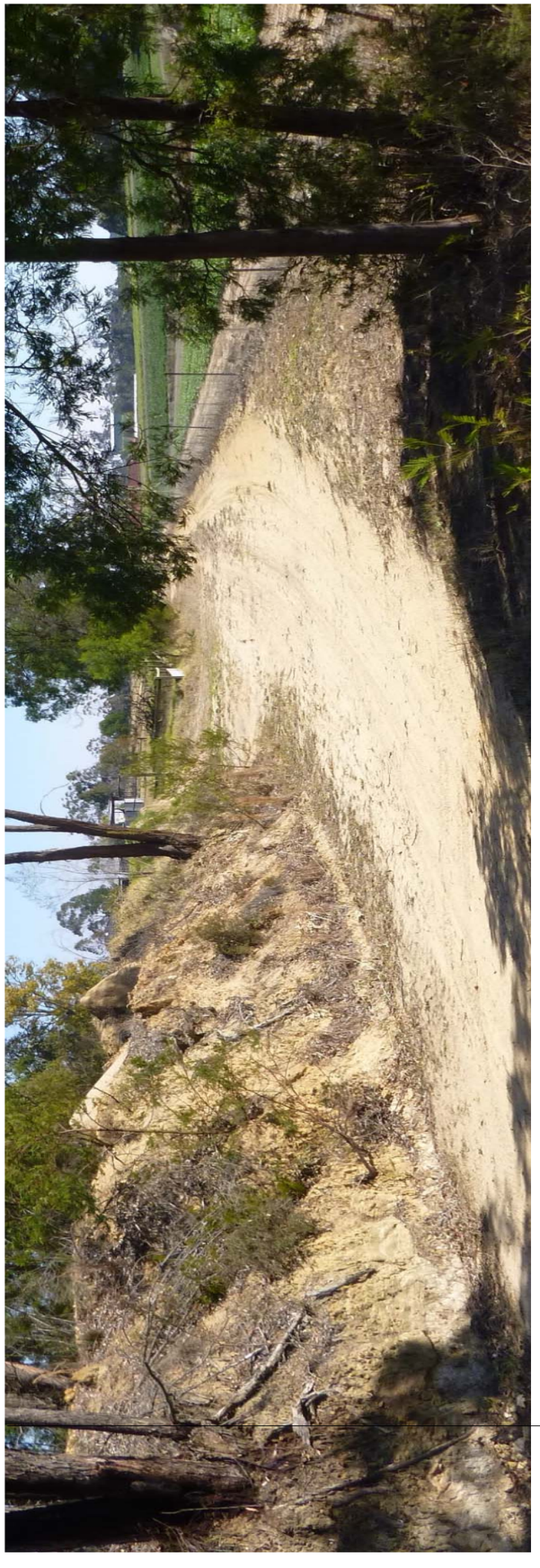

quarry rehabilitation plan - lots 1 & 2 in DP 732708 old telegraph road, maroota

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30th July 2015

prepared by
Mark Couston - Ass. Dip. Env. Ctrl. (CSU), Grad. Dip. Env. Mgmt. (CSU), Cert. Soil & Water Mgmt. (UWS), MECA.
OEH - Scientific Licence No. S L100777, DPI - Animal Research Authority 04-4786

Background
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 and site inspections were conducted in August 2014.

This plan amends the previous plan dated 24th September 2014 by reducing the area of Stage 1 within Lot 1 in DP 732708 and retaining the existing fill embankment at the eastern end of the site.

Existing Site & Current Land Uses
The site currently covers 2 separate allotments being Lots 1 & 2 in DP 732708 both of which have frontages on Old Telegraph Road. Lot 1 covers the southern portion of the subject site and consists of 2 residential dwellings with associated sheds located towards the road frontage with an old trotting track and open pasture covering the majority of the site. Lot 2 covers the northern portion of the site and is largely occupied with market gardens with a dwelling and associated sheds at the western end towards the road frontage. Currently both allotments are categorised as Class 3 agricultural land.

Proposed Quarrying
The extraction is proposed to occur in 2 stages being:
- Stage 1 within Lot 1 in DP 732708 (southern allotment) covering an area of 5.6 ha, and
- Stage 2 within Lot 2 in DP 732708 (northern allotment) covering an area of 5.1 ha.

