

BIODIVERSITY AND REHABILITATION MANAGEMENT PLAN

CORAKI QUARRY, SEELEMS ROAD CORAKI, NSW

Prepared for
Groundwork Plus on behalf of Quarry Solutions Pty Ltd



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Biodiversity Assessment and Management Pty Ltd



Director

BIODIVERSITY AND REHABILITATION MANAGEMENT PLAN

CORAKI QUARRY, SEELEMS ROAD, CORAKI, NSW

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Table of Terms and Abbreviations

BAAM	Biodiversity Assessment and Management Pty Ltd
BAR	Biodiversity Assessment Report
BRMP	Biodiversity and Rehabilitation Management Plan
EEC	Endangered Ecological Community
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
FSC	Fauna Spotter/Catcher
NSW	New South Wales
OEH	New South Wales Office of Environment and Heritage
TSC Act	New South Wales <i>Threatened Species Conservation Act 1995</i>

1.0 INTRODUCTION

1.1 BACKGROUND

Quarry Solutions Pty Ltd commissioned the preparation of a development application for an Extractive Industry at Seelems Road (via Petersons Quarry Road), Coraki in New South Wales on land properly described as Lot 401 on DP633427, Lot 402 on DP802985, Lot 403 on DP802985, Lot 408 on DP1166287, Lot A on DP397946, Lot A on DP389418, Lot 3 on DP701197, Lot 2 on DP954593, Lot 1 on DP954592 and Lot 1 on DP310757. To inform the application, Biodiversity Assessment and Management Pty Ltd (BAAM) prepared a Biodiversity Assessment Report (BAR) to document an assessment of the biodiversity values in and around the development footprint (the “study area”), and to inform decision making regarding the avoidance and mitigation of impacts of the project on significant biodiversity values (BAAM 2015).

Four specimens of *Macadamia tetraphylla* (Rough-shelled Bush Nut) were recorded during the field survey undertaken to inform the BAR. This species is currently listed as Vulnerable under both the New South Wales *Threatened Species Conservation Act 1995* (TSC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In response to this survey result, the original development footprint was redesigned to avoid the clearing of these specimens, with a 25 m buffer to be established and maintained around the plants (**Figure 1-1**).

The assessment also confirmed the presence of four native vegetation types within or in close proximity to the study area, all of which are recognised as Endangered Ecological Communities (EECs) in New South Wales. However, these native vegetation communities all occur outside of the development footprint and will not be directly impacted (**Figure 1-1**).

Habitat to the north-east of the study area showed evidence of use by Koala (*Phascolarctos cinereus*) (Vulnerable: TSC Act and EPBC Act), and although no such evidence of Koala occurrence was found within the study area, it is possible this species may occasionally utilise scattered food trees occurring within the development footprint.

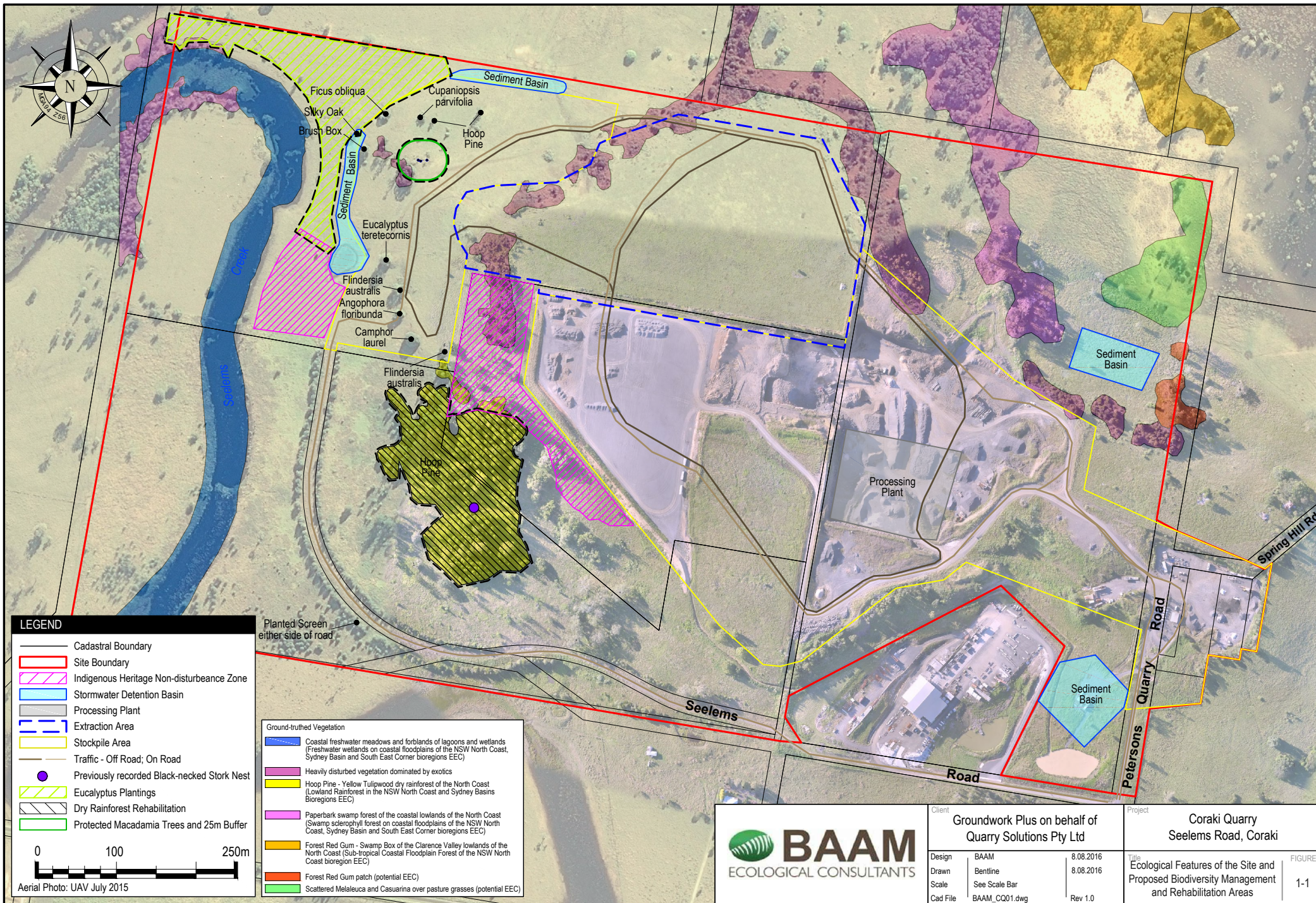
Otherwise, the development footprint was found to be largely devoid of native vegetation and has been used for grazing livestock and existing

quarrying operations. Native vegetation to be removed occurs as scattered paddock trees or as minor components within otherwise heavily disturbed and exotic-dominated patches of regrowth.

Following a review of the BAR, the New South Wales Office of Environment and Heritage (OEH) requested further information on the management of potential impacts to the identified biodiversity values on the site. Subsequently, an addendum to the BAR was prepared that provided further detail regarding the maintenance, ongoing management and timeframes for the sustainable management of the *Macadamia tetraphylla* specimens and the surrounding buffer, as well as a description of a suitable offset to compensate for the direct loss of native vegetation (including Koala food trees) and potential impacts to surrounding biodiversity from the operation of the site. The latter included rehabilitation of the Hoop Pine dry rainforest community within the centre of the study area (to improve its condition and compensate for the loss of dry rainforest vegetation and habitat values for native fauna within the footprint) and plantings of dominant canopy tree species along the upper margins of Seelems Creek adjacent to the proposed development footprint (to replace those Koala habitat trees lost within the footprint and facilitate Koala movement between larger habitat patches to the north and south of the site).

Development Consent SSD7036, approving the development application, was received from the New South Wales Department of Planning and Environment on 18 April 2016. Condition 33 of Schedule 3 of the Development Consent specifies that a Biodiversity and Rehabilitation Management Plan (BRMP) must be prepared for the site that must:

- a) be prepared in consultation with OEH (a summary of which is provided in **Appendix 1**);
- b) provide details of the conceptual final landform and associated land uses for the site;
- c) describe how the management of biodiversity would be integrated with the overall rehabilitation of the site;
- d) include detailed performance and completion criteria for evaluating the performance of the biodiversity management measures and rehabilitation of the site, including triggers for any necessary remedial action;



- e) describe the short, medium and long-term measures that would be implemented to:
 - protect and enhance the remnant vegetation and habitat on the site, including the measures to protect the *Macadamia tetraphylla*, endangered ecological communities and threatened species on site;
 - rehabilitate the *Macadamia tetraphylla* buffer area, Hoop Pine Dry Rainforest community, and the Seelems Creek rehabilitation area as shown in Appendix 6;
 - ensure compliance with the rehabilitation objectives, and the progressive rehabilitation obligations in this consent;
- f) include a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria;
- g) identify the potential risks to the successful implementation of the plan and include a description of the contingency measures that would be implemented to mitigate these risks; and
- h) include details of who would be responsible for monitoring, reviewing, and implementing the plan.

1.2 PURPOSE AND CONTENT OF THE PLAN

The overall purpose of the BRMP is to document how the site will be managed and rehabilitated to ensure no net loss of biodiversity values and to ensure ongoing, negative impacts on the surrounding environment are prevented following the completion of onsite activities.

Section 2.0 outlines the intended outcome for the *Macadamia* buffer and other significant biodiversity areas proposed for protection and enhancement/rehabilitation, the overall rehabilitation objectives, and the conceptual final landform and land uses for the site.

Sections 3.0 to 5.0 describe the biodiversity management and rehabilitation measures to be implemented, and associated performance and completion criteria and monitoring program.

Section 6.0 identifies the potential risks to the successful implementation of the plan and describes the contingency measures that would be implemented to mitigate these risks, while **Section 7.0** outlines the relevant roles associated with the implementation of the plan, and their respective responsibilities.

2.0 INTENDED SITE OUTCOMES

2.1 BIODIVERSITY PROTECTION AND ENHANCEMENT

2.1.1 *Macadamia* Buffer

Recognised activities to assist in the protection and recovery of *Macadamia tetraphylla* focus on the protection and expansion of rainforests and other native habitats (OEH 2016). Accordingly, the intended outcome for the buffer area is to achieve a pocket of native, self-sustaining rainforest habitat which not only protects the existing *Macadamia tetraphylla* specimens but could also act as a “stepping stone” for fauna moving between larger patches of habitat elsewhere on the site and in the local landscape.

2.1.2 *Endangered Ecological Communities and Habitat for Native Fauna*

Taking into account the current condition of the various EECs within and in close proximity to the site, enhancement efforts will focus on the Hoop Pine dry rainforest community to the south of the development footprint. The intended outcome is to create a higher quality patch of intact, dry rainforest habitat at this location, which would benefit native fauna species known to utilise this community. It is considered this would compensate for the loss of degraded patches and individual, isolated rainforest trees elsewhere on the site.

The paperbark swamp forest and Forest Red Gum open forest to the north-east of the study area are currently subject to relatively low levels of disturbance, and retain a high proportion of native species and a number of valuable habitat trees. Accordingly, the intended outcome for these communities is to maintain their condition through the prevention of any increase in disturbance as a result of onsite activities.

Successful rehabilitation of the native wetland community associated with Seelems Creek in the western portion of the study area would be difficult to achieve, given the influence of upstream land uses as a source for re-occurring weed invasion. Rather, the upper margins of Seelems Creek will be planted with Koala food trees to replace those lost within the development footprint and facilitate Koala movement between larger habitat patches to the north and south of the site. It is also intended that any further decline in the condition of the native wetland community associated with

Seelems Creek as a result of onsite activities is prevented.

2.2 GENERAL SITE REHABILITATION AND FINAL LANDFORM

As noted in Condition 31 of Schedule 3 of the Development Consent, the overall rehabilitation objectives for the site are to:

1. Achieve a safe, stable and non-polluting, final landform that is integrated with surrounding natural landforms as far as is reasonable and feasible, and designed to minimise the visual impacts of the development when viewed from surrounding land.
2. Decommission and remove all surface infrastructure, unless required for the ongoing operation of Petersons Quarry (or as agreed with the Secretary).
3. Revegetate the quarry benches and pit floor within Lot 401 on DP633427 using a combination of pasture species and native vegetation corridors, which link other remnant vegetation on site.

A conceptual final landform that reflects compliance with these objectives and integrates the protection and management of significant biodiversity values within the development footprint is shown in **Figure 2-1**. It should be noted that the adjacent Petersons Quarry will continue operation beyond the life of the Coraki Quarry project, and the rehabilitation of land and removal of infrastructure associated with Petersons Quarry is beyond the scope of this BRMP. Accordingly, general site rehabilitation will be restricted to Lot 401 on DP633427.

The location of the extraction area and stockpiles within Lot 401 on DP633427 has been historically used for grazing, and the final, rehabilitated land form is intended to be compatible with this historical land use, mainly comprising grassed, gently sloping and free draining platforms with remaining sediment basins converted into water reservoirs for stock watering purposes. This final land form will also be safe and stable, will achieve a sustainable plant cover that will protect against potential sediment and erosion impacts, and will reduce the need for long term monitoring and maintenance by achieving a rehabilitation outcome that will be quickly established and completed after the project ceases.

Figure 2-1 also indicates the establishment of open forest vegetation along the southern boundary of the site. It is not intended to establish a patch of high quality habitat representative of any naturally occurring ecological community at this location – rather, it is intended that this area would be revegetated so as to form a temporary physical boundary and buffer between the site and the adjacent Peterson's Quarry, until such time that Petersons Quarry is fully developed.

A conceptual final land use (zoning) plan is shown in **Figure 2-2**. This reflects the intention to re-establish the historical use of the site for primary production (grazing). A letter sent to the Department of Planning and Environment clarifying the final landforms is provided in **Appendix 2**.

3.0 BIODIVERSITY MANAGEMENT AND REHABILITATION MEASURES

3.1 POTENTIAL THREATS TO BE MANAGED

3.1.1 *Macadamia Buffer*

Recognised threats to *Macadamia tetraphylla* (OEH 2016) include:

- Clearing and fragmentation of habitat for coastal development, agriculture and roadworks.
- Risk of local extinction due to low numbers.
- Grazing and trampling by domestic stock.
- Fire.
- Invasion of habitat by weeds.
- Loss of local genetic strains through hybridisation with commercial varieties.
- Reduction of genetic diversity as a result of fragmentation.

