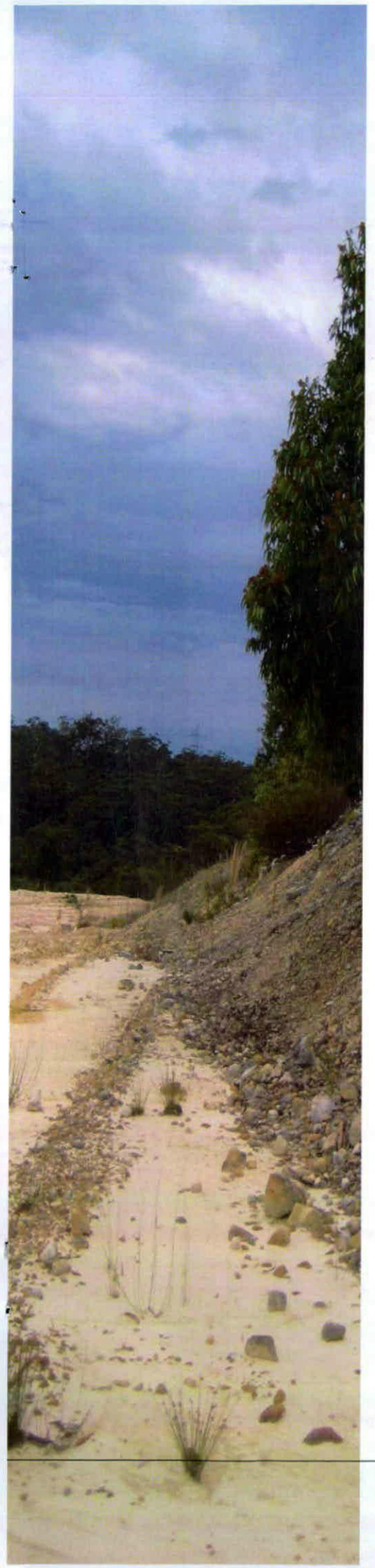

quarry rehabilitation plan - for Part Lot 3 DP 567166 & Part Lot 2 DP 510812 Old Northern Road, Maroota

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revised - 15th January 2010

prepared by
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DECCW - Scientific Licence No. S11031, DA - Animal Research Authority 04-4786

Background

This plan was initially prepared as part of the Environmental Impact Statement, Species Impact Statement & Development Application No. 578/2009 for the extraction of sandstone material on parts of Lot 3 in DP 567166 and Lot 2 in DP 510812 off Old Northern Road at Maroota. The report has been revised in response to Hornsby Council's comments and specifically addresses issues raised in correspondence from Banksia Ecology to Hornsby Council dated 14/08/09 and 16/11/09.

This plan outlines the extraction process, the rehabilitation works and the final land uses and includes specifications and rehabilitation procedures. The plan was commissioned by PF Formation Pty Ltd with instructions provided by Environmental Planning Pty Ltd.

Existing Site
The site currently contains several land uses comprising of agricultural land, sandstone extraction and processing areas and natural bushland habitats. The threatened species of Tetratheca glandulosa and Pimelea curviflora var curviflora have been recorded within the bushland habitats and these habitats also provide foraging opportunities for several threatened fauna species found in the local area.

Proposed Land Uses
The proposed development involves the staged extraction of sandstone material in 3 areas;
- the northern areas, Area A & Area B, being approximately 6.6 ha and currently containing native vegetation; and
- the southern area, Area C, being approximately 4.8 ha and is currently used as agricultural pasture.

The proposed operation also provides for the rehabilitation of the extraction areas to their pre existing land uses with additional rehabilitation of the existing extraction area, Area D, approximately 3.9 ha for agricultural purposes and Area E, approximately 1.6 ha as native vegetation.

Rehabilitation Planning
A number of rehabilitation planning principals have been considered in this report including:
- State Regional Environmental Plan No. 9 Extractive Industry (No.2) 1995
- Development Control Plan - Extractive Industries (Hornsby Council 1998)
- Best Practice Environmental Management Rehabilitation & Revegetation (Cwlth Environmental Protection Agency, 1995)
- Guidelines to the Mining, Rehabilitation & Environmental Management Process, version 3. (NSW Dept Primary Industries, 2006)
- Agricultural Land Classification Atlas, Sydney Basin, including the Lower Nepean - Hawkesbury Catchment (NSW Agriculture, 1995)

Contents

HORNSBY SHIRE COUNCIL

This sheet is approved subject to the notes, advice and conditions listed in Development Consent No. 578/2009 **dated:** 3 March 2010

GENERAL MANAGER

Per:

scale **nts**

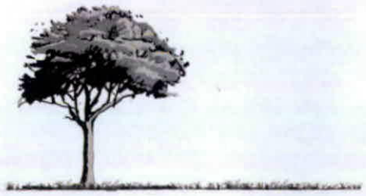
dwg no. **smrmcs1.01** rev. **0.4**

sheet **1** of **11**

drawing title **cover page**

existing landuses on the site and adjacent allotments

existing sand extraction & processing



grassland pasture or cleared areas

rural forest - partially cleared

open forest / woodland - bushland

HORNSBY SHIRE COUNCIL

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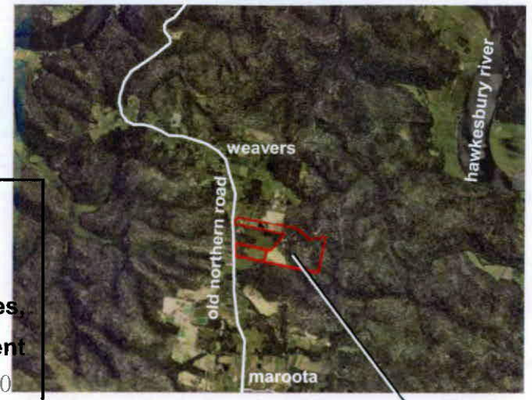
GENERAL MANAGER

Per:

regional air photo



habitat

The site adjoins the bushland habitats of Marramarra National Park which is managed for conservation purposes. This reserve along with the natural habitats on the site provide refuge and foraging opportunities for a variety of native fauna including several threatened species.

Threatened species reported (Burcher 2007) within 5km of the site include Turquoise Parrot (Neophema pulchella), Powerful Owl (Ninox strenua), Spotted-tailed Quoll (Dasyurus maculatus), Eastern Pygmy-possum (Cercartetus nanus), Large-eared Pied Bat (Chalinolobus dwyeri) and Red-crowned Toadlet (Pseudophryne australis).

The vegetation within the Open Forest / Woodland area is typical of the Sydney Sandstone Complex (Benson Howell, 1994).

The Open Forest occurring along the riparian areas of Coopers Creek is characterised by canopy trees of Sydney Peppermint (Eucalyptus piperita), Smooth-barked Apple (Angophora costata) and Turpentine (Syncarpia glomulifera) with an understorey of Christmas Bush (Ceratopetalum gummiferum), Old-Man Banksia (Banksia serrata) and Forest Oak (Allocasuarina torulosa).

The Woodland area extends along the ridgeline and slopes and consists of Scribbly Gum (Eucalyptus haemastoma), Narrow-leaved Apple (Angophora bakeri) Stringybark (Eucalyptus sparsifolia), Yellow Bloodwood (Corymbia eximia), Red Bloodwood (Corymbia gummifera), Grey Gum (Eucalyptus punctata), Sydney Peppermint and Smooth-barked Apple (Angophora costata).

Two threatened species have been recorded (Burcher 2007) as occurring on the site. These are Pimelea curviflora var curviflora and Tetratheca glandulosa. Whilst Pimelea curviflora var curviflora is known to occur in large numbers adjacent the site in Marramarra National Park, the Tetratheca glandulosa on the site is considered to be part of a more restricted population.

Detailed assessment of the impact of the proposed sand mining on the local ecology and threatened species are made in the Species Impact Statement (Burcher 2008).

site characteristics

site geology:	hawkesbury sandstone (Herbert, 1983),
soil landscape:	Sydney Town soil landscape (McInnes, 1997),
vegetation structure - bushland	woodland / open forest / grassland (Burcher, 2007),
vegetation association	sydney sandstone ridgetop woodland sydney sandstone gully forest (Benson & Howell, 1994) cleared grassland,
catchment	Coopers Creek / Hawkesbury River,
fire history	wildfire Jan 1994, wildfire Dec 2002,

legend

- extraction & rehabilitation boundary
- allotment boundaries
- water body
- aboriginal site
- Pimelea curviflora var curviflora
- Tetratheca glandulosa (recorded on part of the site, other records are known to occur on the site and on the adjoining land to the north east & south)

this plan is based upon

pf formation, part lot - DP567166, maroota, part lot 2 - DP510812, maroota, plan 1 april 2005 from 1:12,000 scale aerial photography flown 26/10/2004 Geo-Spectrum (Australia) Pty. Limited,

ground survey, Hammond Smeally & Co.