Proposed Land Uses
The proposed rehabilitation of the quarry area involves progressive stripping and reuse of topsoil, temporary storage and reuse of overburden material, progressive contouring of the final landform, establishment of pasture and return of the affected areas to Class 3 – agricultural land. As part of this process a permanent dam is to be constructed on Lot 1 as part of Stage 1.

Rehabilitation Planning
A number of rehabilitation planning principals have been considered in this report including:
- Sydney Regional Environmental Plan No. 9 Extractive Industry (No.2) 1995
- Hornsby Development Control Plan 2013, s. 2.5 Extractive Industries
- 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

legend

site boundaries

limits of extraction area

existing waterbody - dam

330 kV power lines & stauntion

1m contours with contour levels

control points (star pickets)

1. Lat -33.462090 Lon 151.008330
2. Lat -33.462320 Lon 151.008620
3. Lat -33.462930 Lon 151.008660
4. Lat -33.463260 Lon 151.008490
5. Lat -33.463450 Lon 151.008070

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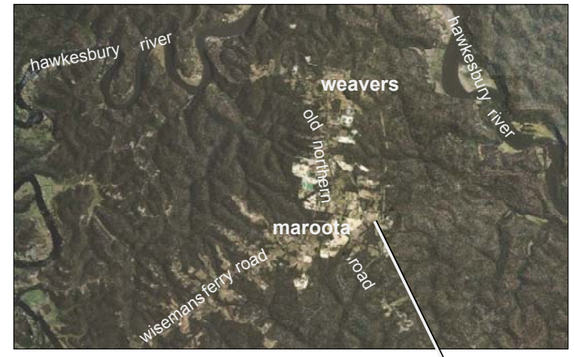
local context



general site description

The site is located on the northern outskirts of Sydney within the rural precinct of Maroota. The subject site covers 2 separate allotments being Lots 1 & 2 in DP 732708 both of which have frontages on Old Telegraph Road.

Lot 1 covers the southern portion of the subject site and consists of 2 residential dwellings with associated sheds located towards the road frontage with an old trotting track and open pasture covering the majority of the site. Towards the western portion of the allotment a substantial fill batter falls away to the overhead 330kV power lines and easement and beyond this the western portion of the site contains natural habitats and vegetation.

Lot 2 covers the northern portion of the site and is largely occupied with market gardens with a dwelling and associated sheds at the western end towards the road frontage. To the east of the market gardens the land slopes down to a large dam at the rear, eastern end of the allotment with scattered indigenous vegetation on the slopes and surrounding the dam.

The extent of the proposed extraction area is mainly within the developed / modified landscape currently occupied by open pasture, market gardens and in some parts scattered remnant trees.

The extraction is proposed to occur in 2 stages being:
- Stage 1 within Lot 1 in DP 732708 (southern allotment), and
- Stage 2 within Lot 2 in DP 732708 (northern allotment).

site characteristics

geology	hawkesbury sandstone (Herbert, 1983)
soil landscape	maroota soil landscape / sydney town soil landscape (McInnes, 1997)
vegetation structure	grassland / heath / open woodland
vegetation association	exotic pasture / sydney sandstone ridgetop woodland
catchment	coopers creek
receiving waters	hawkesbury river

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project
quarry rehabilitation plan - lots 1 & 2 in DP 732708 old telegraph road, maroota

drawing title
existing site characteristics & context

existing land use & vegetation

market gardens (currently mapped as class 3 agricultural land, DPI 1995)

open pasture (currently mapped as class 3 agricultural land, DPI 1995)

modified woodland under power lines

isolated paddock trees

woodland

legend

site boundaries

limits of extraction area

existing waterbody - dam

330 kV power lines & stauntion

210 1m contours with contour levels

control points (star pickets)

1. Lat -33.462090 Lon 151.008330
2. Lat -33.462320 Lon 151.008620
3. Lat -33.462930 Lon 151.008660
4. Lat -33.463260 Lon 151.008490
5. Lat -33.463450 Lon 151.008070