Threats currently present on the site include invasion of habitat by weeds, and grazing and trampling (of seedlings) by domestic stock. While domestic stock will no longer represent a threat during the operation of the quarry, continued or increased invasion of the buffer by weeds is likely to occur in the absence of appropriate management. Weed invasion can change vegetation community composition, out-compete native plants and, in some cases, increase the intensity of fire, leading to further community degradation. Other potential impacts (if left unmanaged) during the operation of the quarry could include:

- accidental disturbance to the plants and/or adjacent habitat due to uncontrolled or unintentional vehicle/machinery access and/or stockpiling of quarried material within the buffer;
- incursion of stockpiled material due to structural failure of adjacent stockpile mounds and/or erosion and sedimentation following rainfall, which could smother the plants and/or adjacent habitat;
- incursion of wind-blown dust from adjacent activities including clearing, earthworks, stockpiles, vehicle movements, and blasting, which can inhibit plant growth; and
- impacts on plant health from altered water flow patterns and/or an increase or decrease in water availability.

3.1.2 *Endangered Ecological Communities*

The integrity of EECs occurring within or in close proximity of the site is currently under threat from weed invasion and grazing and trampling by domestic stock. Continued or increased invasion by weeds is likely to occur in the absence of appropriate management. Weed invasion can change vegetation community composition, out-compete native plants and, in some cases, increase the intensity of fire, leading to further community degradation. Other potential impacts (if unmanaged) during the operation of the quarry could include:

- accidental disturbance to EECs due to uncontrolled or unintentional vehicle/machinery access and/or stockpiling of quarried material;
- incursion of stockpiled material due to structural failure of adjacent stockpile mounds and/or erosion and sedimentation following rainfall;
- incursion of wind-blown dust from adjacent clearing, earthworks, stockpiles, vehicle movements and blasting; and
- impacts on community health from altered water flow patterns and/or an increase or decrease in water availability.

3.1.3 *Native Fauna*

The greatest current threat to threatened species known or expected to utilise the site is the deterioration in the quality of habitats from weed invasion and grazing and trampling by domestic stock. In addition to ongoing threats to habitat, potential impacts (if left unmanaged) during the operation of the quarry could include:

- Direct injury or mortality during clearing works (i.e. crushed during tree felling, run over by machinery, etc);
- Subsequent injury or mortality due to loss of habitat and inability to successfully self-relocate to suitable replacement habitat (i.e. due to distance, exposure to elements and/or predation, movement barriers, etc).
- Reduced breeding success due to onsite disturbances.

Animals particularly susceptible to such impacts include Koalas, hollow-dependant fauna, nesting birds, and reptiles.

3.2 MANAGEMENT MEASURES PRIOR TO SITE CLEARING AND OPERATION

3.2.1 *Macadamia Buffer*

The four recorded specimens of *Macadamia tetraphylla* occur together within the centre of Lot 401 on DP633427, adjacent to a clump of other scattered, paddock trees and outside of any of the recognised native vegetation zones on the study area (**Figures 3-1 and 3-2**). These plants are either relicts of a dry rainforest or forested wetland community that once occupied this part of the site, or they have propagated from seeds dispersed from nearby communities.

As outlined in BAAM (2015), the original footprint has been redesigned to avoid the clearing of these *Macadamia tetraphylla* specimens. Taking into account site constraints and the necessary size of the stockpiling area to meet operational requirements, the revised footprint incorporates the retention of these specimens and a 25 m buffer (**Figures 3-1 and 3-2**). This far exceeds the minimum tree protection zone recommended within AS 4970-2009 "Protection of trees on development sites", which specifies a buffer radius equivalent to 12 times the stem diameter at breast height to minimise direct impacts to tree canopies and root zones (Standards Australia 2009). A larger (25 m) buffer is appropriate for this site, given the threatened status of the plants and the scale of the adjacent development and associated, potential impacts from dust and soil compaction.

Prior to the commencement of onsite activities, the *Macadamia tetraphylla* population will be clearly demarcated with the use of flagging to facilitate onsite recognition and prevent inadvertent access by vehicles and machinery during initial onsite activities. The exact locations of the *Macadamia tetraphylla* specimens will also be recorded and incorporated into all relevant site and project documentation and communicated to all onsite personnel and contractors with details concerning the importance of the plants and their protection.

Seasonal monitoring of the Macadamias will then be undertaken until the commencement of buffer establishment to track plant health and detect any impact from onsite activities.

Six months prior to the commencement of the clearing of native vegetation from the site and subsequent earthworks/stockpiling activities, the buffer boundary will be clearly demarcated with

the use of fencing or flagging¹ to facilitate onsite recognition and prevent inadvertent access by vehicles and machinery during adjacent onsite activities (**Figures 3-1 and 3-2**). The exact location of the buffer boundary will also be recorded and incorporated into all relevant site and project documentation and communicated to all onsite personnel and contractors with details concerning the intended outcome for the buffer area.

An initial collection and storage of seeds from the existing plants will also be undertaken as soon as possible following these activities as insurance against potential mortality due to quarrying operations.

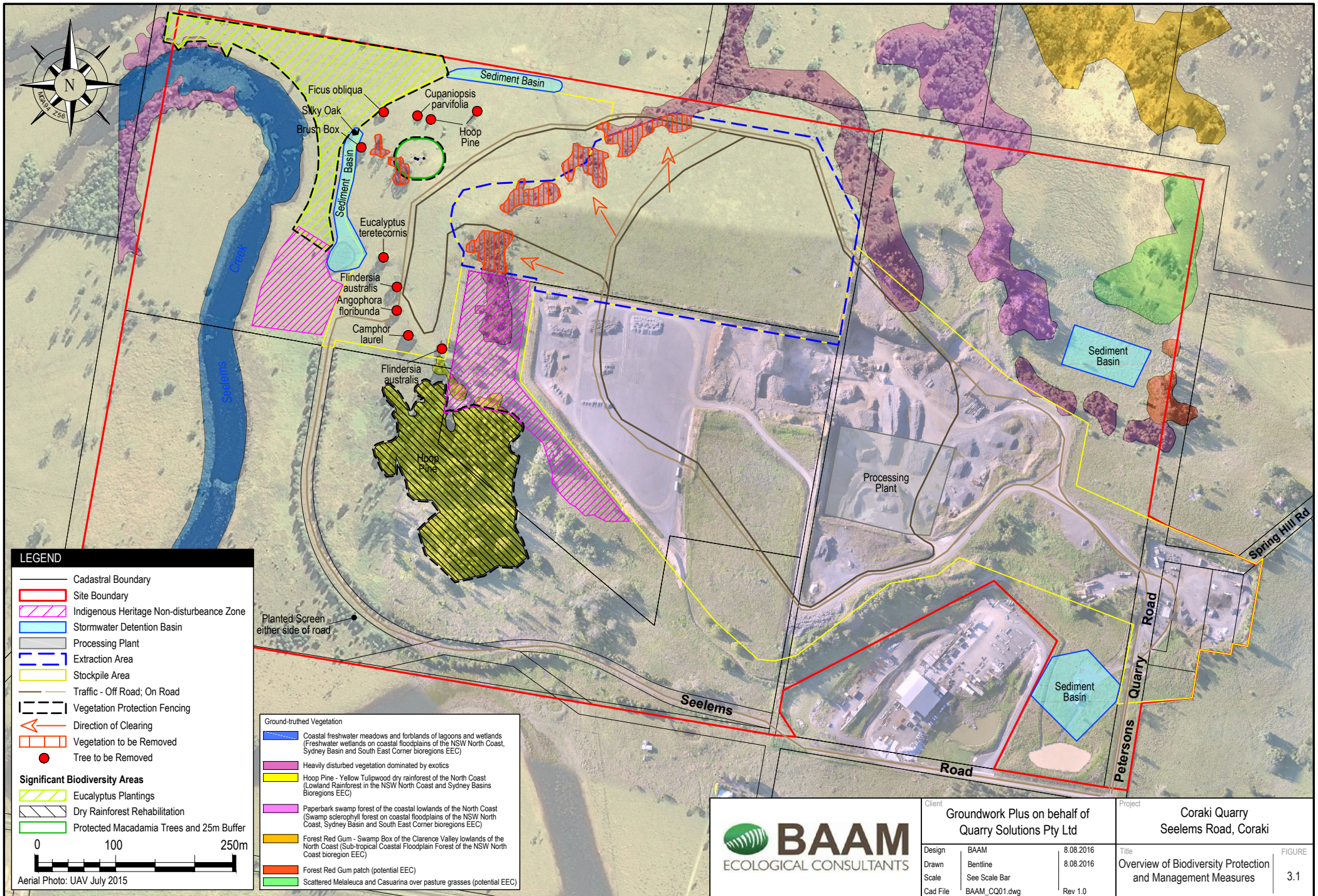
Activities will then focus on the enhancement of the buffer area such that the initial phases of habitat development are established prior to the commencement of clearing, earthworks and operational activities in the surrounding area. This will initially involve the removal of existing environmental weeds (e.g. Lantana) from within the buffer boundary, utilising a low impact strategy that minimises disturbance to the existing native vegetation and minimises opportunities for re-infestation. That is:

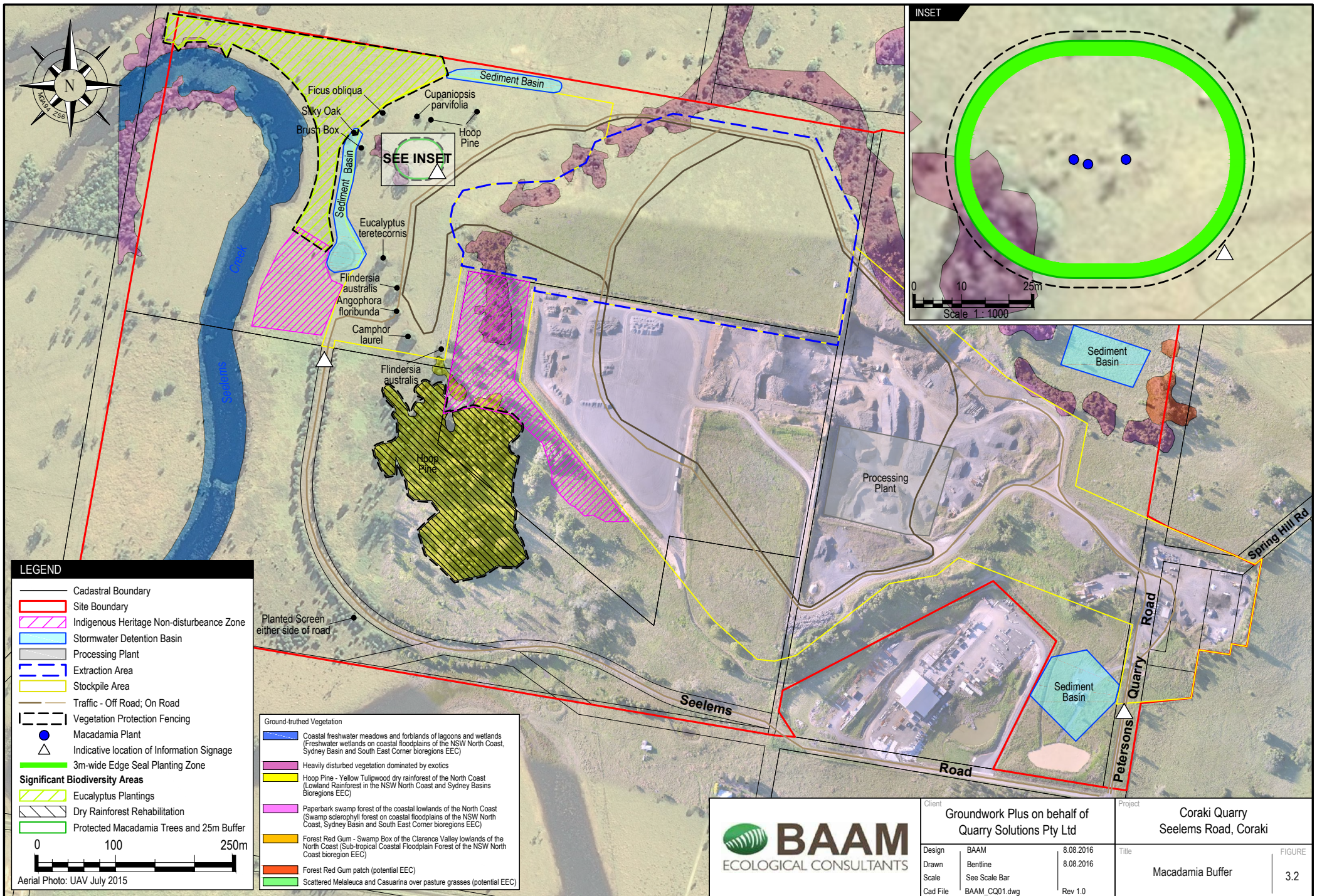
- Work outwards from intact native vegetation areas towards areas of weed infestation;
- Make minimal disturbance to the existing native species and the soil;
- Weed control should involve primary weed removal, follow-up and long term maintenance; and
- Do not over-clear; let native plant regeneration dictate the rate of weed removal.

In general, manual removal of herbaceous weeds, regrowth and seedlings is preferred to minimise disturbance to soil stability and existing native species, while chemical removal can be utilised for larger weeds and areas of large infestation containing few natives.

It should be noted that the "vegetation to be removed" indicated within the Macadamia buffer area on **Figure 3-1** is to be restricted to the removal of exotic vegetation. Any native vegetation is to be left in situ.

¹ If livestock grazing is to continue within the property during quarry operation, stock-proof fencing will need to be established to protect rehabilitation works. Otherwise, star pickets with flagging or orange construction mesh will suffice.





Replacement and supplementary plantings will then be undertaken to minimise the re-establishment of weeds and facilitate the establishment of a self-sustaining, native rainforest community. The primary focus will be to quickly establish a native canopy to shade out weed regrowth and provide suitable conditions for other rainforest plants to thrive. To this end, priority will be given to fast growing, larger pioneer tree species for making up the initial plantings. Once the canopy starts shading out the weeds, a broader selection of other tree species will be planted between the pioneer species to increase species diversity and habitat complexity/availability for native fauna. As the more diverse canopy begins to establish, shrubs will then be introduced. Mulch created from the chipping, shredding or tub-grinding of native vegetation cleared from elsewhere on the site (or sourced from other suitable suppliers, as required) will also be used to create and maintain a weed free ground layer.

