LANDSCAPE AND REHABILITATION MANAGEMENT PLAN

GRANTS ROAD SAND QUARRY
LANSCAPE AND REHABILITATION
MANAGEMENT PLAN

GRANTS ROAD SAND QUARRY

NOVEMBER 2015

Conacher Consulting Pty Ltd
Environmental and Land Management Consultants
PO Box 4082, East Gosford NSW
Phone: 02 4324 7888
conacherconsulting@gmail.com

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Conacher Consulting P.L. ABN 62 166 920 869
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SECTION 1

INTRODUCTION

1.1 BACKGROUND

This Landscape and Rehabilitation Management Plan (LRMP) has been prepared by Conacher Consulting to address the Project Approval Conditions for the Grants Road Sand Quarry Extension (Application No. 08/0099 dated 25 July 2014), under Section 75 of the EP&A Act (1979).

The author of this Plan, Phillip Anthony Conacher of Conacher Consulting, has been endorsed by the Secretary of the Department of Planning and Environment as a suitably qualified person to prepare this Plan.

The Project Approval Conditions addressed in this LRMP are specifically condition No. 27 of Schedule 3 (preparation of Landscape and Rehabilitation Management Plan) with the inclusion of the requirements of Conditions 23 (Biodiversity Offset Strategy), 25 (Rehabilitation Objectives) and 26 (Progressive Rehabilitation).

Included in the Project Approval Conditions as Schedule 5, is a Statement of Commitments between the Quarry Operators and the Department of Planning and Environment. Commitments 9 (Biodiversity and Environment Management) and 17 (Mine Rehabilitation) also include details relevant for inclusion into the LRMP.

To meet the inclusive requirements of the Approval Conditions this LRMP includes three sub-plans for land management areas within the site, as identified below:

- Biodiversity Off-set Area Management Plan - Included in Section 2
- Quarry Buffer Area Landscape Management Plan - Included in Section 3
- Quarry Area Rehabilitation Plan - Included in Section 4

The location of the areas covered by these three sub-plans is shown in Figure 1. For reporting purposes these sub-plans have been incorporated into this single document. These sub-plans may be separated into single purpose documents in any subsequent review or revisions.

The location within this report where each item of Condition 27 of the Project Approval has been addressed is identified in Table 1.1.

<table>
<thead>
<tr>
<th>Condition 27 Criteria</th>
<th>Location where addressed within LRMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) be prepared by suitably qualified person(s) whose appointment has been approved</td>
<td>See Section 1.1</td>
</tr>
<tr>
<td>by the Secretary</td>
<td></td>
</tr>
<tr>
<td>(b) be prepared in consultation with OEH, DRE and Council, and submitted to the</td>
<td>See Section 1.5</td>
</tr>
<tr>
<td>Secretary for approval by the end of July 2015</td>
<td></td>
</tr>
<tr>
<td>(c) describe how the implementation of the biodiversity offset strategy would be</td>
<td>See Section 1.3 overall implementation</td>
</tr>
<tr>
<td>integrated with the overall rehabilitation of the site;</td>
<td>Section 2.4 (Biodiversity offset Area)</td>
</tr>
<tr>
<td></td>
<td>Section 3.5 (Buffer Area)</td>
</tr>
<tr>
<td></td>
<td>Section 4.4 (Quarry Area Rehabilitation)</td>
</tr>
<tr>
<td>Condition 27 Criteria</td>
<td>Location where addressed within LRMP</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>(d) describe the short, medium, and long term measures that would be implemented to: • manage the remnant vegetation and habitat on the site and in the offset areas; • implement the biodiversity offset strategy; and • ensure compliance with the rehabilitation objectives and the progressive rehabilitation obligations in this approval;</td>
<td>See Section 2.5 / Table 2.1</td>
</tr>
<tr>
<td>(e) include detailed performance and completion criteria for evaluating the performance of the biodiversity offset strategy and the rehabilitation of the site, including triggers for any necessary remedial action;</td>
<td>See Section 2.6</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: • enhancing the quality of remnant vegetation and fauna habitat; • landscaping the site and along public roads to minimise visual and lighting impacts; • restoring native endemic vegetation and fauna habitat; • maximising the salvage of environmental resources within the approved disturbance area – including tree hollows, vegetative and soil resources – for beneficial reuse; • ensuring minimal environmental consequences for threatened species, populations and habitats; • minimising the impacts on native fauna, including undertaking pre-clearance surveys; • controlling weeds and feral pests; • controlling erosion; • controlling access; and • bushfire management;</td>
<td>See Sections 2.5 and 3.5</td>
</tr>
<tr>
<td>(g) include a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;</td>
<td>See Sections 2.6 and 3.4</td>
</tr>
<tr>
<td>(h) identify the potential risks to the implementation of the biodiversity offset strategy and rehabilitation of the site, and include a description of the contingency measures that would be implemented to mitigate these risks; and</td>
<td>See Section 2.7</td>
</tr>
<tr>
<td>(i) include details of who would be responsible for monitoring, reviewing and implementing the plan.</td>
<td>See Section 2.4</td>
</tr>
</tbody>
</table>
1.2 AMENDMENTS TO STRATEGIES, PLANS OR PROGRAMS

The resource extraction has been approved for a 30 year period (to July 2044) as a staged resource extraction and progressive quarried area rehabilitation development. The approved staging of the works area is shown in Figure 4. The following Biodiversity Offset Area Management Plan and the Quarry Area Rehabilitation Plans have been prepared on the basis of the approved staged quarrying area plan. However, as identified in Approval Conditions 14 of Schedule 2, it is noted that at any time the proponent may submit any revised strategies, plans or programs to the Secretary of the Department of Planning for approval. This approval for revisions or amendments is also relevant to any changes incorporated into this LRMP.

1.3 IMPLEMENTATION OF LANDSCAPE AND REHABILITATION PLAN

Each of the three sub-plans will be implemented concurrently and are dependent on the extent and progress of quarrying activities being undertaken. However each sub-plan has its own specific objectives, actions, review and monitoring procedures which will enable the requirements of each Plan to be implemented on a site and action orientated basis. All sub-plans will be subject to annual reporting procedures to meet with the annual environmental performance review identified in Condition 4 of Schedule 5.

1.4 CONSULTATION WITH ABORIGINAL STAKEHOLDERS

Consultations with Aboriginal stakeholders will be undertaken during the initial year of implementing the site assessments within the Biodiversity Offset Area. The procedures and requirements to be addressed for this consultation are identified in the Heritage Management Plan prepared to address Condition 30 (Schedule 3).

The Cultural Heritage Plan identifies that:

“The Biodiversity Offset Area is to be inspected by an archaeologist and registered Aboriginal parties prior to any revegetation or other works. Any sites located will be recorded.”

If any aboriginal heritage sites are found within the Biodiversity Offset Areas the archaeologist will provide specific management advice.

1.5 AGENCY CONSULTATIONS

The NSW Office of Environment and Heritage (OEH), Department of Resources and Energy (DRE) and Gosford City Council (GCC) were consulted regarding the preparation of this plan. Details of consultations are outlined as follows:

NSW Department of Planning and Environment

A copy of the Draft Landscape and Rehabilitation Management Plan was forwarded to the NSW Department of Planning and Environment. A detailed response requiring more details on the actions proposed and monitoring was provided on 13 October 2015.

This version of the LRMP addresses the issues identified by the Department.