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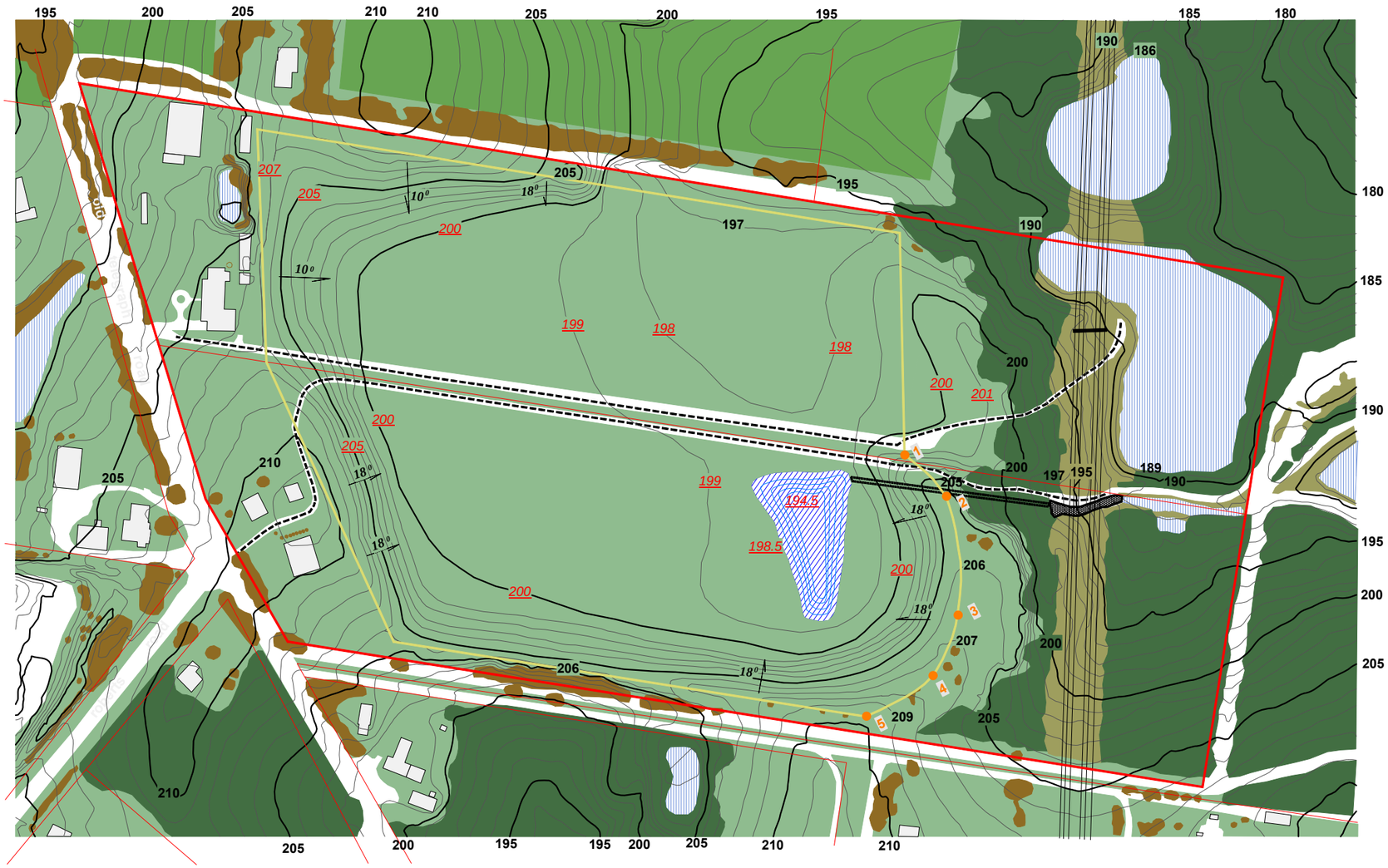
project: **quarry rehabilitation plan - lots 1 & 2 in DP 732708 old telegraph road, maroota**

drawing title: **existing site land uses**



proposed land use & vegetation

open pasture (class 3 agricultural land)

modified woodland under power lines

isolated paddock trees

woodland

legend

site boundaries

limits of extraction area

existing waterbody - dam

330 kV power lines & stauntion

210 existing contour levels

210 proposed contour levels

° nominated proposed slopes (degrees)

proposed waterbody - dam

proposed vehicle access track

proposed sandstone rip-rap channel

proposed drainage pipe (300mm dia.) installed using trenchless technology (directional drilling or auger / thrust boring)

0 50 100 150 200 250

9 control points (star pickets)