100 0 100 200 metres

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mark couston	1: 5000	15/01/10	smrmex1.01	0.4	2 11

project

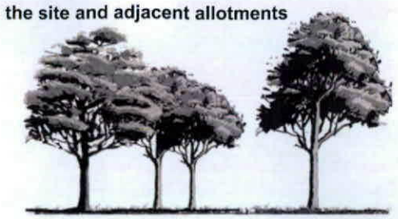
quarry rehabilitation plan for part lot 3 DP 567166 & part lot 2 DP 510812 old northern road, maroota.

drawing title

existing site land uses & habitats and extraction & rehabilitation areas

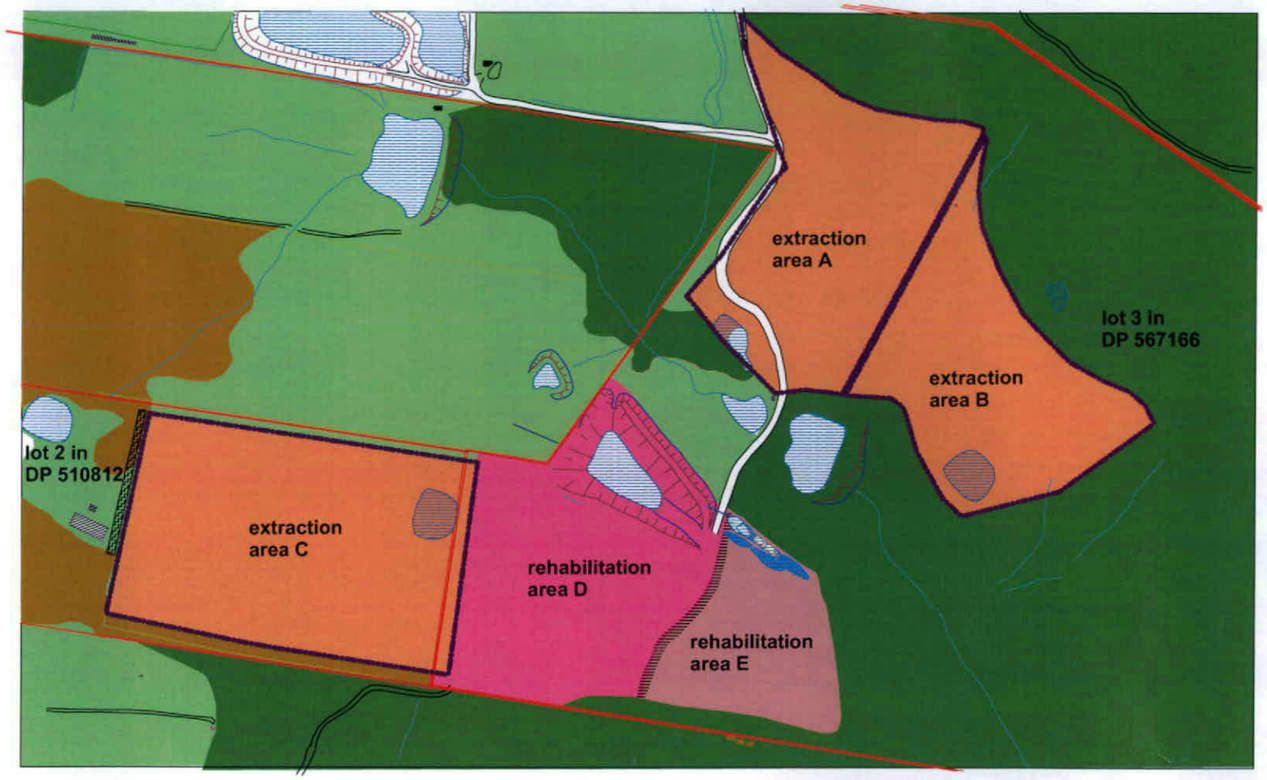
existing landuses on the site and adjacent allotments

grassland pasture or cleared areas
- class 3 & 4 agricultural land



rural forest - partially cleared

open forest / woodland
- bushland



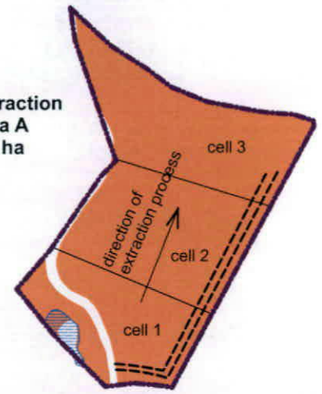
progressive extraction and rehabilitation

The extraction and rehabilitation process is to be carried out in a progressive process in operational cells. Each cell is to reflect the stage of the extraction / rehabilitation process.

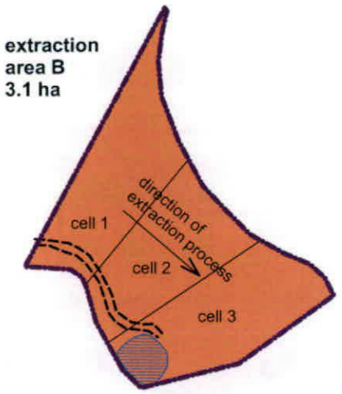
The typical process involves simultaneous operations involving:
- removal of vegetation and topsoil in the preceding cell;
- extraction of material in the current working cell, and
- rehabilitation of the previously worked cell.

This approach avoids the need to store topsoil and organic material, reduces double handling of topsoil, maximises the rate of native plant regeneration from seed stored in soil and limits the visual impact of the extraction face.

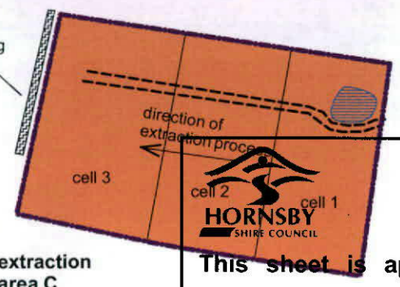
extraction area A
3.5 ha



extraction area B
3.1 ha

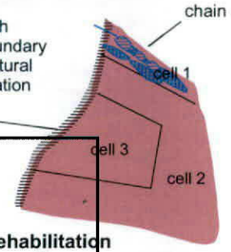


temporary 2m high bund, 3m wide, for visual screening



permanent low 1m high earthen berm as a boundary between future agricultural land and native vegetation rehabilitation

chain of ponds



extraction area C
4.8 ha

rehabilitation area C
1.6 ha

This sheet is approved subject to the notes, advice and conditions listed in Development Consent No. 578/2009 **dated:** 3 March 2010

GENERAL MANAGER

Per:

legend

- allotment boundaries
- water body / dam
- extraction area & boundary
- temporary access roads within extraction & rehabilitation areas

100 0 100 200 metres

staging of works

Staging of the extraction process is to commence in the following sequence:

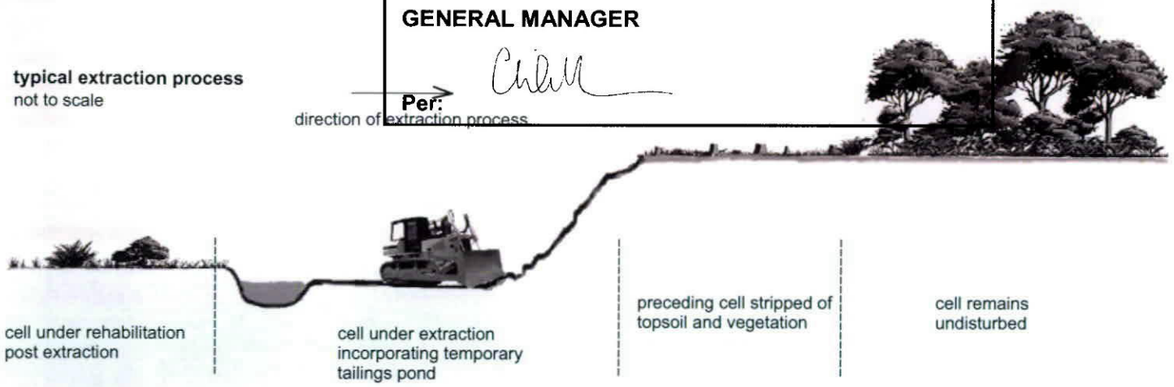
Stage 1 (0 -10 years after date of development consent)
- Area E, progressive rehabilitation to native vegetation.
- Area A, progressive extraction and rehabilitation to native vegetation.
- Area C, progressive extraction and rehabilitation to agricultural land use.

Stage 2 (10 - 20 years after date of development consent)
- Area B progressive extraction and rehabilitation to native vegetation.
- Area D rehabilitation to agricultural land use.

typical extraction process

not to scale

direction of extraction process



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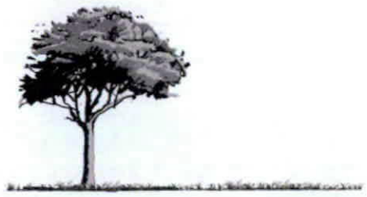
project
quarry rehabilitation plan for part lot 3 DP 567166 & part lot 2 DP 510812 old northern road, maroota.

drawing title
operational stages & typical extraction and rehabilitation process

existing landuses on the site and adjacent allotments

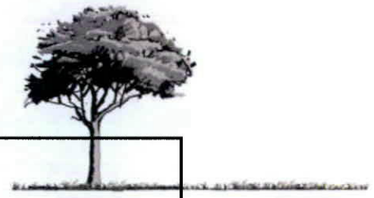


grassland pasture or cleared areas - class 3 & 4 agricultural land

rural forest - partially cleared

open forest / woodland - bushland

rehabilitation landuses



rehabilitated grassland pasture - class 3 & 4 agricultural land

rehabilitated open forest / woodland - bushland

HORNSBY SHIRE COUNCIL

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GENERAL MANAGER

Per:

legend

- aboriginal site
- allotment boundaries
- water bodies
- Tetratheca glandulosa - retained in situ
- permanent low 1m high earthen berm as a watershed boundary between agricultural land and native vegetation

final landform objectives

The final landform is based upon a number of planning criteria including:

The final landform is to be capable of supporting sustainable agricultural production or other post-extraction land uses compatible with the established character and the landscape and natural quality of the Maroota locality. (SREP No. 9 Extractive Industry (No.2) 1995)

Rehabilitation should identify a final stable and permanent landform which is environmentally and visually acceptable (SREP No. 9 Extractive Industry (No.2) Planning Report)

Extraction areas should be progressively rehabilitated to reflect and integrate with the shape, form, contour, colour, texture, drainage characteristics and landscape quality of the surrounding terrain. (Extractive Industries DCP, Hornsby Council 1998)

land uses & final landform

The extent of the extraction process is defined by the areas shown as being rehabilitated as either bushland or agricultural land. No extraction is to occur beyond the rehabilitation areas and existing land uses and landforms shall remain.

