that there is a separate process for the determination of this bond.

Obviously, the Plan is only as good as its implementation. We would appreciate being provided copies of any implementation reports for progressive landscaping and rehabilitation of this landform.

Thanks for the opportunity to provide comments to these plans.

Regards

Mat
Mat Bell
Senior Ecologist

Natural Systems
Great Lakes Council
PO Box 450, Forster, NSW, 2428
P: 02 6591 7243 | F: 02 6591 7368
E: mathew.bell@greatlakes.nsw.gov.au

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Your Environmental Rate - Delivering a Healthy Great Lakes

Please think & act sustainably - print only if required
APPENDIX A3

DP&E COMMENTS ON DRAFT MANAGEMENT PLAN
**Landscape and Rehabilitation Management Plan (L&RMP)**

Under Schedule 3, Condition 32 of the Project Approval MP 09_0175, KEQ is required to prepare and implement a Landscape and Rehabilitation Management Plan to the satisfaction of the Secretary. Refer to the table below for the applicable approval requirements, the relevant sections in the submitted MP and the Department’s review comments.

<table>
<thead>
<tr>
<th>09_0175 Requirement</th>
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<tbody>
<tr>
<td>The Proponent shall prepare and implement a Landscape and Rehabilitation Management Plan for the project to the satisfaction of the Secretary. This Plan would relate to the area of the quarry and all perimeter lands. This plan must:</td>
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<tr>
<td>a. be prepared by a suitably qualified expert whose appointment has been approved by the Secretary;</td>
<td>N/A</td>
<td>Requirement has been met satisfactorily.</td>
<td>NFA</td>
</tr>
<tr>
<td>b. be prepared in consultation with OEH and Council, and submitted to the Secretary for approval prior to the commencement of construction activities;</td>
<td>Section 1.2</td>
<td>The Department recommends consultation with agencies to be provided in an Appendix of the management plan.</td>
<td>Please provide OEH and Council consultation correspondence.</td>
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<tr>
<td>c. describe how the implementation of the Tetratheca juncea Translocation Program would be integrated with the overall rehabilitation of the site;</td>
<td>Section 6.2.5</td>
<td>Table 2 notes that this condition is met under Section 6.11 – there is no Section 6.11 in the MP. Section 6.2.5 makes reference to the Tj Translocation Plan.</td>
<td></td>
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<tr>
<td>d. describe the short, medium and long-term measures that would be implemented to:</td>
<td>Section 5, 6 &amp; 8</td>
<td>Please include a section that addresses how the proponent might minimise socio-economic effects associated with quarry closure, as per condition 30 Subsection B of the Project Approval.</td>
<td>As per comment</td>
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<tr>
<td>- manage remnant vegetation and habitat on the site; and</td>
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<td>- ensure compliance with the rehabilitation objectives and progressive rehabilitation obligations of this approval.</td>
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<td>e. include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, including triggers for any remedial action;</td>
<td>Section 12 &amp; 14</td>
<td>Requirement has been met satisfactorily.</td>
<td>NFA</td>
</tr>
<tr>
<td>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 preparation of the plan), including the procedures to be implemented for:</td>
<td>Section 6-8</td>
<td>Section 6.4.3 identifies measures for weed control (dot point 4) however feral pest control is not included.</td>
<td>Specify measures for feral pest control.</td>
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<td>----------------------------------------------------------------------------</td>
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<td>and fauna habitat within the rehabilitation area, including details of the</td>
<td>Section</td>
<td>Section 11.1.1, first line – change 'should to 'will'.</td>
<td>Amend text.</td>
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<tr>
<td>target revegetation communities of the rehabilitated landform;</td>
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<td>• coordinating the relocation of native fauna to protected habitats</td>
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<td>associated with pre-clearing fauna surveys;</td>
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<td>• maximising the salvage of environmental resources within the approved</td>
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<td>disturbance area - including tree hollows, vegetative and soil resources -</td>
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<td>for beneficial reuse in the enhancement of the rehabilitation area;</td>
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<td>• collecting and propagating seed;</td>
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<td>• ensuring minimal environmental consequences for threatened species,</td>
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<td>populations and habitats;</td>
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<td>• minimising the impacts on native fauna on site, including the details</td>
<td></td>
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<td>and implementation of appropriate pre-clearance surveys;</td>
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<td>• minimising the impacts on fauna movement between undisturbed areas of</td>
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<td>the site and nearby vegetation (including potential fauna crossings);</td>
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<td>• controlling weeds and feral pests;</td>
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<td>• controlling erosion;</td>
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<td>• controlling access and providing for management trails; and</td>
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<td></td>
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<td>• bushfire management and implementation of ecologically appropriate</td>
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<td>bushfire intervals.</td>
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<td>g. include a program to monitor the effectiveness of these measures, and</td>
<td>Section</td>
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<td>progress against the performance and completion criteria;</td>
<td>11</td>
<td>Requirement has been met satisfactorily.</td>
<td>NFA</td>
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<tr>
<td>h. identify the potential risks to successful implementation of the</td>
<td>Section</td>
<td>Requirement has been met satisfactorily.</td>
<td>NFA</td>
</tr>
<tr>
<td>Tetratheca juncea Translocation Program and rehabilitation of the site,</td>
<td>12 &amp; 14</td>
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<td>and include a description of the contingency measures that would be</td>
<td></td>
<td>Table 2 notes that this condition is met under Section 6.12 – there is no</td>
<td></td>
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<tr>
<td>implemented to mitigate these risks;</td>
<td></td>
<td>Section 6.12 in the MP.</td>
<td></td>
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<tr>
<td>i. include details as to how the rehabilitated land would be permanently</td>
<td>Section</td>
<td>Requirement has been met satisfactorily.</td>
<td>NFA</td>
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<tr>
<td>conserved and managed as part of the broader Biodiversity Offset Area</td>
<td>16</td>
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<td>approved in these conditions;</td>
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<tr>
<td>j. include details of who would be responsible for monitoring, reviewing,</td>
<td>Section</td>
<td>Requirement has been met satisfactorily.</td>
<td>NFA</td>
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<td>and implementing the plan; and</td>
<td>16</td>
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<tr>
<td>k. include details as to the timing of</td>
<td></td>
<td>Requirement has been met</td>
<td>NFA</td>
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### 09_0175 Requirement

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<td>actions set-out in the plan</td>
<td>15</td>
<td>satisfactorily.</td>
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### Other Comments

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<tr>
<td>3.1</td>
<td>Change Minister for Planning to Planning Assessment Commission, as the approval authority</td>
<td>Amend text.</td>
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<tr>
<td>3.3</td>
<td>Construction Activity hours are 8am to 1pm on Saturdays, not 7am to 1pm.</td>
<td>Amend text.</td>
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<tr>
<td>12</td>
<td>Table 12 – Please justify why 1,500 µS/cm is an acceptable water quality. The Department thinks that this is high compared to water quality in surrounding streams. The Department also notes that, for instance, the Hunter River Salinity trading scheme uses a trigger level of 900 µS/cm</td>
<td></td>
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<td></td>
<td>Table 13 – Please consider these figures, when re-evaluating the first and second level triggers for void water quality (see comment above)</td>
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