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**Hodgson Quarries and
Plant Pty Ltd**

**Landscape and
Rehabilitation Plan**

**for the Sand Quarry, Roberts Rd
Maroota, NSW**

Prepared by:

VGT Environmental Compliance Solutions Pty Ltd

in conjunction with:

Hodgson Quarries and Plant Pty Ltd

Hodgson Quarries and Plant Pty Ltd

Landscape and Rehabilitation Plan for the Sand Quarry, Roberts Rd Maroota, NSW

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20/06/2016	R0 Updated OEMP 2011 for changes in extraction sequence and additional modifications in EA 2016
29/06/2017	R1 As required by consent condition 60
16/03/2018	R2 As per DPE comments 8/2/18

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Section 1. Introduction

1.1. Site Description

Hodgson Quarries and Plant Pty Ltd (the client, Hodgson) operate a sand quarry on Roberts Road at Maroota, NSW. The site comprises lots 1 and 2 DP 228308 and lot 2 DP 312327 in The Hills Shire Council (see Figure One in the OEMP). The development application number 267-11-99 was for extraction and on-site processing of sand, clay, and pebble; and construction of a bund wall.

The development has been in operation continuously since the 1970's.

1.2. Scope

A modification (Mod 2) to the consent DA 267-11-99 approved in March 2016 has resulted in the requirement for the preparation of a Landscape and Rehabilitation Management Plan in accordance with condition 60.

This replaces the Interim Rehabilitation Plan submitted as Sub-Plan F of the 2016 Operational Environmental Management Plan.

Section 2. Statutory Requirements

2.1. Department of Planning and Environment

The development consent issued by Minister for Urban Affairs and Planning (Ref S98/00772) on 31 May, 2000, and updated (NSW Department of Planning and Environment, March 2016) outlines the rehabilitation objectives (condition 58) and the requirement for progressive rehabilitation (condition 59).

The following table outlines required rehabilitation objectives from condition 58:

Table 1. Rehabilitation Objectives

Feature	Objective
Site (as a whole)	Safe, stable and non-polluting Final landform integrated with surrounding natural landforms as far as is reasonable and feasible, and minimising visual impacts when viewed from surrounding land
Surface Infrastructure	Decommissioned and removed, unless the Secretary agrees otherwise
Quarry Benches	Landscaped and vegetated using native tree and understorey species
Quarry Pit Floor	Landscaped and revegetated using improved pasture species, native trees and understorey species
Final Void	Minimise the height and slope of batters Minimise the drainage catchment
Community	Ensure public safety Minimise the adverse socio-economic effects of quarry closure

Condition 59 states:

“The Applicant shall rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim stabilisation measures must be implemented where reasonable and feasible to control dust emissions in disturbed areas that are not active and which are not ready for final rehabilitation.

Note: It is accepted that parts of the site that are progressively rehabilitated may be subject to further disturbance in future.”

Condition 60 outlines the requirements for a Landscape and Rehabilitation Management Plan (LRMP) given below:

Table 2. Consent Requirements for LRMP

Condition	Comments from DPE 8/2/18	Where Addressed
60. The Applicant shall prepare a Landscape and Rehabilitation Management Plan for the development to the satisfaction of the Secretary. This plan must: (a) be submitted to the Secretary for approval by 30 June 2017, unless otherwise agreed by the Secretary;	Satisfactory	This report
(b) provide details of the conceptual final landform and associated land uses for the site	Not satisfactory: The conceptual final landform is reliant on the agree wet weather high groundwater level. This has not yet been approved.	Section 3
(c) describe the short, medium and long-term measures that would be implemented to ensure compliance with the rehabilitation objectives and progressive rehabilitation obligations in this consent	Satisfactory	Section 4.4 & Section 4.5
(d) include a detailed description of the measures that would be implemented over the next 3 years (to be updated for each 3 year period following the 3 years covered by the initial approval of the plan) including the procedures to be implemented for:		Section 4.4, Section 4.5, Section 5
• maximising the salvage of environmental resources within the approved disturbance area for beneficial reuse;	Satisfactory	Section 4.5.5 & Section 5
• protecting vegetation and fauna habitat outside the approved disturbance area on-site	Satisfactory	Section 4.4.1.3, Section 6.2.3
• minimising the impacts on native fauna	Satisfactory	Section 6.2.3
• landscaping the site to minimise visual and lighting impacts	Partial. What is the timeframe for screening to be fully established?	Section 5.4 and Section 6.2.8
• reviewing improved pasture species and application rates	Satisfactory	Section 5.5

Condition	Comments from DPE 8/2/18	Where Addressed
<ul style="list-style-type: none"> controlling weeds and feral pests 	Partial. Section 6.2.4 notes that 'regular' weed removal shall be conducted. Please specify the frequency of weed and pest inspections to determine if action is required	Section 6.2.4, Frequency addressed in Section 8.4, Section 8.5
<ul style="list-style-type: none"> controlling erosion 	Satisfactory	Section 9 of Surface Water Management Plan. 6.2.1
<ul style="list-style-type: none"> controlling access 	Satisfactory	Section 6.2.9
and <ul style="list-style-type: none"> bushfire management 	Satisfactory	Section 6.2.7
(e) include a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria;	Satisfactory	Section 7 & Section 8
(f) include a mass balance calculation to ensure that appropriate volumes of material are available to implement the final landform as described in this plan	Satisfactory	Section 4.5.6
(g) provide for the construction and maintenance of the process water dam in accordance with the approved design and construction criteria (see Condition 42(b));	Construction methodology of the process dam not provided.	Process Dam construction no longer required, see Section 4.4.2
(h) identify the potential risks to the successful rehabilitation of the site, and include a description of the contingency measures that would be implemented to mitigate these risks	Satisfactory	Section 9
(i). include details of who would be responsible for monitoring, reviewing, and implementing the plan	Satisfactory	Section 11

Condition 65 outlines Management Plan requirements.

2.2. Other Authorities

During the preparation of the Environmental Management Strategy and Operational Environmental Management Plan, the Office of Environment and Heritage (OEH) and The Hills Shire Council (Council) were consulted for comments. The OEH declined to comment, however Council provided the following requests regarding the Flora and Fauna Management Plan:

1. Additional information is required to be provided on Part (c), dot point 3, in regard to planting around the conservation area.

planting around the conservation area to further buffer this area and enhance its long term viability as a bushland ecosystem;

2. Additional information is required to be provided on Part (c), dot point 4, in regard to improving connectivity of existing and future vegetation. In this regard the information provided refers only to separation distances between vegetation and does not adequately address how areas will be linked, actions required to be undertaken such as additional planting, and on-going management.

connection of existing areas and future areas of revegetation to form a network of wildlife corridors throughout site and to adjoining lands to facilitate species recruitment through natural immigration;

These points are addressed in Section 6.2.3.

Section 3. Post Quarrying Land Use

3.1. Conceptual Final Landform

The conceptual final landform is shown on *Figure One*.

The majority of the site is to be revegetated with locally occurring native species. The existing site facilities and unimproved pasture will remain in the north-west of the site and the process dam is to be retained.

The final landform is to slope gently from the native trees screens along Old Northern Road and from the planted bunds along Roberts Road to the dam in the north-eastern corner.

The final landform floor within this document has been adopted to reflect the Groundwater Management Plan (GWMP) prepared by Dundon Consulting 21st September 2017. Figure 14 from the GWMP document shows the Maroota Sands wet weather high groundwater level contours. The 185 RL groundwater level has been transposed onto *Figure One* in this document, and the 2 metre freeboard above this contour (i.e. 187m RL) is also shown. The floor gradually slopes to the south and south west to 188m RL, which also reflects the findings in Figure 14 from the GWMP.

This landform is contingent on approval by DoI-Water as to the agreed wet weather high groundwater level.

There are 30 metre buffers from Old Northern Road and Roberts Road and 10 metre buffer from the northern boundary. The batter slopes are between 3 Horizontal: 1 Vertical (3H:1V) to 2.5H:1V.

The battered faces will be constructed with insitu clay over-burden and inter-burden as well as clay wash from the processing plant. The exact amount of clay that will be encountered has not been determined and due to its lensing nature is un-economical to quantify. As

extraction approaches the buffer limits the proponent will assess the mass balance of burden verses final landform at that time and extract the sand to an appropriate slope and then place burden, shape and then finally topsoil to achieve the proposed slopes.

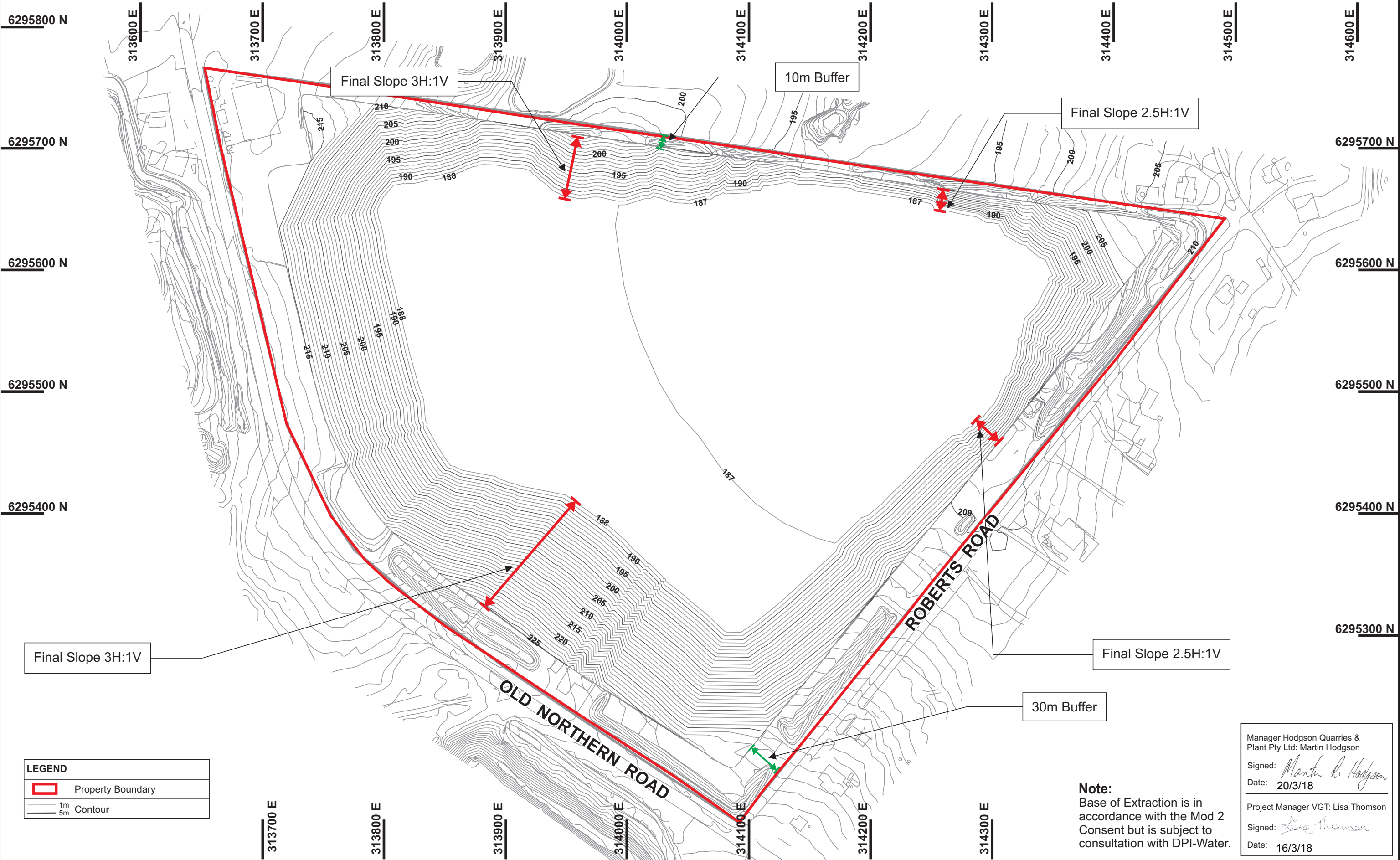
3.2. Proposed Final Land uses

The final land use has been described in the Environmental Assessment (Nexus Environmental Planning Pty Ltd, September 2015):

- Indigenous native vegetation to the majority (70 %) of the site
- Unimproved pasture/existing facilities to remain (23 %)
- Dams (7 %).

Plan of:	Roberts Rd Maroota Sand Quarry Rehabilitation Plan 2017 - Final Landform	Location:	Maroota Quarry, Roberts Road, Maroota, NSW	Source:	Google Earth Pro - Image Date 5 September 2017	Our Ref:	5072_HMA_EMP_RP17_C001_V4_F1.cdr
Figure:	ONE	Council:	Hills Shire Council	Survey:	Integral Surveying	Plan By:	LT/JD
Sheet:	1 of 1	Tenures:	N/A	Projection:	MGA	Project Manager:	LT
Version/Date:	V4 13/03/2018	Client:	Hodgson Quarries & Plant Pty Ltd	Contour Interval:	1m	Office:	Thornton

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 Signed: *Martin R. Hodgson*
 Date: 20/3/18

Project Manager VGT: Lisa Thomson
 Signed: *Lisa Thomson*
 Date: 16/3/18

Note:
 Base of Extraction is in accordance with the Mod 2 Consent but is subject to consultation with DPI-Water.

Section 4. Rehabilitation Planning and Management

4.1. Site Access Control

Access to the site is currently controlled using barbed wire fencing around the perimeter. The gate is located adjacent to the weighbridge and office. The landowner will retain this external fencing, and add internal fencing as required. Areas under active rehabilitation will be marked and locations included in the induction for staff and contractors.

4.2. Domain Selection

Based on the NSW Planning and Environment Resources and Energy division *ESG3: Mining Operations Plan guidelines* (NSW Trade & Investment, ESU, Sept 2013), the site has been divided into Primary Domains (Operational) as listed in *Table 3* and illustrated on Figure Two and Secondary Domains (Post Mining Land Use) as listed in *Table 4*. The numbering is taken from the ESG3 guidelines and not all domains listed in the guidelines apply to this site. The application of these domains assists in the planning of the rehabilitation and provides a clear picture of the progress of the site over time. At present the site comprises of only primary domains.

4.2.1. Primary Domains

Table 3. Operational Domain Codes

Code	Primary Domains (Operational)
1	Infrastructure Area
3	Water Management Area
4	Overburden Emplacement Area
6	Void (open cut void)
9	Native Vegetation Conservation Area

4.2.1.1. Domain 1: Infrastructure

This domain includes the buildings (office, workshop, lunch room, weighbridge, storage hard-stand, and nursery) and plant, car parks and haul roads, and stockpile areas.

4.2.1.2. Domain 3: Water Management Areas

This domain consists of the Process Dam, the drying areas and sediment dams within the active quarry, and the two dams used by the landowner.

4.2.1.3. Domain 4: Overburden Emplacement Areas

Overburden and topsoil has been previously emplaced on the perimeter of the property as visual and acoustic bunds and in stockpiles. All perimeter bund walls are vegetated with a mix of pasture and native trees. Temporary bunds are pushed up around each extraction area. The bunds should be vegetated with temporary pasture species within 10-20 days as described in the Surface Water Management Plan.

The emplacement area in the north-east of the site has some temporary vegetation and some uncovered stone and sand.

4.2.1.4. Domain 6: Open Cut Void

This domain consists of active walls surrounding the edge of the active extraction area. All of the inner pit walls are un-vegetated.

4.2.1.5. Domain 9: Native Vegetation Conservation Areas

These are areas of remnant native vegetation that are required to remain undisturbed.

4.2.2. Secondary Domains

Table 4. Post Mining Land Use Domain Codes

Code	Secondary Domains (Post Mining)
A	Infrastructure
B	Water Management Area
C	Rehabilitation Area- Grassland
E	Rehabilitation Area- Woodland
J	Native Vegetation Conservation Area

4.2.2.1. Domain A- Infrastructure

This domain incorporates the site access road and haul roads to be retained for future property access.

4.2.2.2. Domain B Water Management Area

This domain incorporates the remaining final landform water body to be retained for future land uses.

4.2.2.3. Domain C Rehabilitation Area- Grassland

This domain incorporates areas within the mine that were formerly extraction areas and other infrastructure not to be retained at completion of extraction activities. The grassland areas will consist of native grasses and shrubs as well as some tree species and is located within the gently sloped floor of the final landform leading to the final landform water body.

4.2.2.4. Domain E Rehabilitation Area- Woodland

This domain incorporates all remaining rehabilitated areas. It is noted that the vegetation re-established within this domain will be generally comparable with the species composition of the existing community, however, vegetation structure will vary and may not specifically classify as the existing community. The woodland areas are located around the perimeter of the property and the steeper slopes in the final landform.

4.2.2.5. Domain J Native Vegetation Conservation Area

This domain consists of the remnant native vegetation that will not be disturbed.

Plan of:	Roberts Rd Maroota Sand Quarry Rehabilitation Plan 2017 - Existing Domains	Location:	Maroota Quarry, Roberts Road, Maroota, NSW	Source:	Integral Surveying - Image Date May 2016	Our Ref:	5072_HMA_EMP_RP17_C002_V1_F2.cdr
Figure:	TWO	Council:	Hills Shire Council	Survey:	Integral Surveying	Plan By:	LT/JD
Sheet:	1 of 1	Tenures:	N/A	Projection:	MGA	Project Manager:	LT
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LEGEND	
Feature/Domain	
	Property Boundary
	30metre Buffer
	Contour
Primary Domains (Operational)	
	1 Infrastructure Area (Including Stockpile)
	3 Water Management Area
	4 Overburden Emplacement Area
	6 Void (Open Cut Void)
	9 Conservation Area
Rehabilitation Phases	
	Rehabilitation Phase (Ecosystem & Land Use Establishment)

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 Project Manager VGT: Lisa Thomson
 Signed: *Lisa Thomson*
 Date: 16/3/18

4.3. Rehabilitation Phases

Rehabilitation phases, as described by the ESG3 Guidelines, will be used to describe the current rehabilitation status of the site and future progress of the rehabilitation. The rehabilitation phases vary depending on the rehabilitation objectives for each domain. For the purposes of this report, Relinquished Lands, refers to a particular domain having reached the rehabilitation objectives set and the final landform has been approved by the Secretary.

Table 5. Summary of Current Rehabilitation Phases (by Domain)

Domain/ Rehabilitation Phase	Infrastructure/ Infrastructure (1A)	Infrastructure/ Grassland (1C)	Water Management/ Water Management (3B)	Water Management/ Grassland(3C)	Overburden Emplacement/ Grassland (4C)	Overburden Emplacement/ Woodland (4E)	Void/ Grassland (6C)	Void/ Woodland (6E)	Native Vegetation Area- (9J)
Active Mining Area	✓	✓	✓	✓	✓	✓	✓	✓	✓
Decommissioning	✗	✗	✗	✗	✗	✗	✗	✗	✓
Landform Establishment	✗	✗	✗	✗	✗	✗	✗	✗	✓
Growth Medium Development	✗	✗	✗	✗	✗	✗	✗	✗	✓
Ecosystem and Land Use Establishment	✗	✗	✗	✗	✗	✗	✗	✗	✓
Ecosystem and Land Use Sustainability	✗	✗	✗	✗	✗	✗	✗	✗	✗
Relinquished Lands	✗	✗	✗	✗	✗	✗	✗	✗	✗

4.4. Activities Planned for Short Term (3 years)

4.4.1. Stages 1 and 2

4.4.1.1. *Temporary Bundwall Construction*

Extraction will initially be focused within Stages 1 and 2 in the first few years. This will require the construction of the temporary bunds as shown in *Figure Four*.

4.4.1.2. *Progressive Rehabilitation*

It is planned to extract from the eastern portion of Stage 1 to completion in the next few years. Once this area has been exhausted clay and overburden material won from the south west extraction area will be emplaced in order to create the final landform within the cell. The final contours will be graded to approximately 3H:1V and covered with 300mm of subsoil from the stockpiled subsoil. Topsoil to a depth of 100mm will be keyed in with layer of mulch up to 75mm depth placed on top prior to planting.