The final land use after the extraction process is completed has been based upon a number of factors. these factors include;
- objectives of relevant planning instruments;
- the objectives of the land owners;
- the land use objectives of a previous development consent for part of the site on the south western portion of Lot 3 in DP 567166;
- the need to provide compatible land uses;
- opportunities for agricultural production, and
- the need to provide flora & fauna habitats and minimise the impact on the local ecology.

The final land form after the extraction process as shown on this plan has been based upon the integration of the existing terrain using typical slopes and contours that occur locally.

The volume of overburden material to be generated from the extraction process has not been determined and is subject to the the type of material excavated. The final contours shown on this plan shall be formed by either; the backfilling of overburden material, limiting the extent of the extraction or a combination of both.

Constructed slopes or rock faces formed by either excavation or backfilling will need to be undertaken in a manner that ensures their long term stability.

this plan is based upon

pf formation, part lot - DP567166, maroota, part lot 2 - DP510812, maroota, plan 1 april 2005 from 1:12,000 scale aerial photography flown 26/10/2004 Geo-Spectrum (Australia) Pty. Limited,

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100 0 100 200 metres

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project: **quarry rehabilitation plan for part lot 3 DP 567166 & part lot 2 DP 510812 old northern road, maroota.**

drawing title: **proposed land uses and final landform & contours**

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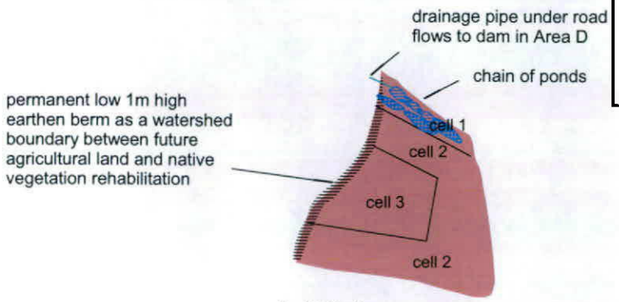
GENERAL MANAGER

Per:

rehabilitation process Area E stage 1: (0 - 10 years)

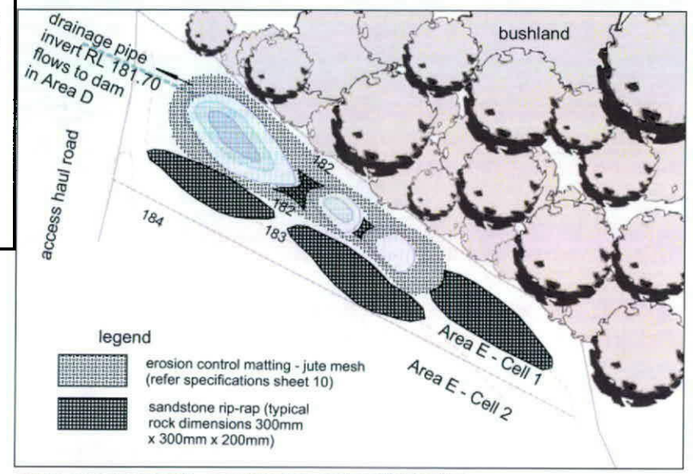
area E, 1.6 ha



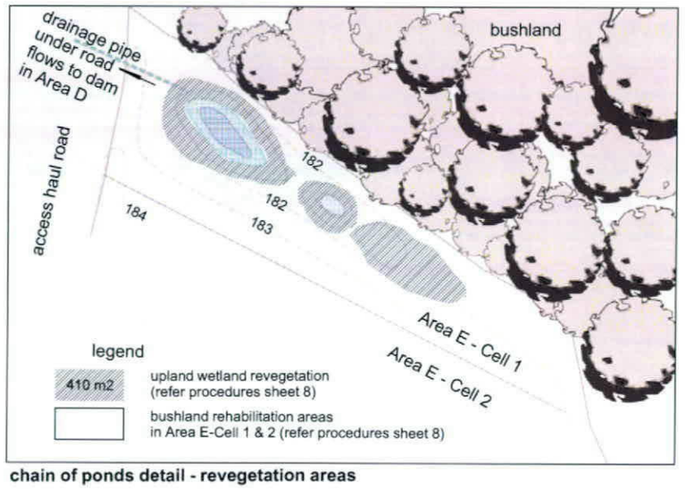
rehabilitation area E

1.1 - Star pickets shall be erected at 5m intervals along the boundary between Area E and Area D to identify the rehabilitation area on the ground.
1.2 - All exotic flora and environmental weed species shall be eradicated across Area E using standard weed control techniques (refer Specifications sheet 10).
1.3 - Existing stockpiles of residual topsoil from the earlier extraction process are to be removed and stockpiled in Area D for future use in areas D or C.
1.4 - The chain of 3 ponds, in Area E - Cell 1, are to be constructed in accordance with the Chain of Pond Chainage detail (refer this sheet).
1.5 - Sandstone rip-rap is to be placed adjacent the ponds (refer details this sheet and Specifications sheet 10) to act as a gross sediment filter and/or to provide for micro-habitat variation.
1.6 - Any Isolepis nodosa (Knobby Club-rush) or native Xyris spp. naturally regenerating within Area E are to be transplanted into the upper pond in the constructed Chain of Ponds.
1.7 - Final grading of this Area E is to be carried out in accordance with the Proposed Land Use and Final Landform & Contour Plan (refer sheet 4) on the Area E western boundary.
1.8 - A permanent sediment /weed control fence with 3 strand wires (top middle & within 100mm from the base) shall be installed along the berm using the installed star-pickets (refer 1.1). The entire berm is to be stabilised with erosion control matting (refer Specifications sheet 10) and rehabilitated in accordance with Bushland Rehabilitation Procedure (refer sheet 8).
1.9 - Revegetation of the Chain of Ponds shall be carried out in accordance with the Upland Wetland Revegetation Procedures (refer sheet 9).
1.10- The southern slope of Area E -Cell 2 is to be terraced with 2 benches to reduce the erosion potential of the slope and to assist with the recruitment of native vegetation.
1.11- Area E must be maintained free of all exotic flora and environmental weed species prior to receiving bushland topsoil using standard weed control techniques (refer Specifications sheet 10).
1.12- Area E - part Cell 1, Cell 2 & Cell 3 is to receive the topsoil from the natural bushland habitats only, east of the existing access track in Area A - Cell 1 using an increase topsoil stripping depth of 120mm (refer Clearing Native Vegetation & Topsoil Removal Procedures sheet 8).
1.13- Area E, Cells 1, 2 & 3 are to be rehabilitated as bushland in accordance with Bushland Rehabilitation Procedure (refer sheet 8).
1.14- Maintenance of Area E - Cells 1, 2 & 3 shall be conducted in accordance with the Bushland Rehabilitation Procedure (refer sheet 8).
1.15- Monitoring & reporting associated with Area E -Cells 1, 2 & 3 shall be conducted in accordance with the Reporting & Monitoring Protocols (refer sheet 11).

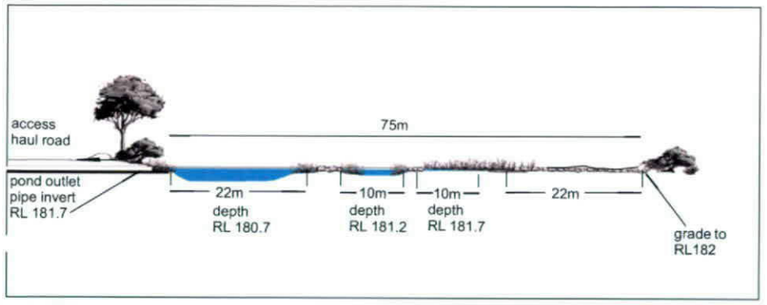
Area E chain of ponds detail



chain of ponds detail - construction and configuration



chain of ponds detail - revegetation areas



chain of ponds detail - long section with dimensions and levels

100 0 100 200 metres

20 0 20 40 metres

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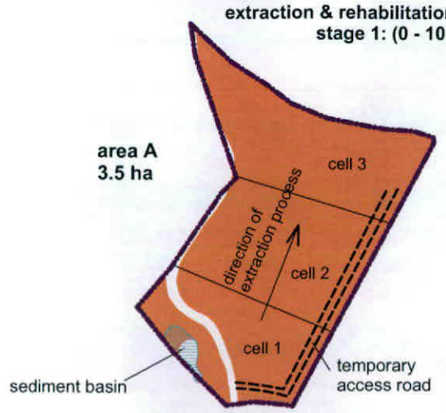
prepared by	scale	date	dwg no.	rev.	sheet of
mark couston	1: 5000 area 1: 100 detail	15/01/10	smrmpp2.01	0.4	5 11

project
quarry rehabilitation plan for part lot 3 DP 567166 & part lot 2 DP 510812 old northern road, maroota.