NSW Office of Environment and Heritage

- A request for consultation (letter dated 27 October 2014) was forwarded to the OEH addressed to Mr Richard Bath / Senior Team Leader Planning for the Hunter Central Coast Region Regional Operations Group. No response was received.
Correspondence and a copy of the Draft Landscape and Rehabilitation Plan was forwarded to OEH on 10 September 2015. The OEH responded on 6 October 2015 identifying that more specific actions and targets for completion and corrective actions are required.

**Department of Resources and Energy**
- A request for consultation (letter dated 27 October 2014) was forwarded to the NSW Department of Trade and Investment Regional Infrastructure and Services Resources and Energy Division addressed to Cressida Gilmore / Team leader Land Use. An email response was received from Malcolm Drummond / Senior Geoscientist - Land Use Assessment on 30 October 2014 who advised that “there are no matters which NSW Trade & Investment - Division of Resources & Energy need to address in regards to the LRMP.”
- On 10 September 2015 the Department advised via a phone conversation that they would not have any need to comment on the Draft Landscape and Rehabilitation Plan.

**Gosford City Council**
- A request for consultation (letter dated 27 October 2014) was forwarded to Gosford City Council, addressed to Mr Paul Anderson / Chief Executive Officer. An informal response was received from Ms Kendal Caynes Gosford City Council / Environment Officer that Council had no further requirements to be addressed in the preparation of the plan.
- Correspondence and a copy of the Draft Plan was forwarded to Council on 10 September 2015. No response was received.
SECTION 2

BIODIVERSITY OFFSET AREA MANAGEMENT PLAN

2.1 BACKGROUND

The Biodiversity Offset Strategy and approval conditions (Condition No.23 Schedule 3) require a total on-site biodiversity offset area covering 6.37 ha.

The offset area is to incorporate:

i) At least 4 ha of moderate to good quality Scribbly Gum Woodland and/or another vegetation community commensurate with the local surroundings is to be enriched and established.

ii) Enhancement of suitable habitat for threatened fauna species.

iii) Placement of at least 36 fauna nest boxes.

The establishment of the biodiversity off-set area and the relevant vegetation enhancement and habitat management requirements are incorporated into this Biodiversity Area Offset Management Plan (BOAMP). The Biodiversity Offset Areas are located on-site and are shown in Figure 2.

2.2 PLAN OBJECTIVES

The overall aim of the offset strategy is to improve the biodiversity values of the identified offset areas. The objectives of this BOAMP are to identify:

i. The location of the biodiversity offset areas.

ii. Actions and mechanisms to be implemented to establish at least 4ha of vegetation in the moderate to good category.

iii. Actions for establishing and enhancing habitat for threatened fauna species.

iv. Methods for the construction and installation of 36 fauna nest boxes.

v. A program to be implemented over a 10 year period for the Biodiversity Offset Strategy.

vi. Ongoing monitoring and reporting of the actions undertaken within the biodiversity offset area.

vii. Any adaptive measures or actions which could be undertaken to rectify any problems arising from the implementation of the Biodiversity Offset Strategy.

viii. Any other relevant matters required to be covered which may be referenced in the Approval Conditions, Environmental Assessment Report or the Statement of Commitments.

ix. Any key threatening processes which can be addressed and reduced through the actions implemented in the Biodiversity Offset Areas.
2.3 REQUIREMENTS OF APPROVAL CONDITION No.27 (LANDSCAPE AND REHABILITATION MANAGEMENT PLAN)

The details of this BOAMP are provided in a format to address both the objectives outlined above and relevant matters identified in Condition No. 27 (Appendix 3) of the Approval Conditions. Table 1.1 identifies the criteria for inclusion in the Landscape and Rehabilitation Management Plan.

2.4 IMPLEMENTATION OF BIODIVERSITY OFFSET STRATEGY

The Biodiversity Offset Strategy would be implemented over a 10 year period through the actions, measures and requirements identified in the BOAMP.

The 10 year implementation program is directly linked to the operational (extensions) stages of the quarry works area. The expansion of the quarry area will provide physical habitat resources (eg tree hollows rocks, topsoil, overburden capping, rubble etc) from future expansion areas which will be used for habitat enhancement and as a planting substrate. Additionally, funding for implementing the BOAMP will become available through quarry product sales, over the 10 year implementation period.

The quarry approval has been granted to 2044 and therefore it is expected that the works undertaken within the biodiversity offset areas during the 10 year period of the BOAMP will be provided with some ongoing maintenance funding or other resources until the planned closure of the quarry in 2044.

The works required for the biodiversity offset area, as outlined in the BOAMP, will be the responsibility of the quarry owners/operators. Where required specialist consultants or contractors will be engaged to undertake identified works.

The revegetation and habitat enhancement works required for the Biodiversity Offset Area are independent of the rehabilitation of the worked quarry areas. The quarry area is separated from the Biodiversity Offset Area by the quarry buffer area. The purpose of the quarry buffer area is to separate the direct impacts of the quarry activity area and the quarry rehabilitation area from the Biodiversity Offset Area.

Drainage from the quarry area will pass through the drainage lines of the Biodiversity Offset Area after passing through the site water management structures. In this regards the runoff water flow is integrated between the quarry rehabilitation area and Biodiversity Offset Area.

The inspections, monitoring and reporting of the progress of the BOAMP will be undertaken by a qualified and experienced Project Ecologist or Site Rehabilitation Environmental Consultant in association with the landowner. Conacher Consulting Pty Ltd has been engaged to supervise the offset strategy works and undertake the required monitoring.

2.5 ACTIONS TO BE IMPLEMENTED

The actions to be implemented within the biodiversity offset area to meet the objective of this BOAMP and the relevant approval conditions are itemised in Table 2.1. The timing of these actions has been identified so that implementation can be undertaken progressively as the quarry area extends and both funding and salvaged resources becomes available.

The first year of the implementation of the BOAMP will concentrate on identifying, recording and mapping the site specific micro-features of the biodiversity offset area. This will include identifying areas of:

- Remnant native vegetation and regrowth
Weed dominance
- Hollow tree resources
- Rock outcrops
- Drainage lines/soaks/water flows
- Fallen trees

This habitat and physical features micro-mapping will be used as a basis for determining the location and extent of a range of biodiversity management actions including:
- Suitable fence location
- Implementation of weed control strategies
- Areas for native seed/propagules collection
- Habitat/vegetation condition monitoring points
- Areas requiring erosion/sediment control
- Areas for habitat enhancement

Supplementary planting details are provided in Appendix 1 and Weed Management details are provided in Appendix 2.

Guidelines for fauna nest boxes are provided in Appendix 3.

The timing of the implementation of the actions for the management of the biodiversity offset area are provided in Table 2.1. These are separated into:
- Short term (year 1 and years 2, 3, 4).
- Medium term (years 5, 6, 7).
- Longer term (years 8, 9, 10).

### 2.6 BUSHFIRE CONTROL

The adjoining areas of the National Park estate are subject to control burning programs. In its current conditions the Biodiversity Offset Area is a very low bushfire risk. During the rehabilitation stages controlled burning is not proposed to be used as part of the rehabilitation or revegetation program. A water tanker with bushfire pump is available from the quarry to control the spread of a bushfire from the National Park if required.