1. Lat -33.462090 Lon 151.008330
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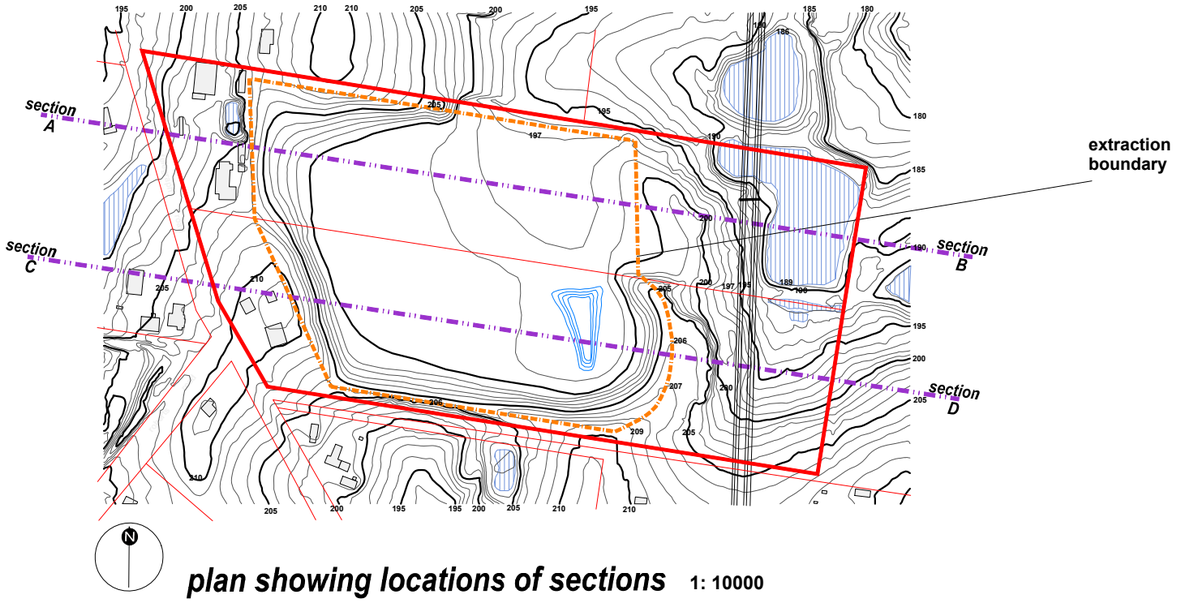
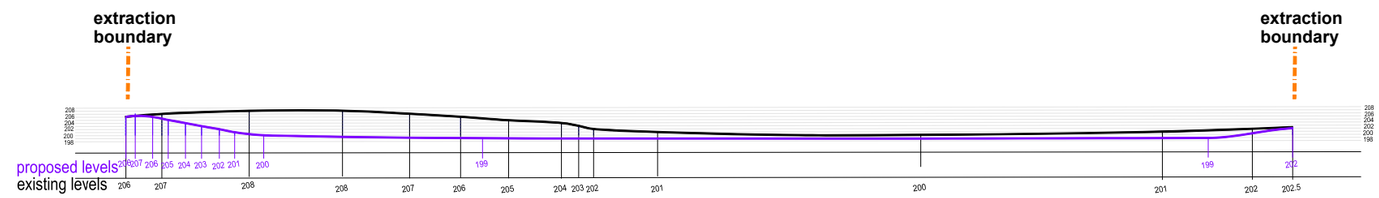
project
quarry rehabilitation plan - lots 1 & 2 in DP 732708 old telegraph road, maroota

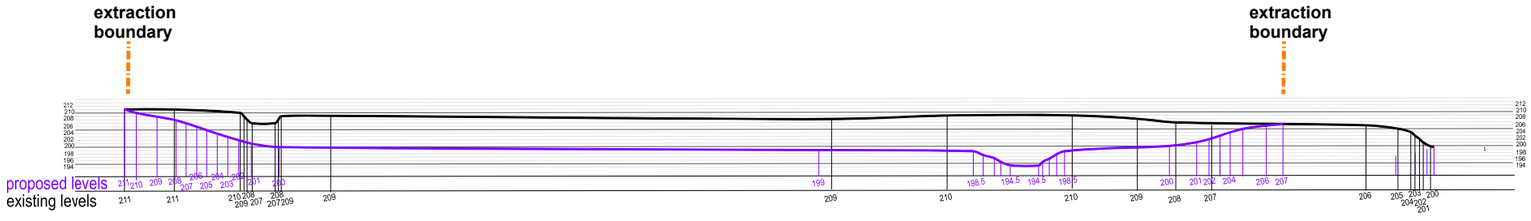
drawing title
proposed final landform & land uses