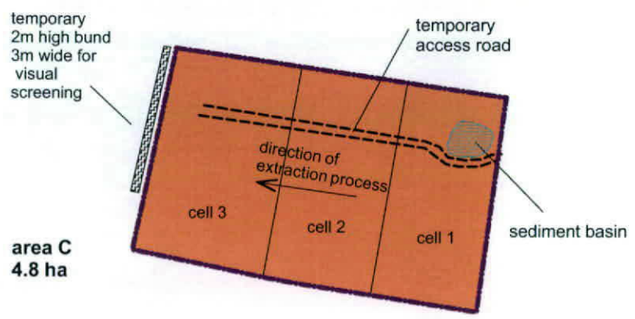
drawing title
stage 1 - rehabilitation process in Area E

extraction & rehabilitation process Area A
stage 1: (0 - 10 years)



2.1 - The boundaries of Area A are to be marked on the ground using star pickets to visibly identify the extent of the area.
2.2 - A systematic survey is to be carried out to identify the locations of Tetratheca glandulosa plants. (refer sheet 8 Tetratheca glandulosa Propagation & Translocation Procedures).
2.3 - Prior to the clearing of vegetation, initial measures for the translocation of the Tetratheca glandulosa must be implemented (refer sheet 8, Tetratheca glandulosa Propagation & Translocation Procedures).
2.4 - The machinery service area is to be relocated to Area D.
2.5 - A section of the haul road is to be realigned north of the existing causeway towards the western boundary of Area A and the causeway crossing will be retained.
2.6 - All annual weeds such as Whisky Grass (Andropogon virginicus) and Veldtgrass (Ehrharta sp.) along existing tracks shall be eradicated from Area A using standard weed control methods (refer specifications, sheet 9).
2.7 - Native vegetation, east of the existing access road, is to be removed from Area A-Cell 1 in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8).
2.8 - Topsoil in bushland habitats east of the existing access road, is to be stripped from Area A- Cell 1 in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8) and is to be used in rehabilitation of Area E-Cells 1, 2 & 3. Topsoil stripping shall be increased in depth to 120mm to allow for greater coverage in Area E
2.9 - Exotic vegetation and topsoil west of the existing access road is to be removed and stockpiled in Area D for future rehabilitation of agricultural land.
2.10- A temporary tailings pond is to be established at the low part of the extraction Cell.
2.11- Temporary sediment and erosion controls such as earth bunding are to be installed (refer specifications sheet 8).
2.12- Extraction is to be carried out in Cell 1 with final landforms incorporated as part of the extraction process or formed from overburden material.
2.13- Towards the completion of extraction in Area A-Cell 1, vegetation is to be removed from Area A-Cell 2 in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8).
2.14- Towards the completion of extraction in Area A-Cell 1, topsoil is to be stripped in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8) from Area A- Cell 2 and used in the rehabilitation of Area A-Cell 1 (refer Bushland Rehabilitation Procedure, sheet 8).
2.15- Extraction is to be carried out in Area A- Cell 2 with final landforms incorporated as part of the extraction process or formed from overburden material.
2.16- A temporary tailings pond is to be established at the low part of the extraction Cell 2.
2.17- Rehabilitation and maintenance of Area A-Cell 1 is to continue (refer Bushland Rehabilitation Procedure sheet 8).
2.18- Prior to the clearing of vegetation in Area A- Cell 3, initial measures for the translocation of the Tetratheca glandulosa in Area A- Cell 3 must be implemented (refer sheet 8, Tetratheca glandulosa Propagation & Translocation Procedures).
2.19- Towards the completion of extraction in Area A-Cell 2, vegetation is to be removed from Area A-Cell 3 in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8).
2.20- Towards the completion of extraction in Area A-Cell 2, topsoil is to be stripped in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8) from Area A- Cell 3 and used in the rehabilitation of Area A-Cell 2 (refer Bushland Rehabilitation Procedure, sheet 8).
2.21- Final measures for the translocation of the Tetratheca glandulosa must be implemented (refer sheet 8, Tetratheca glandulosa Propagation & Translocation Procedures).
2.22- Extraction is to be carried out in Area A- Cell 3 with final landforms incorporated as part of the extraction process or formed from overburden material.
2.23- A temporary tailings pond is to be established at the low part of the extraction Cell 3.
2.24- Rehabilitation and maintenance of Area A-Cells 1 & 2 is to continue (refer Bushland Rehabilitation Procedure sheet 8).
2.25- Towards the completion of extraction in Area A-Cell 3 vegetation is to be removed from Area B-Cell 1 in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8).
2.26- Towards the completion of extraction in Area A-Cell 3, topsoil is to be stripped in accordance with Clearing Native Vegetation & Topsoil Removal Procedures, refer sheet 8) from Area B Cell 1 and used in the rehabilitation of Area A-Cell 3 (refer Bushland Rehabilitation Procedure, sheet 8).
2.27- In the event that there is a delay between the completion of extraction in Area A-Cell 3 and the commencement of extraction in Area B-Cell 1, weed control must be carried out to maintain the Area A-Cell 3 free of noxious and environmental weeds.
2.28- Rehabilitation and maintenance of Area A- Cells 1, 2 & 3 is to continue (refer Bushland Rehabilitation Procedure sheet 8).

extraction & rehabilitation process Area C
stage 1: (0 - 10 years)



3.1 - The boundaries of Area C are to be marked on the ground using star pickets to visibly identify the extent of the area.
3.2 - Native vegetation is to be removed from Area C- Cell 1 and is to be stockpiled in area D. Native vegetation containing seed can be used as supplementary brushmatting in Area E where there is limited natural regeneration.
3.4 - Vegetation & Topsoil is to be removed from Area C- Cell 1 and is to be used to form an earthen bund for visual screening at the western end of Area C- Cell 3 (refer Agricultural Land Rehabilitation Procedure sheet 8).
3.5 - Temporary sediment and erosion controls are to be installed (refer specifications sheet 8).
3.6 - A temporary tailings pond is to be established at the low part of the extraction Cell.
3.7 - Extraction is to be carried out in Area C-Cell 1 with final landforms incorporated as part of the extraction process or formed from overburden material.
3.8 - The main sediment pond / dam is to be established in the lower part of Area C.
3.9 - Towards the end of Area C- Cell 1 extraction, vegetation and topsoil are to be stripped from Area C- Cell 2.
3.10- Where final landforms are established in Area C- Cell 1, the stripped topsoil and vegetation from Cell 2 is to be utilised in Area C- Cell 1 (refer Agricultural Land Rehabilitation Procedure sheet 8).
3.11 - Extraction is to be carried out in Cell 2 with final landforms incorporated as part of the extraction process or formed from overburden material.
3.12 - A temporary tailings pond is to be established at the low part of the extraction Cell.
3.13- Rehabilitation of Area C- Cell 1 is to be carried out (refer Agricultural Land Rehabilitation Procedure sheet 8).
3.14- Towards the end of Area C- Cell 2 extraction, vegetation and topsoil are to be stripped from Cell 3.
3.15- Where final landforms are established in Area C- Cell 2, the stripped topsoil and vegetation from Area C- Cell 3 is to be utilised in Area C- Cell 2 (refer Agricultural Land Rehabilitation Procedure sheet 8).
3.16- Extraction is to be carried out in Area C- Cell 3 with final landforms incorporated as part of the extraction process or formed from overburden material.
3.17- A temporary tailings pond is to be established at the low part of the extraction Cell.
3.18- Rehabilitation of Area C- Cell 2 is to be carried out (refer Agricultural Land Rehabilitation Procedure sheet 8).
3.19- At the completion of the Extraction of Area C- Cell 3 the topsoil and vegetation used for the construction of the earthen bund is to be used as part of the rehabilitation process of Area C - Cell 3 (refer Agricultural Land Rehabilitation Procedure sheet 8).
3.20- Rehabilitation of Area C- Cell 3 is to be carried out (refer Agricultural Land Rehabilitation Procedure sheet 8).

HORNSBY SHIRE COUNCIL

This sheet is approved subject to the notes, advice and conditions listed in Development Consent No. 578/2009 **dated:** 3 March 2010

GENERAL MANAGER

Per:

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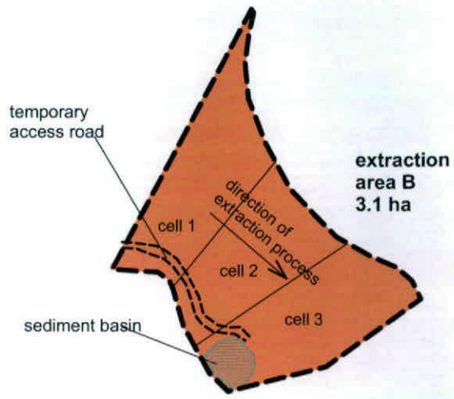
mark couston	1: 5000	15/01/10	smrmsp1.01	0.4	6 11

project
quarry rehabilitation plan for part lot 3 DP 567166 & part lot 2 DP 510812 old northern road, maroota.