A selection of suitable species and planting densities are provided in **Table 3.1**, based on the rainforest species observed growing as scattered individuals and/or within naturally

occurring rainforest communities in the study area and some additional species known from the local area. A combined total of at least 40 rainforest trees will be planted within the buffer and the Hoop Pine dry rainforest community to the south of the development footprint to compensate for the loss of rainforest trees from within the footprint at a ratio of 5:1. Additional trees will be planted as necessary to create a closed canopy. While plantings within the buffer will be arranged randomly at the densities identified in **Table 3.1**, a 3m-wide “edge-seal” of thicker shrub species and mulch will be planted along the perimeter of the buffer to assist in preventing the encroachment of weeds from adjacent areas (**Figure 3-2**). Further details regarding the planting strategy are provided in **Table 3.2**.

Initial weed control and planting activities will commence six months prior to the commencement of the clearing of native vegetation from the site and subsequent earthworks/stockpiling activities to enable the new plants to establish and any preliminary issues to be identified.

Table 3.1. Planting schedule for Macadamia buffer – species and densities

Stratum / Species	Common Name	Density**
Pioneer tree species (initial plantings)*		
<i>Acacia melanoxylon</i>	Blackwood	4m centres
<i>Alphitonia excelsa</i>	Red Ash	4m centres
<i>Commersonia bartramia</i>	Brown Kurrajong	4m centres
<i>Glochidion ferdinandi</i>	Cheese tree	4m centres
<i>Guioa semiglauc</i>	Guioa	4m centres
<i>Jagera pseudorhus</i>	Foambark	4m centres
<i>Mallotus philipensis</i>	Red Kamala	4m centres
Tree layer (secondary plantings)		
<i>Alectryon tomentosum</i>	Hairy Alectryon	2m centres
<i>Araucaria cunninghamii</i>	Hoop Pine	5m centres
<i>Archidendron pruinosum</i>	Laceflower	2m centres
<i>Cryptocarya triplinervis</i> var. <i>pubens</i>	Three-veined Laurel	2m centres
<i>Cupaniopsis parviflora</i>	Small-leaved Tuckeroo	2m centres
<i>Drypetes deplanchei</i>	Yellow Boxwood	2m centres
<i>Dysoxylum fraserianum</i>	Rosewood	2m centres
<i>Dysoxylum mollissimum</i> subsp. <i>molle</i>	Red Bean	2m centres
<i>Elaeocarpus obovatus</i>	Hard Quandong	2m centres
<i>Ficus obliqua</i>	Small-leaved Fig	5m centres
<i>Flindersia australis</i>	Crow's Ash	2m centres
<i>Melia azederach</i>	White Cedar	2m centres
<i>Polyscias elegans</i>	Celerywood	2m centres
<i>Streblus brunonianus</i>	Whalebone Tree	2m centres
Shrub layer		
<i>Alchornea ilicifolius</i>	Native Holly	2m centres
<i>Breynia oblongifolia</i>	Breynia	2m centres
<i>Lomandra longifolia</i>	Spiny-head Mat-rush	2m centres
<i>Notelaea longifolia</i>	Mock Olive	2m centres
<i>Pittosporum revolutum</i>	Hairy Pittosporum	2m centres

*Rapidly growing, pioneer species recommended by McMinn

(<http://www.davidmcminn.com/ngc/pages/fastrainforest.htm>) and otherwise known to be suitable pioneer species.

**3-4m spacings are recommended by McMinn (<http://www.davidmcminn.com/ngc/pages/fastrainforest.htm>) for initial plantings of fast-growing, larger pioneer species, followed by inter-plantings with slower-growing trees. An overall planting density of 1-2m spacings is recommended to achieve earlier canopy closure (Catterall and Harrison 2006). Lower densities are recommended for larger trees such as Hoop Pines and figs. A combined total of at least 40 rainforest trees will be planted within the buffer and the Hoop Pine dry rainforest community to the south of the development footprint to compensate for the loss of rainforest trees from within the footprint at a ratio of 5:1.

Table 3.2. Planting strategy for Significant Biodiversity Areas

Task	Details
Preparation of Planting Areas	<p>Remove weeds as described. Particular care must be taken to avoid poisoning native species, particularly seedlings, young saplings, native grasses and herbaceous species. Follow up weed control in these areas will be undertaken every three months after the initial weeds removal.</p> <p>Collect and store seeds from existing <i>Macadamia tetraphylla</i> specimens as soon as possible for use as backup propagation source if mortality occurs during onsite activities, and repeat annually.</p>
Plant Supply	<p>Plants shall be sourced from local provenance (locally sourced seed) stock where available to enhance survival rates.</p> <p>Species and planting densities are listed in Table 3.1. Plants should be “tube-stock” size. This size is cost effective and has higher survival rates and faster growth rates than advanced stock.</p> <p>Tube stock shall be provided in forestry tubes with a minimum plant height of 20cm and a well-developed root system.</p> <p>Seedlings are to be healthy and displaying signs of active growth – any plants displaying yellowing, disease, root curling or are root bound are not to be planted, nor are any plants with weeds growing in the pot. Seedlings must be moist at time of planting; if necessary, water stock prior to planting. Plant supplier should be instructed to “harden off” the plants before delivery to site to allow greater survival rates.</p>
Mulch	Apply weed-free mulch to a depth of 100mm. Mulch should not touch the stem of plants.
Planting	<p>Planting holes should be the same depth as the forestry tube, in a slight shallow. Planting holes should be watered with approximately 3-5L of water prior to installing plant.</p> <p>Plants to be placed into planting holes ensuring stem is not buried and the roots are not exposed, i.e. backfill soil into the planting hole around the plant to the same level as the forestry tube, making sure there are no air pockets.</p> <p>Arrange seedlings randomly at the minimum densities identified in Tables 3.1 and 3.3, giving priority to fast growing, larger pioneer tree species for making up the initial plantings and creating canopy shade, followed by inter-plantings with slower growing species.</p> <p>Create a 3 m - wide “edge-seal” of thicker shrub species and mulch along the perimeter of the buffer to assist in preventing the encroachment of weeds from adjacent areas.</p>
Protection	Install tree guards around plantings within the Eucalypt planting area to protect against frost and grazing by native and exotic fauna.
Watering	<p>Seedlings are to be watered with a minimum of 5 – 10 litres of water each at the time of planting, then watered weekly (approximately 8-10 litres depending on weather conditions) for four weeks and then monthly or as necessary until seedlings are established (approximately 3 – 6 months). Avoid the creation of boggy conditions during watering, adjusting quantities as necessary.</p> <p>Once established, consider watering by site water trucks with a dispersive nozzle to simulate natural rainfall.</p>
Maintenance and Monitoring	<p>Maintenance will consist of ongoing weed control around plantings and watering when required (as noted above). Dead or damaged plants and depleted mulch will be replaced according to the methods described above.</p> <p>The health of the <i>Macadamia tetraphylla</i> specimens will be monitored during all scheduled maintenance activities.</p> <p>Further details on monitoring are provided in Section 5.0.</p>

3.2.2 Endangered Ecological Communities

Prior to the commencement of onsite activities, the boundaries of all EECs and other areas for retention (e.g. the Indigenous Heritage Non-Disturbance Zones) within or near the boundary of the active area will be illustrated in all relevant site plans and communicated to all onsite personnel and contractors with details concerning the importance of the areas, their protection, and intended outcomes.

Six months prior to the commencement of the clearing of native vegetation from the site and subsequent earthworks/stockpiling activities, the boundary of the Hoop Pine dry rainforest community to the south of the development footprint will be clearly demarcated with the use of fencing or flagging² to facilitate onsite recognition and prevent inadvertent access by vehicles and machinery during adjacent onsite activities (**Figure 3-1**).

Activities will then focus on the enhancement of the Hoop Pine dry rainforest community to the south of the development footprint (**Figure 3-3**), such that the initial phases of habitat development are established prior to the commencement of clearing, earthworks and operational activities in the surrounding area.

The Hoop Pine dry rainforest community is currently infested with exotic species on the margins, including Camphor Laurel (*Cinnamomum camphora*), privets (*Ligustrum* spp.), White Passion Flower (*Passiflora subpeltata*), Coral Berry (*Rivina humilis*) and Climbing Asparagus Fern (*Asparagus africanus*), and is relatively low in native species richness compared to other communities that are representative of the Lowland Rainforest EEC. Rehabilitation efforts will therefore focus on the control of existing weeds within and along the margins of this community, combined with supplementary plantings to increase overall diversity and replace rainforest trees lost from within the footprint.

Existing environmental weeds will be removed utilising a low impact strategy that minimises opportunities for re-infestation and disturbance to existing native vegetation. That is:

- Work outwards from intact native vegetation areas towards areas of weed infestation;
- Make minimal disturbance to the existing native species and the soil;
- Weed control should involve primary weed removal, follow-up and long term maintenance; and
- Do not over-clear; let native plant regeneration dictate the rate of weed removal.

In general, manual removal of herbaceous weeds, regrowth and seedlings is preferred to minimise disturbance to soil stability and existing native species, while chemical removal can be utilised for larger weeds and areas of large infestation containing few natives.

Replacement and supplementary plantings will then be undertaken to minimise the re-establishment of weeds, replace the loss of rainforest trees from within the footprint, and increase overall diversity within the rainforest patch. The primary focus will be to quickly establish a native canopy along the margins of the patch and close existing canopy gaps to shade out weed regrowth and provide suitable conditions for other rainforest plants to thrive. To this end, priority will be given to fast growing, larger pioneer tree species for making up the initial plantings. Once the canopy starts shading out the weeds, a broader selection of other tree species will be planted between the pioneer species to increase species diversity and habitat complexity/availability for native fauna. As the more diverse canopy begins to establish, shrubs will then be introduced. Mulch created from the chipping, shredding or tub-grinding of native vegetation cleared from elsewhere on the site (or sourced from other suitable suppliers, as required) will also be used to create and maintain a weed free ground layer.

A selection of suitable species and planting densities are provided in **Table 3.3**, based on representative tree and shrub layer species from “gallery” Dry Rainforest communities of coastal floodplains in northern New South Wales (OEH 2016). A combined total of at least 40 rainforest trees will be planted within the Hoop Pine dry rainforest and the Macadamia buffer to compensate for the loss of rainforest trees from within the footprint at a ratio of 5:1. Additional trees will be planted as necessary to create a closed canopy within the rehabilitated area.

² If livestock grazing is to continue within the property during quarry operation, stock-proof fencing will need to be established to protect rehabilitation works. Otherwise, star pickets with flagging or orange construction mesh will suffice.