The north eastern portion of Stage 1 will continue to be re-worked and the final landform to be developed. It is envisaged that the re-shaping of this area will continue for the life of the project and it will not be ready to revegetate in the next few years.

4.4.1.3. *Protection of Existing Vegetation*

The focus of tree and vegetation protection is limited to the perimeter of the site, including the vegetated earth bunds, which were created as part of the initial approval of the extraction works. As extraction will not proceed beyond the bunds it is unlikely that these

areas will be disturbed. Temporary fencing may be erected in target areas to prevent access if required.

The landscape plan within the EIS envisaged that native trees would be included in the plantings over the perimeter bunds. The local energy provider has removed seedlings from the perimeter bunds under power lines due to concerns with mature heights of the trees planted. It is therefore planned to vegetate these areas with shrubs rather than trees.

4.4.2. Process Dam Development

The original 1999 EIS described a Process Dam extracted to a depth of 178m RL or firm base, with a temporary internal wall approximately 10m high. *Figure Eight* shows the original cross sections along with the current extraction depth limit. As can be seen, these dam construction works are no longer required at the new extraction limit of RL 187m, which is the current water level of the process dam, rather than the original 178m.

There will therefore be no further construction within the Process Dam footprint.

4.5. Activities Planned for Medium and Long Term

4.5.1. Permanent Bundwall Construction

Construction of the permanent bundwalls on the perimeter of the site will commence prior to the opening up of Stages 3 to 6. They will be constructed from site material, including stockpiled subsoil material where available as per temporary bunds. Material from temporary bunding and clay may also be used.

4.5.2. Progressive Rehabilitation

Proposed landscape rehabilitation areas within the site can only occur when the active cells have been fully extracted to the site perimeter and are no longer being utilised by machinery to access further cells, or for stockpiling etc. Therefore, as soon as areas within the site have been fully extracted, these areas will be made available for rehabilitation and fenced off to allow for undisturbed regeneration. Rehabilitation treatment of these areas is described in *Section 5.1 to 5.7* below.

4.5.3. Protection of Existing Vegetation

Protection of existing vegetation will continue over the life of the site as outlined in *Section 4.4.1.3* above.

4.5.4. Process Dam Development

As discussed in *Section 4.4.2*, the development, design and management of the processing dam is no longer allowable under the current consent modification.

4.5.5. Reuse Existing Resources

The site will seek to reuse onsite material to undertake rehabilitation works.

Table 6. Re-Use of Site Resources

Resource	Potential Reuse
Overburden	Construct the bund walls
Topsoil and sub-surface soil	Used in rehabilitation and on the bund walls No contaminated or unsuitable material is to be allowed onto the site for use in rehabilitation.
Native seed	Collected from the surrounding area or purchased from a certified supplier to be used in rehabilitation
Turf	Stripped turf to be placed on temporary bund walls
Water in dams	Provide water for irrigation of vegetation in rehabilitation areas
Rocks	To be replaced in rehabilitation areas to provide habitat for native fauna, if available.

4.5.6. Resource Mass Balance

The availability of topsoil for the rehabilitation of the site is contingent on the stripping of new cells. Depths of topsoil vary over the site but generally the top 100mm of soil provides a topsoil material. Below this, up to 500mm in depth provides a subsoil suitable for use as a growth medium. Topsoil reserves currently held on the site are stored in the perimeter bunds that are designated to remain in the final landform and are unavailable for rehabilitation. There are minor reserves pushed up around the extraction area as temporary visual and acoustic bunds. The approved final landform requires that areas to be revegetated are covered by 100mm of topsoil over 300mm of subsoil material. New permanent bundwalls are to be covered with 300mm of topsoil followed by jute matting and 75mm of mulch.

As discussed previously, the final landform is contingent on discussions with DoI-Water as to the agreed wet weather high groundwater level which is currently under investigation and the presence of clay lenses (waste) that may reduce the viability of economic extraction. The exposure of unexpected clay lenses, on the other hand may provide additional material for rehabilitation efforts that is difficult to quantify.

The total rehabilitation area to be topsoiled according to the current approved landform is 207,000m². The following table summarises the estimated volumes of material required and the estimated resource stockpiled or available on the site. It excludes the permanent bunds from the calculation and excludes any material currently pushed up around the current extraction area.

Table 7. Soil Mass Balance

Material	Remaining Area to be stripped (m²)	Stripping Depth (m)	Volume estimated to be won (m³)	Volume required for Final Landform* (m³)
Topsoil	53,638	0.1	5,364	20,685
Subsoil	53,638	0.5	26,819	62,054

*Note these figures may vary from the EA due to groundwater constraints.

From the above calculation it appears there may be a shortfall in the volume of topsoil and subsoil available. Waste clay material recovered as a by-product of the extraction may be stockpiled for future use a sub-soil material in order to make up the shortfall. Importation of topsoil material may be required if subsoils and waste clay material prove to be unsuitable as a substitute with amelioration measures.

4.5.7. Final Landform

The final landform will be achieved in the long term after the resource extraction has been exhausted from the site. This will occur in approximately 8 to 9 years if current rates of extraction are maintained. Rehabilitation may take several years to complete after that time and full maturation of the vegetation and establishment of the ecosystem may take some decades after that.

Section 5. Rehabilitation Implementation

Section 5 is reproduced from *Section 4.5* in the *Rehabilitation Report* in the EA (Nexus Environmental Planning Pty Ltd, September 2015).

5.1. Topsoil Stripping and Storage

Areas of the site approved for extraction works shall have the topsoil level stripped and stockpiled for later re-use. Following the topsoil stripping, approximately 500mm of the next layer of soil, the sub-soil, shall also be stripped and stockpiled in a similar manner to the topsoil. The purpose stripping this additional layer of soil is for re-use on temporary and permanent bunding and also to replicate the soil profile in rehabilitated areas as close to the existing growing conditions of the vegetation community to be re-established.

It is proposed to stockpile the topsoil and subsoil in a convenient location which is both out the way of daily activity, however, easily accessed for re-use in the creation of bunds and for preparation of rehabilitation areas as necessary. The location of stockpiled material may change depending on the nature of the extraction works on site and the re-use of the stockpiled material will occur in line with extraction operations and timing schedules outlined in the EA.

A log book will be maintained to record the volumes of material stripped, storage location and re-use volumes and locations.

5.2. Seed Collection / Certified Stock

It is unlikely that seed collection will be undertaken on the site due to the lack of suitable plants on the site. Plant material will be sourced from a local supplier, who is able to certify seed or plant stock has been locally sourced and grown.

Plan of:	Roberts Rd Maroota Sand Quarry Rehabilitation Plan 2017 - Final Rehabilitation Plan (EA Plan LPDA 15-94/4)	Location:	Maroota Quarry, Roberts Road, Maroota, NSW	Source:	Concept Landscape Architects/Nexus Environmental Planning Pty Ltd Proposed Rehabilitation of Existing Sand Mine/Final Rehabilitation Details/Section 75W Modification 2 Dwg No:LPDA 15-94/4 Rev D 7/09/2015	Our Ref:	5072_HMA_EMP_RP17_C003_V2_F3.cdr
Figure:	THREE	Council:	Hills Shire Council	Survey:	N/A	Plan By:	LT/JD
Sheet:	1 of 1	Tenures:	N/A	Projection:	N/A	Project Manager:	LT
Version/Date:	V2 09/03/2018	Client:	Hodgson Quarries & Plant Pty Ltd	Contour Interval:	N/A	Office:	Thornton

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LEGEND

- FINAL DAM LOCATION AND EXTENTS - REFER ENGINEER'S PLANS
- EXISTING VEGETATION TO BE RETAINED AND PROTECTED
- STAGES 3, 4, 5 AND 6 BUND WALLS TO BE STABILISED WITH JUTE MATTING AND POCKET PLANTING - REFER DETAILS 4, 5 AND 6
- STAGES 3, 4, 5 AND 6 BUND WALLS TO BE REMOVED WHERE WITHIN FINAL EXCAVATION EXTENTS
- EXISTING VEGETATED BUND WALLS TO BE RETAINED
- EXISTING VEGETATED BUND WALLS TO BE REMOVED WHERE WITHIN FINAL EXCAVATION EXTENTS
- BOTTOM OF PIT TO BE HYDRO-MULCHED WITH NATIVE SEED MIX - REFER DETAIL 10
- 1V.3H GRADE EMBANKMENTS MASS PLANTED WITH ENDEMIC SPECIES - REFER DETAILS 07 AND 08
- EMBANKMENTS WITH FINAL SLOPES STEEPER THAN 1V.3H TO BE STABILISED WITH JUTE MATTING AND POCKET PLANTED WITH ENDEMIC SPECIES - REFER DETAILS 07 AND 11
- ENDEMIC SCREEN PLANTING WITH PERIMETER BUFFER SETBACKS - REFER DETAILS 07 AND 08
- STAGE 5B EXTRACTION ZONE TO BE USED FOR THE STOCKPILING OF SITE TOPSOIL AND SUBSOIL, AND USED FOR FINAL REHABILITATION PLANTING PREPARATION WORKS - REFER DETAILS

THE FOLLOWING SHALL BE UNDERTAKEN TO ENSURE AVAILABLE MATERIAL FOR THE PLANTING PREPARATION OF THE FINAL REHABILITATED SITE:

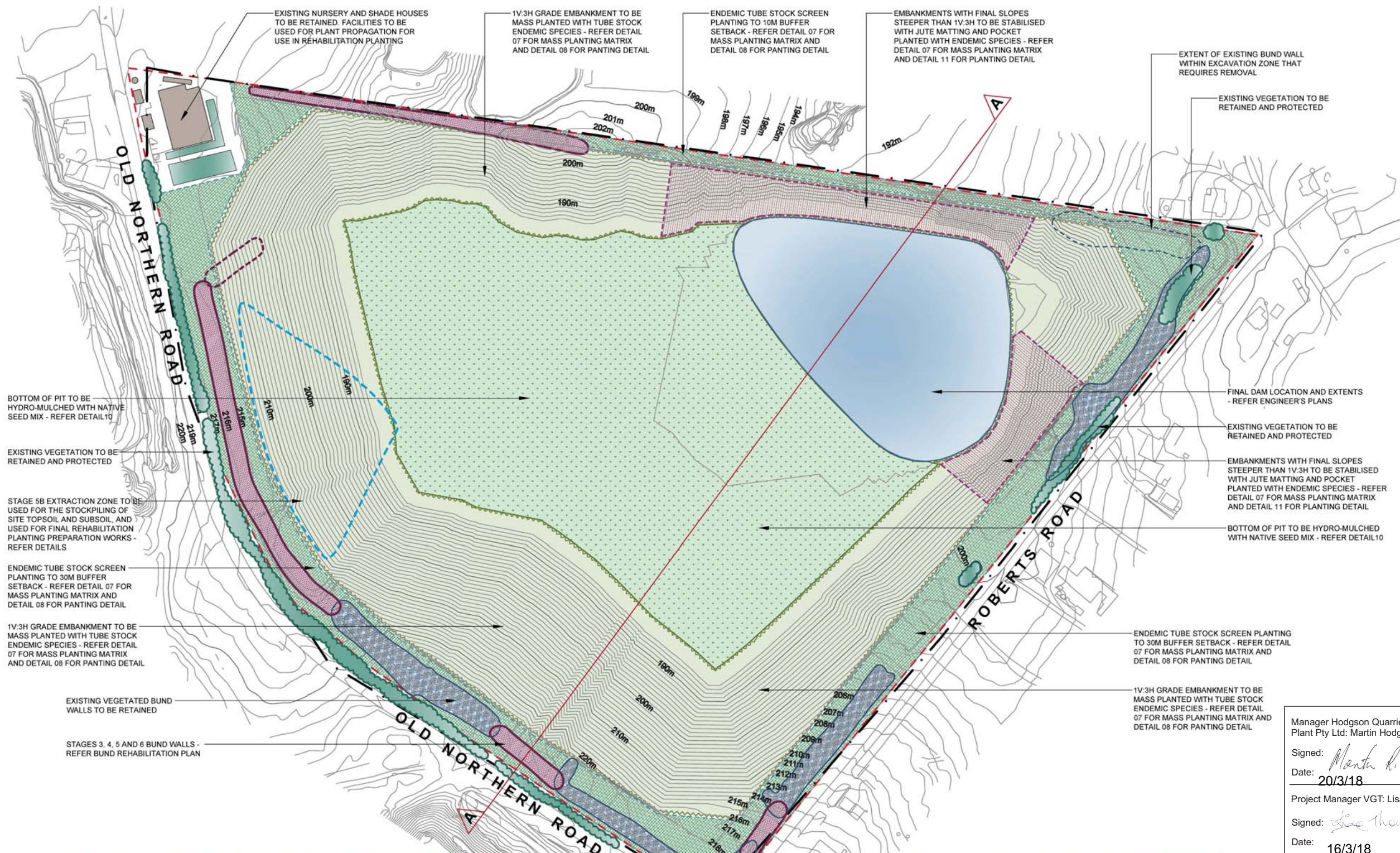
- 300MM DEPTH TOPSOIL TO BE EXCAVATED AND STOCKPILED (WITHIN STAGE 5 EXCAVATION ZONE)
- SUBSOIL TO BE TO BE EXCAVATED AND STOCKPILED (WITHIN STAGE 5 EXCAVATION ZONE)

THIS MATERIAL SHALL BE EXCAVATED AND STOCKPILED PRIOR TO COMMENCEMENT OF THE EXTRACTION WORKS FOR EACH STAGE, AND SHALL BE STORED SEPARATELY TO STOCKPILED MATERIAL FOR BUND WALL CONSTRUCTION.

STOCKPILED MATERIAL SHALL BE USED PROGRESSIVELY AS AREAS OF THE SITE ARE EXCAVATED AND FINISHED IN THEIR FINAL FORM AND READY FOR REHABILITATION PLANTING WORKS.

STOCKPILES MUST BE CLEARLY LABELLED AND IDENTIFIABLE TO ENSURE CORRECT FUTURE USE APPROPRIATE SEDIMENT AND EROSION CONTROL MEASURES SHALL BE UNDERTAKEN TO ENSURE NO MIXING, LEACHING, RUN-OFF OR CONTAMINATION OF STOCKPILES.

- CONSULTANTS INFORMATION**
- REFER TO PLANS, DETAILS, SPECIFICATION AND REPORTS PREPARED BY OTHER CONSULTANTS FOR ALL INFORMATION RELATING TO THAT PRACTICE, INCLUDING:
- NEXUS ENVIRONMENTAL PLANNING: PROJECT MANAGEMENT AND PLANNING
 - LYLE MARSHALL & ASSOCIATES: TRAFFIC AND ACCESS
 - AUSTRALIAN GROUNDWATER TECHNOLOGIES: GROUNDWATER MONITORING & MANAGEMENT
 - PETER DUNDON & ASSOCIATES: GROUNDWATER
 - VGT ENVIRONMENTAL COMPLIANCE SOLUTIONS: SITE LAYOUT AND EXTRACTION PLANS, MODIFIED DAM DESIGN, MODIFIED RESOURCE VOLUMES
 - WILKINSON MURRAY: ACOUSTIC IMPACT ASSESSMENT, AIR QUALITY ASSESSMENT



Manager Hodgson Quarries & Plant Pty Ltd: Martin Hodgson
 Signed: *Martin R. Hodgson*
 Date: 20/3/18
 Project Manager VGT: Lisa Thomson
 Signed: *Lisa Thomson*
 Date: 16/3/18

5.3. Temporary Bunding

The construction of the temporary bundwalls shall be as described in the EIS from the material won from Stages 1 and 2 (see *Figure Four- Bund Rehabilitation Plan (EA Plan LPDA 15-94/2)* and *Figure Five- Bund Rehabilitation Details (EA Plan LPDA 15-94/3)*) as follows:

- Turf is to be stripped using a turf cutter and stored in an appropriate location.
- 300mm depth of topsoil will be excavated and stockpiled (outside of extraction areas)
- Subsoil is to be excavated and stockpiled (outside of extraction areas).
- Stockpiles will be clearly labelled and identifiable to ensure correct future use.
- Appropriate sediment and erosion controls shall be undertaken to ensure no mixing, leaching, run-off or contamination of stockpiles.
- Temporary bundwalls are to be constructed in accordance with the engineers staging plans and directions as listed i.e. 5 metres high with 1H:1V walls.
- Temporary bundwalls will be re-turfed with stripped turf from stages 1 and 2 extraction zones.

Plan of:	Roberts Rd Maroota Sand Quarry Rehabilitation Plan 2017 - Bund Rehabilitation Plan (EA Plan LPDA 15-94/2)	Location:	Maroota Quarry, Roberts Road, Maroota, NSW	Source:	Concept Landscape Architects/Nexus Environmental Planning Pty Ltd Proposed Rehabilitation of Existing Sand Mine/Bund Rehabilitation Plan/Section 75W Modification 2 Dwg No:LPDA 15-94/2 Rev D 7/09/2015	Our Ref:	5072_HMA_EMP_RP17_C004_V2_F4.cdr
Figure:	FOUR	Council:	Hills Shire Council	Survey:	N/A	Plan By:	LT/JD
Sheet:	1 of 1	Tenures:	N/A	Projection:	N/A	Project Manager:	LT
Version/Date:	V2 09/03/2018	Client:	Hodgson Quarries & Plant Pty Ltd	Contour Interval:	N/A	Office:	Thornton

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LEGEND

- STAGED EXTRACTION ZONES - REFER ENGINEER'S PLANS
- TEMPORARY BUND WALLS:** STAGES 1 AND 2 BUND WALL TO BE RE-TURFED WITH STRIPPED TURF FROM STAGES 1 AND 2 EXTRACTION ZONES - REFER DETAILS 1, 2 AND 3
- PERMANENT BUND WALLS:** STAGES 3, 4, 5 AND 6 BUND WALLS TO BE STABILISED WITH JUTE MATTING AND POCKET PLANTING - REFER DETAILS 4, 5 AND 6
- EXISTING VEGETATED BUND WALLS TO BE RETAINED

PRIOR TO COMMENCEMENT OF STAGES 1 AND 2 EXTRACTION WORKS, THE FOLLOWING SHALL BE UNDERTAKEN TO ENSURE AVAILABLE MATERIAL FOR THE CONSTRUCTION OF BUND WALLS:

- TURF TO BE STRIPPED USING A TURF CUTTER AND STORED IN AN APPROPRIATE LOCATION
- 300MM DEPTH TOPSOIL TO BE EXCAVATED AND STOCKPILED (OUTSIDE OF EXTRACTION AREAS)
- SUBSOIL TO BE TO BE EXCAVATED AND STOCKPILED (OUTSIDE OF EXTRACTION AREAS)

PRIOR TO COMMENCEMENT OF STAGES 3, 4, 5 AND 6 EXTRACTION WORKS, THE FOLLOWING SHALL BE UNDERTAKEN TO ENSURE AVAILABLE MATERIAL FOR THE CONSTRUCTION OF BUND WALLS:

- 300MM DEPTH TOPSOIL TO BE EXCAVATED AND STOCKPILED (OUTSIDE OF EXTRACTION AREAS)
- SUBSOIL TO BE TO BE EXCAVATED AND STOCKPILED (OUTSIDE OF EXTRACTION AREAS)

STOCKPILES MUST BE CLEARLY LABELLED AND IDENTIFIABLE TO ENSURE CORRECT FUTURE USE. STOCKPILING SHALL BE LOCATED IN AN AREA OUTSIDE OF SUBSEQUENT EXTRACTION AREAS AND AS CLOSE AS POSSIBLE TO THE FUTURE BUND WALLS LOCATIONS. APPROPRIATE SEDIMENT AND EROSION CONTROL MEASURES SHALL BE UNDERTAKEN TO ENSURE NO MIXING, LEACHING, RUN-OFF OR CONTAMINATION OF STOCKPILES.