<table>
<thead>
<tr>
<th>SITE RESOURCE MAPPING</th>
<th>ACTIONS</th>
<th>SHORT TERM</th>
<th>MEDIUM TERM</th>
<th>LONG TERM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>YEAR 1</td>
<td>YEARS 2, 3, 4.</td>
<td>YEARS 5, 6, 7.</td>
</tr>
<tr>
<td>A1</td>
<td>Complete micro habitat/site features mapping</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>Identify and analyse soil erosion/sediment problems</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>A3</td>
<td>Identify surface drainage features</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>A4</td>
<td>Identify habitat enhancement needs</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>ACTIONS</td>
<td>SHORT TERM</td>
<td>MEDIUM TERM</td>
<td>LONG TERM</td>
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<tr>
<td></td>
<td>YEAR 1</td>
<td>YEARS 2, 3, 4.</td>
<td>YEARS 5, 6, 7.</td>
<td>YEARS 8, 9, 10.</td>
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<tr>
<td>VEGETATION AND WEED MANAGEMENT</td>
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<td></td>
</tr>
<tr>
<td>B1 Collect soil samples for nutrient testing</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>B2 Map main weed occurrences</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>B3 Develop weed management strategy</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B4 Prepare revegetation strategy</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B5 Collect suitable seeds for revegetation</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B6 Implement revegetation strategy</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FENCING</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>C1 Identify deer exclusion fencing requirements</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2 Construct deer exclusion fencing</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C3 Maintain deer exclusion fencing</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>HABITAT ENHANCEMENT</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>D1 Implement habitat enhancement</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>D2 Install 36 nestboxes, record locations</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D3 Salvage environmental/habitat resources</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>D4 Undertake pre-clearance surveys</td>
<td></td>
<td>X</td>
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<td></td>
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<tr>
<td>REPORTING/MONITORING</td>
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</tr>
<tr>
<td>E1 Re-assess risks to implementation of action</td>
<td>X</td>
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<td>X</td>
<td></td>
</tr>
<tr>
<td>E2 Implement adaptive response strategies</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
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<td>E3 Implement monitoring and reporting strategy to cover:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Nestboxes</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>– Weed control</td>
<td>X</td>
<td>X</td>
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</table>
TABLE 2.1
ACTIONS TO BE IMPLEMENTED (BIODIVERSITY OFFSET AREA)

<table>
<thead>
<tr>
<th>ACTIONS</th>
<th>SHORT TERM</th>
<th>MEDIUM TERM</th>
<th>LONG TERM</th>
</tr>
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<tr>
<td></td>
<td>YEAR 1</td>
<td>YEARS 2, 3, 4.</td>
<td>YEARS 5, 6, 7.</td>
</tr>
<tr>
<td>Reporting/Monitoring</td>
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<td></td>
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<tr>
<td>- Vegetation growth/condition</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>- Revegetation areas</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>- Habitat enhancement measures</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>- Fencing condition</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>- Ongoing actions</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>- Remedial actions</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Actions to address Key Threatening Processes

The overall management of the biodiversity offset area is to be undertaken with an objective of minimising and rectifying, as far as practical, any key threatening processes occurring within the biodiversity offset area. Some of the key threatening processes from historical land management which may have affected threatened biodiversity within the biodiversity offset area are:

- Loss of hollow bearing trees
- Removal of dead wood and dead trees
- Herbivory and environmental degradation caused by feral deer
- Invasion of native plant communities by exotic perennial grasses
- Invasion, establishment and spread of *Lantana camara*
- Bushrock removal
- Clearing of native vegetation
- Competition and grazing by the feral rabbit

Description of Actions to be implemented in Biodiversity Offset Area.

A1  Micro-habitat mapping

Micro-habitat is the habitat substrate which a fauna species might utilize. Rock outcrops, drainage lines, ground hollows, tree hollows are micro-habitats within a larger landscape area.

A2  Identify and analyse soil erosion/sediment problems

Soil erosion is the removal of soil by the action of running water, often over un-vegetated areas. Sedimentation is the accumulation of soil eroded from the land surface.
A3  Identify surface drainage features
Habitat enhancement is the provision of additional fauna or flora microhabitat features such as hollow logs, rocks, soil, mulch. This action may incorporate habitat management measures such as noxious weed control.

B1  Soil samples for nutrient testing
The nutrient levels in the soil within the offset areas particularly nitrogen and phosphorus, will provide some data on the nutrient states of the soils in comparison to natural nutrient levels. These soil samples will be laboratory tested to provide information on how the soil nutrient levels can be managed during site rehabilitation and revegetation.

B2  Map Noxious Weed Management
The extent of noxious weeds within the biodiversity offset areas is required to be determined so that weed control and management activities can be directed to the area where weeds are present. A map of the weed occurrences for the biodiversity offset areas will be prepared at a scale of 1:500 or 1:1000.

B3  Develop weed management strategy
Weed management is the control of spread or removal of an identified weed source. Weed management techniques are described in Appendix 1.

B4  Revegetation Strategy
Revegetation is the introduction of plant species into an identified area to achieve a particular purpose such as; soil stability, native species enrichment, fauna habitat/feeding resources or for vegetation community structure purposes. Assisted regeneration of the native species is part of the revegetation strategy. Further details on site revegetation are provided in Appendix 1. Transplanting of Juncus species from the future quarry areas will also occur.

B5  Collect suitable seeds for revegetation
Native species within the site suitable for revegetation include:

- Allocasuarina littoralis
- Callistemon citrinus
- Doryanthes excels
- Kunzea ambigua
- Leptospermum spp.
- Themeda triandra

Seeds from these species will be obtained for revegetation purposes through direct seed collection when suitable seeds are available or by cutting seed baring branches. These branches will be placed over a suitably prepared seedbed within the revegetation areas. Additional native grass seeds may be required if insufficient seed resources are available from within the site.

B6  Implement Revegetation Strategy
Revegetation within the three identified native plant revegetation areas in the offset areas. The revegetation details are identified in Appendix 1. The objective of the revegetation works is to:

C1  Identify protective fencing requirements
Feral deer are the major threat to ongoing successful, long term revegetation. Parts of the offset area are already fenced however the location, type and condition of this fencing does not exclude feral deer from grazing within the site. The existing fence is to be inspected and the location of more appropriate deer exclusion fencing is to be determined.

C2  Construct deer exclusion fencing
Protective fencing is to be constructed around the revegetation areas as determined following action C1 above. Fencing will incorporate deer exclusion wire mesh fencing (2 metre height) with steel posts at the manufactures recommendations.
Fenced areas will be provided with 3 metre wire vehicle access gates.

**C3 Maintain deer exclusion fencing**
Fencing is to be maintained in an operational condition at all times. The condition of the fencing is to be reported on during the regular monitoring inspections.

**D1 Implement habitat enhancement measures**
The various habitat enhancement measures (as per action A4 above) are to be implemented as habitat resource material becomes available and at the locations determined from action A3.

**D2 Install 36 nestboxes**
The required nest-boxes have been installed throughout the biodiversity offset areas in October 2015 prior to any clearing of hollow bearing trees. The details of the nest boxes (size, location, utilization etc) are to be provided with the initial annual Monitoring Report.

**D3 Salvage environmental/habitat resources**
Any useful materials such as tree hollows, rocks, mulch, topsoil, capping rubble from areas of quarry expansion will be relocated to the biodiversity offset area for revegetation or habitat enhancement purposes.