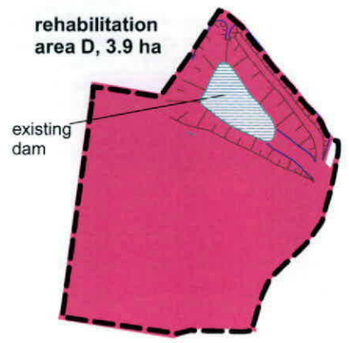
drawing title
stage 1 - extraction and rehabilitation process Areas A & C

extraction & rehabilitation process Area B
stage 2: (10 - 20 years)



4.1 - The boundaries of Area B are to be marked on the ground using star pickets to visibly identify the extent of the area.
4.2 - A systematic survey is to be carried out to identify the locations of Tetratheca glandulosa plants. (refer sheet 8 Tetratheca glandulosa Propagation & Translocation Procedures).
4.3 - Prior to the clearing of vegetation in Area B- Cell 1, initial measures for the translocation of the Tetratheca glandulosa in Area B- Cell 1 must be implemented (refer sheet 8 Tetratheca glandulosa Propagation & Translocation Procedures).
4.4 - All annual weeds such as Whisky Grass (Andropogon virginicus) and Veldtgrass (Ehrharta sp.) along existing tracks shall be eradicated from Area B using standard weed control methods (refer specifications sheet 9).
4.5 - Vegetation is to be removed from Area B-Cell 1 in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8).
4.6 - Topsoil is to be stripped from Area B- Cell 1 in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8) and is to be used in rehabilitation of Area A-Cell 3.
4.7 - Final measures for the translocation of the Tetratheca glandulosa in Area B- Cell 1 must be implemented (refer sheet 8 Tetratheca glandulosa Propagation & Translocation Procedures).
4.8 - A temporary tailings pond is to be established at the low part of the extraction Cell.
4.9 - Temporary sediment and erosion controls such as earth bunding are to be installed (refer specifications sheet 8).
4.10- Extraction is to be carried out in Area B- Cell 1 with final landforms incorporated as part of the extraction process or formed from overburden material.
4.11- Prior to the clearing of vegetation in Area B- Cell 2, initial measures for the translocation of the Tetratheca glandulosa in Area B- Cell 2 must be implemented (refer sheet 8 Tetratheca glandulosa Propagation & Translocation Procedures).
4.12- Towards the completion of extraction in Area B-Cell 1, vegetation is to be removed from Area B-Cell 2 in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8).
4.13- Final measures for the translocation of the Tetratheca glandulosa in Area B- Cell 2 must be implemented (refer sheet 8 Tetratheca glandulosa Propagation & Translocation Procedures).
4.14- Towards the completion of extraction in Area B-Cell 1, topsoil is to be stripped in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8) from Area B-Cell 2 and used in the rehabilitation of Area B-Cell 1 (refer Bushland Rehabilitation Procedure, sheet 8).
4.15- Extraction is to be carried out in Area B- Cell 2 with final landforms incorporated as part of the extraction process or formed from overburden material.
4.16- A temporary tailings pond is to be established at the low part of the extraction Cell 2.
4.17- Rehabilitation and maintenance of Area B- Cell 1 is to continue (refer Bushland Rehabilitation Procedure sheet 8).
4.18- Prior to the clearing of vegetation in Area B- Cell 3, initial measures for the translocation of the Tetratheca glandulosa in Area B- Cell 3 must be implemented (refer sheet 8 Tetratheca glandulosa Propagation & Translocation Procedures).
4.19- Towards the completion of extraction in Area B-Cell 2, vegetation is to be removed from Area B-Cell 3 in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8).
4.20- Towards the completion of extraction in Area B-Cell 2, topsoil is to be stripped in accordance with Clearing Native Vegetation & Topsoil Removal Procedures (refer sheet 8) from Area B-Cell 3 and used in the rehabilitation of Area B-Cell 2 (refer Bushland Rehabilitation Procedure, sheet 8).
4.21- Final measures for the translocation of the Tetratheca glandulosa in Area B- Cell 3 must be implemented (refer sheet 8 Tetratheca glandulosa Propagation & Translocation Procedures).
4.22- Extraction is to be carried out in Area A- Cell 3 with final landforms incorporated as part of the extraction process or formed from overburden material.
4.23- A temporary tailings pond is to be established at the low part of the extraction Cell 2.
4.24- Rehabilitation and maintenance of Area B-Cells 1 & 2 is to continue (refer Bushland Rehabilitation Procedure sheet 8).
4.25- Rehabilitation of Area B- Cell 3 is to be carried out using a higher proportion of logs and rock boulders.
4.26- Rehabilitation of Area B- Cell 3 is to involve collection of topsoil from previous rehabilitated sites in Areas A & B (up to 20 years old) and this is to be carried out under the guidance of an independent qualified and experienced ecologist.
Topsoil is to be collected from Areas A & B in long narrow strips or as a mosaic pattern.
4.27- Rehabilitation of Area B- Cell 3 is to utilise brushmatting containing viable seed collected from the surrounding bushland.
4.28- Rehabilitation of Area B- Cell 3 is to involve the planting of 100 provenance canopy trees of Eucalyptus, Corymbia or Angophora to promote the build-up of leaf-litter and fine organic material which are to be progressively culled over a 5 year period to achieve similar tree canopy to that in the surrounding natural bushland.
4.29- Rehabilitation of Area B- Cell 3 is to include collection of native seed from the surrounding natural bushland within the allotment in particular Acacia species and Poaceae family and which is to be broadcast over the cell.
4.30- Rehabilitation and maintenance of Area B-Cells 1, 2 & 3 is to continue (refer Bushland Rehabilitation Procedure sheet 8).

rehabilitation process Area D
stage 2: (10 - 20 years)



5.1 - At the completion of the rehabilitation of Area B, final grading of the landform is to be carried out across Area D.
5.2 - All residual top soil remaining from the previous extraction process in Area D is to be used as part of the rehabilitation process.
5.3 - Rehabilitation is to be carried out (refer Agricultural Land Rehabilitation Procedures sheet 8).

HORNSBY SHIRE COUNCIL

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project
quarry rehabilitation plan for part lot 3 DP 567166 & part lot 2 DP 510812 old northern road, maroota.

drawing title
stage 2 - extraction and rehabilitation process Areas B & D

Tetratheca glandulosa propagation & translocation procedures

Background.

Tetratheca glandulosa is a low growing, spreading shrub, usually less than 20 cm high but occasionally can be up to 50 cm high.

Tetratheca glandulosa is listed as a Vulnerable species in the schedules of the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) in the schedules of the Threatened Species Conservation Act 1995 (NSW). The impact of the development on Tetratheca glandulosa has been considered in the Species Impact Statement (Aquila Ecological Surveys, 2008) and this translocation procedure is part of the conservation strategies for the species on this site.

Pollination, seed production and germination triggers of Tetratheca glandulosa are poorly known. A similar species, Tetratheca juncea, is unable to self-pollinate due to the physical characteristics of the plant's reproductive parts and pollen vectors (possibly a species of native bee) are required for successful pollination. The fecundity, viability, dispersal, longevity and dormancy of seed from the species is unknown (DECC, 2000).

Plants are known to resprout from a woody root stock following fire; however the role that fire plays in seed germination in unclear. Juveniles appear to be uncommon within a population, with the majority of plants usually consisting of resprouting adults that are likely to be clonal (DECC 2000).

The Tetratheca glandulosa plants on this site have experienced wildfires in 1994 & 2002 and the population within and adjacent to the extraction areas persists.

Whilst species in the Tetratheca genus are reported to be readily propagated by cuttings (Wrigley & Fagg, 1996) there has been limited evidence directly relating to the propagation of Tetratheca glandulosa.

Propagation of the species has been carried out by Mount Annan Botanic Garden in 1991 from the Terrey Hills area. In this case cutting material was processed by taking semi hardwood cuttings dipped in clonex purple 4000ppm and propagated in a nursery environment. The results were limited but resulted in 1 plant per 24 cuttings (J. Whyte pers comm.)

Propagation & Translocation Procedure
The translocation of Tetratheca glandulosa plants within the extraction areas involves 2 strategies. These are:
- propagation of Tetratheca glandulosa from cuttings, and
- translocation of soil containing the Tetratheca glandulosa root stock.

6.1 - Prior to any vegetation clearing within an extraction Area, a systematic survey is to be undertaken identifying all Tetratheca glandulosa plants during the flowering period July-November.
6.2 - Prior to any vegetation clearing within an extraction Area, the area within a 2m radius surrounding known Tetratheca glandulosa plants or groups of plants shall be clearly identified by star-pickets and a boundary of coloured flagging tape.
6.3 - Prior to clearing of vegetation within an extraction Area, cuttings are to be taken from all stems of the plant and transferred to a propagation nursery with specialist experience in the propagation of native species.
6.4 - The clearing native vegetation & topsoil removal is to occur within the extraction Cell leaving the Tetratheca glandulosa habitat islands identified by the star pickets and flagging tape undisturbed.
6.5 - The recipient sites for the Tetratheca glandulosa must be within the Cell that has received the surrounding topsoil and is under rehabilitation. The area to receive the Tetratheca glandulosa must be identified and if necessary further prepared before the translocation proceeds.
6.6 - Tetratheca glandulosa plants shall be removed by an excavator with a a minimum bucket size of 300mm x 600mm removing soil to a minimum depth of 150mm. As an alternative a translocation "shovel" can be used to remove intact sods. With each method the root mass should be preserved in the excavated soil with minimal disturbance. Any remaining topsoil or leaf litter shall be translocated.
6.7 - For the purposes of monitoring, the recipient area shall be identified with the star-pickets and flagging tape noting that Tetratheca glandulosa plants & root stock has been translocated.
6.8 - To encourage the resprouting of the Tetratheca glandulosa the translocated root stock and soil is to be maintained by regular watering. To minimize the impact on soil organisms and mycorrhizal fungi no fertiliser is to be used.
6.9 - Tetratheca glandulosa plants that have been successfully propagated and have established adequate root systems will be replanted in a rehabilitation Cell containing topsoil.
6.10- Tetratheca glandulosa plantings are to be marked with a star-picket and coloured flagging tape noting tubestock planting.
6.11- Monitoring of the translocated root stock and propagated tubestock is to be carried out (refer monitoring and performance measures).

clearing native vegetation & topsoil and bushland rehabilitation procedures (translocation works)

Background
The extraction cells in Areas A & B and part of C currently contain indigenous vegetation with an Open Forest and Woodland structure. The vegetation is in good condition with very few exotic weed species present. Whilst the vegetation in these areas is proposed to be removed as part of the extraction process, it is likely that substantial quantities of viable seed is present in the topsoil and on the standing vegetation.