plan showing locations of sections **1: 10000**



section A - B



section C - D

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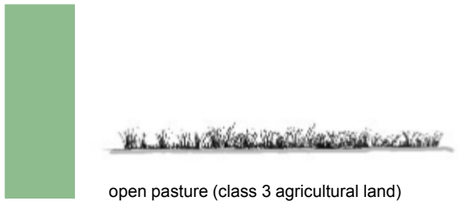
project
quarry rehabilitation plan - lots 1 & 2 in DP 732708 old telegraph road, maroota

drawing title
quarry cross sections final landform

surrounding land uses



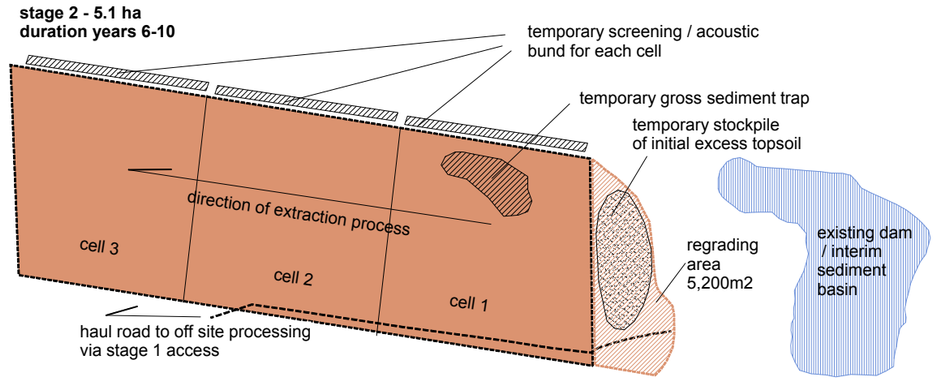
open pasture (class 3 agricultural land)

modified woodland under power lines

isolated paddock trees

woodland

staging of works



legend

site boundaries

extraction area

topsoil stockpile and regrading area

existing waterbody - dam

330 kV power lines & stauntion

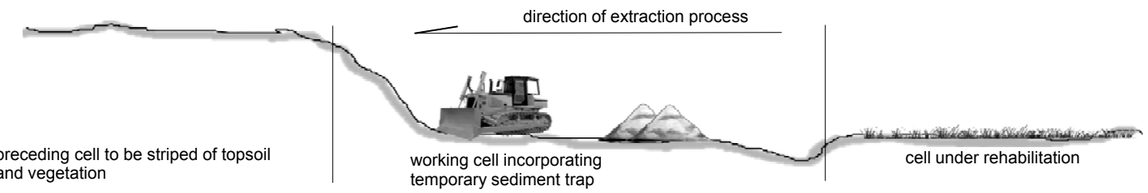
0 50 100 150 200 250

typical extraction process

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 initial or preceding cell;
- extraction of material in the working cell, and
- rehabilitation of the previously worked cell.

This approach minimises the need to store topsoil and organic material, reduces double handling of topsoil, maximises potential plant regeneration from seed or vegetative material stored in soil.