CONSULTANTS INFORMATION

REFER TO PLANS, DETAILS, SPECIFICATION AND REPORTS PREPARED BY OTHER CONSULTANTS FOR ALL INFORMATION RELATING TO THAT PRACTICE, INCLUDING:

- NEXUS ENVIRONMENTAL PLANNING: PROJECT MANAGEMENT AND PLANNING
- LYLE MARSHALL & ASSOCIATES: TRAFFIC AND ACCESS
- AUSTRALIAN GROUNDWATER TECHNOLOGIES: GROUNDWATER MONITORING & MANAGEMENT
- PETER DUNDON & ASSOCIATES: GROUNDWATER
- VGT ENVIRONMENTAL COMPLIANCE SOLUTIONS: SITE LAYOUT AND EXTRACTION PLANS, MODIFIED DAM DESIGN, MODIFIED RESOURCE VOLUMES
- WILKINSON MURRAY: ACOUSTIC IMPACT ASSESSMENT, AIR QUALITY ASSESSMENT



Manager Hodgson Quarries & Plant Pty Ltd: Martin Hodgson
 Signed: *Martin R. Hodgson*
 Date: 20/3/18

Project Manager VGT: Lisa Thomson
 Signed: *Lisa Thomson*
 Date: 16/3/18



SITE PHOTO 1: EXISTING GRASS BUND WALLS TO BE RETAINED



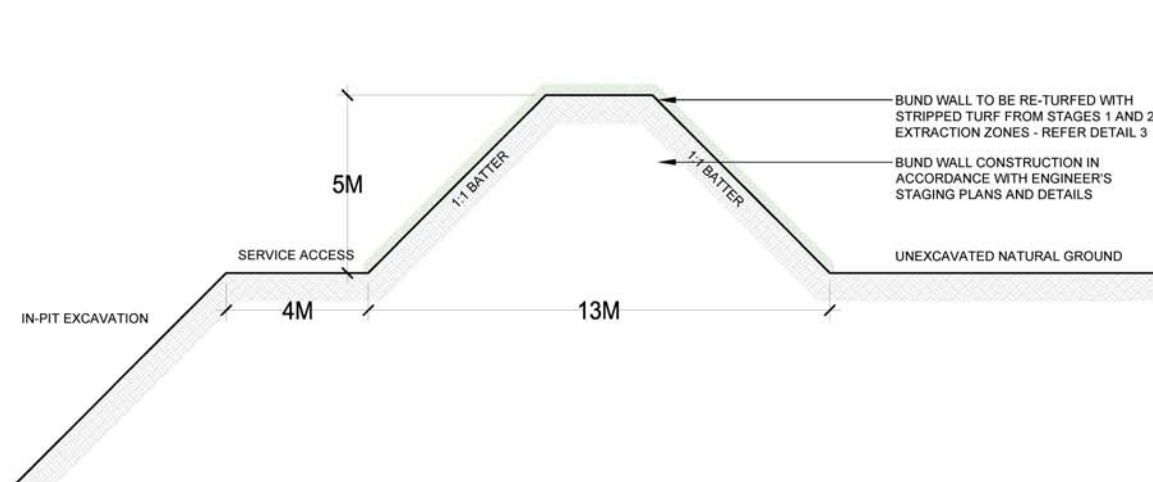
SITE PHOTO 2: GRASS BUND WALLS RECENTLY MASS PLANTED WITH ENDEMIC TUBE STOCK



SITE PHOTO 3: EXISTING BUND WALLS WITH ESTABLISHED ENDEMIC VEGETATION

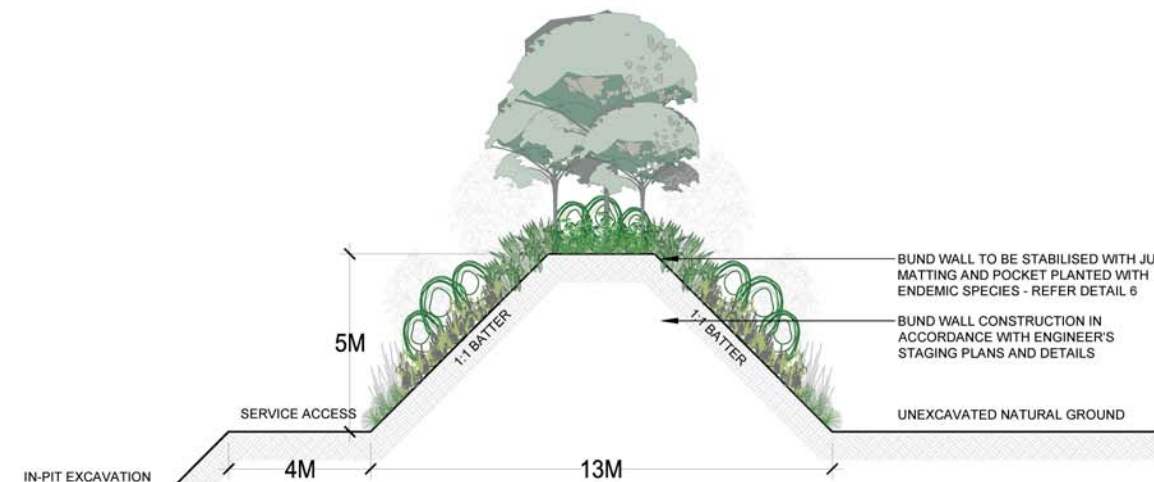
Plan of:	Roberts Rd Maroota Sand Quarry Rehabilitation Plan 2017 - Bund Rehabilitation Details (EA Plan LPDA 15-94/3)	Location:	Maroota Quarry, Roberts Road, Maroota, NSW	Source:	Concept Landscape Architects/Nexus Environmental Planning Pty Ltd Proposed Rehabilitation of Existing Sand Mine/Bund Rehabilitation Details/Section 75W Modification 2 Dwg No:LPDA 15-94/3 Rev B 14/10/2014	Our Ref:	5072_HMA_EMP_RP17_C005_V1_F5.cdr
Figure:	FIVE	Council:	Hills Shire Council	Survey:	N/A	Plan By:	LT/JD
Sheet:	1 of 1	Tenures:	N/A	Projection:	N/A	Project Manager:	LT
Version/Date:	V1 09/03/2018	Client:	Hodgson Quarries & Plant Pty Ltd	Contour Interval:	N/A	Office:	Thornton

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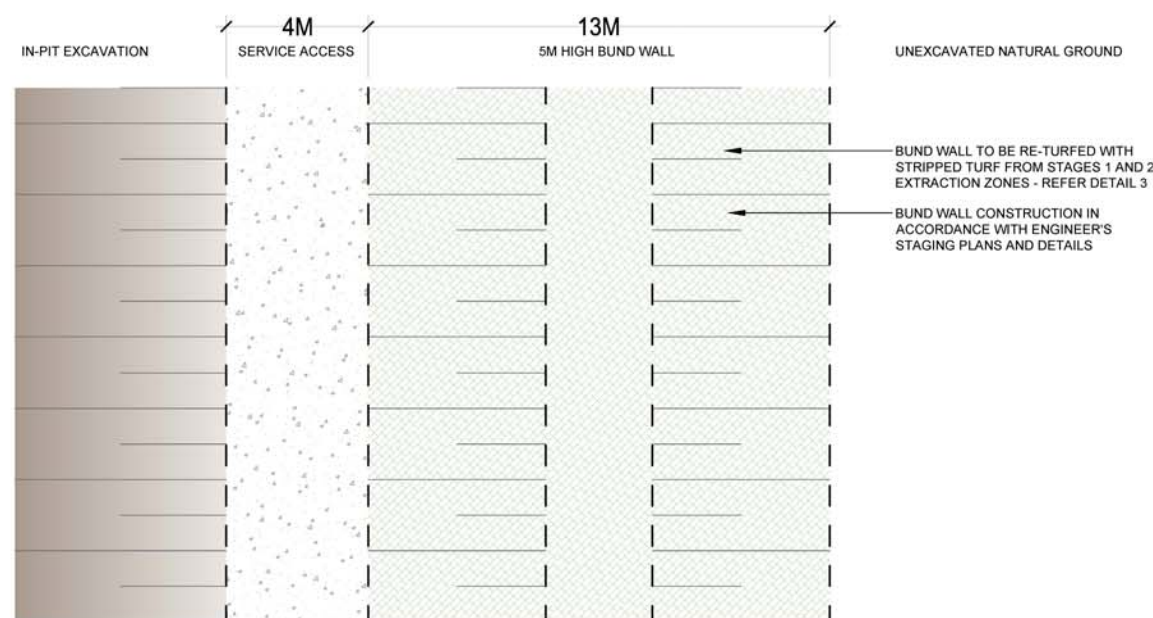
DETAIL 01: TEMPORARY BUND WALL SECTION

SCALE 1:100



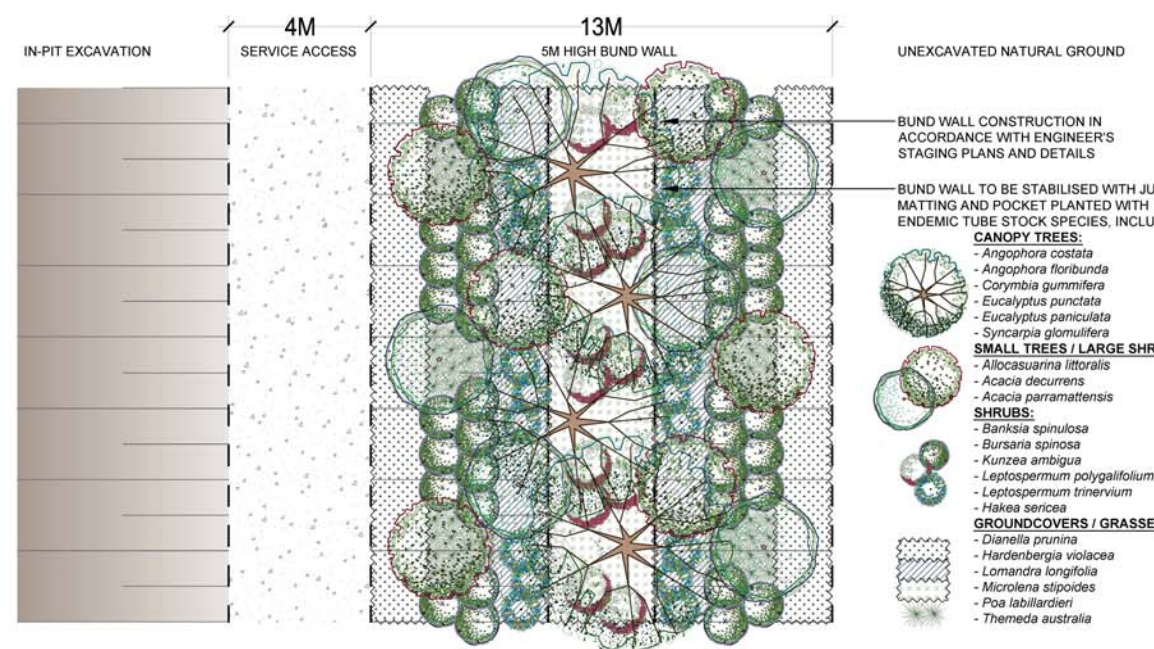
DETAIL 04: PERMANENT BUND WALL SECTION

SCALE 1:100



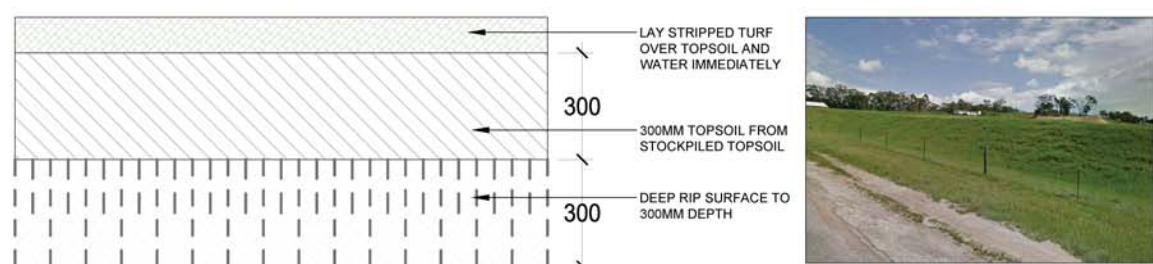
DETAIL 02: TEMPORARY BUND WALL PLAN

SCALE 1:100



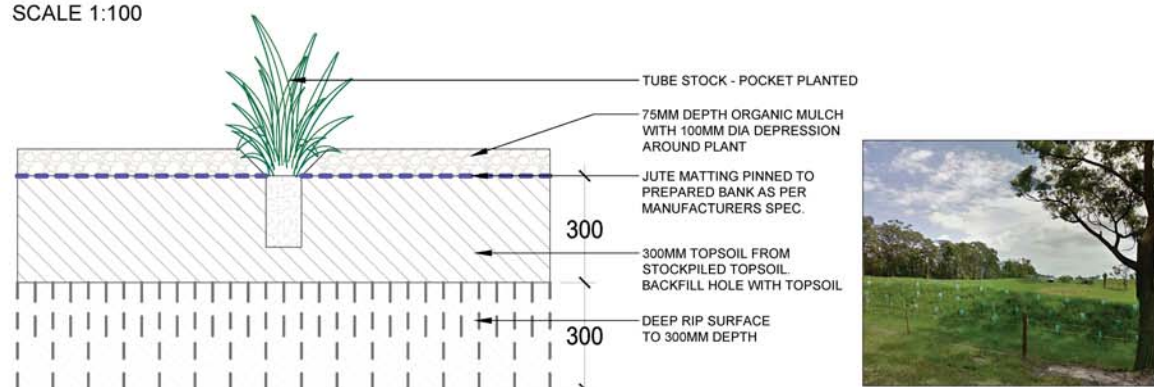
DETAIL 05: PERMANENT BUND WALL PLAN

SCALE 1:100



DETAIL 03: TEMPORARY BUND WALL TURFING

SCALE 1:10



DETAIL 06: PERMANENT BUND WALL TUBE STOCK PLANTING

SCALE 1:10

MAINTENANCE SCHEDULE

GENERAL
AFTER THE COMPLETION OF THE SPECIFIED REHABILITATION WORKS, VEGETATED AREAS SHALL BE SUBJECT TO A MINIMUM LANDSCAPE WORKS PERIOD OF 12 MONTHS. DURING THIS TIME THE LANDSCAPE CONTRACTOR SHALL MAKE GOOD ALL DEFECTS WHICH MAY OCCUR FOR WHATEVER REASON.

CONSOLIDATION AND MAINTENANCE SHALL MEAN THE CARE AND MAINTENANCE OF ALL AREAS UNDERGOING REHABILITATION IN ACCORDANCE WITH THIS REPORT AND ASSOCIATED PLANS, ENSURING THAT A SATISFACTORY RESULT OCCURS FOR THESE AREAS WITH REGARDS TO GERMINATION AND ESTABLISHMENT.

THE MAINTENANCE SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING ITEMS WHERE AND AS REQUIRED:

- WATERING ALL LANDSCAPED AREAS
- MONITORING GERMINATION, REPLACEMENT PLANTING AND RE-HYDROMULCHING
- WEED CONTROL
- MAKE GOOD AREAS OF SOIL SUBSIDENCE OR EROSION
- TOPPING UP OF MULCHED AREAS
- SPRAY / TREATMENT FOR INSECT AND DISEASE CONTROL
- MONITORING AND CONTROLLING RABBITS

WATERING
ALL AREAS WHICH HAVE BEEN HYDROMULCHED OR POCKET PLANTED SHALL BE WATERED IN THOROUGHLY FOLLOWING INITIAL WORKS, & SHALL BE WATERED A MINIMUM 3 TIMES PER WEEK DURING WINTER, AND 4 TIMES PER WEEK DURING SUMMER. WATERING SHALL BE DONE BY HAND, UTILIZING DAM WATER ON SITE. FREQUENCY OF WATERING MAY BE ADJUSTED BASED ON WHETHER CONDITIONS, WITH THE OBJECTIVE TO ENSURE THE MAXIMUM PERCENTAGE OF SUCCESSFUL ESTABLISHED PLANT STOCK.

MONITORING GERMINATION, REPLACEMENT PLANTING AND RE-HYDROMULCHING
AREAS UNDERGOING REHABILITATION SHALL BE CONTINUALLY MONITORED UNTIL WELL ESTABLISHED, WITH FAILURES BEING REPLACED IN LINE WITH THE REPORT AND LANDSCAPE SPECIFICATION, AND FAILED HYDROMULCHING RE-SPRAYED.

ALL REPLACEMENTS SHALL BE TO SPECIFICATION, AND OF A SIZE EQUIVALENT TO SIMILAR HEALTHY SPECIES SURROUNDING THE REJECTED PLANT, OR, AS IN THE CASE OF MATURE TREES, TO THE ORIGINAL SIZE AND QUALITY, AS A MINIMUM.

WEED CONTROL
WEED REMOVAL SHALL BE CONDUCTED REGULARLY, WITH HAND REMOVE ALL TOP GROWTH ROOTS, RHIZOMES AND STOLONS OF UNWANTED VEGETATION. THE REGULAR CONTROL OF ALL WEEDS IS ESSENTIAL. THE APPLICATIONS OF PRE-EMERGENT SPRAYS ARE ACCEPTABLE WITH APPROVED CHEMICALS APPLIED IN STRICT ACCORDANCE WITH MANUFACTURER DIRECTIONS. ANY SPRAYING SHALL BE DONE DURING CALM DAYS, TO AVOID WINDS BLOWING HERBICIDES ONTO NATIVE PLANTING.

INSECT, DISEASE CONTROL AND RABBIT CONTROL
THE LANDSCAPE CONTRACTOR SHALL BECOME FAMILIAR WITH THE HEALTHY APPEARANCE OF THE PLANT MATERIAL, AND CONSTANTLY MONITOR IT FOR DAMAGE OR PEST INFESTATIONS. WHEN EITHER OF THESE BECOME EVIDENT THE CONTRACTOR SHALL IMMEDIATELY APPLY THE NECESSARY CONTROL MEASURES.

IF NEWLY PLANTED AREAS ARE BECOMING SUBJECT TO RABBIT ATTACK, IT MAY BE NECESSARY TO INSTALL APPROVED RABBIT-PROOF FENCING TO THE AREA OF REHABILITATION, TO ENSURE MINIMAL DAMAGE IS DONE.

Manager Hodgson Quarries & Plant Pty Ltd: Martin Hodgson

Signed: *Martin R. Hodgson*
Date: 20/3/18

Project Manager VGT: Lisa Thomson

Signed: *Lisa Thomson*
Date: 16/3/18

5.4. Permanent Bunding and Screen Planting

Permanent bundwalls are to be constructed within a 30m setback to Old Northern Road and Roberts Road. A service access area of 4m will be retained between the pit excavation and the toe of the bundwalls. The bundwall will extend a further 13m (toe to toe) towards the boundary as shown in Detail 4 & 5 of the EA plans shown in *Figure Five*. These walls are to be mass planted with native tube stock, according to the Rehabilitation Plan in the EA.

Boundary plantings under powerlines are to be in accordance with energy provider requirements, i.e. grasses and groundcovers only. Existing perimeter vegetation is to remain as undisturbed as possible. Access is only to be permitted for rehabilitation and monitoring activities as required by the consent.

There is expected to be minimal adverse stray light impacts due to the presence of the bunds as well as the screen planting. The site does not operate overnight and lighting of the processing area is not required.

The construction will proceed as shown in the EIS Landscaping Plan as outlined below.

- 300mm depth of topsoil will be excavated and stockpiled (outside of extraction areas).
- Subsoil is to be excavated and stockpiled (outside of extraction areas).
- Stockpiles will be clearly labelled and identifiable to ensure correct future use.
- Appropriate sediment and erosion controls shall be undertaken to ensure no mixing, leaching, run-off or contamination of stockpiles.
- Permanent bundwalls are to be constructed in accordance with the engineers staging plans and directions as listed i.e. 5 metres high with 1H:1V walls.
- The surface of the bunds will be deep ripped to 300mm and topsoil to a depth of 300mm be keyed in.
- The bundwalls will be stabilised with Jute Matting and 75mm of organic mulch laid on top with pocket planting of endemic tube stock species.
- Species to be planted under the power lines will have a mature height that will not interfere with the overhead infrastructure i.e. Shrub and grass species.
- Planting density will be as shown in *Figure Five- Bund Rehabilitation Details (EA Plan LPDA 15-94/3) Details 4 and 5* from the EA Landscaping Plan.