The rehabilitation process focuses on using this inherent resilience in the soil seed bank and the capacity of native vegetation to naturally regenerate from seed or root stock rather than revegetation methods that rely on propagation and use of a limited number of species.

The clearing of native vegetation and bushland rehabilitation proceedures (translocation works) will need to be carried out in consultation with an independent, qualified and experienced ecologist with assessments carried out during the process and certification required at key stages in the procedures.

clearing native vegetation & topsoil removal procedures (donor site)

7.1 - Prior to disturbance a pre clearance floristic assessment is to carried out to establish baseline data for future comparisons in accordance with the Monitoring & Reporting (refer sheet 10).
7.2 - Prior to the clearing of vegetation within an Area, weed control using standard weed control methods (refer specifications) is to be carried out across the Area.
7.3 - Prior to the clearing of vegetation within an Area, important microhabitats such as tree hollows and ephemeral drainage soaks shall be identified by an independent, qualified and experienced ecologist using coloured flagging tape or star-pickets with boundary coloured flagging tape.
7.4 - Prior to clearing of vegetation, nest boxes (refer specifications) shall be erected within the bushland areas to be retained on the site. The number of nest boxes should be determined by an identified by an independent, qualified and experienced ecologist as part of the pre-clearing habitat assessment and must be at least equal to the number of hollow bearing trees identified for removal.
7.5 - Prior to the clearing of vegetation, an independent, qualified and experienced ecologist is to inspect the Cell to ensure the Cell is free of weeds and, if satisfied, provide certification that the Cell programmed for extraction is free of exotic and weed species.
7.6 - Prior to the clearing of vegetation in an extraction Cell, branches containing viable seed shall be manually collected and stockpiled or used immediately as brushmatting in Cells under rehabilitation.
7.7 - With the exception of important microhabitats identified with flagging tape and/or star-pickets, the understorey vegetation and small trees within an extraction Cell are to be removed with a slasher tractor, tritter or manually and stockpiled separately. It is important at this stage that machinery does not mix or invert soil profiles and minimises the mixing of natural leaf litter with slashed vegetation.
7.8 - With the exception of important microhabitats identified with flagging tape and/or star-pickets, trees are to be felled with chainsaws and dragged and stockpiled separately outside cells under rehabilitation. It is important that machinery does not mix or invert soil profiles.
7.9 - With the exception of important microhabitats identified with flagging tape and/or star-pickets, the leaf litter and organic material is to raked as a separate process and stockpiled separately, leaving the topsoil in place.
7.10- Before stripping of topsoil, it is important to ensure that the recipient site is ready to receive the topsoil and topsoil is not stockpiled.
7.11- With the exception of important microhabitats identified with flagging tape and/or star-pickets, the topsoil within the extraction Cell is to be stripped using excavators to to a depth of between 100mm - 120mm. Topsoil shall not be stored or stockpiled and shall be immediately used as part of the rehabilitation process in the preceding Cell.
7.12- Important microhabitats trees with hollows will be inspected and trees known to contain fauna or where occupation is uncertain will be shaken to allow fauna to vacate the hollow prior to felling of the tree. Hollow-bearing trees should be gently lowered to avoid harm to any fauna and to avoid damage to the hollow. Any nocturnal fauna captured subsequent to felling will be released in adjacent bushland during that evening.
7.13- Other important habitats such as ephemeral drainage soaks shall be inspected by hand and reptiles and amphibians shall be relocated to similar habitats within the site outside the extraction Areas.
7.14- All remaining trees shall be removed and timber shall be stockpiled outside Cells receiving topsoil translocation.
7.15- After fauna have been relocated from important microhabitat areas the vegetation, leaf litter and topsoil shall be removed in separate processes with topsoil used immediately and leaf litter and vegetation stockpiles separately.
7.16- In the event that topsoils detailed handled, topsoil is not to stand unused for more than 1 day or overnight.

bushland rehabilitation procedures (recipient site)

7.17 -Prior to any movement of soil within the recipient Area, weed control using standard weed control methods (refer specifications) is to be carried out across the Area.
7.18- Prior to any movement of soil within the recipient Area, an independent, qualified and experienced ecologist is to inspect the Area to ensure the Cell is free of weeds and, if satisfied, provide certification that the Area programmed for rehabilitation is free of exotic and weed species.
7.19- Final grading of the landform within the Cell is to be undertaken based upon the plan Proposed Landuses and Final Landform and Contour. The overburden or exposed sandstone material is likely to be acidic in nature. The background pH of natural sandstone top soils are naturally acidic with pH 4.0 commonly occurring. Whilst it is unlikely that soil conditioners such as Lime will be required ph testing of the sub topsoil material should be undertaken.
7.20- Boulders and rocks (approx 1m x 0.8m x 0.5m) generated from previous extraction process can be scattered across the rehabilitation Cell at an average of 10m intervals to provide microhabitat for recolonising ground dwelling fauna.
7.21- The translocation and rehabilitation process should be done in manageable areas to prevent the tracking over or accessing areas partially completed.
7.22- Final graded areas shall be ripped to a depth of 0.3m.
7.23- Prior to the translocation of topsoil within the recipient Cell, an independent, qualified and experienced ecologist is to inspect the Cell to ensure the final grading, decompaction of substratum and soil amelioration is adequate, and if satisfied provide certification that the Cell programmed for rehabilitation has been adequately prepared.
7.24- Topsoil shall be spread to a depth of approximately 100mm with experienced bush regeneration contractors following spreading machinery (eg excavator) locating rhizomes or rootstock and replanting these items to the proper depth and upright position.
7.25- Decayed log or trunk sections removed from clearing operations (approx 3m in length) shall be randomly scattered over the Cell at an average of 10m intervals to provide microhabitat for recolonising ground dwelling fauna.
7.26- Available brushmatting material containing viable seed is to be lightly spread over the topsoil areas.
7.27- In areas prone to erosion, organic fibre jute matting (refer specifications sheet 10) can be used.
7.28- To minimise the establishment of weed species, fertiliser is not to be used as a soil amendment.
7.29- Regular watering is to be undertaken to assist with plant establishment and dust suppression within 2 days of soil translocation, weekly (for 0 - 1 month), fortnightly (for 1-2 months), and monthly (for 2-6 months) unless rain occurs.
7.30- Maintenance weed control (refer specifications) must occur after rehabilitation of each Cell at; 1 monthly intervals (for 1-3 months), 3 monthly intervals (for 4-12 months) and 6 monthly intervals (for 12-36 months) after rehabilitation.
7.31- No access to the rehabilitation Cell is to occur except for prescribed watering, visual assessments and weed or sediment control.
7.32- Assessment of the completion of the translocation works within each Cell is to be carried out by an independent, qualified and experienced ecologist and, if satisfied, provide certification that the rehabilitation and translocation has been completed.
7.33- Currently we are advised that there is no evidence of herbivorous foraging on agricultural crops such as lettuce within the allotment. In the event that there is evidence of foraging activity on regenerating seedlings by rabbits, goats or wallabies etc., exclusion fencing shall be installed around rehabilitation Cells. Exclusion fencing shall be star-pickets with sediment control fencing for rabbits and parra- webbing to deter goats and wallabies.
7.34- Regular monitoring of the rehabilitation Cells is to be carried out (refer sheet 10 Monitoring and Performance Measures).
7.35- After 3 years from the commencement of rehabilitation where the natural regeneration has not achieved the vegetation densities required by the Performance Measures (refer sheet 10, Re-establishment of Native Flora) supplementary planting shall be carried out.

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project
quarry rehabilitation plan for part lot 3 DP 567166 & part lot 2 DP 510812 old northern road, maroota.

drawing title
procedures for Tetratheca glandulosa propagation & translocation and bushland rehabilitation

upland wetland revegetation procedures

Background
The Chain of Ponds is intended to formalise the existing constructed depression in Area E- Cell 1 and improve sediment control functions below the rehabilitation area whilst providing habitat diversity. The Chain of Ponds are designed to provide ephemeral habitats and it is expected that water levels will fluctuate and pondages will expand and contract depending upon rainfall events.

Upland Wetland Revegetation
8.1 - Prior to the construction of the Chain of Ponds all exotic and environmental weed species shall be controlled within 10m of the Chain of Ponds using standard bush regeneration weed control techniques (refer specifications sheet 9).
8.2- Construction of the Chain of Ponds is to be carried out in accordance with the Area E - Chain of Ponds Detail (refer sheet 5)
8.3 - Native species capable of being transplanted and are regenerating across Area E are to be transplanted into the upper pondage.
8.4 - With the exception Broad-leaved Cumbungi (Typha orientalis), native wetland species of sedges and rushes shall be collected from existing waterbodies on the site and shall be transplanted into the littoral zones of the constructed pondages. No more than 15% of the plant material of each species is to be collected from existing waterbodies.
8.5 - Replanting shall occur in water depths similar to those where the plant material was collected from.
8.6 - Planting densities of the littoral zone of the pondages is to be an average of 6 plants per m2 with grading from higher densities towards the banks and lower densities towards the limnetic zones in the lower and middle pondages.
8.7 - To achieve these planting densities supplementary planting is likely to be required. Where supplementary planting is required it shall consist of:
- Common Rush (Juncus usitatus) and/or Knobby Club-rush (Isolepis nodosa) used from bank to just below the level of pondage water, RL 181.7;
- Club-rush (Schoenoplectus mucronatus) used from just below pondage water level (RL 181.6) to 100mm below water level, and
- Common Spike-rush (Eleocharis acuta) 100mm below water level to 350mm below water level.

agricultural land rehabilitation procedures

Background
Area C is currently used for agricultural purposes and consists of open pasture. Area C is currently mapped as Class 3 Agricultural Land (NSW Agriculture, 1995). Area D has been subject to previous sand extraction and is predominately mapped as Class 3 Agricultural Land with Class 4 Agricultural Land mapped in the lower eastern portions (NSW Agriculture, 1995).