**D4 Undertake pre-clearance Surveys**
All hollow bearing trees are to be checked prior to clearing by a nocturnal spotlight survey by the Ecologist. Any trees which contain fauna are to be sectionally dismantled or otherwise selectively and carefully cleared by controlled felling and machinery assisted lowering to minimise impact to any occupying fauna. Records of these pre-clearance surveys are to be maintained by the Ecologist and provided in the annual report.

**E1 Re-assess risks to implementation of action**
Each action is to be reviewed on an annual basis to determine if the action/risk/implementation has been successfully undertaken. Additionally an analysis to determine if the changing site conditions require modifications to the actions will be undertaken on an annual basis.

**E2 Undertake adaptive response Strategies**
Any strategies/actions required to be undertaken as a response to non-compliance, or poor performance of the actions are to be identified as part of the regular reporting program.

**E3 Implement monitoring and reporting strategy**
Apart from any reporting or inspections undertaken to implement any actions identified for the biodiversity offset area a monitoring progress inspection is to be undertaken every 3-4 months with an annual monitoring report covering all of the actions in Table 2.1 to be completed.

**2.7 MONITORING OF PERFORMANCE AND COMPLETION CRITERIA**

Each action identified in Table 2.1 will be monitored, seasonally as required or on an annual basis (for 10 years) to determine if the action has been implemented and whether the action is successfully working towards the objectives of the BOAMP. Once the actions have been evaluated at the end of the first year of the management plan the relevant performance/completion criteria can then be further refined for each criteria. A record of actions implemented including dates, locations and action details is to be kept for monitoring purposes. This reporting of actions is to be undertaken by the landowner. Monitoring of biodiversity offsets is to be undertaken on an annual basis under the approval. Monitoring is required to assess the establishment and maintenance of at least 4 ha of moderate – good
quality Scribbly Gum Woodland vegetation and report on any nest box maintenance or replacement necessary over the initial 10 years. Implementation and monitoring details are provided in Table 2.2.

**Vegetation Quadrat Monitoring**

Biodiversity offset areas are to be monitored annually with fifteen fixed 100m² monitoring quadrats. The following is to be assessed for each of the monitoring quadrats:

- Floristics;
- Native plant cover;
- Exotic plant cover;
- Plant regeneration (including percentage survival for plantings);
- Signs of surface erosion and sedimentation;
- Presence of feral animals;
- Natural Disturbance;

Results of the monitoring surveys are to be provided in annual monitoring reports, provided to the Department of Planning and Environment.

A framework for assessing the identified actions against performance criteria will be incorporated into any subsequent plan when the first year actions have been reported.

**Nest Box Monitoring**

The condition and use of the 36 nest boxes will be monitored annually during the September – December season breeding period.

**Photo Point Monitoring**

A photopoint monitoring station will be positioned in each of the 15 vegetation monitoring quadrats.

<table>
<thead>
<tr>
<th>RESOURCE MAPPING</th>
<th>Action</th>
<th>Performance / Completion Criteria</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Complete micro habitat/site features mapping</td>
<td>Provide appraisal map of existing habitats</td>
<td>Complete visual inspection and provide photo monitoring and appraisal map with 1st year monitoring report</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Provide map of all created habitat features.</td>
<td>Monitor habitat supplementation progress annually and provide final map of habitat features on completion with 10th year monitoring report.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maps to cover 100% of offset site</td>
<td></td>
</tr>
<tr>
<td>Identify and analyse soil erosion/sediment problems</td>
<td>Provide map of any erosion and sedimentation identified</td>
<td>Complete visual inspection and provide photo monitoring, map and report on details for each annual monitoring inspection.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide photographic evidence of rectification of 100% of problem areas in following</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Action</td>
<td>Performance / Completion Criteria</td>
<td>Monitoring</td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>----------------------------------</td>
<td>------------</td>
<td></td>
</tr>
<tr>
<td><strong>IMPLEMENTATION AND MONITORING DETAILS FOR PROPOSED ACTIONS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identify surface drainage features</td>
<td>Provide appraisal map of existing surface drainage features. Maps to cover 100% of offset site.</td>
<td>Complete visual inspection and provide photo monitoring and appraisal map with 1st year monitoring report</td>
<td></td>
</tr>
<tr>
<td>Identify habitat enhancement needs</td>
<td>Provide map of locations of proposed habitat enhancement works in baseline monitoring report. Map to cover all enhancements proposed for short term works (first 4 years) and medium term works (4-7 years) At minimum map to include locations for nest boxes, ground logs, rock armouring of drainage lines and rock pile/habitat works</td>
<td>Complete and provide photos and map of proposed habitat enhancement locations and details. Provide timeline for works. Include with 1st year monitoring report</td>
<td></td>
</tr>
<tr>
<td>Collect soil samples for nutrient testing</td>
<td>Collect and analyse at least 4 soil samples</td>
<td>Complete and provide soil lab results with 1st year monitoring report</td>
<td></td>
</tr>
<tr>
<td>Map main weed occurrences</td>
<td>Map occurrences of noxious weeds for 100% of offset areas</td>
<td>Complete visual inspection and provide photo monitoring and appraisal map with 1st year monitoring report. Repeat every 2 years for duration of works</td>
<td></td>
</tr>
<tr>
<td>Develop weed management strategy</td>
<td>Provide locations, works methods, target species and target reductions for all noxious weed occurrences mapped with baseline monitoring report.</td>
<td>Adapt weed management strategy as dictated by monitoring success levels to achieve suppression of targeted infestation areas</td>
<td></td>
</tr>
<tr>
<td>Implement revegetation strategy</td>
<td>Revegetate areas where dense weed infestations have been removed, areas subject to capping and any remediated drainage lines. Revegetation must achieve moderate to good condition cover based on benchmark of target community within 5-10 years</td>
<td>Complete visual inspection and provide photo monitoring and appraisal map every 12 months</td>
<td></td>
</tr>
<tr>
<td>Identify protective fencing requirements</td>
<td>Provide map of proposed deer exclusion fencing locations</td>
<td>Provide details with 1st year monitoring report</td>
<td></td>
</tr>
<tr>
<td>Construct protective fencing</td>
<td>All protective fencing to be erected in coordination with revegetation works and to be completed within 4 years of</td>
<td>Complete visual inspection and provide photo monitoring annually until all proposed fences are</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2.2
IMPLEMENTATION AND MONITORING DETAILS FOR PROPOSED ACTIONS

<table>
<thead>
<tr>
<th>Action</th>
<th>Performance / Completion Criteria</th>
<th>Monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Program commencement erected.</td>
<td></td>
</tr>
</tbody>
</table>
| Maintain protective fencing | Protective fencing to be checked monthly  
Any fence damage to be repaired as soon as possible | Complete visual inspection and provide photo monitoring of any fence damage every 12 months |
| Implement habitat enhancement | All habitat enhancements proposed in baseline monitoring report to be implemented progressively over 10 years | Complete visual inspection and provide photo monitoring every 12 months.  
Report on compliance with proposed timeline of works |
| Install 36 nest boxes, record locations | All nest boxes to be installed and map to be provided within baseline monitoring report. Nest boxes to be maintained in good condition for at least 10 years | Complete visual inspection and provide photo monitoring of all nest boxes every 2 years |
| Salvage environmental/habitat resources | All identified habitat resources within proposed quarry areas to be progressively relocated to offset areas in unison with quarry staging | Complete visual inspection and provide photo monitoring of all salvaged resources installed in offset area.  
Provide with annual monitoring reports as necessary. |
| Undertake pre-clearance surveys | Complete for all hollow bearing trees and provide certification letter for each stage on completion of clearing works | No monitoring required. |

### 2.7 POTENTIAL RISK AND CONTINGENCIES

Each action listed in Table 2.3 will be re-assessed each year for both the risk of the action failing or for not being successfully implemented. The contingency to be identified will be a further action, response or adaptive measure to be implemented to address the shortcomings of the action within the reporting period. The reporting process for risks to actions failing or not successfully being implemented will be incorporated into any revised plan when the success or otherwise of the actions have been reported.