In areas where the permanent perimeter bund walls will not be constructed, buffer visual screening will be achieved through planting in a manner as close as practicable to that described in the EA. Endemic species will be planted within the 10m setback from the boundary as described in *Section 5.5.2* below for Pocket Planting. In summary tubestock will mass planted with density as described in *Table 10*. Slopes greater than 3H:1V will be stabilised with jute matt.

Soil preparation will proceed as follows:

- The surface of the buffer areas will be deep ripped to 300mm and topsoil to a depth of 300mm be keyed in.
- The buffer areas will be stabilised with Jute Matting if slopes are greater than 3H:1V and 75mm of organic mulch laid on top with pocket planting of endemic tube stock species. Jute matting is not required for slopes less than 3H:1V.
- Planting density will be as shown in *Figure Six- Final Rehabilitation Details- (EA Plan LPDA 15-94/5) Detail 7 & 9* from the EIS Landscaping Plan.

5.4.1. Timeframe for Screen Establishment

Permanent bund walls will be completed as suitable material becomes available for construction, as importation is not permitted. Within six months after construction is completed, the walls will be vegetated with grasses or ground-covers to reduce dust emissions and stabilise the structures. Complete screening may take three years or more where larger trees are to be planted in accordance with the Landscape Plan from the EA. Vegetation will be monitored as detailed in *Section 8* and replaced as required.

Plan of:	Roberts Rd Maroota Sand Quarry Rehabilitation Plan 2017 - Final Rehabilitation Plan (EA Plan LPDA 15-94/5)	Location:	Maroota Quarry, Roberts Road, Maroota, NSW	Source:	Concept Landscape Architects/Nexus Environmental Planning Pty Ltd Proposed Rehabilitation of Existing Sand Mine/Final Rehabilitation Details/Section 75W Modification 2 Dwg No:LPDA 15-94/5 Rev B 14/10/2014	Our Ref:	5072_HMA_EMP_RP17_C006_V2_F6.cdr
Figure:	SIX	Council:	Hills Shire Council	Survey:	N/A	Plan By:	LT/JD
Sheet:	1 of 1	Tenures:	N/A	Projection:	N/A	Project Manager:	LT
Version/Date:	V2 09/03/2018	Client:	Hodgson Quarries & Plant Pty Ltd	Contour Interval:	N/A	Office:	Thornton

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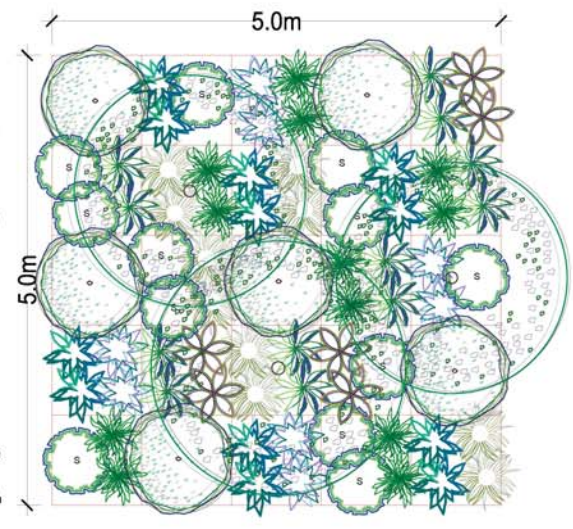
SECTION AA: FINAL REHABILITATION OF SITE SCALE 1:1000

Manager Hodgson Quarries & Plant Pty Ltd: Martin Hodgson
 Signed: *Martin R. Hodgson*
 Date: 20/3/18
 Project Manager VGT: Lisa Thomson
 Signed: *Lisa Thomson*
 Date: 16/3/18

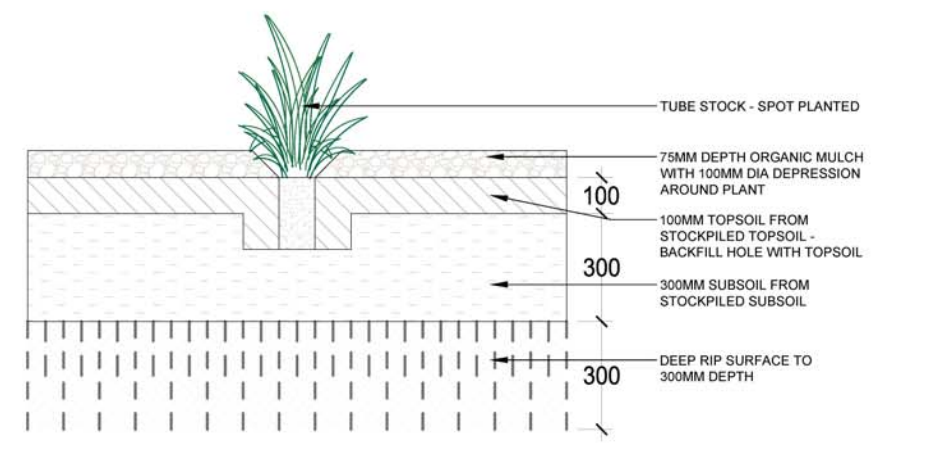
LEGEND & SCHEDULE

Planting shall be modified to suit embankment, existing trees and natural elements and where planting areas are smaller than the 5m grid. Refer to the Final Rehabilitation Plan for required planting areas.

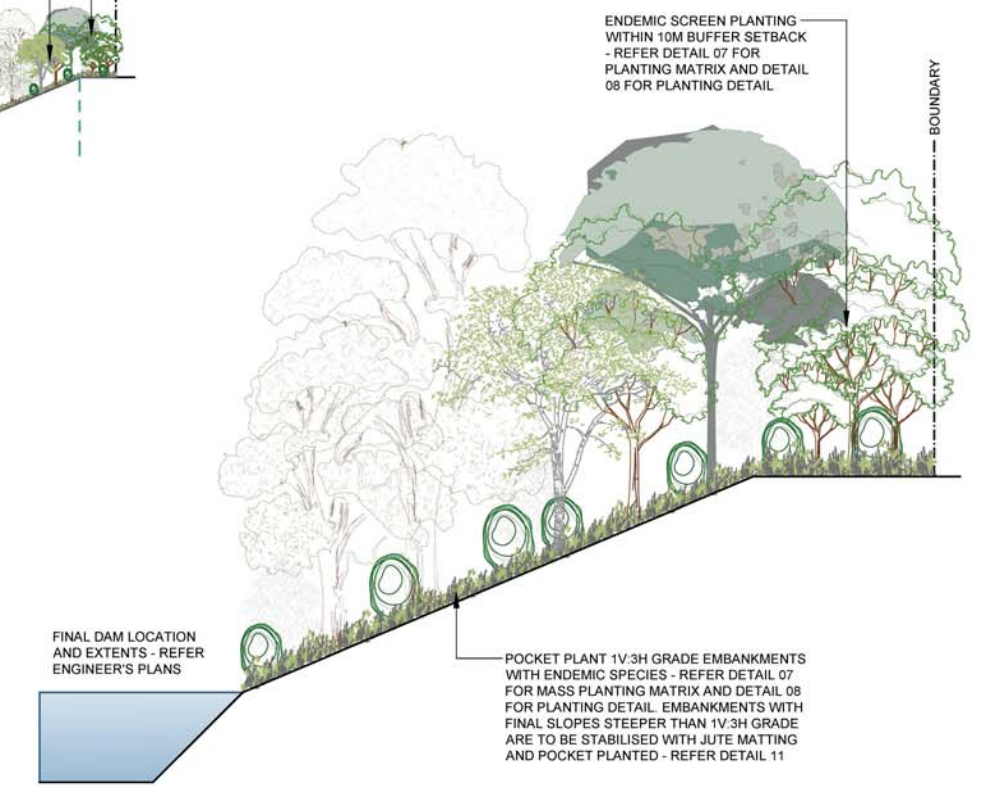
- TREES**
Angophora costata, Angophora floribunda, Corymbia gummifera, Eucalyptus punctata, Eucalyptus paniculata, Syncarpia glomulifera
 tube stock
 Planting Density: 3 per 5m grid (alternate species each 5m grid)
- SHRUBS**
Banksia spinulosa, Bursaria spinosa, Kunzea ambigua, Leptospermum polygalifolium, Leptospermum trinervium & Hakea sericea
 tube stock
 Planting Density: 12 per 5m grid (2 of each species per 5m grid)
- SMALL TREES / LARGE SHRUBS**
Alicausuarina littoralis, Acacia decurrens & Acacia parramattensis
 tube stock
 Planting Density: 6 per 5m grid (2 of each species per 5m grid)
- GRASSES & GROUNDCOVERS**
Dianella pruriina, Hardenbergia violacea, Lomandra longifolia, Microlena stipoides, Poa labillardieri & Themeda australis
 tube stock
 Planting Density: 60 per 5m grid (10 of each species per 5m grid)



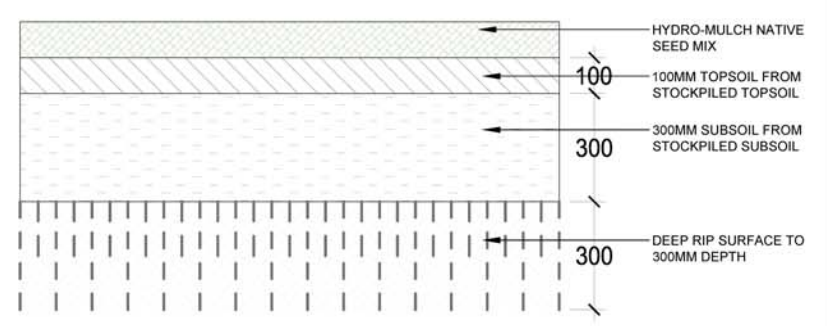
DETAIL 07: TUBE STOCK MASS PLANTING SCALE 1:40



DETAIL 08: PLANTING FOR BUFFER SETBACKS AND EMBANKMENTS WITH 1V:3H GRADE SCALE 1:10



DETAIL 09: TYPICAL BUFFER SCREEN PLANTING AND EMBANKMENT TREATMENT SCALE 1:200



DETAIL 10: HYDRO-MULCH TREATMENT SCALE 1:10

HYDRO-MULCHING SPECIFICATION:

Site Preparation
 Areas to be seeded shall be ripped (up to 300mm deep) using a suitable machine or a chain designed for this purpose. The area should be free of weed growth, large stones or other debris prior to applying subsoil and topsoil as detailed.

Hydromulching
 The application of Hydromulching Native seed shall commence immediately after topsoil has been placed on the surface prepared.

Application Rates
 The required areas shall be treated by the Contractor will the following:
 a. Native Seed 15 kgs per Hectare
 b. Cover Crop Seed 35 kgs per Hectare
 c. Fertiliser 200kg - 500 kg per hectare. Selection will depend on soil analysis results and client requirements.
 d. Wood Fibre Mulch (Dyed green) 2 tonnes - 2.5 tonnes per hectare.
 e. Binder Envirotrack at 40- 60kg per hectare or Polymer binder maximum 250 litres per hectare. Note: The seed and fertiliser rates are a representative sample only of the quantities that should be applied per hectare.

Grass Seed Mix
 A qualified ecologist shall be engaged to collect native seed from the area to be used as part of the hydromulch mix. Where appropriate quantities of seed are unable to be collected onsite, the required native seed shall be purchased from an endemic seed collector and shall include the following species, typical of the 'Sandstone - Shale Transition Forest':

Trees:
Alicausuarina littoralis, Angophora costata, Angophora floribunda, Eucalyptus acmenoides, Eucalyptus notabilis and Syncarpia glomulifera

Shrubs:
Acacia longifolia, Acacia parramattensis, Banksia spinulosa, Bursaria spinosa, Kunzea ambigua, Leptospermum polygalifolium, Leptospermum trinervium and Hakea sericea

Grasses and Groundcovers:
Dianella pruriina, Hardenbergia violacea, Lomandra longifolia, Microlena stipoides, Poa labillardieri and Themeda australis

The grass seed component of the hydromulch mix shall, depending on the season, be made up of the following grasses:

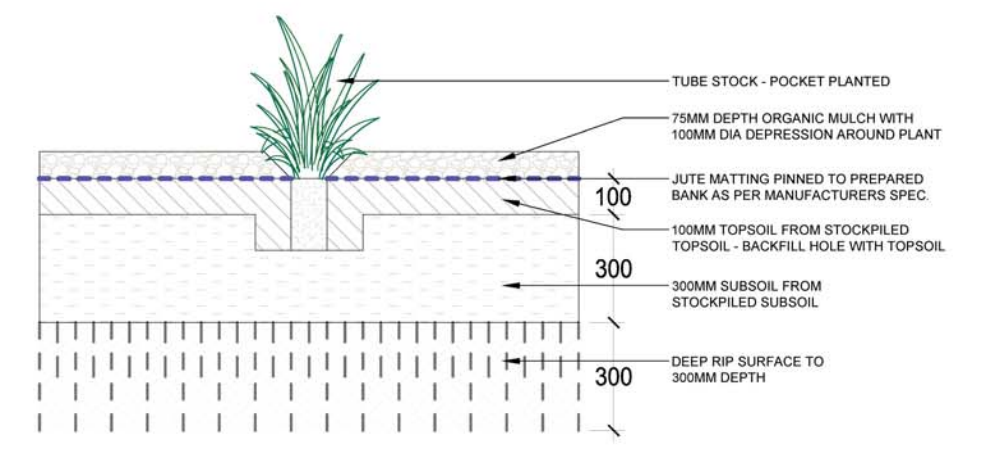
Autumn / Winter Mix:	
- Oats	15Kg/ha
- Rye Grass	10Kg/ha
- White Clover	5Kg/ha
- Red Clover	5Kg/ha
Summer / Spring Mix:	
- Japanese Millet	20Kg/ha
- Dobson Ryegrass	9Kg/ha
- White Clover	3Kg/ha
- Red Clover	3Kg/ha

Grass seed mixes for areas where a permanent grass cover is required shall also contain:
 - Rhodes Grass 5Kg/ha
 - Hulled Couch 5Kg/ha

Operation
 Seed, fertiliser, wood fibre mulch, water and binder shall be thoroughly mixed together with water to provide a slurry and then applied under pressure onto the area to be treated by means of hydromulching equipment specifically designed for this purpose and by operators trained in the use of this equipment.

After Care Maintenance
 Watering of the seeded area shall be carried out immediately and the wood-fibre should be kept moist until a satisfactory germination occurs. After this, sufficient watering must be kept up until the native plants have reached a stage where they can survive in their own right.

Note:
 1. The seeds of many Australian Native Species have a hard outer covering that must be removed or softened before germination can take place. Nature relies on bush fires to assist germination of some species by splitting the outer coating with heat. The hard seeds (eg Acacia) shall be immersed in boiled water and left to soak for up to 24 hours before planting.
 2. In this operation the germination of Australia Native Species is not reliable and therefore can take up to 3 to 12 months before a result is achieved.
 3. Surfaces that fail to germinate shall be reseeded.



DETAIL 11: PLANTING FOR EMBANKMENTS STEEPER THAN 1V:3H GRADE SCALE 1:10

5.5. Rehabilitation Treatment

As described in the EA, there are three (3) types of landscape rehabilitation treatments proposed; hydromulching, pocket planting in natural material & pocket planting in jute matting (for steeper grades).

1. Hydromulching: This treatment is proposed for the open, general flat areas of the site, located centrally. The process is detailed in Detail 10 of LPDA 15-94 / 5 – Final Rehabilitation Details (shown in *Figure Six*), which includes preparation and specification for the proposed hydromulching works.
2. Pocket planting in natural finishes: This treatment is proposed for the finished embankments located around the perimeter of the site (in accordance with the ‘Hodgson Maroota Quarry Final Landform’ Plan prepared by VGT Environmental Compliance Solutions Pty Ltd. This treatment is proposed for embankments up to a maximum grade of 1 in 3. The process is detailed in Detail 7 & 8 of LPDA 15-94 / 5 – Final Rehabilitation Details (shown in *Figure Six*), which includes preparation and plant schedules for this process.
3. Pocket planting in Jute Matting: This treatment is proposed for the finished embankments located around the perimeter of the site (in accordance with the ‘Hodgson Maroota Quarry Final Landform’ Plan prepared by VGT Environmental Compliance Solutions Pty Ltd. This treatment is proposed for embankments which exceed a grade of 1 in 3.

The process is detailed in Detail 7 & 11 of LPDA 15-94 / 5 – Final Rehabilitation Details (shown in *Figure Six*), which includes preparation and plant schedules for this process.

5.5.1. Hydromulch Areas

As described in the EA, the areas will be treated as follows.

5.5.1.1. Site Preparation

Once final contours have been developed, areas to be seeded shall be ripped (up to 300mm deep) and 300mm of previously stockpiled subsoil will be emplaced. Approximately 100mm of topsoil will then be spread over the surface in preparation for hydromulching. The application of hydromulching native seed shall commence immediately after topsoil has been placed or the surface prepared.

5.5.1.2. Application Rates

The required areas shall be treated by the contractor with the following:

- Native seed at 15kg per Hectare.
- Cover crop seed at 35kg per Hectare.
- Fertiliser at 200kg to 500kg per hectares. Selection will depend on soil analysis results and client requirements.
- Wood fibre mulch (dyed green) 2 tonnes to 2.5 tonnes per Hectare.
- Binder Environtack at 40kg to 60kg per Hectare or Polymer binder maximum 250L per Hectare. Note, the seed and fertiliser rates are a representative sample only of the quantities that should be applied per hectare.

Seed, fertiliser, wood fibre mulch, water and binder shall be thoroughly mixed together with water to provide a slurry and then applied under pressure onto the area to be treated by means of hydromulching equipment specifically designed for this purpose and by operators trained in the use of this equipment.

5.5.1.3. Grass Seed Mix

The species to be used on the site shall include those typical of the 'Sandstone-Shale Transition Forest' as listed below. It will also comprise of pasture species to ensure rapid groundcover whilst native species germinate.

Table 8. Native Species to be applied in hydromulch areas

Species
<p>Trees</p> <p>Allocasuarina littoralis</p> <p>Angophora costata</p> <p>Angophora floribunda</p> <p>Eucalyptus acmenoides</p> <p>Eucalyptus notabilis</p> <p>Syncarpia glomulifera</p>
<p>Shrubs</p> <p>Acacia longifolia</p> <p>Acacia parramattensis</p> <p>Banksia spinulosa</p> <p>Bursaria spinose</p> <p>Kunzea ambigua</p> <p>Leptospermum polygalifolium</p> <p>Leptospermum trinervium</p> <p>Hakea sericea</p>
<p>Grasses and Groundcover</p> <p>Dianella prunina</p> <p>Herdenbergia violacea</p> <p>Lomandra longifolia</p> <p>Microlena stipoides</p> <p>Poa labillarderi</p> <p>Themeda australis</p>

Table 9. Grass species to be applied in hydromulch areas

Grass Species	Application rate
Autumn/Winter Mix	
Oats	15kg/Ha
Rye grass	10kg/Ha
White clover	5kg/Ha
Red clover	5kg/Ha
Summer/Spring Mix	
Japanese Millet	20kg/Ha
Dobson Ryegrass	9kg/Ha
White clover	3kg/Ha
Red clover	3kg/Ha
Grass seed mix for permanent grass cover areas	
Rhodes Grass	5kg/Ha
Hulled Couch	5kg/Ha

5.5.2. Pocket Planting Areas

These areas encompass the perimeter slopes of the site inside the permanent bundwalls where batters are generally 3H:1V, with some areas slightly steeper that will require additional attention to reduce potential erosion impacts. As described in the EA, they will be treated as follows.