Class 3 Agricultural Land is considered to be grazing land or land well suited to pasture improvement. It may be cultivated or cropped in a rotation with pasture. Class 4 Agricultural land is considered to be suitable for grazing but not for cultivation. Agricultural on this class of land is based on native pastures or improved pastures using minimum tillage techniques.

To ensure that there is no loss of agricultural productivity Areas C and D are to be rehabilitated to satisfy Class 3 & 4 agricultural criteria.

Agricultural Land Rehabilitation Procedures
9.1 – Topsoil stockpiled in the existing bund between Area D & C shall be relocated and stored in Area D.
9.2 – Topsoil shall be progressively stripped in Area C to a depth of between100mm and 300mm and shall be immediately used as part of the rehabilitation process in the preceding Cell after the grading of the final landform. During the initial extraction process where there are no Cells under rehabilitation, the topsoil is to be used as a temporary visual bund (2m high, 3m wide) at the eastern end of Area C.
9.3 – At the completion the extraction process within each Cell final grading of the landform is to be undertaken based upon the Proposed Landuses and Final Landform and Contour Plan.
9.4– After the spreading of topsoil over the final contouring, temporary erosion and sediment controls (refer specifications) such as sediment fence, check weirs etc. shall be installed in concentrated flow paths where appropriate.
9.5 – The topsoil, overburden and exposed sandstone is likely to be acidic in nature. The topsoil is to be treated with agricultural or coarsely crushed limestone or Dolomite with additional fertiliser as necessary.
9.6 – Final slopes greater than 10 degrees (18%) shall be stabilized with a temporary cover crop (refer specifications) to minimize the potential for sheet or rill erosion.
9.7 - Regular watering is to be undertaken to assist with plant establishment and dust suppression.
9.8 – To assist with the agricultural productivity of Areas C & D, legumes such as Lucerne and Clover species should be considered as the initial pasture crop to improve soil fertility and soil nitrogen levels.
9.9 – Regular monitoring of the rehabilitation Cells is to carried out (refer monitoring and performance measures).
9.10– Longer term agricultural activities within Areas C & D are to be consistent with future farm management plans.

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drawing title
procedures for upland wetland revegetation and agricultural land rehabilitation

specifications

Erosion & sediment controls

All erosion and sediment controls such as berms, sediment fences, rumble zones, sediment basins and site drainage flow paths must be designed and constructed in accordance with Managing Urban Stormwater: Soils and Construction. 4th Edition (Landcom, 2004), New South Wales Government.

Erosion control matting

Erosion control matting will be biodegradable organic fibre matting such as jute fibre (Jutemaster ® FM) and must be specifically designed for erosion control and allow cover crop seed to germinate, emerge and develop through it. Erosion control matting must be installed and pinned down in accordance with the manufacturer's instructions.

Herbicide usage

Glyphosate based herbicides can be used in conjunction with weed control techniques and is to be used in accordance with the product label and registration. Herbicide usage must be undertaken in a manner or method that does not cause harm to endemic species or new plantings and there is no contamination of surface or ground waters. Herbicide application needs to be recorded in accordance with the Pesticides Act 1999.

Nest Boxes

Nest boxes are to be designed specifically for the target species. Specific nest boxes have been designed and are commercially available for micro-bats, parrots, possums and gliders. Commercially available nest boxes are available from Melbourne Wildlife Sanctuary at La Trobe University, Victoria. Nest Boxes should be installed at a minimum of 3m above ground level, away from night lights with openings facing away from the prevailing weather. Shredded bark or leaf litter should typically be placed in the Nest Box before installation to provide some insulation and nesting material.

Organic mulch

Whilst the use of organic mulch material is not specified in this plan it can be used in areas that are to be rehabilitated as agricultural land. In these circumstances it shall consist of a 75mm (unless otherwise specified) deep layer of chipped wood material of similar standard to Forest Blend ® and is to be free of non-organic material, contaminated chemicals such as hydrocarbons and weed seed. Organic mulch is not intended to be used in the rehabilitation of bushland areas where topsoil is translocated.

Plant maintenance & replacement

All plantings shall be maintained, (watered, weeded) so as to display good health and vigour. Apart from typical seasonal variations, plantings showing poor vigour, stress or disease will be replaced.

Plant stock

All plant material will be tubestock or maxi-cell with the exception of native grasses where viro-cells can be used.

Plants used must be grown from seed or cuttings taken from provenance stock. Greening Australia or local commercial nurseries specialising in native species can be contacted as they have a range of seed from the local provenance. Provided that orders are placed in advance, consignment propagation can be carried out from local stock.

Planting

Planting is to be carried out using standard horticultural practices. Because of the nature of the site and environmentally sensitive lands downstream, no fertiliser is to be used in conjunction with planting in the bushland rehabilitation areas, however if considered necessary, water retaining crystals can be used. All tree plantings are to be planted with staked translucent or cardboard grow tubes.

Planting preparation

Areas identified as for revegetation will be marked out on the ground and weed control carried out to remove/eradicate exotic species (unless noted otherwise). Where the soil is compacted as a result of operating machinery, the planting area is to be deep ripped to a depth of 0.3m, excluding areas beneath the canopy of existing trees to be retained. Ripping of the soil is not to occur in areas where natural regeneration is evident and planting is considered to be supplementary. Revegetation areas are to be mulched (unless noted otherwise) and planted in accordance with the species and densities identified within this report.

Planting species options & diversity

It is recognised that some species listed on this plan may be difficult to propagate or may not be readily available. To overcome this, a range of species options are listed. Where planting is required, to introduce diversity and avoid a mass monoculture of plantings, there must be a minimum of:

- 9 canopy species in roughly equal numbers;
- 15 understorey species in roughly equal numbers, and
- 10 ground covers species in roughly equal numbers

Sandstone riprap material

Non engineered sandstone riprap material is to be laid using rocks that are a minimum 50kg. Typical sandstone dimensions of 50kg rocks are 250mm x 300mm x 300mm.

Temporary cover crop

Temporary cover crop is to be used as a soil stabilising technique to minimise erosion. Depending upon the season, temporary cover crops are to be sown with either:

- Autumn/Winter seed mix – Oats @ 30kg/ha and Japanese millet @ 10kg/ha; or
- Spring/Summer seed mix – Japanese millet @ 30kg/ha plus oats @ 20kg/ha.

Weed control

Weed control is to be undertaken using standard bush regeneration techniques such as hand weeding or with the use of Glyphosate based herbicides when necessary (eg. cut & paint, stem scrape, spot spraying).

Weed material disposal and temporary storage on site.

Weed material containing seed or weed material capable of spreading vegetatively shall be removed from site and disposed of at an appropriate location where it will not cause further environmental damage.

Temporary storage of weed material prior to disposal can occur on site where it is stored, outside drainage lines, on an impervious surface and it is covered with a material that adequately contains the weed debris.

HORNSBY SHIRE COUNCIL

This sheet is approved subject to the notes, advice and conditions listed in Development Consent No. 578/2009 **dated:** 3 March 2010

GENERAL MANAGER

Per:

species options for revegetation (refer specifications)

canopy trees

Genus species	Common Name
Acacia suaveolens	Sweet Wattle
Allocasuarina littoralis	Black She-oak
Allocasuarina torulosa	Forest Oak
Angophora bakeri	Narrow-Leaved Apple
Angophora costata	Sydney Red/Rusty Gum
Angophora hispida	Dwarf/Scrub Apple
Banksia serrata	Old Man Banksia
Ceratopetalum apetalum	Coachwood Tree
Ceratopetalum gummiferum	Christmas Bush
Corymbia eximia	Yellow Bloodwood
Corymbia gummifera	Red Bloodwood
Eucalyptus haemastoma	Scribbly Gum
Eucalyptus piperita	Sydney Peppermint
Eucalyptus punctata	Grey Gum
Eucalyptus sparsifolia	Narrow-Leaved Stringybark
Tristaniopsis collina	Mountain Water Gum

understorey small trees & shrubs

Genus species	Common Name
Acacia linifolia	Flax-Leaved Wattle
Acacia longifolia	Sydney Golden Wattle
Acacia myrtifolia	Red-Stemmed Wattle
Austromyrtus tenuifolia	-
Banksia ericifolia	Heath Banksia
Banksia oblongifolia	-
Banksia spinulosa	Hairpin Banksia
Bauera rubioides	River Rose / Dog Rose
Billardiera scandens	Appleberry
Boronia ledifolia	Ledum/Sydney Boronia
Boronia pinnata	Pinnate Boronia
Bossiaea heterophylla	-
Bossiaea obcordata	Spiny Bossiaea
Dodonaea triquetra	Hop Bush
Gompholobium latifolium	Goldem Glory Pea
Grevillea buxifolia	Grey Spider Flower
Grevillea speciosa	Red Spider Flower
Hakea dactyloides	Broad-leaved Hakea
Lambertia formosa	Mountain Devil
Leptospermum arachnoides	
Leptospermum parvifolium	-
Leptospermum polygalifolium	Yellow Tee-tree
Leptospermum trinervium	Paperbark Tea-tree
Leucopogon microphyllus	-
Melaleuca linariifolia	-
Micrantheum ericoides	-
Monotoca scoparia	Prickly Broom-heath
Ozothamnus diosmifolius	White Dogwood
Pimelea linifolia	Slender Rice-flower
Platysace linearifolia	Narrow-leaf Platysace
Xanthosia pilosa	Woolly Xanthosia
Xylomelum pyriforme	Woody Pear

ground covers

Genus species	Common Name
Actinotus helianthi	Flannel Flower
Actinotus minor	Lesser Flannel Flower
Dampiera stricta	Blue Dampiera
Dianella caerulea	Blue Flax Lily
Dianella prunina	-
Echinopogon caespitosus	Tufted Hedgehog Grass
Entolasia stricta	Wiry Panic
Eriostemon australasius	Wax Flower
Goodenia heterophylla	-
Hardenbergia violacea	False Sarsaparilla
Hibbertia aspera	
Imperata cylindrica	Blady Grass
Lomandra glauca	Pale Mat-rush
Lomandra gracilis	-
Lomandra longifolia	Spiny-headed Mat-rush
Lomandra obliqua	Twisted mat-rush
Lomatia silaifolia	Crinkle Bush
Parsonsia straminea	Common Silkpod
Pseuderanthemum variabile	Pastel Flower
Scaevola ramosissima	
Smilax glyciphylla	Sweet Sarsaparilla
Themeda australis	Kangaroo Grass
Xanthosia tridentata	-