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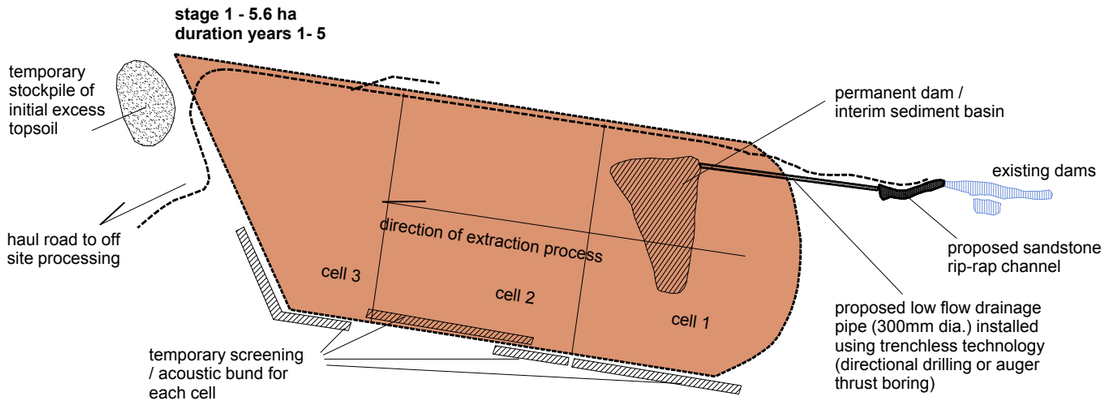
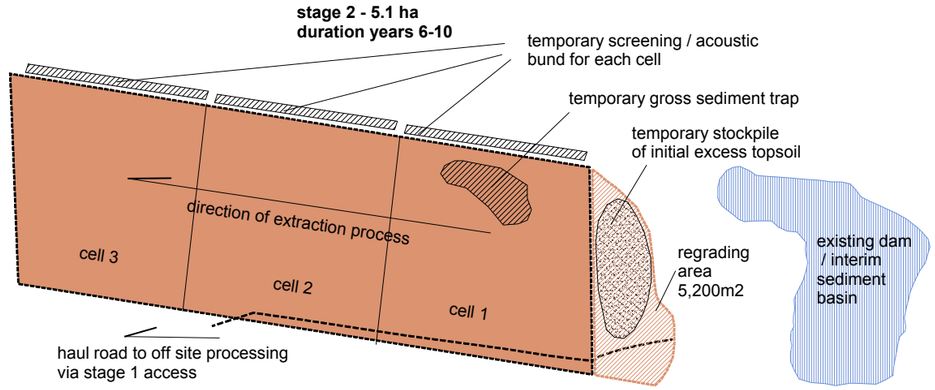
project
quarry rehabilitation plan - lots 1 & 2 in DP 732708 old telegraph road, maroota

drawing title
operational stages & typical extraction and rehabilitation process



agricultural land rehabilitation procedures - stage 1

1.1	Trees are to be felled and other vegetation is to be removed. Vegetative material shall be stockpiled and timber is to be shredded for reuse as part of the rehabilitation process.
1.2	Topsoil is to be stripped in Cell 1 to a depth of between 100mm and 400mm and stockpiled at the western end of Cell 3. Where topsoil is removed in Cells 2 & 3 it shall be used directly over areas where final grading is completed and if no areas are available it shall be stockpiled at the western end of Cell 3.
1.3	The permanent dam is to be excavated in Cell 1 (refer detail sheet 8) noting that the dam size may vary subject to the extent of raw or friable sand extracted and the amount of overburden material available for forming final landforms.
1.4	The drainage pipe (300mm dia.) is to be installed using Trenchless Technology such as directional drilling or auger (thrust) boring. The drainage pipe is to be drilled or bored through natural ground and not through fill material.
1.5	The sandstone riprap channel shall be constructed below the drainage pipe discharge to prevent scouring (refer specification 7.4). The riprap channel is to be constructed in natural soils and not in fill material.
1.6	Excavated material from the dam shall be removed and stored separately as overburden material.
1.7	Overburden material shall be removed from the working Cell and be shall pushed up to form a temporary screening / acoustic bund immediately adjacent the extraction Cell.
1.8	Bund walls are to be stabilized with a temporary cover crop (refer specification 7.7).
1.9	A temporary gross sediment trap shall be constructed in the lower parts of the extraction / working Cell 2 & 3 (refer specification 7.8).
1.10	Raw sand or friable sandstone shall be progressively excavated and loaded into trucks to be processed off site
1.11	Overburden material shall be progressively returned as the quarry working face moves west and final grading shall be undertaken in accordance with the Final Landform & Land Uses plan (refer sheet 4).
1.12	After final grading is carried out topsoil is to be returned from current topsoil stripping activities or from the stockpiled topsoil.
1.13	All areas within 20m upslope of the dam shall be hydromulched with seed (refer specification 7.3) immediately after topsoil has been returned.
1.14	After the spreading of topsoil over the final contouring, temporary erosion and sediment controls (refer specification 7.1) such as sediment fence, check weirs etc. shall be installed in concentrated flow paths where appropriate.
1.15	Samples of topsoil are to be tested and analysed to determine suitability for plant establishment and if necessary remedial actions shall be undertaken.
1.16	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.
1.17	Final slopes greater than 10 deg (18%) shall be stabilized with a temporary cover crop (refer specification 7.7) or hydromulching with seed (refer specification 7.3) to minimize the potential for sheet or rill erosion.
1.18	Regular watering is to be undertaken to assist with plant establishment and dust suppression.
1.19	To maximize agricultural productivity, legumes such as Lucerne and Clover species should be considered as part of the initial pasture crop to improve soil fertility and soil nitrogen levels.
1.20	On-going weed maintenance is to be carried out on a regular basis removing all declared noxious weeds including aquatic weed species should they establish within the permanent waterbodies /dams. Weed control may include the application of herbicides (refer specification 7.2).
1.21	Regular monitoring of the rehabilitation Cells is to be carried out (refer monitoring and performance measures sheet 9).