### TABLE 2.3
POTENTIAL RISKS AND CONTINGENCIES FOR PROPOSED ACTIONS

<table>
<thead>
<tr>
<th>Action</th>
<th>Risk</th>
<th>Contingency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete micro habitat/site features mapping</td>
<td>Mapping and identification is not completed on time or to a satisfactory level</td>
<td>Extend works period to reflect any delay in commencement.</td>
</tr>
<tr>
<td>Identify and analyse soil erosion/sediment problems</td>
<td>Mapping and identification is not completed on time or to a satisfactory level</td>
<td>Extend works period to reflect any delay in commencement.</td>
</tr>
<tr>
<td>Identify surface drainage features</td>
<td>Mapping and identification is not completed on time or to a satisfactory level</td>
<td>Extend works period to reflect any delay in commencement.</td>
</tr>
<tr>
<td>Action</td>
<td>Risk</td>
<td>Contingency</td>
</tr>
<tr>
<td>--------</td>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td>Identify habitat enhancement needs</td>
<td>Mapping and identification is not completed on time or to a satisfactory level</td>
<td>Extend works period to reflect any delay in commencement.</td>
</tr>
<tr>
<td>Collect soil samples for nutrient testing</td>
<td>Work is not completed on time or to a satisfactory level</td>
<td>Extend works period to reflect any delay in commencement.</td>
</tr>
<tr>
<td>Map main weed occurrences</td>
<td>Weed management strategy fails to suppress target weed infestations</td>
<td>Modify control methods to achieve targets</td>
</tr>
<tr>
<td>Develop weed management strategy</td>
<td>Weed management strategy fails to suppress target weed infestations</td>
<td>Modify control methods to achieve targets</td>
</tr>
<tr>
<td>Implement revegetation strategy</td>
<td>Revegetate areas where dense weed infestations have been removed, areas subject to capping and any remediated drainage lines. Revegetation must achieve moderate to good condition cover based on benchmark of target community within 5-10 years</td>
<td>Replace excessive planting losses and adjust species composition to exclude unsuccessful species. Ensure initial soil preparation, watering, herbivore exclusion and weed suppression is adequate</td>
</tr>
<tr>
<td>Identify protective fencing requirements</td>
<td>Plantings are excessively damaged by animals or natural disturbances</td>
<td>Provide additional fencing</td>
</tr>
<tr>
<td>Construct protective fencing</td>
<td>Fences are excessively damaged by animals or natural disturbances</td>
<td>Change style of fencing and/or repair damaged sections</td>
</tr>
<tr>
<td>Maintain protective fencing</td>
<td>Fences are excessively damaged by animals or natural disturbances</td>
<td>Change style of fencing and/or repair damaged sections</td>
</tr>
<tr>
<td>Implement habitat enhancement</td>
<td>Habitat enhancements are not installed within timeframe required</td>
<td>Extend works period as necessary until completion is achieved</td>
</tr>
<tr>
<td>Install 36 nest boxes, record locations</td>
<td>Nest boxes become damaged or decay</td>
<td>Provide replacement nest boxes</td>
</tr>
<tr>
<td>Salvage environmental/habitat resources</td>
<td>Habitat enhancements are not installed within timeframe required</td>
<td>Extend works period as necessary until completion is achieved</td>
</tr>
<tr>
<td>Undertake pre-clearance surveys</td>
<td>Works are not undertaken</td>
<td>Document during annual monitoring report</td>
</tr>
</tbody>
</table>
SECTION 3

BUFFER AREA LANDSCAPE MANAGEMENT PLAN

3.1 BACKGROUND

The Quarry Buffer Area is the area surrounding the extraction area and generally located between the approved extraction area the property boundaries to the north and south, the biodiversity offset areas to the west and east and the southern internal property access road. This Buffer Area is shown in Figure 3. The Council Water Supply Pipeline Easement and the protected Aboriginal Heritage Sites are located either adjacent to, or within, this Buffer Area.

The Buffer Area has been identified through project review as requiring a separate Landscape Management Plan as this area is not subject to the same conservation and rehabilitation requirements as the Biodiversity Offset Area or resource extraction actions as the approved Quarry Area.

3.2 PLAN OBJECTIVES

The objectives of the Buffer Area Landscape Management Plan are to provide details relating to the:

i. Location and principle features of the Buffer Area
ii. Management of existing vegetation within the area
iii. Management of the water pipeline easement
iv. Management requirements of the Aboriginal Heritage Sites as identified in the Aboriginal Heritage Management Plan.
v. Requirements for any additional vegetation plantings to provide a visual screen to the quarry area
vi. Management of vegetation to reduce bushfire hazard to surrounding areas
vii. Revegetation of any noise abatement mounds within the Buffer Area.

The landscape buffer area is part of the quarry approval area, but not as a resource extraction area. Soil stockpiles and overburden stockpiles may be situated within the buffer area to act as noise mounds or visual screens. As identified in the Environmental Assessment Report these stockpiles will be revegetated to provide a stable protective surface to control wind generated dust and runoff generated soil erosion.

3.3 REQUIREMENT TO PREPARE BUFFER AREA LANDSCAPE MANAGEMENT PLAN

The preparation of this Buffer Area Landscape Management Plan (BALMP) has been undertaken to cover matters identified in the Environmental Assessment, Approval Conditions and subsequent Rehabilitation and Heritage Management Plans.

The location, landform and site management requirements of the Buffer Area are significantly different from the Quarry Area and the Biodiversity Offset Area. Therefore, it is appropriate to incorporate the various land, vegetation and cultural heritage requirements into a separate landscape management plan. This will benefit longer term project management purposes as buffer area specific actions can be separated from the quarry area and biodiversity offset actions. The landscape being managed in the Buffer Area is the area of land 15-20 metres wide which surrounds the approved quarry area. This area of land is shown in Figure 3.
3.4 ACTIONS TO BE IMPLEMENTED

The actions to be implemented within the Buffer Area Landscape Management Plan are itemised in Table 3.1. The timing of these actions has been identified so that the actions can be undertaken progressively to reflect the operation area of the quarry and implementation of the actions of the adjoining biodiversity offset areas. Figure 3 provides some details on the actions identified in Table 3.1 in relation to the Buffer Area. The buffer area forms part of the quarry operations area with access by vehicles/machinery required. Fencing is not proposed along the internal perimeters of the buffer area.