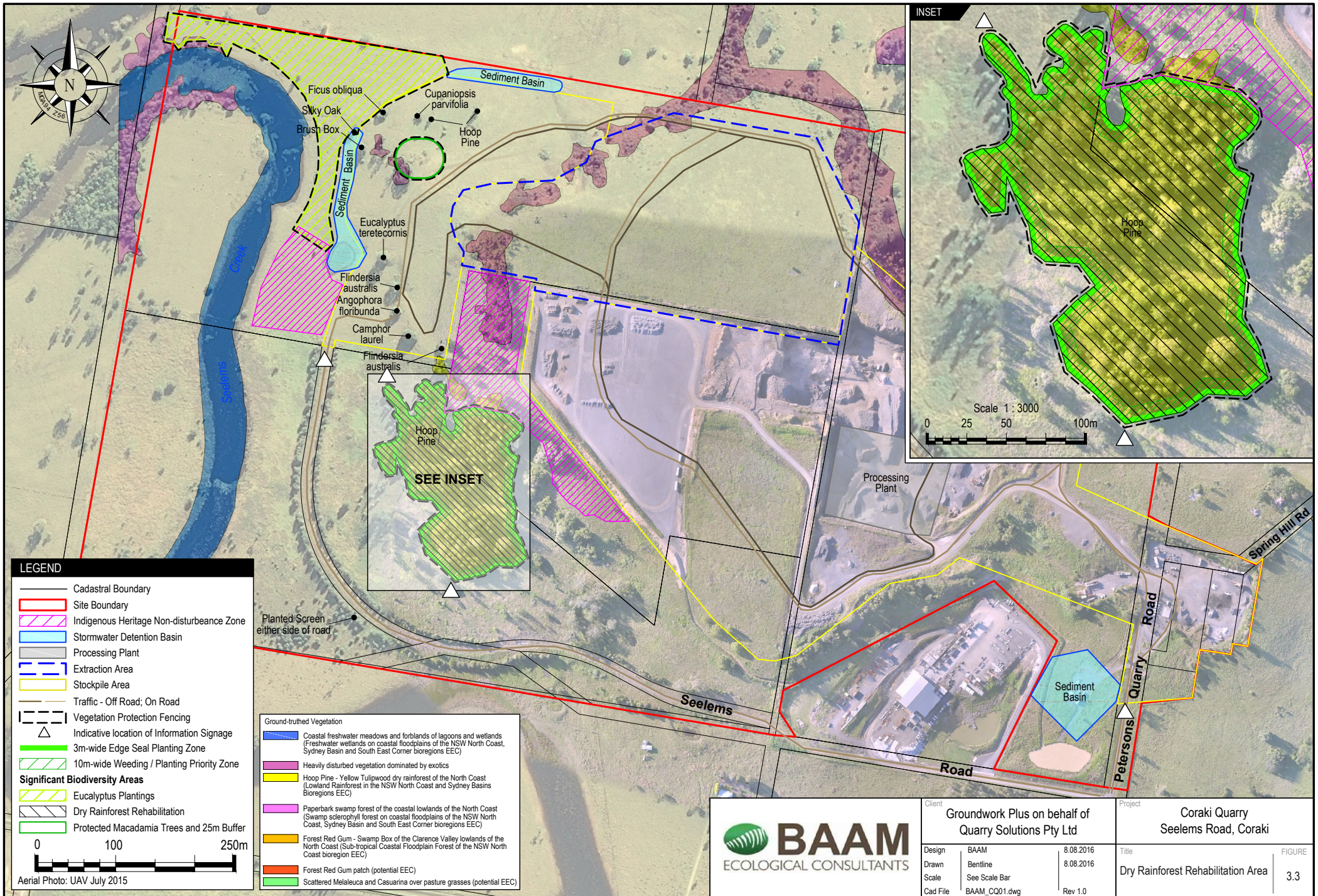


Table 3.3. Planting schedule for Dry Rainforest EEC – species and densities

Stratum / Species	Common Name	Density**
Pioneer tree species (initial plantings)*		
<i>Acacia melanoxylon</i>	Blackwood	4m centres
<i>Alphitonia excelsa</i>	Red Ash	4m centres
<i>Commersonia bartramia</i>	Brown Kurrajong	4m centres
<i>Glochidion ferdinandi</i>	Cheese tree	4m centres
<i>Grevillea robusta</i>	Silky Oak	4m centres
<i>Guioa semiglauca</i>	Guioa	4m centres
<i>Jagera pseudorhus</i>	Foambark	4m centres
<i>Macaranga tanarius</i>	Macaranga	4m centres
<i>Mallotus philipensis</i>	Red Kamala	4m centres
Tree layer (secondary plantings)		
<i>Alectryon tomentosum</i>	Hairy Alectryon	2m centres
<i>Araucaria cunninghamii</i>	Hoop Pine	5m centres
<i>Archidendron pruinatum</i>	Laceflower	2m centres
<i>Baloghia inophylla</i>	Brush Bloodwood	2m centres
<i>Brachychiton discolor</i>	Lacebark Tree	2m centres
<i>Cryptocarya triplinervis</i> var. <i>pubens</i>	Three-veined Laurel	2m centres
<i>Cupaniopsis parviflora</i>	Small-leaved Tuckeroo	2m centres
<i>Drypetes deplanchei</i>	Yellow Boxwood	2m centres
<i>Dysoxylum fraserianum</i>	Rosewood	2m centres
<i>Dysoxylum mollissimum</i> subsp. <i>molle</i>	Red Bean	2m centres
<i>Elaeocarpus obovatus</i>	Hard Quandong	2m centres
<i>Ficus obliqua</i>	Small-leaved Fig	5m centres
<i>Ficus superba</i> var. <i>henneana</i>	Deciduous Fig	5m centres
<i>Flindersia australis</i>	Crow's Ash	2m centres
<i>Melia azederach</i>	White Cedar	2m centres
<i>Polyscias elegans</i>	Celerywood	2m centres
<i>Streblus brunonianus</i>	Whalebone Tree	2m centres
<i>Toona ciliata</i>	Red Cedar	2m centres
Shrub layer		
<i>Alchornea ilicifolia</i>	Native Holly	2m centres
<i>Breynia oblongifolia</i>	Breynia	2m centres
<i>Cassine australe</i>	Red Olive Plum	2m centres
<i>Claoxylon australe</i>	Brittle Wood	2m centres
<i>Gossia bidwillii</i>	Python Tree	2m centres
<i>Lomandra longifolia</i>	Spiny-head Mat-rush	2m centres
<i>Myrsine variabilis</i>	Brush Muttonwood	2m centres
<i>Notelaea longifolia</i>	Mock Olive	2m centres
<i>Pittosporum revolutum</i>	Hairy Pittosporum	2m centres

*Rapidly growing, pioneer species recommended by McMin (<http://www.davidmcminn.com/ngc/pages/fastrainforest.htm>) and otherwise known to be suitable pioneer species.

**3-4m spacings are recommended by McMin (<http://www.davidmcminn.com/ngc/pages/fastrainforest.htm>) for initial plantings of fast-growing, larger pioneer species, followed by inter-plantings with slower-growing trees. An overall planting density of 1-2m spacings is recommended to achieve earlier canopy closure (Catterall and Harrison 2006). Lower densities are recommended for larger trees such as Hoop Pines and figs. A combined total of at least 40 rainforest trees will be planted within the Hoop Pine dry rainforest and the Macadamia buffer to compensate for the loss of rainforest trees from within the footprint at a ratio of 5:1.

While plantings will be arranged randomly at the densities identified in **Table 3.3**, a 3m-wide “edge-seal” of thicker shrubs will be planted along the perimeter of the patch to assist in preventing the encroachment of weeds from adjacent areas (**Figure 3-3**).

Further details regarding the planting strategy are provided in **Table 3.2**. Initial weed control and planting activities will commence six months prior to the commencement of the clearing of native vegetation from the site and subsequent earthworks/stockpiling activities to enable the new plants to establish and any preliminary issues to be identified.

3.2.3 Native Fauna

As noted in **Section 2.1.2**, the upper margins of Seelems Creek are to be planted with Koala food trees to replace those lost within the development footprint and facilitate Koala movement between larger habitat patches to the north and south of the site (**Figures 3-1 and 3-4**). These supplementary plantings will occur prior to the commencement of site clearing and operation to ensure the loss of feeding resources and movement corridors for Koala across the site is as temporary as possible.

Forest Red Gums (*Eucalyptus tereticornis*) within the open forest habitat to the north-east of the study area are known to be used by Koalas, and this species is one of the dominant, naturally occurring trees within coastal woodlands and floodplain forests in the region. Accordingly, this species will be used for the supplementary plantings along the upper margins of Seelems Creek.

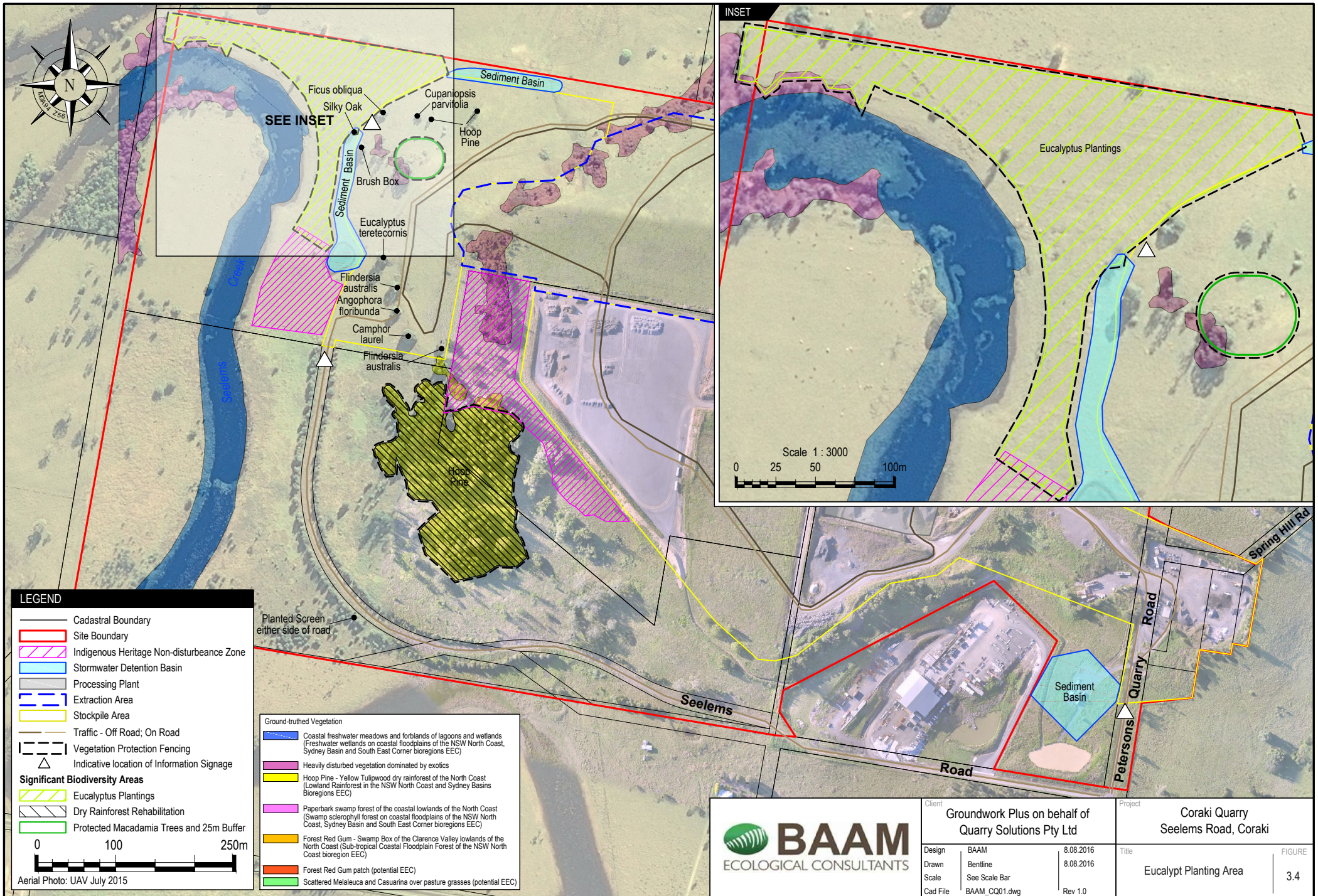
Six months prior to the commencement of the clearing of native vegetation from the site and subsequent earthworks/stockpiling activities, the boundary of the Eucalypt planting area will be clearly demarcated with the use of fencing or flagging³ to facilitate onsite recognition and prevent inadvertent access by vehicles and machinery during initial onsite activities (**Figures 3-1 and 3-4**). The exact locations of the boundary will also be illustrated in all relevant site plans and communicated to all onsite personnel and contractors with details

concerning the importance of the area, its protection, and intended outcomes.

A total of at least 10 trees will be planted to compensate for the loss of Koala habitat trees from within the footprint at a ratio of 5:1, with plantings arranged randomly at a minimum density of 5 m centres. Tree guards will also be placed around each plant to protect against frost and grazing by native and exotic fauna.

Further details regarding the planting strategy are provided in **Table 3.2**. The planting activity will commence six months prior to the commencement of the clearing of native vegetation from the site and subsequent earthworks/stockpiling activities to enable the new plants to establish and any preliminary issues to be identified. Planting locations will be determined on site taking into consideration slope, aspect and other features that may influence planting success. The exact locations of the planted Eucalypt specimens will then be recorded and incorporated into all relevant site and project documentation and communicated to all onsite personnel and contractors with details concerning the importance of the plants and their protection, and to facilitate subsequent monitoring activities.

³ If livestock grazing is to continue within the property during quarry operation, stock-proof fencing will need to be established to protect rehabilitation works. Otherwise, star pickets with flagging or orange construction mesh will suffice.



3.3 MANAGEMENT MEASURES DURING SITE CLEARING AND OPERATION

3.3.1 Significant Biodiversity Areas

Fencing/flagging will be maintained around the perimeters of the Macadamia buffer, Dry Rainforest EEC and Eucalypt planting area until such time that adjacent clearing and earthworks have been completed and stockpiling activities have commenced. Thereafter, access will be restricted to only that necessary for maintenance and management. Permanent signage will also be positioned at strategic locations (e.g. adjacent to haul roads) to notify or remind onsite personnel and contractors of the location and purpose of these significant biodiversity areas and access restrictions.

Where livestock grazing is to continue within non-active parts of the site during quarry operation, stock-proof fencing will be maintained around the Macadamia buffer and Dry Rainforest EEC as necessary to prevent livestock access, while stock-proof fencing will be maintained around the Eucalypt planting area until such time that the plants have grown to a sufficient size to avoid mortality due to livestock access. All stock-proof fencing will be designed to allow movement of native fauna to/from significant biodiversity areas.

Once quarrying operations have commenced and the initial plantings have established in each area, the focus of management will shift to monitoring the health of the *Macadamia tetraphylla* specimens, supplementary plantings and surrounding vegetation, performing routine maintenance activities, identifying any current or imminent threats, and taking corrective action where necessary.

Details regarding the management of impacts on significant biodiversity areas during site clearing and operation are provided in **Table 3.4**. Further details regarding performance and completion criteria, ongoing monitoring and corrective actions are provided in **Sections 4.0 and 5.0** of this BRMP.

3.3.2 Cleared Vegetation

The site development footprint has been positioned to avoid the clearing and fragmentation of the relatively large, well-connected tracts of vegetation and associated habitat within the study area, and avoids all patches of vegetation recognised as native vegetation communities that have greatest value to the majority of known or potentially occurring terrestrial flora and fauna species (**Figure 3-1**).

Even so, approximately 10 scattered, native trees will be removed to accommodate the development footprint, including known Koala habitat tree species (Forest Red Gum *Eucalyptus tereticornis* and Brush Box *Lophostemon confertus*) and a number of dry rainforest species that may provide foraging and nesting resources for birds. Removal of some heavily degraded patches of vegetation (although dominated by exotics) will also remove some native plant species and habitat values for native fauna (**Figure 3-1**).

The following measures will be implemented to ensure the appropriate management of cleared vegetation on the site:

- Cleared, native vegetation will be chipped, shredded or tub grinded and spread as mulch in areas to be rehabilitated.
- Any hollows observed in cleared vegetation will be salvaged and installed in trees to be retained within the site. If encountered, any other habitat features such as logs and stumps will also be incorporated into retained areas for creation of fauna habitat.
- Exotic vegetation mulch will be disposed of as green waste at an authorised waste facility.