5.5.2.1. Site Preparation

Once final contours have been developed, areas to be seeded shall be ripped (up to 300mm deep) and 300mm of previously stockpiled subsoil will be emplaced. Approximately 100mm of topsoil will then be spread over the surface in preparation for planting followed by a further layer approximately 75mm in depth of organic mulch. The application of mulch shall commence immediately after topsoil has been placed or the surface prepared.

For areas where slopes are steeper than 3H:1V, jute matting will be installed between the topsoil and the mulch layer.

5.5.2.2. Tubestock Mass Planting

The planting density of the mass planting within the pocket planting areas is based on the average numbers within a 5m by 5m grid. Planting shall be modified to suit embankment, existing trees and natural elements and where planting areas are small than the 5m grid. Planting holes will be back filled with topsoil and a 100mm depression formed around the plant.

Species and planting density are indicated in the following table.

Table 10. Pocket Planting Tubestock Species List

Species	Planting Density per 5m grid
Trees Angophora costata Angophora floribunda Corymbia gummifera Eucalyptus punctata Eucalyptus paniculata Syncarpia glomulifera	3 with alternate species each 5m grid
Shrubs Banksia spinulosa Bursaria spinose Kunzea ambigua Leptospermum ploygalifolium Leptospermum trinervium Hakea sericea	12 with 2 of each species per 5m grid
Small Trees/Large Shrubs Allocasaurina littoralis Acacia parramattensis	6 with 2 of each species per 5m grid
Grasses and Groundcovers Dianella prunina Herdenbergia violacea Lomandra longifolia Microlena stipoides Poa labillarderi Themeda australis	60 with 10 of each species per 5m grid

5.6. Progressive Rehabilitation

Rehabilitation is to be undertaken progressively where possible. Extraction works will occur across the face of a number of active cells and as soon as these areas are fully extracted to the site perimeter they will be rehabilitated in accordance with the EA (Nexus Environmental Planning Pty Ltd, September 2015). No fill material sourced from outside the site is to be used in site rehabilitation to avoid contamination.

Native vegetation rehabilitation areas are to be hydromulched onto the prepared surface with a native and an annual cereal crop seed mixture.

Unimproved pasture areas and temporary bunds or rehabilitation areas are to be treated with lime or gypsum (if required) and hydromulched with a grass seed mix or laid with pre-stripped turf.

5.7. Decommissioning and Demolition Activities

As the extraction progresses, the holding and drying areas will be decommissioned as required. This will involve removing any water by pumping to the final water body and incorporating any silt material into the final landform.

Decommissioning of the processing plant area will be undertaken during the final stages of the extraction operations. All plant and temporary offices will be removed from the site. Services such as power and water will be disconnected and remaining infrastructure removed. Any concrete pads or footings will also be removed from the site and disposed of at a licenced waste facility. Remaining stockpile material will either be removed from the site or incorporated into the final batters.

The workshop and concrete hardstand located at the site entrance will remain for use by the landowner. The weighbridge will be removed and the all-weather access road restored.

5.8. Summary of Rehabilitation Status

The following summarises the rehabilitation status of the site as described by domains as described in *Section 4.2* and shown in *Figure Two*.

Table 11. Domain 1 to Domain A Progress

Primary Domain	Secondary Domain	Code (with map legend)	Rehabilitation Phase	Area at Report Date (ha)	Area at end of Rehabilitation (ha)
Infrastructure(1)	Infrastructure(A)	1A	Active	0.40	Nil
			Decommissioning	Nil	Nil
			Landform Establishment	Nil	Nil
			Growth Medium Establishment	Nil	Nil
			Ecosystem Establishment	Nil	Nil
			Ecosystem development	Nil	Nil
			Relinquished Lands	Nil	0.40
			Total	0.40	0.40

Table 12. Domain 1 to Domain C Progress

Primary Domain	Secondary Domain	Code (with map legend)	Rehabilitation Phase	Area at Report Date (ha)	Area at end of Rehabilitation (ha)
Infrastructure(1)	Grassland (C)	1C	Active	1.09	Nil
			Decommissioning	Nil	Nil
			Landform Establishment	Nil	Nil
			Growth Medium Establishment	Nil	Nil
			Ecosystem Establishment	Nil	Nil
			Ecosystem development	Nil	Nil
			Relinquished Lands	Nil	1.09
			Total	1.09	1.09

Table 13. Domain 3 to Domain B Progress

Primary Domain	Secondary Domain	Code (with map legend)	Rehabilitation Phase	Area at Report Date (ha)	Area at end of Rehabilitation (ha)
Water Management Area (3)	Water Management Area (B)	3B	Active	2.17	Nil
			Decommissioning	Nil	Nil
			Landform Establishment	Nil	Nil
			Growth Medium Establishment	Nil	Nil
			Ecosystem Establishment	Nil	Nil
			Ecosystem development	Nil	Nil
			Relinquished Lands	Nil	2.60
			Total	2.17	2.60

Table 14. Domain 3 to Domain C Progress

Primary Domain	Secondary Domain	Code (with map legend)	Rehabilitation Phase	Area at Report Date (ha)	Area at end of Rehabilitation (ha)
Water Management Area (3)	Grassland (C)	3C	Active	3.24	Nil
			Decommissioning	Nil	Nil
			Landform Establishment	Nil	Nil
			Growth Medium Establishment	Nil	Nil
			Ecosystem Establishment	Nil	Nil
			Ecosystem development	Nil	Nil
			Relinquished Lands	Nil	3.24
			Total	3.24	3.24

Table 15. Domain 4 to Domain C Progress

Primary Domain	Secondary Domain	Code (with map legend)	Rehabilitation Phase	Area at Report Date (ha)	Area at end of Rehabilitation (ha)
Overburden Emplacement Area (4)	Rehabilitation Area-Grassland (C)	4C	Active	0.77	Nil
			Decommissioning	Nil	Nil
			Landform Establishment	Nil	Nil
			Growth Medium Establishment	Nil	Nil
			Ecosystem Establishment	Nil	Nil
			Ecosystem development	Nil	Nil
			Relinquished Lands	Nil	0.77
			Total	0.77	0.77

Table 16. Domain 4 to Domain E Progress

Primary Domain	Secondary Domain	Code (with map legend)	Rehabilitation Phase	Area at Report Date (ha)	Area at end of Rehabilitation (ha)
Overburden Emplacement Area (4)	Rehabilitation Area-Woodland (E)	4E	Active	0.13	Nil
			Decommissioning	Nil	Nil
			Landform Establishment	Nil	Nil
			Growth Medium Establishment	Nil	Nil
			Ecosystem Establishment	Nil	Nil
			Ecosystem development	Nil	Nil
			Relinquished Lands	Nil	0.13
			Total	0.13	0.13

Table 17. Domain 6 to Domain C Progress

Primary Domain	Secondary Domain	Code (with map legend)	Rehabilitation Phase	Area at Report Date (ha)	Area at end of Rehabilitation (ha)
Void (open Cut Void) (6)	Rehabilitation Area-Grassland (C)	6C	Active	3.38	Nil
			Decommissioning	Nil	Nil
			Landform Establishment	Nil	Nil
			Growth Medium Establishment	Nil	Nil
			Ecosystem Establishment	Nil	Nil
			Ecosystem development	Nil	Nil
			Relinquished Lands	Nil	8.55
			Total	3.38	8.55

Table 18. Domain 6 to Domain E Progress

Primary Domain	Secondary Domain	Code (with map legend)	Rehabilitation Phase	Area at Report Date (ha)	Area at end of Rehabilitation (ha)
Void (open Cut Void) (6)	Rehabilitation Area-Woodland (E)	6E	Active	4.79	Nil
			Decommissioning	Nil	Nil
			Landform Establishment	Nil	Nil
			Growth Medium Establishment	Nil	Nil
			Ecosystem Establishment	Nil	Nil
			Ecosystem development	Nil	Nil
			Relinquished Lands	Nil	12.1
			Total	4.79	12.1

Table 19. Domain 9 to Domain J Progress

Primary Domain	Secondary Domain	Code (with map legend)	Rehabilitation Phase	Area at Report Date (ha)	Area at end of Rehabilitation (ha)
Conservation Area (9)	Conservation Area (J)	9J	Active	Nil	Nil
			Decommissioning	Nil	Nil
			Landform Establishment	Nil	Nil
			Growth Medium Establishment	Nil	Nil
			Ecosystem Establishment	0.99	Nil
			Ecosystem development	Nil	Nil
			Relinquished Lands	Nil	0.99
			Total	0.99	0.99

Section 6. Environmental Issues Management

6.1. Rehabilitation Risk Assessment

A risk assessment of Environmental and Rehabilitation issues has been undertaken in accordance with standard risk assessment practices outlined in ISO 31000 *Risk Management – Principles and Guidelines*. The Consequence/Likelihood Matrix has been used with the following scale definitions:

Table 20. Consequence/Likelihood Matrix

			Consequence				
			1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Severe
Likelihood	E	Almost Certain	IV	III	II	I	I
	D	Likely	IV	III	III	II	I
	C	Possible	V	IV	III	II	II
	B	Unlikely	V	IV	III	III	II
	A	Rare	V	V	IV	III	II

Likelihood Scale

E	Almost Certain	Expected to occur within weeks
D	Likely	Will probably occur, has happened within recent months
C	Possible	Might occur at sometime within next 2-3 months
B	Unlikely	Could occur within 6-12 months although unlikely
A	Rare	Might occur at some time in exceptional circumstances

Consequence

5	Severe	Irreversible long term environmental harm.
4	Major	Prolonged environmental impact with significant remedial measures required.
3	Moderate	Moderate environmental impacts with immediate remedial measures effective.
2	Minor	Minimal environmental harm with minor remediation activities
1	Insignificant	Little or no environmental harm. Remediation not required.

Table 21. Site Summary Rehabilitation Risk Assessment

Environmental Risks	Description	Likelihood	Consequence	Risk
Erosion and Sediment Control	Risk of soil loss due to erosion	Possible	Moderate	III
Erosion and Sediment Control	Risk of sediment leaving the site	Rare	Minor	V
Soil and Overburden Types(s) and Suitability	Risk of growth media be unsuitable for growth of vegetation	Unlikely	Moderate	III
Flora	Risk of weeds impacting on growth of vegetation	Possible	Moderate	III
Fauna	Risk of fauna habitat, for foraging, being impacted by the final landform	Rare	Minor	V
Fauna	Risk of feral animals impacting on ecological sustainability	Unlikely	Minor	IV
Slopes and Slope Management	Risk of unstable slopes impacting on final landform	Possible	Moderate	III
Slopes and Slope Management	Insufficient material available for batters in final landform	Possible	Moderate	III
Surface Water Quantity	Risk of insufficient water for revegetation	Unlikely	Major	III
Surface Water Quality	Risk of harm caused by poor quality of water in final water body	Rare	Minor	V
Bushfire	Risk of harm to vegetation, fauna and rehabilitation plantation	Rare	Moderate	IV
Visual Amenity	Risk of impact on local residences	Possible	Insignificant	V
Trespassing	Risk of impact on rehabilitation areas by public	Rare	Minor	V

6.2. Rehabilitation Risk Management

6.2.1. Erosion and Sediment Control Measures

Table 22. Summary of Erosion and Sediment Control Risks

Environmental Risks
Risk of soil loss due to erosion
Risk of sediment leaving the site

Soil and erosion control measures have been detailed in the Surface Water Management Plan (SWMP) by VGT Pty Ltd. The measures discussed in the SWMP apply equally to the control of sediment and erosion during operations and the rehabilitation phase of the site operations. The relevant sections are reproduced below.

6.2.1.1. General Instructions

The control of erosion and sedimentation at the site focusses on source reduction measures. In general these measures include:

- *Reading the SWMP with the engineering plans and any other plans or written instructions issued in relation to development at the subject site.*
- *Ensure contractors undertake all soil and water management works as instructed in this specification and constructed following the guidelines stated in Department of Housing (2008) (the "Blue Book").*
- *Informing all subcontractors of their responsibilities in minimising the potential for soil erosion and pollution to downslope areas.*

6.2.1.2. Works Sequence

- *All works are to be undertaken following the engineering plans*
- *Topsoil will be stripped and stockpiled in a convenient location which is both out the way of daily activity, however, easily accessed for re-use in the creation of bunds and for preparation of rehabilitation areas as necessary.*
- *Construct earth banks (Stormwater Collection Drains) to divert as much clean water as possible and capture the dirty water.*
- *Rehabilitate lands previously used to stockpile topsoil with clay residue materials and previously stockpiled topsoil.*
- *Install barrier fencing to limit access to rehabilitated areas.*
- *Ensure management practices are carried out to minimise areas being affected by wind and water erosion.*

6.2.1.3. Erosion Control

- *The soil erosion hazard on the site will be kept as low as practicable by minimising disturbance. Some ways of doing this are outlined in Table 23.*
- *Extraction will take place within a defined work area and materials will be transported only within the site for processing.*
- *Entry to land not involved directly in the extraction process will be prohibited and will be managed as natural grassland.*
- *Limit vehicular access to the site to that essential for construction work.*

Table 23. Limitations to Access

Landuse	Access Limitations	Comments
Extraction	Land disturbances beyond five (preferably two) metres from the edge of the operations are prohibited.	All site workers should clearly recognise these areas and they should be clearly marked — suitable materials include barrier mesh, sediment fencing, etc. The project manager will determine their actual location on site. They can vary in position to conserve existing vegetation best while being considerate of the needs of efficient works activities.
Access Roads	Roads and tracks are limited to a width that are the minimum necessary to allow safe operation of heavy equipment	
Remaining Lands	Land disturbances are prohibited except for essential management works.	

Here, rehabilitation means achieving a C-factor (Revised Universal Soil Loss Equation) of less than 0.1 and set in motion a program that should ensure it will drop permanently, by reducing the risk of erosion by vegetation, paving, armouring, etc. as soon as practicable after extraction activities cease.

NOTE: The cover factor, C, is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. A C-factor of 1.0 corresponds to that of bare soil.

While C-factors are likely to rise to 1.0 during the work's program, they should not exceed those given in Table 24 within the specified times.

Table 24. Maximum acceptable C-factors at nominated times during works

Lands	Maximum C-Factor	Remarks
Waterways and other areas subjected to concentrated flows, post construction.	0.05	Applies after ten working days from completion of formation and before they are allowed to carry any concentrated flows. Flows are limited to those indicated in "Blue Book". Foot and vehicular traffic are prohibited in these areas.
Stockpiles, post clearance	0.1	Applies after ten working days from completion of formation.
All lands, including waterways and stockpiles during construction	0.15	Applies after 20 working days of inactivity, even though works might continue later.

Note: working days does not include public holidays, weekends or days when work is not possible due to wet weather.

The required C factors can be achieved in the short term (temporary protection for up to six months) with either:

- a suitable soil binder in areas of sheet flow, e.g. topsoil stockpiles
- anionic bitumen emulsion sprayed over hessian cloth (at 0.5 L/m²) in areas of concentrated flow, e.g. diversion banks and waterways
- a temporary vegetative cover i.e. replace stripped turf.

Application of any soil binders employed should follow the manufacturer's instructions.

- While ever the C-factor is higher than 0.1, maintain the lands in a condition that resists removal by wind. This can be achieved by:

- *keeping moist (not wet) by sprinkling with water*
- *where practicable, leaving the surface in a cloddy state.*
- *Notwithstanding the above, schedule works so that the duration from the conclusion of land shaping to completion of final stabilisation is less than:*
 - *10 days on slopes steeper than 30 per cent*
 - *20 days on slopes less steep than 30 per cent.*
- *Lands planted recently with grass species or re-turfed will be watered regularly until an effective cover has properly established and plants are growing vigorously. Follow-up seed and fertiliser will be applied as necessary in areas of minor soil erosion and/or inadequate vegetative protection.*
- *Where practicable, keep foot and vehicular traffic away from all recently stabilised areas.*
- *Stockpiles of topsoil to be located at least five metres from areas of likely concentrated or high velocity flows, especially drainage lines and access roads. If necessary, earth banks or drains will be constructed to divert localised run-on.*
- *Replace soil materials in the same order they are removed from the ground. It is particularly important that all subsoils are buried and topsoils remain on the surface at the completion of works.*
- *Earth batters will be laid back to lower grades before the rehabilitation program starts.*
- *All waterways, drains, spillways and outlets will be constructed to be stable in accordance with the "Blue Book" for soils with high erodibilities.*
- *Topsoil stockpiles are not to exceed 3m in height with a minimum crest width of 3m and if not immediately re-turfed, are to be seeded with a temporary vegetation cover if stockpiles are to remain longer than 14 days.*
- *Topsoil is to be stripped in a moist condition to avoid pulverisation and dust.*

6.2.1.4. *Sediment Control*

Clean water is diverted around the site via series of earthen bunds where possible or utilising the natural ridgeline topography and bunds. This reduces the volume of water within the active site available to entrain sediment. All surface water captured over the disturbed areas of the quarry is considered dirty and is collected in on site dams. No water is discharged off site therefore the risk of sediment leaving the site is very low.

By the final rehabilitation stages the total catchment area will be directed to a dam located in the north east. The final catchment will be approximately 39Ha, including the rural/residential catchment east of Roberts Road. Extraction will have proceeded to final depth and a spillway will be designed to overtop at 192m AHD. Once the vegetation of the site has been completed the risk of entrainment of sediment will be negligible and any water overtopping the final dam will be considered clean.

6.2.2. Soil and Overburden Suitability

Table 25. Summary of Soil and Overburden Suitability Risks

Environmental Risks
Risk of growth media be unsuitable for growth of vegetation

The soil landscape of the Maroota area is described in Soil Landscapes of St Albans 1:100,000 Sheet in which the typical soils of the area are classified under the soil landscape known as Sydney Town (st). In particular the Maroota Sand comprises a sequence of interbedded and poorly sorted sands, gravels, clayey gravels, gravelly sands, pebbly sands, clayey/silty sands and clay which range from compacted to partly consolidated materials. The bulk of these sediments however consists of sand sized material. The general characteristics of the soils have been classified as follows:

- Very low fertility.
- Strongly acidic with low water holding capacities and low to very low nutrient status and cation exchange capabilities.
- Soil depth varies considerably and occasionally rock outcrops limit root penetration.
- Erosion hazard is high to very high.

According to the E-Spade online soil mapping data, the A soil horizon typically consists of a sandy clay loam with a neutral pH. The B Horizon consists of mainly sandy clay with a pH varying from 7.5 to 6.5, generally trending to a lower pH with depth. There is no appreciable salinity noted.

The species selected for rehabilitation of the site are endemic and suitable for the low fertility soils. It is not anticipated that the soil quality will therefore limit the rehabilitation success of the site. However, soil testing will be undertaken prior to planting to determine if soil ameliorants are required.

6.2.3. Native Flora and Fauna

Table 26. Summary of Flora and Fauna Risks

Environmental Risks
Risk of weeds impacting on growth of vegetation
Risk of fauna habitat, for foraging, being impacted by the final landform
Risk of feral animals impacting on ecological sustainability

The management of native flora and fauna will be as described within the Flora and Fauna Management Plan (FFMP) contained within the Environmental Management Plan. The objective of the plan to protect known threatened flora species on the site and ensure correct procedures are applied in the event of other threatened flora or fauna species being located on the site.

A draft FFMP was reviewed by the Baulkham Hills Council and in email correspondence dated the 19th of October 2016, Council required more information regarding Condition 55 of the consent. The FFMP was updated on the 23rd of November 2016 and submitted to

the Secretary and is approved. At the time two of the items that Council requested more information on were not updated with the proviso that the information would be forthcoming when the Rehabilitation Plan was updated and submitted to the Secretary by 30th of June 2017. The items are listed below.

1. *Additional information is required to be provided on Part (c), dot point 3, in regard to planting around the conservation area i.e. 'planting around the conservation area to further buffer this area and enhance its long term viability as a bushland ecosystem'.*
2. *Additional information is required to be provided on Part (c), dot point 4, in regard to improving connectivity of existing and future vegetation. In this regard the information provided refers only to separation distances between vegetation and does not adequately address how areas will be linked, actions required to be undertaken such as additional planting, and on-going management i.e. 'connection of existing areas and future areas of revegetation to form a network of wildlife corridors throughout site and to adjoining lands to facilitate species recruitment through natural immigration.'*

The following is intended to provide the additional information.