<table>
<thead>
<tr>
<th>TABLE 3.1</th>
<th>ACTIONS TO BE UNDERTAKEN (BUFFER AREA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIONS</td>
<td>SHORT TERM</td>
</tr>
<tr>
<td></td>
<td>YEAR 1</td>
</tr>
<tr>
<td>BUFFER AREA DELINEATION - Identify on-ground and on plan</td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>15m to 20m designated buffer area</td>
</tr>
<tr>
<td>A2</td>
<td>Pipeline easement</td>
</tr>
<tr>
<td>A3</td>
<td>Aboriginal Heritage sites</td>
</tr>
<tr>
<td>A4</td>
<td>Trees to be retained</td>
</tr>
<tr>
<td>A5</td>
<td>Location of noise abatement mounds</td>
</tr>
<tr>
<td>A6</td>
<td>Drainage areas/culverts access easements</td>
</tr>
<tr>
<td>FENCING/ACCESS</td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>Identify existing fence/condition</td>
</tr>
<tr>
<td>B2</td>
<td>Identify fence access/gate requirements for pipeline easement, aboriginal heritage sites, vehicle access</td>
</tr>
<tr>
<td>VEGETATION</td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>Identify remnant vegetation</td>
</tr>
<tr>
<td>C2</td>
<td>Locate and mark hollow bearing trees</td>
</tr>
<tr>
<td>C3</td>
<td>Assess weed infestations requiring control</td>
</tr>
<tr>
<td>C4</td>
<td>Identify bushfire hazard management needs by machinery slashing or stock grazing</td>
</tr>
<tr>
<td>C5</td>
<td>Summarise vegetation management in aboriginal heritage sites</td>
</tr>
<tr>
<td>C6</td>
<td>Identify vegetation management for noise abatement mounds</td>
</tr>
<tr>
<td>DRAINAGE AND LAND MANAGEMENT</td>
<td></td>
</tr>
<tr>
<td>D1</td>
<td>Identify through drainage from quarry area and pipeline easement</td>
</tr>
<tr>
<td>D2</td>
<td>Inspect for soil erosion or sediment accumulations</td>
</tr>
<tr>
<td>D3</td>
<td>Maintain area free of rubbish accumulations</td>
</tr>
</tbody>
</table>
3.5 IMPLEMENTATION OF BUFFER AREA LANDSCAPE MANAGEMENT PLAN

The BALMP will be implemented from the approval date for the duration of the quarry operations. The identified actions will be implemented during either the short term (1-4 years), medium term (5-10 years) or longer term (>10 years). The identified actions will be inspected and reported on an annual basis for the first 10 years in conjunction with the adjoining Biodiversity Offset Area reporting. Any noticeable failures, or non-compliance issues, will be identified and addressed as remedial actions or reportable matters. If required the BALMP can be revised or amended to reflect any changed circumstance or conditions present within the buffer area.

The annual monitoring and reporting process is to evaluate the performance/completion criteria for each action. Any rectification or contingency matter is to be identified and detailed in the annual monitoring report. This will also provide a time frame for implementing the relevant action to address non-compliance or ameliorative matters needed.
SECTION 4

QUARRY AREA REHABILITATION PLAN

4.1 BACKGROUND

This Quarry Rehabilitation Plan has been prepared to address approval conditions 25 (Rehabilitation Objectives), 26 (Progressive Rehabilitation) and 27 (Landscape and Rehabilitation Management Plan). The Biodiversity Offset Area Management Plan (Section 2) addressed most of the items identified in Condition No. 27. Therefore this Quarry Rehabilitation Plan (QRP) relates specifically to the rehabilitation requirements for the quarry extraction areas identified as Areas A, B, C and D in the previous Environmental Assessment Report. Precinct E will be the location of the water quality and nutrient control measures and are not proposed for rehabilitation over the next 10 years. Subsequent versions of this QRP will be prepared for subsequent operations either at three yearly intervals or at shorter time periods, subject to the extent of resource extraction and site rehabilitation occurring within the period between plans.

4.2 PLAN OBJECTIVES

The objectives of this Quarry Rehabilitation Plan are to provide details relating to:

i. The staged rehabilitation of the quarried areas
ii. Addressing the rehabilitation objectives of the approved condition No. 25
iii. Addressing the progressive rehabilitation requirements of approval condition No.26
iv. The integration of the Biodiversity Offset Strategy with the overall rehabilitation of the site

Approval Condition No.25 provides the additional specific rehabilitation objectives which are to be achieved as identified in Table 4.1.

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>OBJECTIVES</th>
<th>COMMENTS</th>
</tr>
</thead>
</table>
| Site (As a whole) | • Safe, stable and non-polluting 
• Minimise the visual impact of the final landforms as far as is reasonable and feasible | • Site regrading, surface revegetation, erosion controls, batters reshaped progressively subject to infill levels |
| Surface Infrastructure | • To be decommissioned and removed unless the Secretary agrees otherwise | • Infrastructure to be removed at end of quarrying |
| Quarry Benches | • Suitably landscaped and revegetated using native species | • Native trees and shrubs on batters, steeper slopes |
| Quarry Pit Flor | • Establish land with a level floor of at least Class 4 agricultural suitability over 80% of the quarry floor 
• Pasture grass to stabilise low slope surfaces. 
• Finished soil depth 0.5-1.0 metres | |

Progressive rehabilitation of disturbed areas to minimise the total area exposed to dust generation is a requirement of approval condition No.26 (Schedule 3).
4.3 REQUIREMENT TO PREPARE QUARRY REHABILITATION PLAN

This Quarry Rehabilitation Plan is part of the overall Landscape and Rehabilitation Management Plan required as identified in approval Condition No.27 and in item 17 of the Statement of Commitments.

4.4 IMPLEMENTATION OF QUARRY REHABILITATION PLAN

The rehabilitation of the Precinct A area is to be undertaken on a progressive basis after the extraction levels for the resources is reached in this stage. Partial filling of voids with Excavated Natural Material (ENM) used as engineered fill material in compliance with the Excavated Natural Material Resource Recovery Exemption and approval condition No.33 (Schedule 3) will be undertaken prior to regrading site overburden and topsoil over the fill material. This process will ensure the adoption of a progressive infill and ongoing rehabilitation program. Over the next three years quarry void rehabilitation will progress within Precinct A as fill material becomes available. Resource material will still continue to be extracted from Precinct A, B and C with the water quality management measures being maintained within Precinct D.

Quarry batters will be reduced in height by the gradual in-filling of the quarry floor to achieve a landform level at or slightly lower than the pre-ex cavation levels. The final capping over any compacted excavated natural material will comprise at least 500mm of sand/soil mix to achieve the desired Class 4 agricultural suitability land condition over at least 80% of the quarried area.

The final surface revegetation will comprise a mix of stabilizing grass, kikuyu grass, rye-grass and mixed clover species. Fertilizer requirements will be subject to soil test results.