Table 3.4. Impact management for significant biodiversity areas during site clearing and operation

Objective	Task	Details (Note: further details regarding performance and completion criteria, ongoing monitoring and corrective actions are provided in Sections 4.0 and 5.0 of this BRMP)
Protect significant biodiversity areas from accidental clearing and other direct disturbance from site workers, machinery and livestock	Clearly demarcate the boundaries of significant biodiversity areas and record the location of the <i>Macadamia tetraphylla</i> specimens	<p>Use fencing/flagging around the perimeter of significant biodiversity areas to facilitate onsite recognition, prevent direct impacts from grazing by domestic stock (if relevant), and prevent inadvertent access by vehicles and machinery during initial onsite activities and supplementary planting establishment.</p> <p>Maintain fencing/flagging until such time that adjacent clearing and earthworks have been completed and stockpiling activities have commenced. Thereafter, erect permanent signage at strategic locations (e.g. adjacent to haul roads) to notify or remind onsite personnel and contractors of the location and purpose of the significant biodiversity areas and access restrictions.</p> <p>Ensure exact locations of the <i>Macadamia tetraphylla</i> and planted Eucalypt specimens and the significant biodiversity area boundaries are recorded and incorporated into all relevant site and project documentation and inductions.</p>
	Inform all site workers of their obligations with regard to <i>Macadamia tetraphylla</i> and significant biodiversity area protection	<p>Include information on the location and purpose of the significant biodiversity areas as part of onsite inductions.</p> <p>Arrange pre-start meeting to clearly define roles and the approach to <i>Macadamia tetraphylla</i> and significant biodiversity area protection and management, including access restrictions.</p>
	Maintain stock-proof fencing, as necessary	<p>Maintain stock-proof fencing around the Macadamia buffer and Dry Rainforest EEC as necessary to prevent livestock access, as required.</p> <p>Maintain stock-proof fencing around the Eucalypt planting area until such time that the plants have grown to a sufficient size to avoid mortality due to livestock access.</p> <p>Design all stock-proof fencing to allow movement of native fauna to/from significant biodiversity areas.</p>
	Undertake regular inspections of the significant biodiversity area perimeters for direct disturbance	<p>Undertake monthly visual inspections of the significant biodiversity area perimeters to identify any obvious disturbance due to vehicle/machinery access, dumping or incursion of stockpiled material or natural events (e.g. storm damage). Where any such disturbance is identified, this will trigger an assessment of the health of the <i>Macadamia tetraphylla</i> specimens and other native vegetation and any necessary corrective actions.</p>
Protect significant biodiversity areas from other potential impacts	Prevent the introduction and proliferation of weeds as a result of onsite activities	<p>In addition to preventing vehicle and machinery access and subsequent weed transfer risk within significant biodiversity areas, the following actions should be taken during the life of the Project to reduce the possibility of weeds (or their propagules) entering the site:</p> <ul style="list-style-type: none"> Regularly survey disturbance areas, hard stand areas and haul/access roads, and identify and remove any new infestations of invasive weeds encountered as soon as possible. Treatment needs to take place in accordance with local and regional Pest Management Plans and State government recommendations. Ensure onsite personnel undertake appropriate training in vehicle hygiene and weed awareness and

Objective	Task	Details (Note: further details regarding performance and completion criteria, ongoing monitoring and corrective actions are provided in Sections 4.0 and 5.0 of this BRMP)
resulting from the operation of the site		<p>identification, and use established roads and tracks while avoiding weed-infested areas/sites.</p> <ul style="list-style-type: none"> • Prepare a car park (preferably gravelled) to house all vehicles entering the site offices. The car park would be regularly checked for any weeds and treated. • Prepare wash down areas and/or utilise Council approved wash down facilities for any machinery or vehicles entering the Project area that have been working outside of the local area. • Obtain weed free certification for any soil, fill, mulch, etc entering the site. • Dispose of weed plant material and seed by disposal at approved Council refuse stations. • Appoint a person responsible for regularly monitoring for potential weed occurrences (and treatment if required) of equipment, vehicles, machinery and materials (including soil, mulch, fill) entering the site. • Undertake visual surveys prior to topsoil stripping operations and, if necessary, implement control mechanisms to reduce the risk of the contamination of topsoil stockpiles with seed and vegetative weed material. Regularly monitor all topsoil stockpiles and manage them for weed infestation. • Maintain existing groundcover for as long as possible by restricting/minimising land disturbance at any one time, rehabilitate disturbed areas as soon as practical following extraction, and maximise the diversity and cover of native species when revegetating disturbed areas. Prior to the establishment of vegetation, a spraying campaign may be required to prevent migration or establishment of weed species into the area under rehabilitation; or using alternative methods for controlling weeds including manual weeding, burning, slashing, weed matting and mulching. • Monitor and evaluate the progress of weed management efforts on-site.
	Prevent incursion of stockpiled material due to structural failure of adjacent stockpile mounds and/or erosion and sedimentation following rainfall	<p>Avoid the stockpiling of material immediately adjacent to significant biodiversity areas.</p> <p>Ensure stockpile mounds in close proximity to significant biodiversity areas are shaped and otherwise stabilised to avoid structural failure.</p> <p>Ensure measures are in place to prevent erosion of stockpiled material and direct sediment-laden runoff away from significant biodiversity areas, under the guidance of an erosion and sediment control plan.</p> <p>Implement measures to avoid the spill of earth and rock downslope of the quarry footprint into areas of retained vegetation, as necessary, under the guidance of a site environmental management plan.</p>
	Prevent incursion of excessive dust from adjacent clearing, earthworks, vehicle movements and blasting	<p>Avoid the undertaking of excessive dust-generating activities during strong winds and/or in close proximity to significant biodiversity areas.</p> <p>Ensure measures are in place to prevent the excessive generation of dust, under the guidance of a site environmental management plan. Such measures may include:</p> <ul style="list-style-type: none"> • dampening down of cleared areas, extraction working areas, haul roads, stockpiles and other hardstand areas by water spraying when visual surveillance indicates excessive dust generation and propagation from point or mobile sources;

Objective	Task	Details (Note: further details regarding performance and completion criteria, ongoing monitoring and corrective actions are provided in Sections 4.0 and 5.0 of this BRMP)
		<ul style="list-style-type: none"> installing and maintaining water sprays or dust extraction systems on crushing and screening plant; limiting topsoil/overburden removals at any one time to that necessary while providing for effective production; limiting removal of topsoil/overburden to periods of favourable weather conditions; restricting vehicle and mobile machinery movements to designated routes and hardstand areas; temporarily revegetating topsoil stockpiles; revegetating completed areas to stabilise the landscape as soon as practicable; enforcing a <40 km/hr maximum speed limit on unsealed haul and internal roads; ensuring employees and contractors are aware of dust minimisation practices; and daily visual surveillance of control measures to ensure system performance accords with design and implementation criteria.
	Prevent significant alterations in water availability to significant biodiversity areas	<p>Ensure measures are in place to prevent a significant increase or decrease in water availability to significant biodiversity areas as a result of surrounding activities, under the guidance of a site environmental management plan.</p> <p>Ensure measures are in place to prevent a significant decrease in the quality of water available to significant biodiversity areas as a result of surrounding activities, under the guidance of a site environmental management plan.</p>
Maintain Macadamia health and condition of surrounding habitat and other significant biodiversity areas	Monitor and control weeds within significant biodiversity areas on a routine basis.	<p>Following initial weed control activities during native plant establishment, undertake 3-monthly inspections of significant biodiversity areas to identify any new or recurring weed infestations. Many of the weeds that will affect the plantings will arise from within the significant biodiversity areas from either the soil seed bank or bird droppings. Tall grass may be the most competitive to plantings establishment, particularly in the absence of grazing.</p> <p>Remove weeds as described in Section 3.2.</p> <p>Continue maintenance activities until the intended outcome for each significant biodiversity area is achieved (refer Section 2.0). Thereafter, monitor weeds on a six-monthly basis.</p>
	Maintain appropriate conditions for plant establishment and ongoing habitat viability	<p>Water plants monthly or as necessary until seedlings are established (approximately 3 – 6 months). Avoid the creation of boggy conditions during watering, adjusting quantities as necessary.</p> <p>Once established, consider watering by site water trucks with a dispersive nozzle to simulate natural rainfall.</p> <p>Following initial establishment, undertake 3-monthly inspections of each significant biodiversity area to identify any issues with plant health. Adjust watering regime, replenish mulch and undertake replacement plantings as necessary, as described in Section 3.2. Take corrective action to address any impacts from onsite activities, as required.</p> <p>Continue maintenance activities until the intended outcome for each significant biodiversity area is achieved (refer Section 2.0). Thereafter, monitor weeds on a six-monthly basis.</p>
	Monitor vegetation	Monitor Macadamia health and the condition of surrounding habitat and other significant biodiversity areas during all

Objective	Task	Details (Note: further details regarding performance and completion criteria, ongoing monitoring and corrective actions are provided in Sections 4.0 and 5.0 of this BRMP)
	health on a routine basis.	scheduled maintenance activities and take corrective actions to address notable declines, as necessary.
Insure against the loss of Macadamia specimens as a result of onsite activities	Collect backup propagation material from <i>Macadamia tetraphylla</i> specimens on a routine basis	Collect and store seeds from existing <i>Macadamia tetraphylla</i> specimens on an annual basis for use as backup propagation source if mortality occurs during onsite activities.

3.3.3 Native Fauna - Clearing

The degraded habitats present within the area of the proposed development footprint provide very limited habitat value for threatened fauna species. Even so, a number of native species have been observed utilising the site during previous surveys, or are expected to occur, including numerous birds and reptiles.

Furthermore, habitat to the north-east of the study area is known to be used by Koala and it is possible this species may occasionally utilise scattered food trees occurring within the development footprint, including certain trees to be removed. Other arboreal mammals such as possums may also use these trees.

In addition to Koala, a number of threatened fauna species have the potential to occur within habitats close to the site, at least as transient visitors during foraging (particularly birds and bats). Black-necked Stork (*Ephippiorhynchus asiaticus*) (Endangered: TSC Act) and Comb-crested Jacana (*Irediparra gallinacea*) (Vulnerable: TSC Act) are also known to occur on the site from previous records, and habitats close to the development site continue to provide suitable habitat for these species.

To ensure potential impacts on fauna present during clearing is minimised, all clearing of trees and other vegetation with notable habitat values should be undertaken under the supervision of an experienced Fauna Spotter/Catcher (FSC). The FSC is to undertake an initial pre-clear inspection of the site each morning immediately prior to the commencement of clearing activities to check for resident fauna. Particular attention should be paid to nesting birds, the potential presence of Koalas and possums resting within tree foliage, and the presence of large reptiles (i.e. monitors, snakes and dragons) basking in exposed areas or sheltering under debris or within stockpiled material. Any reptiles are to be herded away from the work area into adjacent habitat to be retained or cleared at a later stage, while any trees found to contain, or suspected of containing, Koalas, possums, nests or other wildlife are to be flagged for further attention during clearing. Temporary excavations should also be checked for trapped fauna.

Following the inspection, clearing operations and methods are to be discussed between the FSC and clearing contractor to ensure any highly mobile resident fauna are provided with an opportunity to move safely away from disturbance areas.

The FSC will then be responsible for relocating or assisting the self-relocation of uninjured wildlife encountered during clearing works, and seeking the appropriate treatment of any injured or orphaned wildlife through liaison with local Wildlife Carers. The FSC is to communicate any potential issues with the machinery operators and the Site Manager to minimise the risk to native wildlife.

Vegetation clearing is to be undertaken in a sequential manner to allow animals the opportunity to move to adjoining habitat of their own volition. In general, clearing should commence from the south-eastern part of the site and progress towards the northern and western parts of the site (**Figure 3-1**). This will direct any self-relocating animals towards retained habitats on adjoining properties, away from the existing Petersens Quarry site. Where it is preferable from an operational perspective to clear in a different direction during particular stages of the development, temporary exclusion fencing should be considered to prevent any escaping wildlife from accessing operational areas.

Immediately prior to each area of vegetation being cleared, patches of undergrowth are to be beaten to flush out any wildlife, and logs and debris on the ground are to be rolled to check underneath. The machine operator should then clear all undergrowth and smaller shrubs prior to the felling of trees. Any trees known to contain, or suspected of containing, possums should be left overnight, after the understory has been removed, to allow the animal an opportunity to self-relocate. Otherwise, the use of an elevated work platform should be considered to enable the FSC to capture the animal prior to the felling of the tree. Where either option is not feasible, as a last resort the machine operator is to knock or nudge the tree to encourage the animal to move away from the work area. If an animal decides to self-relocate during the onsite activities, all work in the area is to stop and move to another part of the site until the animal has moved away.

Trees are to be lowered as smoothly and softly as possible to reduce the risk of impact on fauna from crushing injuries. Trees are to be felled into cleared areas to allow the FSC to search cleared vegetation more efficiently.

Where active nests are located, all effort should be made to access the nest prior to the felling of the tree to prevent damage and attempt relocation.

If any stockpiles of cleared vegetation have been retained for longer than three days, it must be assumed they are occupied by wildlife. Before they are removed or disturbed, they must first be checked by the FSC.

All nocturnal wildlife captured is to be held until dusk at which time they are to be released into suitable, nearby habitat.

Koala

Should any trees on site be found to contain a Koala (during the pre-clear inspection or otherwise during onsite activities), the following steps must be taken:

- Clearing works in the vicinity of the tree are to be ceased immediately.
- A well-marked exclusion zone of 25 metres is to be established around the tree.
- All personnel on site must be advised of the presence of the Koala and any adjoining trees must be clearly flagged.
- Neither the tree containing the Koala nor any tree with adjoining canopy can be disturbed, and no works are to be conducted within 25 metres of the Koala, until after the animal has vacated the tree of its own volition.
- The tree containing the Koala must not be isolated, so as to ensure a safe passage for the Koala from the work site.
- The FSC must monitor the Koala at hourly intervals to check it is not overly stressed or about to move across the work site.
- If the Koala has not left the tree by the end of the day, the FSC must confirm the presence or absence of the animal before clearing commences the following day.
- Under no circumstances is a Koala to be physically removed, other than via prior authorisation from OEH.
- Should a Koala need to be removed, a site specific approach needs to be developed and the action authorised by or undertaken by an OEH officer.

Black-necked Stork

Although previous studies indicate a Black-necked Stork once nested in a Hoop Pine located within the centre of the dry rainforest community occurring in the centre of the study area (refer **Figure 1-1**), targeted searches undertaken as

part of the current field survey found no active nests in any of the trees within this community, nor was any evidence of recent nesting activity found. Therefore, Black-necked Stork does not currently utilise these trees for nesting. However, this vegetation continues to provide potential breeding resources, and there is a small possibility this species may utilise this habitat for nesting in the future.

Accordingly, it is recommended the FSC regularly (i.e. fortnightly) inspects the Hoop Pine dry rainforest community for signs of nesting throughout the clearing and initial construction phase of the project where this coincides with the breeding season for Black-necked Stork (May to January, inclusive). If any nesting activity is identified, a species management plan is to be developed and implemented that ensures any impacts to this species are not significant.

3.3.4 Native Fauna – Operation

In addition to the implementation of measures to manage impacts on significant biodiversity areas described in **Section 3.3.1**, the following measures will be adopted to manage impacts to native fauna during operation of the site:

- Establish 'go slow zones' (40km/hr) for vehicles and machinery where non-gazetted roads or tracks are located adjacent to patches of native vegetation communities.
- Undertake regular monitoring of road kills within the site.
- Undertake regular monitoring of pest animal activity within the site, particularly wild dogs (which may kill koalas) and feral pigs (which may degrade rainforest communities), and control pest animal populations as necessary.
- Facilitate pest animal management through the implementation of waste management measures under the guidance of a site environmental management plan.
- Limit construction and operational work to daylight hours as far as practicable, and any lighting within outdoor areas should comply with relevant Australian Standards and be of low spillage, with no or limited upward spillage.
- Minimising noise and vibration under the guidance of a site environmental management plan.