6.2.3.1. *Conservation Areas*

Conservation areas are defined as existing vegetation that is to be retained and protected. They are described in *Figure Three Final Rehabilitation Plan (EA Plan LPDA 15-94/4)* and are located on the perimeter of the site along Old Northern Road and Roberts Road. They are characterised by the presence of mature trees typical of a *Shale-Sandstone Transitional Forest*. Along Old Northern Road the tree stands are thin i.e. no more than 1 to 2 trees in width. The northern portions on Roberts Road are distributed along and adjacent to existing bundwalls and form more substantial stands.

Protection of these areas will largely be achieved by preventing access via fencing or similar. These areas will be blended into the mass plantings that will be undertaken on the existing and proposed perimeter bundwalls and buffer setbacks on Old Northern and Roberts Roads.

It will not be necessary for additional planting within the conservation areas to enhance the vegetation. It is envisaged that once the adjacent mass planted areas within the setbacks and bundwalls are completed and established, the viability of the bushland ecosystem will increase. This will primarily be due to the migration of species across the conservation areas and the new plantings due to propagation and self-seeding as vegetation becomes self-sustaining. The end result is an increasing biodiversity and therefore sustainability.

6.2.3.2. *Connectivity*

The biodiversity value of corridor networks is well known. Landscapes that retain more connections between patches of otherwise isolated areas of vegetation are more likely to maintain more numerous and more diverse populations of various plant and animal species. If existing remnants are left to persist without sufficient immigration to maintain genetic diversity, continued losses of biodiversity are likely.

Within the site the connectivity of wildlife corridors during the operational phase will be limited to the perimeter of the site where buffer areas will be established as described above. As the rehabilitation of the site progresses within the extraction area connectivity within the site will increase. Felled logs and rocks may be placed strategically within all rehabilitation areas to encourage migration of fauna species into the site. Nesting boxes may also be considered in the existing mature trees to foster breeding in arboreal species.

Regionally the site is located approximately 5km west of the Marramarra National Park. The site currently has potential linkages to the national park to the east of the site where forested areas abut Roberts Road. Forested Crown land to the west of the site, opposite Old Northern Road, leading to the Hawksbury River currently has poor, isolated linkages

to the Marramarra NP due to the proliferation of sand mining and other agricultural activities that lie between.

Whilst the current site does not support wildlife corridors, future rehabilitation efforts will eventually provide improved connectivity with the forested Crown lands to the west of Old Northern Road. Additionally it is presumed that the rehabilitation of the sand mine to the west of the site, a barrier to linkages, will be conducive to enhancing the connectivity between the two ecosystems.

6.2.4. Weed and Pest Management

Table 27. Summary of Weed and Pest Management Risks

Environmental Risks
Risk of weeds impacting on growth of vegetation
Risk of fauna habitat, for foraging, being impacted by the final landform
Risk of feral animals impacting on ecological sustainability

Weed removal shall be conducted as detailed in *section 8.4*, with hand removal of all top growth, rhizomes and stolons of unwanted vegetation. The regular control of all weeds is essential. The applications of pre-emergent sprays are acceptable with approved chemicals applied in strict accordance with manufacturer's directions. Any spraying will be done during calm days to avoid winds blowing herbicides into native planting.

If evidence of feral animal impacts on revegetation is noted, control measures such as rabbit proof fencing will be investigated. A baiting program may also be investigated with the appropriate authorities if required.

6.2.5. Slopes and Slopes Management

Table 28. Summary of Slopes and Slopes Management Risks

Environmental Risks
Risk of unstable slopes impacting on final landform
Insufficient material available for batters in final landform

The conceptual final landform proposed generally consists of a 3H:1V slopes around the perimeter of the site leading to a relatively flat floor draining to a water body in the north east of the void. Some areas to the north and east of the final water body may be slightly steeper but are still considered safe and stable.

Vegetation will be established on the rehabilitation areas as soon as practicable in order to reduce the risk erosion and to further stabilise the final slopes. Where slopes on the perimeter exceed 3H:1V, the slopes will be stabilised with jute matting and mass pocket planting of vegetation. This should provide sufficient stability to the batter slopes.

At this stage, the actual final landform may not conform to the approved final landform if the wet weather high groundwater level is determined to be higher than expected. Therefore a mass balance on the overburden material required cannot be undertaken until agreement with Dol-Water is reached as to the extraction depth limit.

6.2.6. Surface Water

Table 29. Summary of Surface Water Risks

Environmental Risks
Risk of insufficient water for revegetation
Risk of harm caused by poor quality of water in final water body

The SWMP contains details of a site water balance, over a critical 10 year period, which indicates that the site has sufficient water on site to maintain the processing operations and still have surplus water to requirements. Thus there will be sufficient water available for progressive rehabilitation efforts whilst the site is under the extraction phase. Once rehabilitation has been completed, the final water body will also have sufficient capacity to provide irrigation for the vegetation until it is sufficiently established.

The water quality in the current and final water body is not expected to present any issues with regards to quality for irrigation of any rehabilitated areas. There are no processes undertaken on the site that would contaminate the captured rainfall. Sediment entrained through incident rainfall is captured in the site dams and settles rapidly. Fuels and oils held on site are of relatively low volumes and stored in bunded areas in the workshop. Spill kits are available and the risk of water contamination is very low.

Surface water monitoring will be undertaken on the site if a potential contaminant is identified, the impacts of irrigation of rehabilitation areas will be investigated. At the completion of the final landform, the final water body quality will be initially assessed to confirm that it will not be detrimental to the planted native vegetation. Further water quality testing is not anticipated to be required.

6.2.7. Bushfire Management

Table 30. Summary of Bushfire Risks

Environmental Risks
Risk of harm to vegetation, fauna and rehabilitation plantation

There is some risk of bushfire due to the grassed land and vegetation in place for dust or visual amenity and nearby native forest areas. The extraction activities will not increase the risk of bushfire. Deliberately lit fires are the most frequent cause of bushfire and the proponent employs several measures such as fencing, signage and monitoring to dissuade trespassers from entering the site.

Fire extinguishers are held onsite and water pumps held onsite could utilise held dam water to extinguish minor fires. Old Northern Road and Roberts Road perform as a fire break in the south, west and east. To the north, there is minimal forested areas and the land is predominately agricultural.

Procedures are in place to contact the local fire brigade in the event of a bushfire. Communication with the Rural Fire Service, emergency services and National Parks and Wildlife Service will be undertaken when necessary to assist them.

Native vegetation, as proposed in this plan, is generally resilient to bushfire and in fact often relies upon them to propagate. If rehabilitation areas are impacted by bushfire, the area will be monitored over a period of 12 months to determine if natural regeneration occurs. If regeneration is insufficient or fails, re-planting will be undertaken.

6.2.8. Visual Impacts

Table 31. Summary of Visual Amenity Risks

Environmental Risks
Risk of impact on local residences

The visual amenity of nearby residents will not be adversely impacted by the extraction or rehabilitation activities. The perimeter bundwalls and buffer tree screening proposed will provide adequate shielding for local residents and users of Old Northern Road and Roberts Road. Residents to the north of the site, which are topographically lower, will observe the progression of exposed faces to revegetated lands and thus reduced impacts.

6.2.9. Controlling Access

Table 32. Summary of Trespassing Risks

Environmental Risks
Risk of impact on rehabilitation areas by public

In the interests of public safety, fences are maintained around the perimeter of the mine sites. Prominent signage has also been erected along the length of the fences to discourage trespassers. Fences will assist in deterring trespassers from entering the site and wilfully or otherwise damaging the rehabilitation areas.

Visitors onto the site must report to the site office and sign in. All visitors must be accompanied by site personnel at all times.

Rehabilitation areas will be marked as 'no-go' areas to prevent unauthorised entry by staff or vehicles and accidental damage. This may be accomplished by fencing or taping off the relevant areas and erecting signs displaying no unauthorised access statements.

Section 7. Performance Indicators and Completion Criteria

Table 33. Rehabilitation Objectives and Completion Criteria

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
Phase 1 - Decommissioning						
Domain 1 - Infrastructure						
All infrastructure and services not suitable for the final landuse will be removed.	Services not required for final landuse are disconnected.	Relevant services disconnected by qualified contractors	Report from qualified contractors	Upon decommissioning completion	EIS/This report	Not commenced/ Post extraction completion
	Infrastructure not required for final land use is removed	Relevant infrastructure removed.	Inspection and report	Upon decommissioning completion	EIS/This report	Not commenced/ Post extraction completion
All roads and hardstand areas to be retained for the final landuse will be reduced in width/size to that suitable for the final landuse.	Roads not required for final landuse are removed.	Roads removed unless specified to be retained	Inspection and report	Upon decommissioning completion	EIS/This report	Not commenced/ Post extraction completion
	Roads required for final landuse are reduced in width (if required)	Roads reduced in width to that suitable for final land use.	Inspection and report	Upon decommissioning completion	EIS/This report	Not commenced/ Post extraction completion
	Hardstand areas reduced to a size required for the final landuse	Hardstand areas reduced in size to that suitable for final landuse.	Inspection and report	Upon decommissioning completion	EIS/This report	Not commenced/ Post extraction completion
Sediment runoff to be contained	Sediment retained in water management structures	Sediment Dams will be designed to Best Practice according to the 'Blue Book' Criteria for a 5 day 90th percentile storm event. All drains will be designed for the 1 in 10 year design storm event.	Existing dams currently meet capacity specifications (see SWMP). Final water body is designed to exceed the required capacity and will be assessed once complete. Inspection for capacity by quarry manager.	For the final water body, on construction completion and monthly until completion.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Temporary dams are in place. Final Water Body construction not commenced/ Post extraction completion
Domain free from hazardous materials	No hazardous material remain	All hazardous material removed	Contamination report prepared by qualified person. Register of Hazardous Material.	Following decommissioning with follow up validation testing as required.	This Report	Not commenced/ Post extraction completion
All remaining stockpiles will be removed and/or reused in the establishment of the final landform.	No remaining stockpiles	All remaining stockpiles are removed.	Inspection and report	Upon decommissioning completion	EIS/This report	Not commenced/ Post extraction completion

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
Phase 1 – Decommissioning (continued)						
Domain 3 - Water Management						
Sediment dams to be retained in the final landform are converted to clean water dams.	No sediment laden water enters the remaining clean water dam system.	<ul style="list-style-type: none"> Final water body has been desilted, if required to increase capacity and minimise sediment entrainment in discharged water. The catchment areas for the final water body is sufficiently rehabilitated so as to only contain clean water runoff. 	Inspection by quarry manager and suitably qualified person.	On construction completion and monthly until completion	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Final Water Body construction not commenced/ Post extraction completion
	Sediment dam discharge due to overtopping does not entrain sediment.	Final water body will be designed to Best Practice according to the 'Blue Book' Criteria for a 5 day 90th percentile storm event. All drains will be designed for the 1 in 10 year design storm event and do not re-entrain sediment. The dam spillway will be designed for the 1 in 100 year design storm event.		For the final water body, on construction completion and monthly until completion.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Final Water Body construction not commenced/ Post extraction completion
Domain 4 – Overburden Emplacement Area						
All overburden will be removed and reused in the establishment of the final landform.	No remaining overburden stockpiles	All overburden stockpiles are removed and or incorporated into the final landform.	Inspection and report	Upon decommissioning completion	EIS, and this report	Not commenced/ Post extraction completion
Sediment runoff to be contained.	Sediment retained in water management structures	Final water body will be designed to Best Practice according to the 'Blue Book' Criteria for a 5 day 90th percentile storm event. All drains will be designed for the 1 in 10 year design storm event and do not re-entrain sediment. The dam spillway will be designed for the 1 in 100 year design storm event.	Existing dams currently meet capacity specifications (see SWMP). Final water body is designed to exceed the required capacity and will be assessed once complete. Inspection by quarry manager and suitably qualified person.	On construction completion and monthly until completion.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Final Water Body construction not commenced/ Post extraction completion

Domain 6 - Open Cut Void

No activities within this domain are required during this phase

Domain 9 - Native Vegetation Conservation Area

No activities within this domain are required during this phase

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
Phase 2 - Landform Establishment						
Domain 1 – Infrastructure						
Domain landform is safe, stable and non-polluting, fit for the purpose of the intended final land use.	Final landform contours similar to proposed final landform contours.	<ul style="list-style-type: none"> Slope lengths in rehabilitated areas shall not exceed 20m for a 3H: 1V batter i.e. an earth bank shall be installed. Slope lengths in rehabilitated areas shall not exceed 30m for a 4H: 1V batter i.e. an earth bank shall be installed. Slope lengths in rehabilitated areas shall not exceed 40m for batters >4H: 1V i.e. an earth bank shall be installed. 	Survey on completion by registered surveyor.	Upon completion of landform establishment phase.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Not commenced/ Post extraction completion
	Suitable sediment and erosion controls in place.	Final water body will be designed to Best Practice according to the 'Blue Book' Criteria for a 5 day 90th percentile storm event. All drains will be designed for the 1 in 10 year design storm event and do not re-entrain sediment. The dam spillway will be designed for the 1 in 100 year design storm event.	Final water body is designed to exceed the required capacity and will be assessed once complete. Inspection by quarry manager and suitably qualified person.	Visual Inspection on construction completion and monthly until completion.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Final Water Body construction not commenced/ Post extraction completion
Domain 3 - Water Management						
Final water body is non-polluting and fit for the purpose of the intended final land use.	Final water body is constructed to the engineer's design specification.	The dam dimensions, location and walls construction will be to the engineer's design specification (yet to be determined). The dam spillway will be designed for the 1 in 100 year design storm event.	Inspection by quarry manager and suitably qualified person.	During construction as determined by the engineer	DECC- Managing Urban Stormwater and engineers plans	Final Water Body construction not commenced/ Post extraction completion
	Final water body is not a pollution hazard to the downstream environment.	Final water body will be designed to Best Practice according to the 'Blue Book' Criteria for a 5 day 90th percentile storm event. The dam spillway will be designed for the 1 in 100 year design storm event.	Final water body is designed to exceed the required capacity post establishment and will be assessed once complete. Inspection by quarry manager and suitably qualified person.	Visual Inspection on construction completion and monthly until completion.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Final Water Body construction not commenced/ Post extraction completion
Domain 4 - Overburden Emplacement Area						
Ensure overburden emplacement areas has been battered/shaped to the final landform.	Final landform contours similar to proposed final landform contours.	<ul style="list-style-type: none"> Slope lengths in rehabilitated areas shall not exceed 20m for a 3H: 1V batter i.e. an earth bank shall be installed. Slope lengths in rehabilitated areas shall not exceed 30m for a 4H: 1V batter i.e. an earth bank shall be installed. Slope lengths in rehabilitated areas shall not exceed 40m for batters >4H: 1V i.e. an earth bank shall be installed. 	Survey on completion by registered surveyor.	Upon completion of landform establishment phase.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Not commenced/ Post extraction completion
Sediment runoff to be contained.	Sediment retained in water management structures	Final water body will be designed to Best Practice according to the 'Blue Book' Criteria for a 5 day 90th percentile storm event. All drains will be designed for the 1 in 10 year design storm event and do not re-entrain sediment. The dam spillway will be designed for the 1 in 100 year design storm event.	Existing dams currently meet capacity specifications (see SWMP). Final water body is designed to exceed the required capacity and will be assessed once complete. Inspection by quarry manager and suitably qualified person.	Visual Inspection on construction completion and monthly until completion.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Final Water Body construction not commenced/ Post extraction completion

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
Phase 2 - Landform Establishment (continued)						
Domain 6 - Open Cut Void						
Domain landform is safe, stable and non-polluting, fit for the purpose of the intended post-mining land use(s)	Final landform contours similar to proposed final landform contours.	<ul style="list-style-type: none"> Slope lengths in rehabilitated areas shall not exceed 20m for a 3H: 1V batter i.e. an earth bank shall be installed. Slope lengths in rehabilitated areas shall not exceed 30m for a 4H: 1V batter i.e. an earth bank shall be installed. Slope lengths in rehabilitated areas shall not exceed 40m for batters >4H: 1V i.e. an earth bank shall be installed. 	Survey on completion by registered surveyor.	Upon completion of landform establishment phase.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Not commenced/ Post extraction completion
Domain landform is effectively drained and protected from erosion	Landform drains towards water management domain	Final water body will be designed to Best Practice according to the 'Blue Book' Criteria for a 5 day 90th percentile storm event. All drains will be designed for the 1 in 10 year design storm event and do not re-entrain sediment. The dam spillway will be designed for the 1 in 100 year design storm event..	Existing dams currently meet capacity specifications (see SWMP). Final water body is designed to exceed the required capacity and will be assessed once complete. Inspection by quarry manager and suitably qualified person.	Visual Inspection on construction completion and monthly until completion.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Final Water Body construction not commenced/ Post extraction completion
Access tracks to be retained	Tracks suitable for private access or pedestrian usage	Slopes of major tracks <10° or have cross drains/banks installed. Where unsuitable soils are present, tracks to be stabilised with crushed bricks, concrete, gravel or similar.	Survey on completion by registered surveyor. Stabilisation methods to be recorded and reported by Site Contractor to the quarry manager.	Upon completion of landform establishment phase.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Not commenced/ Post extraction completion
Materials (including topsoils of the disturbed areas) are recovered, appropriately managed and used efficiently as resource in the rehabilitation	Available topsoils are stockpiled appropriately and reused on the site	Available topsoil is spread over final landform	Site contractor to record growth medium management procedures in to the quarry manager. Records to include amounts stripped, locations and depths re-spread.	As required during construction.	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Not commenced/ Post extraction completion

Domain 9 - Native Vegetation Conservation Area

No activities within this domain are required during this phase

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
Phase 3 - Growth Medium Development						
Domain A - Infrastructure						
No revegetation is to occur in this domain, therefore no activities are required during this phase						
Domain B - Water Management						
No revegetation is to occur in this domain, therefore no activities are required during this phase						
Domain C & D - Rehabilitation Area – Grassland/Woodland						
Establish soil/growing medium suitable for establishment of grassland or woodland vegetation community	Compacted surfaces deep ripped to 300mm along contour.	Photographs of ripped areas	Inspection by quarry manager and suitably qualified person.	Following Deep ripping	EIS and this report	Not commenced/ Post landform establishment
	Hydromulch Area- <ul style="list-style-type: none"> Minimum 300mm of subsoil emplaced over deep ripped surface. Minimum of 100mm of topsoil emplaced over subsoil layer. 	Small 'test pits' dug and photographed to show final media depth, report indicates required thicknesses achieved.	Photographs of test pits reported by quarry manager and/or suitably qualified person	Following spreading of soils.	EIS and this report	Not commenced/ Post landform establishment
	Buffer Setbacks and Embankments with 1V:3H Grade- <ul style="list-style-type: none"> Minimum 300mm of subsoil emplaced over deep ripped surface. Minimum of 100mm of topsoil emplaced over subsoil layer. Minimum of 75mm of organic mulch emplaced over topsoil. 	Small 'test pits' dug and photographed to show final media depth, report indicates required thicknesses achieved.	Photographs of test pits reported by quarry manager and/or suitably qualified person	Following spreading of soils.	EIS and this report	Not commenced/ Post landform establishment
	Embankments Steeper than 1V:3H Grade- <ul style="list-style-type: none"> Minimum 300mm of subsoil emplaced over deep ripped surface. Minimum of 100mm of topsoil emplaced over subsoil layer. Jute matting pinned to topsoiled bank. Minimum of 75mm of organic mulch emplaced over topsoil. 	Small 'test pits' dug and photographed to show final media depth and presence of jute matting, report indicates required thicknesses achieved.	Photographs of test pits reported by quarry manager and/or suitably qualified person	Following spreading of soils.	EIS and this report	Not commenced/ Post landform establishment

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
	Permanent Bundwalls- <ul style="list-style-type: none"> • Minimum 300mm of topsoil emplaced over deep ripped surface. • Jute matting pinned to topsoiled bank. • Minimum of 75mm of organic mulch emplaced over topsoil. 	Small 'test pits' dug and photographed to show final media depth and presence of jute matting, report indicates required thicknesses achieved.	Photographs of test pits reported by quarry manager and/or suitably qualified person	Following spreading of soils.	EIS and this report	Not commenced/ Post landform establishment