4.5 MONITORING AND REPORTING

The on-going rehabilitation of the quarried areas will be monitored and recorded within the quarry operation procedures. The progress of any rehabilitation or site revegetation will be included in the annual Landscape and Rehabilitation Management Plan reporting which is to be instigated as part of the annual environmental performance report to be prepared as required in Condition 4 of Schedule 5.
Figure 1
Overall Site Details
Grants Road Somersby

Legend
- Subject Site Boundary
- Future Quarry Extension Area
- Proposed Biodiversity Offset Areas
- Buffer Area

See Figure 3 for Details of Buffer Area
See Figure 2 for Details of Offset Areas
See Figure 4 for Quarry Rehabilitation

*Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © NSW Govt, Land and Property Information (2018)
Figure 2
Biodiversity Offset Areas
Grants Road Somersby

Legend
- Yellow: Offset Revegetation Areas
- Black: Proposed Biodiversity Offset Areas
- Red: Subject Site Boundary

*Plan for indicative purposes only. Not for detailed measurement.
Source: Aerial © NSW Govt. Land and Property Information (2015)
APPENDIX 1
SUPPLEMENTARY PLANTING DETAILS

1. DETAILS OF VEGETATION TYPE TO BE EMULATED

The following natural vegetation types are present within the site and/or dominant within the adjoining areas:

- Scribbly Gum - Hairpin Banksia - Dwarf Apple heathy woodland on hinterland sandstone plateaux of the Central Coast, Sydney Basin Bioregion;
- Red Bloodwood - scribbly gum heathy woodland on sandstone plateaux of the Sydney Basin Bioregion
- Smooth-barked Apple – sydney peppermint – turpentine heathy open forest on plateaux areas of the Sydney Basin Bioregion

A moderate to good condition benchmark cover for vegetation types is to be achieved for planting areas within the site.

2. IDENTIFICATION OF REQUIREMENT FOR SUPPLEMENTARY PLANTINGS

The requirement for supplementary plantings is to be determined by the results of vegetation regrowth monitoring. Where regrowth monitoring indicates that natural regeneration is not occurring after capping is undertaken, planting is to be undertaken to supplement natural regrowth to ensure the desired cover for the target vegetation type is achieved. The methods and planting densities are to be determined by the project ecologist.

3. DETAILS OF SUITABLE SPECIES FOR SUPPLEMENTARY PLANTINGS

Suitable species for supplementary plantings, desired vegetation cover and minimum planting sizes are provided in Table A1.1 for each vegetation type to be emulated.

<table>
<thead>
<tr>
<th>TABLE A1.1 FLORA SPECIES PLANTING LIST</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target Community Stratum</strong> Scientific Name</td>
</tr>
<tr>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Trees</td>
</tr>
<tr>
<td>Allocasuarina littoralis</td>
</tr>
<tr>
<td>Corymbia gummifera</td>
</tr>
<tr>
<td>Eucalyptus haemastoma</td>
</tr>
<tr>
<td>Shrubs</td>
</tr>
<tr>
<td>Callistemon citrinus</td>
</tr>
<tr>
<td>Kunzea ambigua</td>
</tr>
<tr>
<td>Leptospermum polygalifolium</td>
</tr>
<tr>
<td>Leptospermum trinervium</td>
</tr>
<tr>
<td>Banksia ericifolia</td>
</tr>
<tr>
<td>Banksia serrata</td>
</tr>
<tr>
<td>Groundcovers</td>
</tr>
<tr>
<td>Microlaena stipoides</td>
</tr>
<tr>
<td>Themeda triandra (previously T. australis)</td>
</tr>
</tbody>
</table>
### Table A1.1
FLORA SPECIES PLANTING LIST

<table>
<thead>
<tr>
<th>Target Community Stratum Scientific Name</th>
<th>Common Name</th>
<th>Desired Projected Foliage Cover</th>
<th>Minimum Planting Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doryanthes excelsa</td>
<td>Gymea Lily</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lomandra longifolia</td>
<td>Spiny-headed Mat-rush</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. DETAILS OF SUPPLEMENTARY PLANTING METHODS

4.1 SITE PREPARATION

Capping of revegetation areas may be undertaken with crushed sandstone material in accordance with the methodology described by Buchanan (2009). Site preparation activities for all planting sites will include preliminary weed control. Bare soil areas may be sown with a native grass mix or cover crop to provide temporary soil stabilisation. Soil erosion control measures are to be implemented where necessary.

4.2 PLANT MATERIAL

Plant material used for revegetation within the project area shall be sourced from local stock. All plants are to be provided in a healthy condition.

4.3 PLANTING GUIDELINES

**Planting Densities and Niche species**

The Project Ecologist shall be responsible for determining planting densities and seed application rates necessary to achieve the desired cover for each stratum. The Project Ecologist shall be responsible for ensuring planting densities are achieved and appropriate niche species are utilised.

Niche preferences shall be considered in planting, with plants being placed in the correct position with regard to soil type, moisture, aspect and slope.

**Planting Methods**

Planting holes shall be excavated to a depth of two times the pot size. Slow release native plant fertiliser (low phosphorous formulated native plant fertilizer tablet/granules) shall be placed into the planting hole. In poorly structured soils, native plant soil mix is to be placed and incorporated into the planting hole with fertiliser and water storing granules. Plants must be placed into moistened soil preferably by soaking water into each hole. After planting the soil shall be replaced and carefully firmed, leaving a slight depression around each plant to allow for water collection. Soil is to be replaced in the hole so that the base of the stem is level with the soil surface, not set below the soil, or sitting above.

All plants are to be thoroughly watered before planting and again on a weekly basis for one month after planting. If the weather is hot, additional watering may be required.

**Plant Protection**

If needed tree guards and stakes are to be used around each plant and maintained throughout the maintenance period. The use of Jute mats (mulch mats) is recommended where annual or grass regrowth is expected.

**Mulching**
After planting, the exposed ground should be thickly mulched with low-nutrient mulch such as chipped eucalyptus. No exotic plant material is to be used. Pine bark is not considered to be a suitable mulch material. The provenance of all mulch material must be known and approved by the Project Ecologist. Mulch is not to be used in sand dunes ecosystems or bushfire inner protection areas. Care should be taken to keep mulch material away from the stems of the newly planted tubestock. Alternately, a light sowing of a suitable nurse crop (Rye Corn or Japanese Millet) can be made between plantings to provide a protective microclimate. Sowing rates to be used are those recommended by the supplier and agreed with the Project Ecologist.

**Maintenance and Weed Control**

Plantings must be suitably maintained (watering and weeding). During the maintenance phase any plant losses in excess of 20% of the total number planted must be replaced.

Site maintenance shall consist of the following tasks:

- Weeding throughout the planting area;
- Watering tubestock;
- Replacing lost plants (as required); and
- Removing wind-blown or other rubbish from the planting area.

The Project Ecologist shall provide a preliminary maintenance schedule which incorporates a timetable of works for each of the activities listed above.
APPENDIX 2
WEED MANAGEMENT TECHNIQUES

1. BACKGROUND INFORMATION

Weed management is to be undertaken to promote a moderate to good condition naïve vegetation cover of the targeted communities identified in Appendix 1.

The Bradley method of weed removal should be undertaken as the main method for achieving revegetation of natural bushland. Small tools such as spades, mattocks, garden forks and saws are to be used to reduce soil disturbance and minimise damage to nearby plants. In addition to hand removal of weeds in some situations where weeds are abundant, such as for many of the grass species and when native plants will not be affected by spray drift, the use of Glyphosate herbicide may be suitable in accordance with the manufacturers specifications.

Herbicides should not be applied prior to rain occurring as this reduces the effectiveness and increases the potential for herbicides to enter creeks and drainage lines in runoff.

Additionally initial capping of highly disturbed offset areas currently dominated by exotic vegetation may be undertaken with crushed sandstone material to enable weed suppression in accordance with the methodology described by Buchanan (2009).

2. WEED REMOVAL TECHNIQUES

Weeds are to be removed in accordance with the following techniques recommended by the National Trust, NSW National Parks and Wildlife Service and Australian Association of Bush Regenerators.