3.3.5 General Site Rehabilitation

As noted in **Section 2.2**, the location of the extraction area and stockpiles within Lot 401 on DP633427 has been historically used for grazing, and the final, rehabilitated land form is intended to be compatible with this historical land use, mainly comprising grassed, gently sloping and free draining platforms with remaining sediment basins converted into water reservoirs for stock watering purposes.

Management measures will focus on ensuring the final land form is safe, stable and non-polluting and compatible with the historical land use for the site, while being integrated with surrounding natural landforms as far as is reasonable and feasible.

As noted in Condition 32 of Schedule 3 of the Development Consent, the lands associated with the development must also be rehabilitated progressively; that is, as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time, and interim stabilisation measures must be implemented to control dust emissions in disturbed areas that are not active and which are not ready for final rehabilitation.

Details regarding general site rehabilitation are provided in **Table 3.5**. Further details regarding performance and completion criteria, ongoing monitoring and corrective actions are provided in **Sections 4.0 and 5.0** of this BRMP.

Figure 2-1 also indicates the establishment of open forest vegetation along the southern boundary of the site. Given the natural regeneration of dry rainforest vegetation observed elsewhere on the site, it is considered the trees and shrub species and planting densities provided in **Table 3.1** would be suitable for establishing a temporary vegetated buffer at this location. The planting strategy will also follow the same approach as that for significant biodiversity areas in **Table 3.2**.

Table 3.5. Measures for General Site Rehabilitation (excluding significant biodiversity areas)

Objective	Measures (Note: further details regarding performance and completion criteria, ongoing monitoring and corrective actions are provided in Sections 4.0 and 5.0 of this BRMP)
Created a stable final landform that is connected into the surrounding landscape	<p>Use earthmoving equipment to progressively shape and trim the workings to the desired design profiles and flatten the gradients of selective batters to a stable angle of repose on reaching the terminal limits of extraction.</p> <p>Round or marry the contours into the natural ground surface.</p> <p>Scale down loose rock.</p> <p>Apply topsoil and grass to contours.</p> <p>Provide access to the terminal workings to allow maintenance of rehabilitation works.</p> <p>Design landform and drainage to control erosion for the particular hydrological regime.</p> <p>Where necessary, spread and shape planting media over selected rock faces and apply topsoil to assist in retaining precipitation and controlling sediment movement.</p> <p>Batter terminal quarry benches to varying slopes depending on the geotechnical properties of the substrate.</p> <p>Once quarry operations are completed, contour the extraction floor to a gentle grade to establish a free draining platform. Cover the area in topsoil to a suitable depth and seed with paddock grass species to return the land to its current use of cattle grazing.</p> <p>Retain sediment dams after the cessation of the Project as stock dams (no rehabilitation required).</p>
Utilise topsoil during rehabilitation of the final landform to promote and support plant growth	<p>The following measures should be implemented for topsoil stripping:</p> <ul style="list-style-type: none"> • Do not strip topsoil when it is too wet or too dry. • Undertaking visual surveys prior to all topsoil stripping operations and, if necessary, implementing control mechanisms to reduce the risk of the contamination of topsoil stockpiles with seed and vegetative weed material. Weed control mechanisms may include separate stockpiling, herbicide spraying of stripped soils, or disposal as fill of soil materials infested with weeds. • Use stripped topsoil directly for rehabilitation to the maximum practicable extent, or stockpile and preserve for future use. • Regularly monitoring all topsoil stockpiles and managing them for weed infestation. • Stockpiling of topsoil should not exceed a height of 2 to 3 m and should be shaped (i.e. batters no greater than 2:1) and revegetated to protect the soil from erosion and weed infestation. • Maintain stockpiles in a free draining condition and avoid long-term soil saturation. • Divert runoff waters external to the areas to be stripped away from the working area. • Limit the stripping of topsoil to the minimum area necessary. <p>The following measures should be implemented for topsoil spreading:</p> <ul style="list-style-type: none"> • Directly place stripped topsoil on an area undergoing rehabilitation. • Reshape areas to be topsoiled prior to placing topsoil.

Objective	Measures (Note: further details regarding performance and completion criteria, ongoing monitoring and corrective actions are provided in Sections 4.0 and 5.0 of this BRMP)
	<ul style="list-style-type: none"> Schedule equipment used to spread topsoil to avoid compaction. Before respreading the topsoil, loosen the subsoil to break up any compacted or surface sealing and to enable keying of the two soils. On slopes less than 3:1, loosen lightly compacted subsoil with a tined implement ensuring all ripping operations occur along the contour. Remove topsoil from stockpiles in a manner that avoids vehicles travelling over the stockpiles. Respread topsoil in the reverse sequence to its removal so that the original upper soil layer is returned to the surface to re-establish the entrapped seed content of the soil. Ensure all exposed subsoils are covered. Respread topsoil over selected batters, contours, bunds and disturbed areas to a minimum thickness of 100 mm. After spreading topsoil, ensure the surface is left in a roughened state to assist moisture infiltration and inhibit soil erosion. Prior to any planting, cultivate any compacted or crusted topsoil surfaces. Immediately follow soil spreading by seeding or planting if applicable. Spread straw or organic mulch over the soil to minimise potential soil erosion until the area is revegetated. If erosion occurs on treated surfaces, re-topsoil the area and sow with cover grass.
Revegetate the quarry floor and former stockpile areas in order to return the area to its current use of cattle grazing	<p>Use suitable pasture species for the quarry floor and former stockpile areas other than for the open forest vegetation along the southern boundary of Lot 401 on DP633427 (see below).</p> <p>Adopt natural regeneration followed by seed broadcasting as the preferred method of establishing grassland/pasture vegetation. Consider other methods for establishing vegetation as necessary to suit site conditions (e.g. hydro-mulching, seedling planting and direct seeding).</p> <p>All methods shall be accompanied by appropriate weed control to prevent rehabilitated areas from being overrun with weed species.</p>
Rehabilitate progressively to minimise impacts from dust and erosion of disturbed areas	<p>Undertake rehabilitation of any exposed area as soon as reasonably practicable following disturbance.</p> <p>Minimise the total area exposed for dust generation.</p> <p>Maintain existing groundcover for as long as possible and minimise the total area exposed for dust generation at any time by restricting/minimising land disturbance at any one time.</p> <p>Implement interim stabilisation measures to control dust emissions in disturbed areas that are not active and which are not ready for final rehabilitation.</p> <p>Mulching of heavily disturbed areas can assist in reducing soil erosion. Where necessary, temporary interception devices such as hay bales or geotextile fabric fencing can be employed to slow stormwater and intercept sediment.</p>

Objective	Measures (Note: further details regarding performance and completion criteria, ongoing monitoring and corrective actions are provided in Sections 4.0 and 5.0 of this BRMP)
Establish open forest vegetation along the southern boundary of Lot 401 on DP633427 to form a temporary physical boundary and buffer between the site and the adjacent Petersen's Quarry	Follow the planting strategy outlined in Table 3.2 , using the tree and shrub species and densities outlined in Table 3.1 .
Maintain the viability of rehabilitated areas for their intended use through the control of weeds and pests	<p>Inspect any materials (e.g. earth, soil, mulch and straw) brought onto the site for rehabilitation to ensure the materials are free from weeds and pests.</p> <p>Prior to the establishment of vegetation, a spraying campaign may be required to control weeds to prevent migration of weed species into areas under rehabilitation. Alternative methods for controlling both grass and weeds include manual weeding, slashing, weed matting and mulching.</p> <p>Depending on the situation, specific measures may be required to protect the works from grazing animals, birds and insects, such as fencing, barriers, etc.</p>
Monitor the progress of rehabilitated areas and undertake routine maintenance to ensure intended outcomes are achieved	<p>Visually monitor landform stability, long-term sediment and erosion controls and revegetation of profiled final land surfaces to determine the effectiveness of measures implemented. Engage technical experts to undertake the monitoring as necessary.</p> <p>The key parameters to be measured as part of the monitoring program will include:</p> <ul style="list-style-type: none"> • Erosion • Groundcover • Vegetation species (richness of desired species). • Weed presence. <p>Conduct regular inspections of any rehabilitated areas to ensure timely maintenance works are carried out as necessary.</p> <p>Undertake routine maintenance of rehabilitated areas as outlined in Table 3.6.</p>

Table 3.6. Maintenance schedule for general site rehabilitation (excluding significant biodiversity areas)

Component	Task	Frequency
Weed Control		
Weed control during site preparation (where necessary)	Application of herbicide and / or slashing	One treatment at least two weeks prior to seeding /planting
Ongoing weed management	Application of herbicide	Biannually
Supplementary weeding	Application of herbicide	As required
Revegetation Management		
Routine monitoring	Monitor performance and conduct any necessary maintenance	<ul style="list-style-type: none"> • One month after seeding / seedling planting. • Three months after seeding / seeding planting. • Six months after seeding / seedling planting. • 12 months after seeding / seedling planting. OR <ul style="list-style-type: none"> • Following significant rainfall events (e.g. >25 mm).
Plant failure replacement	Replace diseased or dead plants	As necessary following maintenance inspections
Fertilising	Fertilise (if applicable)	Two months after topsoil spreading or seeding
Mulching	Apply mulch (if available)	One-off around plantings
Pasture Management		
Grass Height	Slashing	Biannually until established
Grass Vigour	Fertilise	Annually (if necessary)

4.0 PERFORMANCE AND COMPLETION CRITERIA

4.1 SIGNIFICANT BIODIVERSITY AREAS

4.1.1 General Impact Mitigation

Performance criteria in relation to the mitigation of impacts from onsite activities upon significant biodiversity areas are as follows:

- No direct disturbance to significant biodiversity areas as a result of access by vehicles and machinery, uninformed access by onsite personnel and contractors, or access by livestock.
- No direct disturbance to significant biodiversity areas as a result of dumping or incursion of stockpiled or other quarried material.
- No new or increasing weed infestations within significant biodiversity areas following initial treatments.
- No significant, negative impacts to vegetation within significant biodiversity areas as a result of dust.
- No significant, negative impacts to vegetation within significant biodiversity areas as a result of changes in water quality or quantity.

4.1.2 Vegetation within the Macadamia Buffer and Dry Rainforest EEC

The primary performance criterion for the Macadamia buffer area is to achieve no reduction in the number of *Macadamia tetraphylla* specimens throughout the duration of onsite activities.

For both the Macadamia buffer area and the Dry Rainforest EEC, remaining performance criteria will be based on achieving the highest score for each of a number of vegetation condition attributes when assessed against recognised benchmarks for "NR179: Hoop Pine - Yellow Tulipwood dry rainforest of the North Coast" vegetation type. Assessment against such benchmarks is the recognised method of determining the relative condition of vegetation communities in accordance with OEH's "Framework for Biodiversity Assessment" (OEH 2014) and is considered an appropriate method of determining performance of the Macadamia buffer and Dry Rainforest EEC in terms of achieving the intended outcomes for these significant biodiversity areas.

Table 4.1 lists the relevant vegetation condition attributes, benchmark measures and performance criteria for the Macadamia buffer and Dry Rainforest EEC, along with indicative timeframes for achievement. Measurement of each attribute is to follow the methods outlined in the Framework for Biodiversity Assessment (OEH 2014). It is noted that the Dry Rainforest EEC patch has already achieved the performance criteria for a number of attributes, in which case the requirement will be to maintain current condition.

4.1.3 Vegetation within other EECs

The intended outcome for the paperbark swamp forest and Forest Red Gum open forest to the north-east of the site, and the wetland community associated with Seelems Creek in the western portion of Lot 410 on DP633427, is to maintain their condition through the prevention of any increase in disturbance as a result of onsite activities.

Tables 4.2-4.4 list the performance criteria for vegetation within these EECs, based on maintaining the same measures of vegetation condition recorded as part of the ecological assessment by BAAM in 2015.

It is acknowledged that the condition of these EECs occurring outside of the active parts of the site could be affected by factors unrelated to the operation of Coraki Quarry (e.g. continued cattle grazing, ongoing weed invasion, etc). Hence any failure to maintain vegetation condition in accordance with these performance criteria (as detected during routine monitoring – refer **Section 5.0**) would trigger the requirement for further investigations into potential impacts from onsite activities.

4.1.4 Vegetation within the Eucalypt Planting Area

The performance criteria for the Eucalypt planting area along the upper margin of Seelems Creek is to achieve the establishment of at least 10 trees within 3 years. To this end, "establishment" is defined as each tree achieving a height of at least 4 m, and/or a trunk with a circumference of more than 31.5 cm at 1.3 m above the ground.