Domain J - Native Vegetation Conservation Area

No activities within this domain are required during this phase

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
Phase 4 - Ecosystem and Land use Establishment						
Domain A - Infrastructure						
No revegetation is to occur in this domain, therefore no activities are required during this phase						
Domain B - Water Management						
Wetlands water management structure to remain therefore no activities required during this phase						
Domain C & D - Rehabilitation Area – Grassland/Woodland						
Re-establishment of a grassland/woodland community with a similar composition to the pre-disturbance community i.e. Shale-Sandstone Transition Forest.	Revegetation species mix applied as suggested in Rehabilitation Management Plan	<ul style="list-style-type: none"> A target coverage factor of 70% will be subject to further refinement. Low mortality of plants used in progressive revegetation with 75% becoming established 3 years. 	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EIS and Rehabilitation Management Plan	Not commenced/ Ongoing
	The rehabilitated area does not constitute an erosion hazard.	Total projected foliage cover is greater than or equal to 70%.	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	DECC- Managing Urban Stormwater, EIS, SWMP and this report	Not commenced/ Ongoing
	Weeds not preventing revegetation from establishing	Weed cover no more than 25% over a 3 year monitoring period within any given areas where revegetation has occurred. Note that non-native species purposefully planted to control erosion are excluded from this target.	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EIS and Rehabilitation Management Plan	Not commenced/ Ongoing
	Grazing by native and domestic fauna not adversely impacting on ecosystem development	Rural fences and gates installed around disturbed area to prevent grazing of domestic stock. Feral animal controls will be implemented if required.	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EIS and Rehabilitation Management Plan	Not commenced/ Ongoing
	Branches and logs of any trees cleared on the site are to be spread within the rehabilitation areas to provide habitat for ground fauna	<ul style="list-style-type: none"> Evidence of logs and other fallen timber spread over re rehabilitated areas. Ground fauna species of similar diversity to adjacent areas of similar habitat. 	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EIS and Rehabilitation Management Plan	Not commenced/ Ongoing
Domain J - Native Vegetation Conservation Area						
Ensure that the conservation areas are progressing towards the Shale-Sandstone Transition Forest vegetation community.	The rehabilitated area does not constitute an erosion hazard.	Total projected foliage cover is greater than or equal to 70%.	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	DECC- Managing Urban Stormwater EIS	Not commenced/ Ongoing
	Weeds not overtaking existing vegetation	Monitoring confirms that after 2 years the non-native/non-target species (weeds) represents less than 20% of projected foliage cover or equivalent to surrounding vegetation not disturbed by mining activities.	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EIS and Rehabilitation Management Plan	Not commenced/ Ongoing
	Grazing by native and domestic fauna not adversely impacting on ecosystem development	Rural fences and gates installed around disturbed area to prevent grazing of domestic stock. Feral animal controls will be implemented if required.	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EIS and Rehabilitation Management Plan	Not commenced/ Ongoing

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
Phase 5 - Ecosystem and Land use Sustainability						
Domain A - Infrastructure						
No activities are required during this phase						
Domain B - Water Management						
Water contained in the final landform is consistent with the baseline ecological, hydrological and geomorphic conditions of the surrounding environment	Water quality monitoring results show that the final water body is non-polluting should it overtop and is suitable for stock water.	Water Quality meets the objective of Section 120 of the Protection of the Environment Operations Act 1997: and Water Quality meets the objective of the ANZECC Guidelines for 90% protection of freshwater ecosystems.	Water to be monitored for pH, Turbidity, Oil & Grease and TSS on a once off basis. NATA laboratory	Once off basis.	EA and Rehabilitation Management Plan	Not commenced/ Post completion
Domain C & D - Rehabilitation Area – Grassland/Woodland						
Re-establishment of a grassland/woodland community with a similar composition to the pre-disturbance community i.e. Shale-Sandstone Transition Forest.	Vegetation self-sustaining.	Monitoring confirms: <ul style="list-style-type: none"> Evidence of new growth of endemic species. Evidence of successive generations of endemic species No further active weed control required (beyond that considered necessary at analogue sites). 	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EA and Rehabilitation Management Plan	Not commenced/ Ongoing
	Rehabilitated areas to be linked to existing and future areas of vegetation where possible to form a network of wildlife corridors	<ul style="list-style-type: none"> Connectivity between current and future rehabilitated areas are established adjacent to existing and future areas of vegetation where possible. Patches are not be separated by more than 10 metres where possible. 	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EA and Rehabilitation Management Plan	Not commenced/ Ongoing
	Rocks of varying sizes are to be spread over rehabilitated areas to provide ground fauna habitat and refuge.	<ul style="list-style-type: none"> Evidence of varying sized rocks between 20 mm and greater than 200 mm spread over rehabilitated areas. Ground dwelling fauna species of similar diversity to adjacent areas of similar habitat. 	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EA and Rehabilitation Management Plan	Not commenced/ Ongoing
	The provision of nest boxes for a range of arboreal fauna to be installed during the establishment of final rehabilitation areas	On completion of the rehabilitation, a suitably qualified ecologist determines the requirement on whether nest boxes are required. If nest boxes are required to be installed a nest box management plan will be prepared.	Monitoring including photography to be conducted by suitably qualified person and reported annually.	On installation	EA and Rehabilitation Management Plan	Not commenced/ Ongoing

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
Domain J - Native Vegetation Conservation Area						
Conservation area is established and self-sustaining	Vegetation self-sustaining.	Monitoring confirms: <ul style="list-style-type: none"> Evidence of new growth of endemic species. Evidence of successive generations of endemic species No further active weed control required (beyond that considered necessary at analogue sites). 	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EA and Rehabilitation Management Plan	Not commenced/ Ongoing
	Conservation area to be linked to existing and future areas of vegetation where possible to form a network of wildlife corridors	<ul style="list-style-type: none"> Connectivity between conservation areas are established adjacent to existing and future areas of vegetation where possible. Patches are not be separated by more than 10 metres where possible. 	Monitoring including photography to be conducted by suitably qualified person and reported annually.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved	EA and Rehabilitation Management Plan	Not commenced/ Ongoing
	The provision of nest boxes for a range of arboreal fauna to be installed during the establishment of final rehabilitation areas	On completion of the rehabilitation, a suitably qualified ecologist determines the requirement on whether nest boxes are required. If nest boxes are required to be installed a nest box management plan will be prepared.	Monitoring including photography to be conducted by suitably qualified person and reported annually.	On installation	EA and Rehabilitation Management Plan	Not commenced/ Ongoing

Objective	Performance Indicator	Completion Criteria	Monitoring Methodology and Responsibility	Monitoring Frequency	Justification /Source	Current Progress and Expected Completion
Phase 6 - Relinquishment						
All Domains						
Relinquishment	Demonstrated compliance with all completion criteria	Outlined above	Completion Report to be prepared by suitably qualified person describing compliance with all criteria.	-	-	Not commenced

Section 8. Monitoring and Maintenance

8.1. General

Monitoring of the rehabilitation of the site will be conducted on a monthly basis during the first 6 months establishment. After that time, if progress is satisfactory, inspections may be conducted on a quarterly basis until the completion criteria are met.

After the completion of permanent rehabilitation works, a monitoring and maintenance schedule is to be followed. This program will be prepared as part of the Landscape and Rehabilitation Program. Maintenance shall include but not limited to, the following items where and as required:

- Watering all landscaped areas.
- Monitoring germination, replacement planting and hydromulching.
- Weed control.
- Make good areas of soil subsidence or erosion.
- Topping up of mulched areas
- Spray/treatment for insect and disease control
- Monitoring and controlling rabbits.

8.2. Watering

All areas which have been hydromulched or pocket planted shall be watered in thoroughly following initial works. In the case of the hydromulch areas the wood-fibre should be kept moist until a satisfactory germination occurs. After this, sufficient watering must be kept up until the native plants have reached a stage where they can survive in their own right. In general this means the rehabilitated areas shall be watered a minimum of 3 times per week during winter and 4 times per week during summer.

Watering shall be preferentially be done by hand utilising dam water on site unless a suitable sprinkler system can be installed. Frequency of watering may be adjusted based on weather conditions, with the objective to ensure the maximum percentage of successful established plant stock.

8.3. Monitoring Germination, Replacement Planting and Re-Hydromulching

Areas undergoing rehabilitation shall be continually monitored (see completion criteria for frequency) until well established, with unsuccessful planting being replaced in line with this report and the landscape specifications. Failed hydromulched areas will be resprayed. Note that native species in the hydromulch can be unreliable to germinate and it may take up to 3 to 12 months before a result is achieved.

Re-laid turf or grasses are to be visually monitored by the manager to ensure that sufficient cover is present to prevent a breach of air quality performance criteria and erosion impacts are minimised.

All replacements shall be to a specification and of a size equivalent to similar healthy species surrounding the rejected plant, or, as in the case of mature trees, to the original size and quality as a minimum.

8.4. Weed Control

The rehabilitation areas will be inspected monthly after establishment for a period of six months. After that time 6 monthly inspections will be undertaken to determine the impact of weeds. Spot spraying and other control methods described in *Section 6.2.4* will be undertaken as required.

8.5. Insect, Disease Control and Control of Rabbits

As described in the EA, the landscape contractor shall become familiar with the healthy appearance of the plant material and constantly monitor it for damage or pest infestations. When either of these become evident the contractors shall immediately apply the necessary control measures.

If newly planted areas are becoming subject to rabbit attack, it may be necessary to install rabbit proof fencing to the area of rehabilitation to ensure minimal damage is done.

8.6. Erosion

The rehabilitation areas will be inspected monthly after establishment for a period of six months. After that time 6 monthly inspections will be undertaken to determine evidence of erosion. Any areas of erosion will be remediated by replacing soil where applicable, applying ameliorants as recommended by a qualified specialist and revegetated as required.

8.7. Monitoring and Maintenance Schedule

The following table summarises the monitoring schedule for the rehabilitation of the site.

Item	Details	Monitoring/Maintenance Frequency
General	Monitoring after rehabilitation establishment	Monthly for the first 6 months. Quarterly until completion criteria met.
Erosion	Evidence of erosion over rehabilitation areas.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved
Vegetation	Watering of rehabilitation vegetation	Preferably 3 times per week during winter and 4 times per week during summer.
	Achievement of 70% ground coverage of revegetation after establishment.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved
	Vegetation self-sustaining i.e. <ul style="list-style-type: none"> Evidence of new growth of endemic species. Evidence of successive generations of endemic species No further active weed control required (beyond that considered necessary at analogue sites). 	Monthly for the first 6 months, then 6 monthly until completion criteria achieved
Weed Inspection and Spraying	The non-native/non-target species (weeds) represents less than 20% of projected foliage cover.	Monthly for the first 6 months. 6 monthly until completion criteria met.
Pest Inspection and Control	Grazing by native and domestic fauna not adversely impacting on ecosystem development.	Monthly for the first 6 months, then 6 monthly until completion criteria achieved
Water management structures	Dams to be monitored for effectiveness in sediment containment i.e. have sufficient capacity.	Monthly until completion criteria met.
	Sediment dams are not discharging dirty water	On construction completion and monthly until completion
	Dirty water is not entering the final water body at completion of rehabilitation works.	On construction completion and monthly until completion criteria met.
Topsoil and Subsoil Volumes	Recording of the amounts and locations of stripped topsoil and subsoils during land clearing.	As required during land clearing.
	Recording of the amounts and locations of stripped topsoil and subsoils emplaced during rehabilitation works.	As required during rehabilitation works.

Section 9. Intervention and Adaptive Management

9.1. Threats to Rehabilitation

A summary of hazards or threats identified for the rehabilitation objectives is given below, along with a risk assessment. For risks deemed higher than acceptable (namely I to III in *Table 34*), a Trigger Action Response Plan (TARP) has been developed. A TARP identifies proposed contingency strategies in the event of unexpected variations in rehabilitation outcomes. These risks have been determined on the assumption that procedures and mitigation measures outlined in this report and other standard procedures that could be reasonably expected have been undertaken.

Table 34. Analysis of Rehabilitation Threats

Rehabilitation Threat	Potential Adverse Outcome	Likelihood	Consequence	Risk	Tarp No
Failure to remove infrastructure and services not suitable for the final landuse.	Unable to complete rehabilitation or establish the identified final landuse.	Rare	Insignificant	V	
Failure to remove all roads and hardstand areas to be retained for the final landuse and reduce the width/size to that suitable for the final landuse.	Unable to complete rehabilitation or establish the identified final landuse.	Rare	Insignificant	V	
Domain is not free from hazardous materials.	Unable to complete rehabilitation or establish the identified final landuse.	Rare	Moderate	IV	
Water discharged from the site is not consistent with the baseline ecological, hydrological and geomorphic conditions of the surrounding environment.	The final landform is a source of pollution.	Unlikely	Minor	IV	
Final landform does not conform to approved final landform	Unable to complete rehabilitation or establish the identified final landuse.	Possible	Moderate	III	1
Domain landform is not safe, stable and secure, fit for the purpose of the intended final land use.	Geotechnical instability of the final open cut void.	Unlikely	Moderate	III	2
Domain landform is not properly protected from erosion.	The final landform is a source of pollution.	Rare	Moderate	IV	
	Vegetation is unable to be established due to erosion.	Rare	Major	III	3

Rehabilitation Threat	Potential Adverse Outcome	Likelihood	Consequence	Risk	Tarp No
Access tracks to be retained are not retained.	Unable to complete rehabilitation or establish the identified final landuse.	Rare	Insignificant	V	
Incorrect species established on final landform	Vegetation community does not become established on final landform affecting final land use and ecosystem	Unlikely	Moderate	III	4
Failure to establish soil/growing medium suitable for establishment of grassland or woodland vegetation community	Insufficient soil available for rehabilitation.	Possible	Moderate	III	5
	Inadequate soil thickness applied to final landform	Possible	Moderate	III	5
	Soil not capable of sustaining vegetation community	Possible	Moderate	III	5
Weed or pest management fails	Weeds and pests become established and require significant resources to manage	Possible	Minor	IV	
Vegetation community is not self-sustaining	Final landform requires significantly more management than analogue sites.	Possible	Moderate	III	6
Vegetation community not receiving adequate rainfall to establish/self-sustain	Failure of vegetation community	Possible	Moderate	III	7
Public access to open cut void possible	Damage to rehabilitation areas	Possible	Moderate	III	8



9.2. Trigger Action Response Plan

Table 35. Trigger Action Response Plan

TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
1	Final landform does not conform to approved final landform.	Stockpiles not removed/used in the establishment of the final landform.	<ul style="list-style-type: none"> Inventory indicates stockpiles are not removed/reused. Slopes required by the final landform are not obtained due to material deficits. 	Stockpile material is to be removed from the site or incorporated into the rehabilitation of the final landform.	Survey plan
		Overburden not used in the establishment of the final landform	<ul style="list-style-type: none"> Inventory indicates stockpiles are not removed/reused. Slopes required by the final landform are not obtained due to material deficits. 	Overburden material is to be removed from the site or incorporated into the rehabilitation of the final landform.	Survey plan
		Slopes too steep to be rehabilitated as planned	Field slope measurements taken during land forming activities indicate slopes do not meet the completion criteria.	Slopes to be reduced until all slopes meet approved final landform unless final landform considered stable by geotechnical review and vegetation establishment success meets completion criteria- subject to approval by DPE	Survey plan prepared by surveyor indicates that final slopes meet approved final landform.
2	Domain landform is not safe, stable and fit for the purpose of the intended final land use.	Geotechnical instability of the final open cut void.	Monitoring or final closure geotechnical assessment identifies instability/unacceptable movement (actual or potential) in final face of open cut void.	<ul style="list-style-type: none"> Suitably qualified geotechnical engineer engaged to assess the instability and provide a range of recommendations to remediate the instability Recommendation to be implemented in consultation with the DPE. 	Geotechnical Report



TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
3	Domain landform is not properly protected from erosion.	Vegetation is unable to be established due to erosion.	Projected total foliage cover is less than 70%	<ul style="list-style-type: none"> • Mine personnel identify site of erosion and remediate through additional earthworks, soil works including addition of ameliorants, supplementary revegetation or other stabilisation method. • If the above is unsuccessful, a suitably qualified professional in sediment and erosion control will be engaged to prepare and assessment report and recommendations to be implemented. 	Managing Urban Stormwater 'Blue Book' 2004 CPESC Report
		Final landform is a source of pollution.	Surface water monitoring records indicate that water quality levels are outside the completion criteria. Visual inspection indicates that the final landform is the source of unacceptable levels of sedimentation or is actively eroding.	<ul style="list-style-type: none"> • Mine personnel identify site of erosion and remediate through additional earthworks, soil works including addition of ameliorants, supplementary revegetation or other stabilisation method. • If the above is unsuccessful, a suitably qualified professional in sediment and erosion control will be engaged to prepare and assessment report and recommendations to be implemented. 	Managing Urban Stormwater 'Blue Book' 2004 CPESC Report



TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
4	Incorrect species established on final landform	Vegetation community does not become established on final landform affecting final land use and ecosystem.	Monitoring indicates that endemic species represent less than 70% of the total species number and projected foliage cover after 2 years from planting and less than 80% after 5 years from planting.	<p>Suitably qualified ecologist or revegetation expert engaged to assess reasons for divergence of failure of endemic species establishment and recommend actions to ensure that the final vegetation community corresponds as closely as possible to the approved community. Additional actions may include:</p> <ul style="list-style-type: none"> • Sowing of additional seed mix for targeted species or additional species endemic to the pre-disturbance community; • Use of Tubestock, seed and mulch mix or other application techniques; • Soil amelioration works such as addition of fertiliser; and • Additional weed control activities (mechanical and/or chemical). 	Ecologist Report



TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
5	Failure to establish soil/growing medium suitable for establishment of grassland or woodland vegetation community.	Insufficient soil available for rehabilitation.	Soil inventory prior to rehabilitation (particularly stockpile volumes) indicates a deficit of soil material.	<ul style="list-style-type: none"> Suitable sources of additional soil material to be identified, including the need for importation of soils from off-site. Investigation into measures that may be implemented to ameliorate other materials to make them suitable for use as a growth medium. 	Annual reporting and scheduled audits/ This report
		Inadequate soil thickness applied to final landform	Test pits following placement of soil material identifies placed soil thickness not consistent with final approved soil thickness.	Additional soil material spread on the final landform.	Annual reporting and scheduled audits/ This report
		Soil not capable of sustaining vegetation community	Topsoil parameters not within the identified criteria (criteria to be determined).	Suitably qualified agronomist or soil scientist engaged to prepare a report including a range of recommendations to ensure that the identified criteria are achieved/soil is suitable for sustaining the vegetation community.	Soil analysis reports and interpretation by qualified specialist.



TARP Ref No	Rehabilitation Threat	Potential Adverse Outcome	Trigger level	Actions to be implemented	Evidence / Reference
6	Vegetation community is not self-sustaining	Final landform requires significantly more management than analogue sites (analogue sites yet to be established).	Monitoring indicates that: <ul style="list-style-type: none"> Established vegetation is not replacing itself through successive generations; or Weed growth is increasing above a projected foliage cover of 20%. 	Suitably qualified ecologist or revegetation expert engaged to assess reasons for additional management requirements and recommend actions to align management required with that of the analogue sites. Additional actions (to be undertaken in targeted areas) may include: <ul style="list-style-type: none"> Sowing of additional seed mix for targeted species or additional species endemic to the pre-disturbance community; Use of Tubestock, seed and mulch mix or other application techniques; Soil amelioration works such as addition of fertiliser; and Additional weed control activities (mechanical and/or chemical) and/or pest management as required (especially of rabbits). 	Ecologist Report
7	Vegetation community not receiving adequate rainfall to establish/self-sustain	Failure of vegetation community	Rainfall below the lowest 10% of records for greater than 3 months	Water cart to be utilised over revegetated areas.	BOM website
8	Public access to open cut void possible	Damage to rehabilitation areas	Monitoring indicates evidence of trespassing and/or damage to rehabilitation areas.	Appropriate fencing, signage and bunding is to be repaired and maintained.	Annual reporting and scheduled audits/ This report

Section 10. Reporting

Areas temporarily rehabilitated, the procedures used and the progress towards completion will be reported in the Annual Review and the Conditions Compliance Report.