2.1 Weed removal techniques for woody plants

**Cut and Paint** (Woody weeds to 10 cm basal diameter)
- Make a horizontal cut close to the ground using secateurs, loppers or a bush saw; and
- Immediately apply herbicide to the exposed flat stump surface.

**Considerations:**
- Cuts should be horizontal to prevent herbicide from running off the stump, sharp angle cuts are hazardous;
- Herbicide must be applied immediately before the plant cells close (within 30 seconds) and translocation of herbicide ceases;
- If plants resprout cut and paint the shoots after sufficient regrowth has occurred; and
- Stem scraping can be more effective on some woody weeds.

**Stem Injection**
- At the base of the tree drill holes at a 45 degree angle into the sapwood;
- Fill each hole with herbicide immediately; and
- Repeat the process at 5 cm intervals around the tree.

**Frilling or Chipping**
- At the base of the tree make a cut into the sapwood with a chisel or axe;
- Fill each cut with herbicide immediately; and
- Repeat the process at 5 cm intervals around the tree.
Considerations:
- Plants should be actively growing and in good health;
- Deciduous plants should be treated in spring and autumn when leaves are fully formed;
- For multi-stemmed plants, inject or chip below the lowest branch or treat each stem individually; and
- Herbicides must be injected immediately before plant cells close (within 30 seconds) and translocation of herbicide ceases.

2.2 Weed removal techniques for small hand-pullable plants

Hand Removal
- Remove any seeds or fruits and carefully place into a bag;
- Grasp stem at ground level, rock plant backwards and forwards to loosen roots and pull out; and
- Tap the roots to dislodge any soil, replace disturbed soil and pat down.

Considerations:
- Leave weeds so roots are not in contact with the soil e.g. hang in a tree, remove from site or leave on a rock.

2.3 Weed removal techniques for vines and scramblers

Hand Removal
- Take hold of one runner and pull towards yourself;
- Check points of resistance where fibrous roots grow from the nodes;
- Cut roots with a knife or dig out with a trowel and continue to follow the runner;
- The major root systems need to be removed manually or scrape/cut and painted with herbicide; and
- Any reproductive parts need to be bagged.

Stem Scraping
- Scrape 15 to 30 cm of the stem with a knife to reach the layer below the bark/outer layer; and
- Immediately apply herbicide along the length of the scrape.

Considerations:
- A maximum of half the stem diameter should be scraped. Do not ringbark;
- Larger stems should have two scrapes opposite each other; and
- Vines can be left hanging in trees after treatment.

2.4 Weed removal techniques for plants with underground reproductive structures

Hand Removal of Plants with a Taproot
- Remove and bag seeds or fruits;
- Push a narrow trowel or knife into the ground beside the tap root, carefully loosen the soil and repeat this step around the taproot;
- Grasp the stem at ground level, rock plant backwards and forwards and gently pull removing the plant; and
- Tap the roots to dislodge soil, replace disturbed soil and pat down.

Crowning
- Remove and bag stems with seed or fruit;
Grasp the leaves or stems together so the base of the plant is visible;
Insert the knife or lever at an angle close to the crown;
Cut through all the roots around the crown; and
Remove and bag the crown.

**Herbicide Treatment – Stem Swiping**
- Remove any seed or fruit and bag; and
- Using a herbicide applicator, swipe the stems/leaves.

**Considerations:**
- Further digging may be required for plants with more than one tuber;
- Some bulbs may have small bulbils attached or present in the soil around them which need to be removed;
- It may be quicker and more effective to dig out the weed;
- Protect native plants and seedlings; and
- For bulb and corm species the most effective time to apply herbicide is after flowering and before fruit is set.

Exotic vegetation should be removed and stockpiled in a clear area away from adjoining bushland. This stockpile should be removed from the site at a convenient time. As part of the regular maintenance of the restored area any regrowth of exotic plant species should be removed and disposed of appropriately.

### 3. USE OF HERBICIDES

There are various categories of herbicides currently used (Buchanan, 1989), specifically those that kill on contact (contact herbicides), and those that must move through the tissue of the plant (systematic herbicides). Other herbicides include those that are non-selective and those that are selective. There are also those herbicides that kill all existing plants and those that prevent germination (Buchanan, 1989). The most commonly used biodegradable herbicides are those containing glyphosate (ZERO ®, Glyphosate 340 ® and Roundup ®).

An advantage of herbicide use is the relatively reduced amount of time taken to spray weeds as compared to physically removing them, particularly for large infestations of weeds. Another advantage is that the dead weeds may provide some measure of soil stabilisation for a short period of time.

Herbicides should not be applied prior to rain occurring. This reduces the herbicides effectiveness as well as being transported in runoff to creeklines and waterways.

An advantage of herbicide use is the low time taken to spray weeds as compared to physically removing them, particularly for large infestations of weeds.

Buchanan (2009), recommends that the use of herbicides should be considered when:

- There are small areas of dense weeds with few or no native plants to protect;
- There are large areas of weeds;
- The weeds are growing too rapidly for physical removal; and
- The weeds are located in areas with a high potential for erosion if vegetation is removed.

The spraying of weeds must only be undertaken by experienced and qualified persons. The success of each treatment must be evaluated by the operator after a set period of time according to the labelled effectiveness for each herbicide. Care must be taken when
applying herbicides near drainage lines to avoid excess use due to the sensitivity of the wetlands and waterways into which runoff will eventually flow.


APPENDIX 3
FAUNA NEST BOX GUIDELINES

1.1 Nest Box Construction Standards

Nest boxes are to be constructed of durable timber materials such as hardwood or marine ply. Nest boxes are to be appropriately sized to compensate for the types of tree hollows to be removed from adjoining areas of development. Where hollows removed from development sites are of suitable and practical size they may be reconstructed as nest boxes.

1.2 Protocol for the Installation of Nest Boxes

The following protocol will be utilised for the installation of nest boxes within the subject site.

i. All nest boxes are to be secured to trees at a minimum height of four metres above ground level. They are to be installed on the trunk or branch of recipient trees with shade or under a tree canopy cover.

ii. Nest boxes are to be attached to the trees using suitably durable fixing such as marine grade stainless steel bolts, or lashed to the host trees using a wire lash covered in plastic hose with suitable springs to allow for movement affixed to the nest box;

iii. Nest boxes are to be installed within the identified Biodiversity Offset Area prior to clearing works within the adjoining quarry site.

iv. Nest boxes are to be erected by an ecologist or an arborist under the supervision of the consulting ecologist;

v. Nest boxes are to be clearly numbered and their locations plotted by a GPS. A map showing these locations and numbers is to be provided in the ongoing monitoring report.

1.3 Nest Box Monitoring Requirements

Nest boxes are to be monitored by the Ecologist to determine their usage and to carry out repairs or replacement (as required) every twelve (12) months for a minimum period of five (5) years following erection. Monitoring is to be undertaken with the use of a pole mounted video camera or similar device to determine nest box occupation.

Monitoring reports are to be prepared by the ecologist after each monitoring event. Each monitoring report is to include details on the following:

- Number of nest boxes;
- A description of the condition of each nest box;
- Details on the presence of any native fauna species observed within nest boxes;
- Details of the presence of any introduced fauna species within nest boxes; and
- Suggested management actions to ensure the good condition and ongoing use of nest boxes by native fauna species.