Table 4.1. Performance criteria for vegetation within the Macadamia buffer and Dry Rainforest EEC

Attribute	Benchmark Measure	Performance Criteria	Timeframe (Dry Rainforest EEC)	Timeframe (Macadamia Buffer)
<i>Macadamia tetraphylla</i> specimens	Current number and condition	No reduction in number or condition	n/a	Ongoing.
Native plant species richness	20	≥ benchmark	2 years (assessed as 19 in 2015)	5 years
Native overstorey cover	20-100	Within benchmark	Already achieved (maintain within benchmark)	5 years
Native midstorey cover	10-60	Within benchmark	Already achieved (maintain within benchmark)	5 years
Native ground cover (grasses)	0-25	Within benchmark	Already achieved (maintain within benchmark)	2 years
Native ground cover (shrubs)	5-25	Within benchmark	Already achieved (maintain within benchmark)	2 years
Native ground cover (other)	5-40	Within benchmark	2 years (assessed as <5 in 2015)	2 years
Exotic plant cover (calculated as percentage of total ground and midstorey cover)		0 – 5%	2 years (assessed as >5 – 33% in 2015)	2 years
Proportion of over-storey species occurring as regeneration		100%	5 years (assessed as 66% in 2015)	10 years

Table 4.2. Performance criteria for vegetation within the paperbark swamp forest EEC

Attribute	Benchmark Measure	Performance Criteria
Native plant species richness	35	50 – <100% of benchmark
Native overstorey cover	10-35	> 10 – <50% or >150 – 200% of benchmark
Native midstorey cover	5-18	50 – <100% or >100 – 150% of benchmark
Native ground cover (grasses)	10-60	> 10 – <50% or >150 – 200% of benchmark
Native ground cover (shrubs)	0-40	Within benchmark
Native ground cover (other)	5-60	50 – <100% or >100 – 150% of benchmark
Exotic plant cover (calculated as percentage of total ground and midstorey cover)		>5 – 33%
Number of trees with hollows	1	≥ benchmark
Proportion of over-storey species occurring as regeneration		>0 – <50%
Total length of fallen logs	5	>10 – <50% of benchmark

Table 4.3. Performance criteria for vegetation within the Forest Red Gum open forest EEC

Attribute	Benchmark Measure	Performance Criteria
Native plant species richness	6	≥ benchmark
Native overstorey cover	10-70	Within benchmark
Native midstorey cover	0-80	Within benchmark
Native ground cover (grasses)	0-50	Within benchmark
Native ground cover (shrubs)	0-60	Within benchmark
Native ground cover (other)	5-60	Within benchmark
Exotic plant cover (calculated as percentage of total ground and midstorey cover)		>33 – 66%
Number of trees with hollows	0.1	0
Proportion of over-storey species occurring as regeneration		>0 – <50%
Total length of fallen logs	5	0 – 10% of benchmark

Table 4.4. Performance criteria for vegetation within the Seelems Creek wetland EEC

Attribute	Benchmark Measure	Performance Criteria
Native plant species richness	5	≥ benchmark
Native overstorey cover	0-5	Within benchmark
Native midstorey cover	0-5	Within benchmark
Native ground cover (grasses)	0-80	Within benchmark
Native ground cover (shrubs)	0-10	Within benchmark
Native ground cover (other)	2-70	Within benchmark
Exotic plant cover (calculated as percentage of total ground and midstorey cover)		0 – 5%

4.2 GENERAL SITE REHABILITATION

Completion criteria for all other, general site rehabilitation activities are as follows:

- Rehabilitation areas are grassed with pasture species suitable for livestock grazing.
- Sediment basins are converted into stock watering dams.
- Terminal faces are assessed by a suitably qualified expert as being safe and stable.
- Rehabilitation areas are free of any contamination and hazardous materials.
- Runoff water quality from the site does not pose a threat to downstream water quality.
- There is no evidence of erosion from rehabilitation areas.
- There are no significant weed infestations within the rehabilitation areas.
- Open forest vegetation is established along the southern boundary of Lot 401 on DP633427.

5.0 MONITORING PROGRAM

5.1 SIGNIFICANT BIODIVERSITY AREAS

Ongoing monitoring is required to ensure the significant biodiversity areas achieve the intended outcomes and to measure how rehabilitation activities are progressing over time in relation to performance criteria and the mitigation of potential risks and threatening processes.

The frequency and nature of monitoring activities will depend on the management activities required for each area and the nature of the threatening processes that may prevent or hinder the achievement of intended outcomes.

Monitoring of significant biodiversity areas will focus on the condition of vegetation, complemented by monitoring of threatening processes associated with quarrying activities.

Table 5.1 provides details regarding the monitoring program for significant biodiversity areas, including methods, frequencies and triggers for corrective actions.

The details and results of each monitoring event will be documented in a monitoring report, including:

- monitoring aims and methods
- recorded data (including photos)
- activities undertaken since the previous monitoring event
- overall progress towards the achievement of intended outcomes
- any issues identified, and
- necessary corrective actions.

5.2 NATIVE FAUNA

Table 5.3 provides details regarding the monitoring program for native fauna, including methods, frequencies and triggers for corrective actions.

The details and results of each monitoring event will be documented in a monitoring report, including monitoring aims and methods, recorded data, activities undertaken since the previous monitoring event, overall progress towards the achievement of intended outcomes, any issues identified and necessary corrective actions.

5.3 GENERAL SITE REHABILITATION

Once general site rehabilitation commences, monthly monitoring will be undertaken to review the ongoing success of the rehabilitation treatment and ensure timely maintenance works are carried out as necessary (refer **Table 3.7**). Rehabilitation measures including landform stability, long-term sediment and erosion controls and revegetation of profiled final land surfaces will be visually monitored and, where relevant, assessed by technical experts to determine the effectiveness of measures implemented. Suitably qualified consultants may be engaged to monitor the establishment of vegetation and land stability. The key parameters to be measured as part of the monitoring program will include:

- Erosion.
- Groundcover.
- Vegetation species (richness of desired species).
- Weed presence.

Table 5.1. Monitoring program for significant biodiversity areas

Component	Method	Frequency	Trigger for Corrective Action	Corrective Action
Native Vegetation Condition				
Health of <i>Macadamia tetraphylla</i> specimens	Photo monitoring and visual inspection of foliage, general plant form/structure (i.e. measurements of height and foliage cover) and any noticeable damage.	Seasonally prior to and during buffer community establishment. Every six months following buffer community establishment.	Plant death, obvious damage or significant reduction in general condition since previous monitoring event.	Investigate likely cause(s) of death/damage/poor condition and focus corrective action accordingly. Increase monitoring frequency and seek expert advice until health improves. Undertake backup propagation and replacement plantings as necessary to maintain number of healthy specimens.
Condition of rehabilitation plantings	Photo monitoring and visual inspection of foliage, general plant form/structure and any noticeable damage.	Seasonally during plant/community establishment. Every six months following plant/community establishment.	Plant death, obvious damage or significant reduction in general condition since previous monitoring event.	Investigate likely cause(s) of death/damage/poor condition and focus corrective action accordingly. Undertake replacement plantings as necessary. Modify planting methods and maintenance regime as necessary to suit species and site conditions. Increase monitoring frequency and seek expert advice until planting performance improves.
Condition of vegetation communities	Photo monitoring and measurement of condition attributes listed in Tables 4.1 – 4.4 , using the methods prescribed in the Framework for Biodiversity Assessment (OEH 2014). The location of monitoring sites for EECs are listed in Table 5.2 .	Annually	Reduction or no required improvement in attribute score since previous monitoring event.	Investigate likely cause(s) of death/damage/poor condition and focus corrective action accordingly. Undertake replacement plantings as necessary. Modify planting methods and maintenance regime as necessary to suit species and site conditions. Increase monitoring frequency and seek expert advice until community performance improves.

Component	Method	Frequency	Trigger for Corrective Action	Corrective Action
Threatening Processes				
New or recurring weed infestations	Photo monitoring and visual inspection throughout each significant biodiversity area to record all weed species and the location and extent of all infestations.	Seasonally during plant/community establishment. Every six months following plant/community establishment.	Notable increase in cover of known weeds since previous weed treatment. Presence of previously unrecorded weeds.	Investigate likely cause(s) of death/damage/poor condition and focus corrective action accordingly. Modify weed control methods and maintenance regime as necessary to suit species and site conditions. Ensure measures to prevent weed proliferation and reinfestation are fit for purpose and all staff are informed and educated on preventative measures. Increase monitoring frequency and seek expert advice until control performance improves.
Direct disturbance by vehicles, machinery and/or otherwise due to access by onsite personnel and contractors	Visual inspection for signs of obvious damage to boundary fencing/flagging and vegetation.	Monthly	Signs of obvious damage to boundary fencing/flagging and/or vegetation.	Ensure fencing/flagging and signage is fit for purpose and all staff are informed and educated on the location and purpose of significant biodiversity areas. Repair or replace fencing/flagging and rehabilitate vegetation.
Direct disturbance due to access by livestock	Visual inspection for signs of livestock presence and obvious damage to boundary fencing and vegetation.	Monthly	Signs of livestock presence or obvious damage to boundary fencing and/or vegetation.	Ensure fencing is erected fit for purpose. Repair or replace fencing and rehabilitate vegetation.
Direct disturbance as a result of dumping or incursion of stockpiled or other quarried material	Visual inspection for incursion of stockpiled or other quarried material.	Monthly	Incursion of stockpiled or other quarried material.	Ensure measures to prevent incursion of stockpiled or other quarried material are fit for purpose and all staff are informed and educated on the location and purpose of significant biodiversity areas. Remove stockpiled or other quarried material from significant biodiversity area, repair or replace measures to prevent incursion of stockpiled or other quarried material and rehabilitate vegetation.

Component	Method	Frequency	Trigger for Corrective Action	Corrective Action
				Consider relocation, reshaping or improved stabilisation of stockpiled material to avoid re-incursion or structural failure.
Dust impacts	Visual inspection for signs of smothering of vegetation by dust.	Seasonally.	Signs of smothering of vegetation by dust.	Reschedule excessive dust-generating activities to avoid windy conditions. Ensure measures to prevent dust incursion are fit for purpose, particularly for dust generating activities in close proximity to significant biodiversity areas.
Impacts due to changes in water quality or quantity	Visual inspection for signs of localised flooding, erosion or damp conditions relative to surrounding environment, dry conditions relative to surrounding environment, or obvious signs of contaminated water supply.	Seasonally.	Signs of localised flooding or damp conditions relative to surrounding environment, dry conditions relative to surrounding environment, or obvious signs of contaminated water supply.	Ensure measures to prevent a significant increase or decrease in water availability within significant biodiversity areas are fit for purpose. Modify site drainage as necessary to avoid further impacts. Ensure measures to prevent a significant decrease in the quality of water available to significant biodiversity areas are fit for purpose.

Table 5.2. Monitoring sites for the measurement of vegetation condition attributes within EECs

Area	Easting	Northing
Dry Rainforest EEC	525304	6794628
Paperbark Swamp Forest EEC	525934	6795101
Forest Red Gum open forest EEC	Approximately 100m east of the above	Approximately 100m east of the above
Wetland EEC	525022	6794879

Table 5.3. Monitoring program for native fauna

Component	Method	Frequency	Trigger for Corrective Action	Corrective Action
Native fauna present during clearing of vegetation	Visual inspection of standing and stockpiled vegetation, ground debris and temporary excavations for resident fauna by FSC.	Immediately prior to the commencement of clearing activities each day.	Death or injury to native fauna as a result of clearing activities.	Investigate likely cause of death/injury and focus corrective action accordingly. Ensure measures to prevent or minimise risk of death or injury to native fauna are fit for purpose and all staff are informed and educated on these measures. Consider rescheduling of clearing activities to avoid periods of active breeding by resident native fauna.
Native fauna present during quarry operation	Visual inspection of roads and access tracks for road kills.	Daily	Death or injury to native fauna as a result of vehicle collisions.	Investigate likely cause of death/injury and focus corrective action accordingly. Ensure measures to prevent or minimise risk of death or injury to native fauna are fit for purpose and all staff are informed and educated on these measures.
New or recurring pest animal activity	Visual inspection for signs of pest animal activity (i.e. scats, tracks and signs of disturbance to vegetation or predation of native fauna).	Annually	Notable increase in pest animal activity. Presence of previously unrecorded pest animals. Death or injury to native fauna as a result of interactions with pest animals.	Investigate likely cause(s) of death/injury and focus corrective action accordingly. Modify pest animal control methods and maintenance regime as necessary to suit species and site conditions. Ensure measures to prevent an increase in pest animal activity and abundance are fit for purpose and all staff are informed and educated on preventative measures. Increase monitoring frequency and seek expert advice until control performance improves.

6.0 POTENTIAL RISKS AND CONTINGENCY MEASURES

Given the majority of significant biodiversity areas occur outside the site development footprint, and the operation of Coraki Quarry will effectively be an extension of existing activities within the adjacent Petersens Quarry, it is considered that the potential risks to biodiversity values on or near the site as a result of onsite activities are relatively minor provided the aforementioned management measures are implemented and routine monitoring is undertaken to identify and address any issues in a prompt and systematic manner.

The greatest risks to biodiversity within the site are impacts to the existing *Macadamia tetraphylla* specimens and surrounding buffer, which is located within a stockpile area. The collection of seed from the existing *Macadamia tetraphylla* specimens is proposed as a contingency measure in case of plant death, in which case propagation will be undertaken to maintain the current population. Otherwise, the natural regeneration of rainforest vegetation elsewhere on the site indicates the establishment of a self-sustaining rainforest community within the buffer will be readily achievable through active planting and effective control or prevention of existing threats (i.e. weed invasion and cattle access).

7.0 ROLES AND RESPONSIBILITIES

Principal (Quarry Solutions Pty Ltd)

- Nominate a Site/Quarry Manager and/or Site Environmental Officer who will represent the Principal in reviewing the performance of contractors, issue instructions and variations, and be responsible for BRMP implementation.
- Promptly notify relevant authorities of any changes to this BRMP and its implementation, and any breach of approval conditions and proposed corrective actions.
- As necessary, engage the services of qualified contractors to assist in the implementation and verification of onsite works associated with this BRMP.

Site/Quarry Manager and/or Site Environmental Officer

- Be responsible for onsite implementation of the BRMP.
- Ensure the contents of the BRMP are adequately communicated to all site personnel, and that they are advised of the consequences if the stated actions are not observed.
- Ensure onsite activities, the implementation of management measures, and monitoring and maintenance activities, are undertaken in accordance with the BRMP.
- Seek advice from qualified contractors and experts, as required.
- Satisfactorily demonstrate to the Principal, contractors and relevant authorities that appropriate measures have been implemented on-site during clearing, operation and rehabilitation to adequately manage the risks to biodiversity values.
- Follow directions of the Principal and recommendations of the contractors with respect to performance of the BRMP.
- Keep records of complaints received and responses relating to the site's biodiversity values, advise the Principal of complaints and responses, investigate and (where appropriate) implement control measures as soon as possible.
- Notify the Principal and contractors of BRMP performance and monitoring, non-compliance and actions taken, and seek advice and attendance at on-site inspections when required.

- Promptly notify the Principal and contractors regarding environmental incidents with potential to cause environmental harm or nuisance.
- Be present at inspections and as triggered by any environmental events or incidents.
- Report on BRMP implementation and performance to the Principal on completion of on-site works and following any maintenance and establishment periods.