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project
quarry rehabilitation plan for part lot 3 DP 567166 & part lot 2 DP 510812 old northern road, maroota.

drawing title
specifications & species options for revegetation

rehabilitation monitoring, reporting & certification

This monitoring and reporting program primarily focuses on the ecological aspects associated with this rehabilitation plan. The monitoring program should be read in conjunction with other monitoring requirements (ground water, air quality etc.) and should form part of the quarry operations Environmental Management Plan.

The monitoring and reporting requirements outlined in the tables below have been developed to meet the ecological monitoring requirements outlined in:
- the requirements of the Director-General of the Department of Environment and Climate Change for the preparation of a Species Impact Statement;
- the requirements of the Director General of the Department of Planning for the preparation of an Environmental Impact Statement (26/07/07), and
- other requirements of State Environmental Planning Policies, Local Environmental Plans and Development Control Plans.

The monitoring program is based upon the aims of rehabilitation procedures, identifies key assessment criteria and performance measures. Whilst reporting is required annually, it is acknowledged that not all stages of the rehabilitation program will be in progress in the initial years and measurable results may not be evident for 3 years after rehabilitation. In the event that bush fires occur locally and spread into the areas under rehabilitation, or in the event of extended drought periods and/or the effects of climatic changes, a review of this monitoring program and the performance measures will need to be made.

note: Certification by an independent qualified and experienced ecologist will be required:
- prior to clearing of native vegetation within each Cell stating that the cell does not contain any exotic or weed vegetation;
- prior to the translocation of top soil within each Cell stating that the recipient Cell does not contain any exotic or weed vegetation and the final grading and substrata has been suitably prepared;
- at the completion of rehabilitation and translocation works of each Cell stating that the rehabilitation and translocation works within the Cell are satisfactorily completed.

Rehabilitation Monitoring & Reporting

Aims	Objectives	Assessment Method	Survey Parameters	Frequency and Timing of Assessment	Performance measure	Remedial Actions
Reintroduction of Tetratheca glandulosa	Propagation of Tetratheca glandulosa	% and number of plants surviving in propagation	Nursery production	6 monthly during production	1 in 24 cuttings taken surviving as tube stock.	Review propagation methods and the season when cuttings are taken.
	Reintroduction of Tetratheca glandulosa	% and number of planted tube stock surviving	All planting locations	6 monthly after planting then annually	95 % of planted tube stock surviving.	Increase the level of maintenance (eg hand watering)
		% and number of stems regenerating from translocated soil, root stock and seed.	All translocated soil from Tetratheca glandulosa areas.	6 monthly after translocation of soil then annually	20% of original number of stems regenerating from rootstock or seed.	Review maintenance (eg hand watering) practices and soil conditions and implement the application of smoke water.
Bushland Rehabilitation	Collection of base line data pre clearing	Floristic Assessment of Areas pre clearing and sand extraction	20, 2m x 2m quadrats within each Area randomly selected within a 4m x 4m grid system, recording stem abundance, species, species diversity, cover and abundance.	Prior to clearing of native vegetation	Not applicable	Not applicable
			Frequency or interpair distances of at least 20 canopy trees in each Area including data on their species, height and trunk DBH (Diameter at Brest Height)	Prior to clearing of native vegetation	Not applicable	Not applicable
			A minimum of 100 random Levy Pole placements along a minimum of 2 transects within each Area using a 3m long Levy Pole with 200mm graduations. Data should be collected of the number of dead or alive contacts with the pole, the height of contact and the species together with the projected canopy cover, depth of leaf litter and ground cover type (earth, rock, leaf litter etc.).	Prior to clearing of native vegetation	Not applicable	Not applicable
	Extent of Bushland Rehabilitation	Bushland rehabilitation works in progress	Extent of areas completed or under bushland rehabilitation (hectares)	Annually	All cells post extraction under bushland rehabilitation.	Undertake bushland rehabilitation procedures.
	Soil stability	Evidence of active soil erosion, sediment deposition or landform slumping.	All areas completed or under rehabilitation	Annually	No evidence of soil erosion, sediment deposition or landform slumping.	Implement soil & erosion controls (refer specifications sheet 10)
	Re-establishment of native flora	Species diversity and vegetation structure in the cells under rehabilitation	20, 2m x 2m quadrats within each Area randomly selected within a 4m x 4m grid system, recording stem abundance, species, species diversity, cover and abundance.	2 year intervals after rehabilitation commences.	Comparative analysis to pre-clearing data	Year 3 after rehabilitation; consideration of supplementary revegetation / planting if required.
			Frequency or interpair distances of at least 20 canopy species in each Area including data on their species, height and trunk DBH (Diameter at Brest Height)	2 year intervals after rehabilitation commences.	Comparative analysis to pre-clearing data	Year 3 after rehabilitation; consideration of supplementary revegetation / planting if required.
			A minimum of 100 random Levy Pole placements along a minimum of 2 transects within each Area using a 3m long Levy Pole with 200mm graduations. Data should be collected of the number of dead or alive contacts with the pole, the height of contact and the species together with the projected canopy cover, depth of leaf litter and ground cover type (earth, rock, leaf litter etc.).	2 year intervals after rehabilitation commences.	Comparative analysis to pre-clearing data	Year 3 after rehabilitation; consideration of supplementary revegetation / planting if required.
		Estimated percentage of weed biomass in the cells under rehabilitation	Randomly selected 10m x 10m m quadrats within each cell under rehabilitation	Annually	< 5% weed biomass	Bush regeneration weed control
	Recolonising Native Fauna	Level of bird autochthony (sensitive bushland species / generalist species)	2x 60 minutes - 2 ha (max) survey in areas under rehabilitation	Prior to extraction and Year 3 after rehabilitation commences	Year 3 after rehabilitation: Evidence of sensitive bushland bird species.	Year 3 after rehabilitation: Additional planting of understorey species to achieve pre clearing understorey densities.
Agricultural Land Rehabiitation	Extent of Agricultural Land Rehabilitation	Agricultural Land rehabilitation works in progress	Extent of areas completed or under agricultural rehabilitation (hectares)	Annually	All cells post extraction under agricultural land rehabilitation.	Undertake agricultural land rehabilitation procedures.
	Soils Stability	Evidence of active soil erosion of sediment deposition or landform slumping.	All areas completed or under rehabilitation	Annually	No evidence	Implement soil & erosion controls (refer specifications sheet 10)
	Vegetation Cover	Vegetation cover in each rehabilitation cell	Randomly selected 10m x 10m quadrats within each cell under rehabilitation	Annually after rehabilitation commences.	No areas of exposed soil without vegetation cover.	Application of temporary cover crop (refer specifications sheet 10) and fertiliser.
Impact on the ecology outside identified areas of extraction on site	Impact on adjacent vegetation and habitats	Evidence of disturbance to bushland habitats and vegetation onsite outside the approved extraction areas.	Visual survey of extraction boundary	Annually	No evidence of disturbance outside the approved extraction area boundaries.	Rehabilitate disturbed areas.
	Impact on faunal populations	Estimated counts of the local Red-crowned Toadlet population.	Within drainage depressions and drains adjacent access tracks outside proposed extraction areas	Year 3 after rehabilitation commences	Evidence of Red-crowned Toadlet using existing habitats outside extraction areas on the site.	Review results of water quality monitoring and controls to determine actions.
		Level of bird autochthony (sensitive bushland species / generalist species)	2x 60 minutes - 2 ha survey in bushland habitats outside the proposed extraction areas	Year 3 after rehabilitation commences	Evidence of sensitive bushland bird species outside extraction areas on the site.	Review of the success of bushland rehabilitation on the site.
		Elliott & hair-tube trapping program	Total of 25 elliott trap nights & 90 hair-tube trap nights	Year 3 after rehabilitation commences	Evidence of native mammals	Feral animal control within bushland habitats on the site / allotment.
		Monitoring of nest boxes	Survey of nest boxes installed.	Year 3 after rehabilitation commences	Evidence of nest boxes outside extraction areas on the site being used by native fauna	Removal of exotic species from nest boxes

HORNSBY SHIRE COUNCIL

This sheet is approved subject to the notes, advice and conditions listed in Development Consent No. 578/2009 **dated:** 3 March 2010

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drawing title
performance measures, monitoring & reporting