A Landscape and Rehabilitation Management Plan (this report) will be prepared to satisfy condition 60, including a program to monitor and report on the effectiveness of measures developed to ensure compliance with the rehabilitation objectives, and progress towards the completion criteria. This Plan will also identify potential risks to the success of the rehabilitation and contingency measures that will be undertaken to mitigate these risks.

The plan will be updated each 3 year period following the 3 years covered by the initial approval of the plan.

Section 11. Responsibility

The Plant Manager is responsible for ensuring rehabilitation activities, both temporary and permanent are implemented according to this Plan and the EA, and that these areas are appropriately monitored and maintained. The Plant Manager may engage a specialist to perform some of these tasks.

The Environmental Manager is responsible for ensuring this plan is reviewed and updated every three years or as required by the following consent condition:

Revision of Strategies, Plans and Programs

67. Within 3 months of the submission of:

(a) an annual review under Condition 66 above;

(b) an incident report under Condition 68 below;

(c) an audit report under Condition 70 below; or

(d) any modification to the conditions of this Consent (unless the conditions require otherwise),

the Applicant shall review, and if necessary revise, the strategies, plans, and programs required under this Consent to the satisfaction of the Secretary.

Where this review leads to revisions in any such document, then within 4 weeks of the review, unless the Secretary agrees otherwise, the revised document must be submitted to the Secretary for approval.

Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.

All staff and visitors are responsible for being aware of the location of rehabilitation areas and ensuring these areas are preserved. Any observed failure or disturbance is to be reported to the Plant Manager.

Section 12. Security Calculation

The security was reviewed using the DPE 'worksheet' which was updated in June 2017. The estimate was made on the current footprint of the mine. Any further mine expansion would necessitate a review of the security. The following describes the Domains in detail and areas are shown on *Figure Seven*.

The rates used in the security calculation have been changed to suit the scale of the site and the appropriate equipment to be utilised in the rehabilitation. In general a 30 tonne excavator and D6 Swamp Dozer the wide tracks would be used which are more suitable for the scale and site conditions.

12.1. Domain 1: Infrastructure

There are electricity services to the processing plant that require disconnection. No mains water is connected to the site. A number of demountable buildings and small industrial sheds within the processing plant will be required to be removed. The concrete footings from the processing area would also be removed. The workshop sheds and hardstand area would be retained. For simplicity, the earthworks and revegetation of this domain has been assessed in the quarry Void Domain. The Processing Dam will also be retained and minor earthworks have been included in this section.

The total rehabilitation cost estimate for this Domain is estimated to be \$32,042.

12.2. Domain 2: Tailings and Rejects Emplacements

This Domain is not applicable to the site.

12.3. Domain 3: Waste Rock Dumps

There are minor overburden bunds pushed up in advance of the extraction area which will be reincorporated into the final landform. Perimeter bunds will be left untouched. The revegetation of these bunds is accounted for in the quarry void domain.

The total rehabilitation cost estimate for this Domain is now estimated to be \$1,904

12.4. Domain 4: Active Mine and Voids

The active pit covers an area of approximately 10.8 Ha, excluding the Processing Dam which would remain, and contains some slopes that will need to be reduced to 3H:1V. The volume of material required to be moved to undertake this reshaping is estimated to be 44,300 cubic metres. Pocket planting of vegetation would be undertaken on the slopes whilst the floor would be hydromulched.

The total rehabilitation cost of this Domain is estimated to be \$73,971.

12.5. Domain 5: Other

No other areas are applicable to this site.

12.6. Management Activities


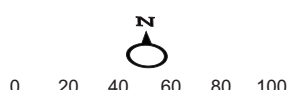
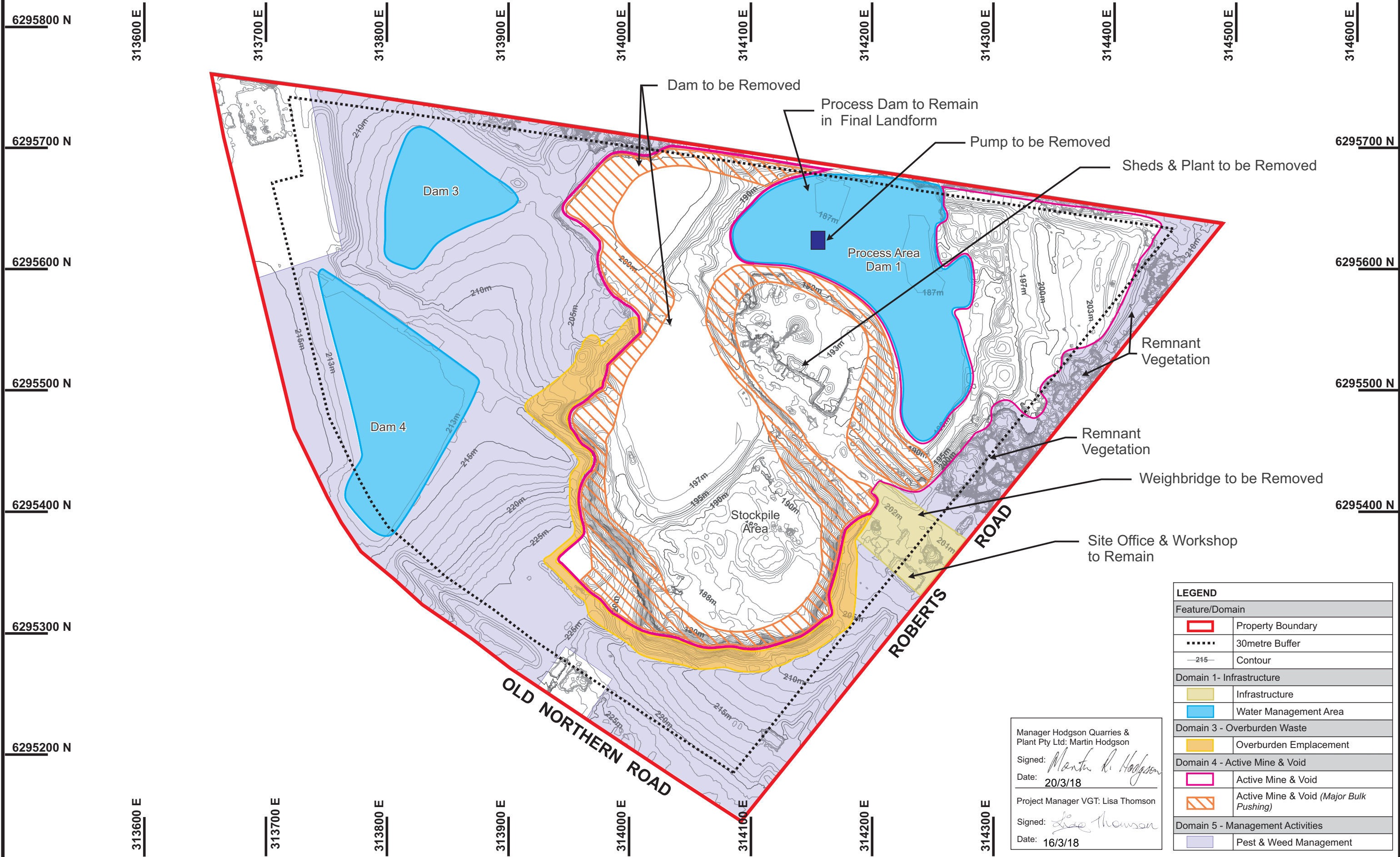
Maintenance of the buffer lands and undisturbed lands have been estimated in this domain.

The cost estimate for development of an unplanned Closure Plan is \$20,000 and mobilisation of equipment for a small mine has been estimated at \$20,000 due to the smaller scale of the operation.

Therefore the total Rehabilitation Cost Calculation is estimated to be \$202,159.

Plan of:	Roberts Rd Maroota Sand Quarry Rehabilitation Plan 2017 - Rehabilitation Cost Estimate Domains	Location:	Maroota Quarry, Roberts Road, Maroota, NSW	Source:	Integral Surveying - Image Date May 2016	Our Ref:	5072_HMA_EMP_RP17_C007_V1_F7.cdr
Figure:	SEVEN	Council:	Hills Shire Council	Survey:	Integral Surveying	Plan By:	LT/JD
Sheet:	1 of 1	Tenures:	N/A	Projection:	MGA	Project Manager:	LT
Version/Date:	V1 09/03/2018	Client:	Hodgson Quarries & Plant Pty Ltd	Contour Interval:	1m	Office:	Thornton

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.

LEGEND	
Feature/Domain	
	Property Boundary
	30metre Buffer
	Contour
Domain 1- Infrastructure	
	Infrastructure
	Water Management Area
Domain 3 - Overburden Waste	
	Overburden Emplacement
Domain 4 - Active Mine & Void	
	Active Mine & Void
	Active Mine & Void (Major Bulk Pushing)
Domain 5 - Management Activities	
	Pest & Weed Management

Manager Hodgson Quarries & Plant Pty Ltd: Martin Hodgson
 Signed: *Martin R. Hodgson*
 Date: 20/3/18

Project Manager VGT: Lisa Thomson
 Signed: *Lisa Thomson*
 Date: 16/3/18

Plan of:	Roberts Rd Maroota Sand Quarry Rehabilitation Plan 2017 - Cross Sections
Figure:	EIGHT
Sheet:	1 of 1
Version/Date:	V1 09/03/2018

This figure may be based on third party data which has not been verified by vgt and may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and vgt does not warrant its accuracy.



Location:	Maroota Quarry, Roberts Road, Maroota, NSW	Source:	Volume 1 EA s75W Modification (2), Sand Extraction, Roberts Road, Maroota Nexus Environmental Planning Pty Ltd Figures 2.6, 2.7, 2.8, 2.9, 2.10 & 2.11- 23/09/2015	Our Ref:	5072_HMA_EMP_RP17_C008_V1_F8.cdr
Council:	Hills Shire Council	Survey:	N/A	Plan By:	JD
Tenures:	N/A	Projection:	N/A	Project Manager:	LT
Client:	Hodgson Quarries & Plant Pty Ltd	Contour Interval:	N/A	Office:	Thornton

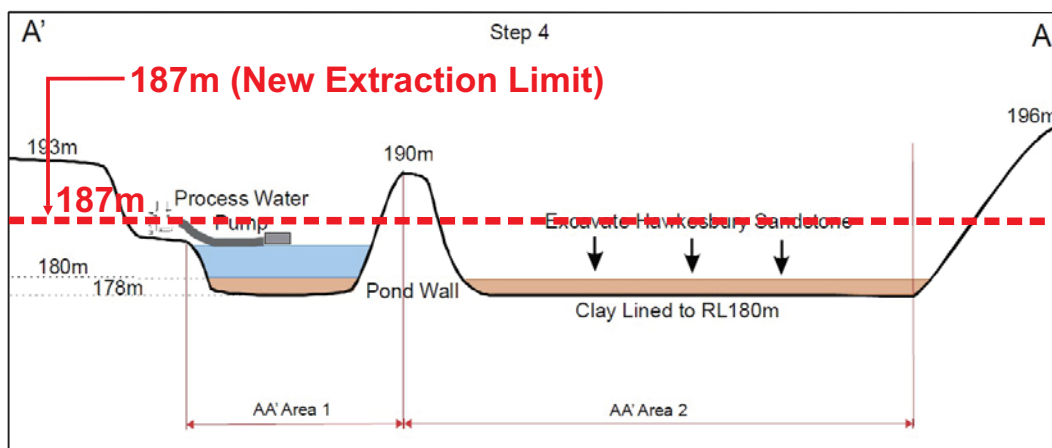


Figure 2.6: Step 4 in the dam construction process.

Note:
These original Figures are from the Nexus Report 23 September 2015 and are schematic (not to scale). The subsequent 187m red dashed line has been placed by VGT as a line of best fit.

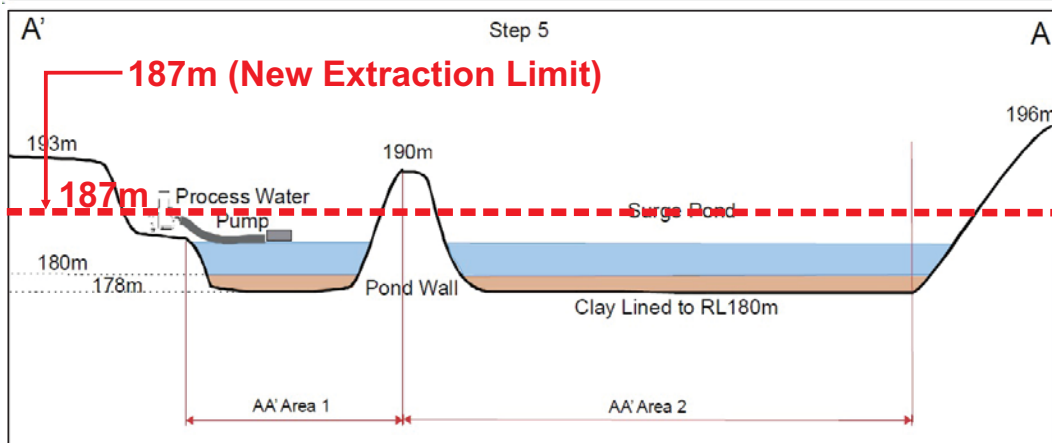


Figure 2.7: Step 5 in the dam construction process.

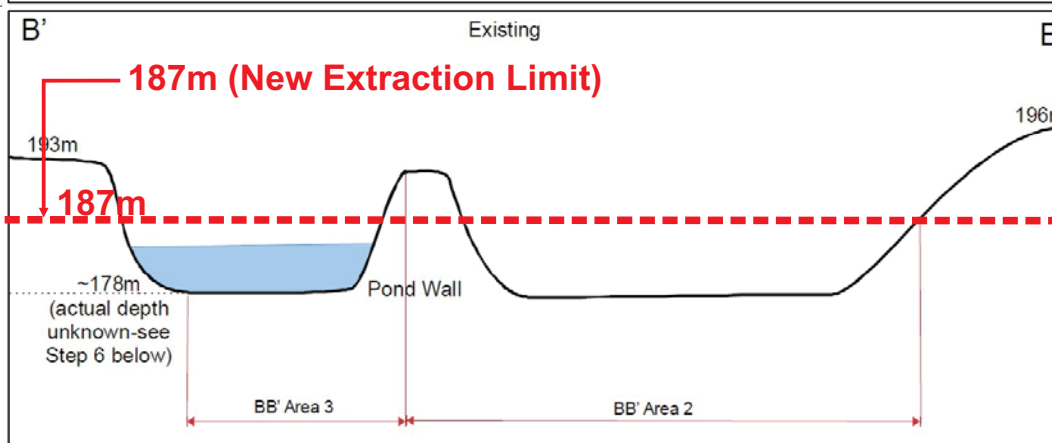


Figure 2.8: Existing Section B-B'.

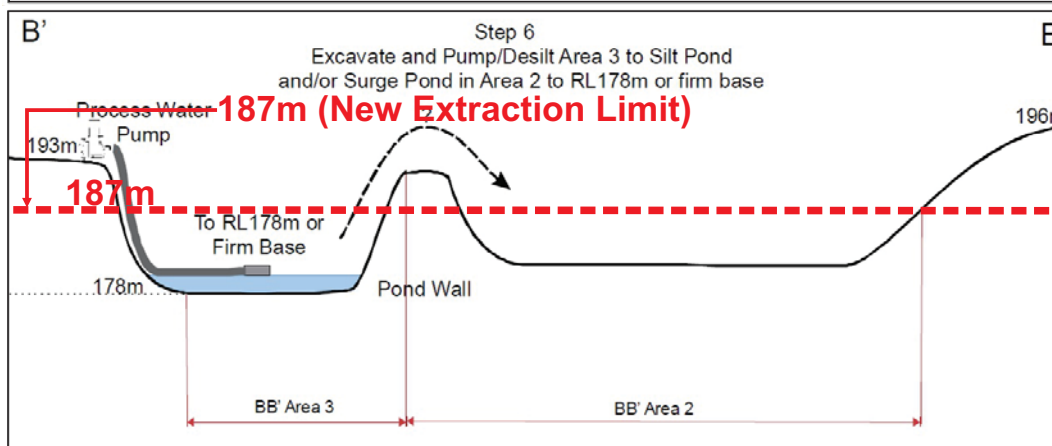


Figure 2.9: Step 6 of the dam construction process.

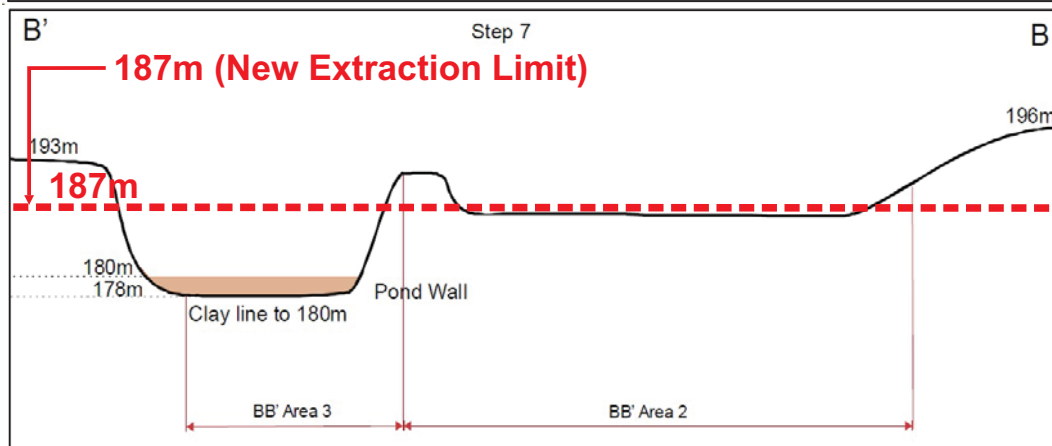


Figure 2.10: Step 7 in the dam construction process.

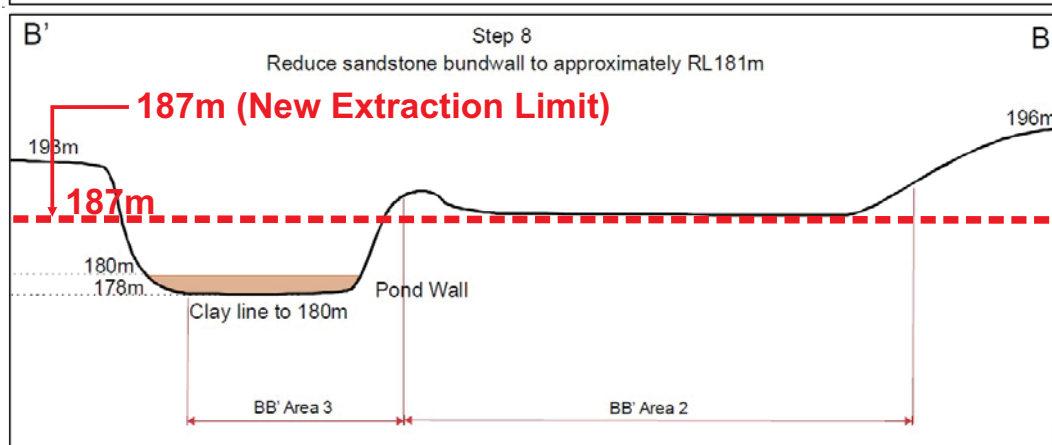


Figure 2.11: Step 8 of the dam construction process.

Manager Hodgson Quarries & Plant Pty Ltd: Martin Hodgson
Signed: *Martin R. Hodgson*
Date: 20/3/18
Project Manager VGT: Lisa Thomson
Signed: *Lisa Thomson*
Date: 16/3/18