Contractors Engaged to Fulfil BRMP Implementation

- Liaise with the Site/Quarry Manager and/or Site Environmental Officer, and the Principal, to facilitate compliance with approval conditions during the project.
- Attend the site to undertake activities as required by the BRMP and otherwise triggered by environmental events or incidents.
- Advise the Site/Quarry Manager and/or Site Environmental Officer on the compliance and effectiveness of the BRMP and its implementation.
- Review and advise the Principal and other relevant authorities of any necessary changes to the BRMP.
- Prepare activity and monitoring reports, as necessary.

Other Onsite Personnel

- Familiarise with the contents and requirements of the BRMP as they relate to onsite tasks and associated responsibilities.
- Implement measures as required by the BRMP as they relate to onsite tasks and associated responsibilities.
- Follow directions of the Site/Quarry Manager and/or Site Environmental Officer and recommendations of contractors with respect to implementation and performance of the BRMP.
- Notify the Site/Quarry Manager and/or Site Environmental Officer regarding environmental incidents with potential to cause environmental harm or nuisance.

8.0 REFERENCES

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South Wales (OEH) (2016).** Threatened
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<http://www.environment.nsw.gov.au/threatenedSpeciesApp/>

Standards Australia (2009). AS 4970-2009
Protection of trees on development sites.
Standards Australia, Sydney.

APPENDIX 1

Summary of correspondence with NSW OEH regarding draft BRMP

14/09/2016

Jim Lawler
Team Leader - Planning
Groundwork Plus

Dear Jim,

RE: Correspondence with NSW OEH regarding draft Biodiversity and
Rehabilitation Management Plan for Coraki Quarry

Dear Jim,

Biodiversity Assessment and Management Pty Ltd was engaged by Groundwork Plus on behalf of Quarry Solutions Pty Ltd to prepare a Biodiversity and Rehabilitation Management Plan (BRMP) for Coraki Quarry in accordance with Condition 33 of Schedule 3 of Development Consent SSD7036, issued by the New South Wales Department of Planning and Environment (DP&E) on 18 April 2016.

Condition 33 of Schedule 3 of the Development Consent specifies that the BRMP must be prepared in consultation with the New South Wales Office of Environment and Heritage (OEH).

The following is a summary of correspondence thus far undertaken with OEH during the development of the BRMP.

30 May 2016

Email sent from BAAM Director and Project Delivery Manager Jedd Appleton (JA) to OEH officer Krister Waern (KW) seeking general advice regarding OEH's expectations in terms of the content of the BRMP and the level of detail to be provided, and whether there are any previous examples and/or guidelines available that would assist in this regard.

JA spoke on the phone to KW later that day, during which it was confirmed that OEH did not have any templates or guidelines for this type of plan, but that the BRMP must have clear, definite and measurable/auditable outcomes and performance criteria, with specific timeframes. KW also confirmed that he would be prepared to review a draft structure for the document to ensure the general layout and content of the plan met OEH's expectations, thereby reducing time associated with OEH's review of the completed document.

BIODIVERSITY ASSESSMENT AND MANAGEMENT PTY LTD
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Cleveland Qld 4163

29 July 2016

JA emailed a document to KW that outlined the proposed format and content of the plan for review.

1 August 2016

KW emailed JA to indicate the report structure looked ok, and to reiterate that sufficient information is to be supplied within the BRMP to address Condition 33 of Schedule 3 of the Development Consent.

26 August 2016

JA emailed the draft BRMP to KW for preliminary review.

2 September 2016

JA emailed KW to advise that the proponent does not intend to clear native vegetation or undertake works in close proximity to significant biodiversity areas for up to 2 years following commencement of the project and, as the BRMP recommends initial weed control and planting activities are completed at least three to six months prior to the commencement of surrounding clearing and earthworks, the intention would be to only commence the rehabilitation activities 6 months prior to the commencement of clearing and stockpiling activities within the western portion of the site, which may not be until 18 months after commencement of the project.

It was also advised that this intention would be made clear in the final version of the BRMP, and it was requested that this be considered during OEH's review of the draft BRMP.

8 September 2016

JA emailed KW to advise that proponent will be submitting the BRMP to DP&E during the following week, and to request some initial response from OEH regarding the document ASAP.

9 September 2016

JA spoke on the phone to KW to discuss progress with the review of the draft BRMP.

KW confirmed he had drafted a letter with some comments on the draft plan for his manager to sign off and send to BAAM. He also confirmed that he had only undertaken a preliminary review at this stage, in the knowledge that OEH will be asked to undertake a formal review once it is submitted to DP&E.

In the meantime, KW was happy to discuss his comments with JA on the phone, realising time was of the essence and the proponent was keen to submit the document to DP&E.

Comments discussed and changes made to the BRMP prior to submission to DP&E were as follows:

- **Comment:** General agreement with intended site outcomes (Section 2).

Changes made to BRMP: not necessary.

- **Comment:** Figure 2.1 – hard to distinguish between the 2 shades of green.

Changes made to BRMP: rectified to make colours more distinguishable.

- **Comment:** Figure 3.1 – shows veg removal within part of the Macadamia buffer?

Changes made to BRMP: clarification provided in the text to confirm only exotic vegetation will be removed from this location.

- **Comment:** Number of specified trees to be planted does not appear to be enough to achieve the required densities for rainforest communities.

Changes made to BRMP: clarification provided in the text that the number of trees stated (i.e. at least 40 in the buffer and dry rainforest patch) is a minimum to compensate for the loss of native trees from elsewhere on the site, whereas additional trees are to be planted as necessary to achieve the intended outcomes for each rehabilitation area.

- **Comment:** Eucalypt planting area indicated is quite large, given only 10 trees will be planted – need to know where these will be (i.e. show on the map).

Changes made to BRMP: text now states that the exact location of the planted trees will depend on site conditions, but will be shown in all relevant onsite documentation once planted to ensure this is clear for monitoring purposes.

- **Comment:** Should include more photo monitoring to allow the progression of the rehab to be apparent for auditing purposes.

Changes made to BRMP: additional photo monitoring specified as part of monitoring activities.

- **Comment:** Management of significant biodiversity areas post-operations – KW mentioned that a letter from OEH dated 17 February 2016 raised the need for the management of rehabilitated significant biodiversity areas to be assured post-operations by way of some mechanism (e.g. covenant), and that this will be reiterated in OEH's formal letter.

Changes made to BRMP: it is understood this matter is being addressed by Groundwork Plus.

- **Comment:** Section 7 – OEH don't really have a statutory role in terms of Plan compliance, so should not be specifically mentioned in this section.

Changes made to BRMP: specific reference to OEH removed and replaced with "relevant authority".

- **Comment:** Timing for commencement of rehab activities – KW has recommended the rehabilitation activities commence 6 months following BRMP approval, rather than 6 months prior to operations within the relevant parts of the site.

Changes made to BRMP: it is understood this matter is being addressed by Groundwork Plus.

Please contact BAAM if you require any further information or clarification.

Yours sincerely,



Jedd Appleton
Project Delivery Manager

APPENDIX 2

Clarification of final landforms for DP&E

Department Principal:
Tegan Smith
Project Contact:
Jim Lawler

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6 February 2018
Ref: 1837 DA1 040

Colin Phillips
Team Leader, Planning Services, Resource Assessments
Department of Planning and Environment
GPO Box 39, Sydney NSW 2001

Via email: colin.phillips@planning.nsw.gov.au

Dear Colin

SSD 7036 CORAKI QUARRY

Clarification of Final Landforms for the Department of Planning and Environment

Background


By email dated 23 January 2018, the Department of Planning and Environment (DP&E), provided comment on the Biodiversity and Rehabilitation Management Plan (B&RMP) prepared by Biodiversity Assessment and Management Pty Ltd dated 14 September 2016. The comments from DP&E sought clarification on the conceptual final landform of the quarry. Through discussion it was suggested that the clarification provided should be included as an appendix to the B&RMP. This letter provides that clarifying information and will be an appendix to a revised version of the B&RMP.

Clarifying information

The B&RMP is based on the Environmental Impact Statement (EIS) submitted to the department for SSD 7036. The EIS contained the conceptual site layout plan, quarry plan and cross sections (refer attached). Statements about the final land form are made in Section 3.2.9 and 7.11 of the EIS. No change is proposed to those arrangements. The cross sections show that the quarry development will result in gently sloping pads. The macadamia trees will be integrated into the western pad. As per the Water Management Plan (WMP) (refer attached), the western pad will drain to the western sediment basins, whilst the rest of the quarry will drain to Petersons Quarry. The EIS cross sections show that the southern boundary of Coraki Quarry will be a series of benches suitable to establish an open forest. Noting of course that the Petersons Quarry will continue to be extracted and therefore the final length of benching may be less than shown on the drawings. I have attached an oblique aerial image (refer attached) to help explain the interface between the two quarries. In this context, it can be understood that the final land form will be gently sloping and free draining pads/platforms. The EIS (including the cross sections), Environmental Management Strategy and WMP are kept on site and are understood by the operator and Richmond Valley Council which owns the Petersons Quarry.

If you require any further information, please do not hesitate to contact me.

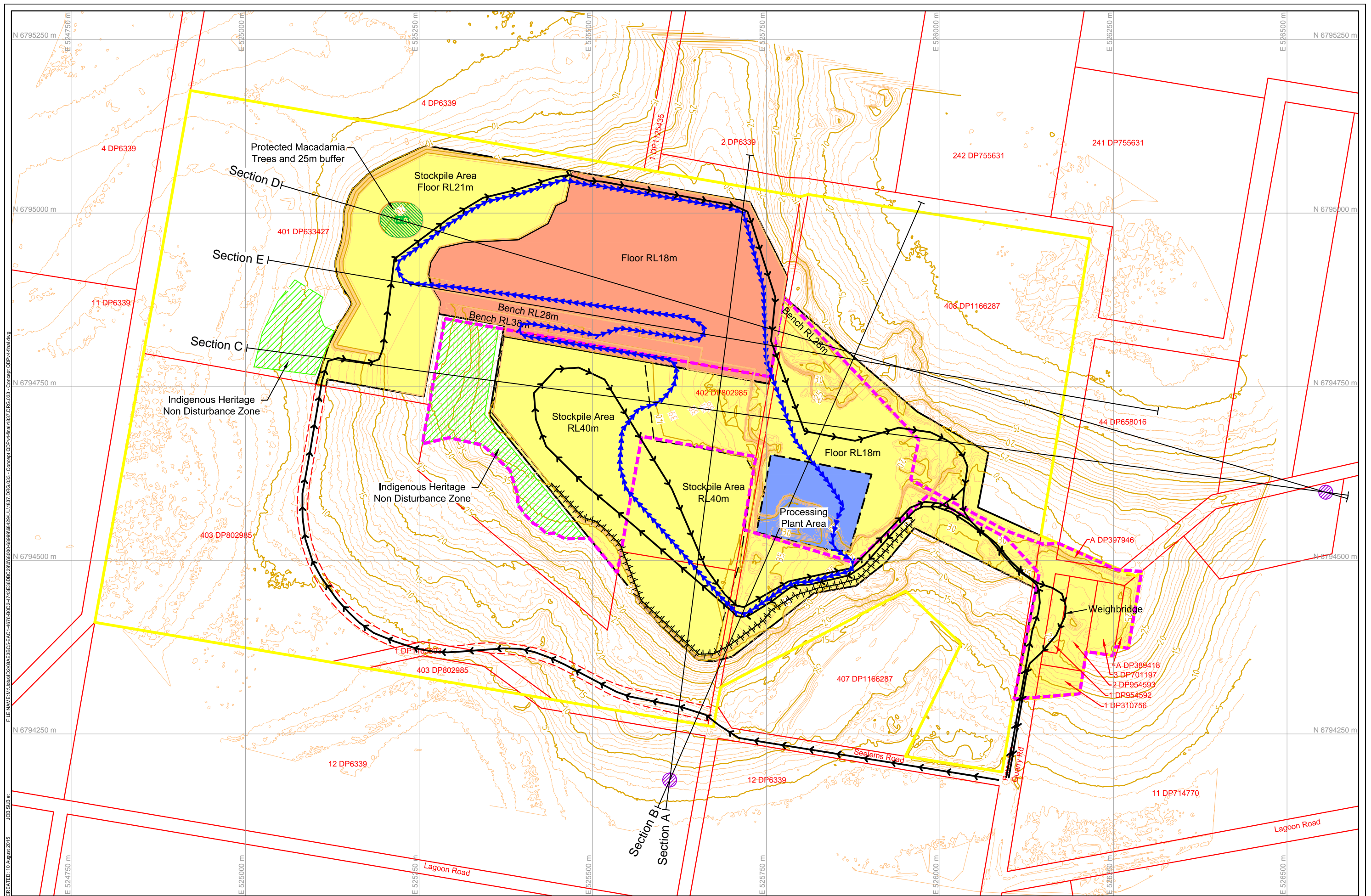
Yours faithfully
Groundwork Plus



Jim Lawler
Project Director

Enc.

- Attachment 1 – Drawing 1837 DRG 027r5 Conceptual Site Layout Plan
- Attachment 2 – Drawing 1837 DRG 033 Conceptual Quarry Development Plan Final Extraction Stage
- Attachment 3 – Drawing 1837 DRG 035 Cross Sections A to E
- Attachment 4 – Water Management Plan Final Extraction Stage Catchment Plan
- Attachment 5 – Aerial Image of Petersons Quarry and Coraki Quarry Interface



REV	DESCRIPTION	DATE	BY

Legend:

- Site Boundary
- Cadastral Boundary
- Approved Petersons Quarry Footprint
- Nearby Sensitive Receptor
- On Road Truck Movement
- Off Road Truck Movement
- Perimeter Bund
- Cross Section (Refer Drg 1837.035)

Stockpile Area = 28.91 ha
Extraction Area = 10.27 ha
Processing Plant Area = 1.65 ha

PROJECT: Coraki Quarry

CLIENT: Quarry Solutions Pty Ltd

TITLE: Conceptual Quarry Development Plan
Final Extraction Stage

GROUNDWORK plus

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SCALE: 1:5,000
When Printed On A3

DATE: 15 September 2015
PRINTED: 3 November 2015

DRAWN: JL
CHECKED: JL

DRAWING NUMBER: 1837.033

REVISION:

LT DATUM: HORIZONTAL / VERTICAL / ZONE
MGA / AHD / 56

Data Sources:
Photography: UAV Survey 2015-07-02; Google, Image date: 2014-12-18
Topography: UAV Survey 2015-07-02
Cadastral:
Ecosystem:
Other:

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