agricultural land rehabilitation procedures - stage 2

2.1	Topsoil is to be stripped in Cell 1 to a depth of between 100mm and 400mm and stockpiled at the eastern end of Cell 1. Where topsoil is removed in Cells 2 & 3 it shall be used directly over areas where final grading is completed and if no areas are available it shall be stockpiled at the eastern end of Cell 1.
2.2	Overburden material shall be removed from the working Cell and be shall pushed up to form a temporary screening / acoustic bund immediately adjacent the extraction Cell.
2.3	Bund walls are to be stabilized with a temporary cover crop (refer specification 7.6).
2.4	A temporary gross sediment trap shall be constructed in the lower parts of the extraction / working Cell (refer specification 7.8).
2.5	Raw sand or friable sandstone shall be progressively excavated and loaded into trucks to be processed off site
2.6	Overburden material shall be progressively returned as the quarry working face moves west and final grading shall be undertaken in accordance with the Final Landform & Land Uses plan (refer sheet 4).
2.7	The regrading area at the eastern end of the Stage 2 shall be recontoured and excavated material is to be used in Stage 2 - Cell 3 to achieve the levels in the Final Landform & Land Uses plan (refer sheet 4). The regrading area shall be reduced from maximum AHD 205m to AHD 201m.
2.8	After final grading is carried out topsoil is to be returned from current topsoil stripping activities or from the stockpiled topsoil.
2.9	After the spreading of topsoil over the final contouring, temporary erosion and sediment controls (refer specification 7.1) such as sediment traps, sediment fences, check weirs etc. shall be installed in concentrated flow paths where appropriate.
2.10	Samples of topsoil are to be tested and analysed to determine suitability for plant establishment and if necessary remedial actions shall be undertaken.
2.11	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.
2.12	Final slopes greater than 10 deg (18%) shall be stabilized with a temporary cover crop (refer specification 7.7) or hydromulching (refer specification 7.3) to minimize the potential for sheet or rill erosion.
2.13	Regular watering is to be undertaken to assist with plant establishment and dust suppression.
2.14	To maximize agricultural productivity, legumes such as Lucerne and Clover species should be considered as the initial pasture crop to improve soil fertility and soil nitrogen levels.
2.15	On-going weed maintenance is to be carried out on a regular basis removing all declared noxious weeds including aquatic weed species should they establish within the permanent waterbodies /dams. Weed control may include the application of herbicides (refer specification 7.2).
2.16	Regular monitoring of the rehabilitation Cells is to be carried out (refer monitoring and performance measures sheet 9).

Background
The land within Stage 1 is currently used for general agricultural purposes and consists of open pasture and Stage 2 land is currently used as market gardens. Both Stage 1 & Stage 2 land is currently mapped as Class 3 Agricultural Land (NSW Agriculture, 1995). To ensure that there is no loss of agricultural productivity Stage 1 & Stage 2 areas are to be rehabilitated to satisfy Class 3 agricultural criteria, however there is scope to return Stage 2 to market gardens by retaining, reusing and further improving topsoil.

Class 3 Agricultural Land is considered to be grazing land or land well suited to pasture improvement. It may be cultivated or cropped in rotation with pasture.

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project: **quarry rehabilitation plan - lots 1 & 2 in DP 732708 old telegraph road, maroota**

drawing title: **extraction & rehabilitation procedures in stage 1 & stage 2 areas**

specifications

7.1 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.

7.2 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 new plantings and there is no contamination of surface or ground waters.

7.3 hydromulching with seed

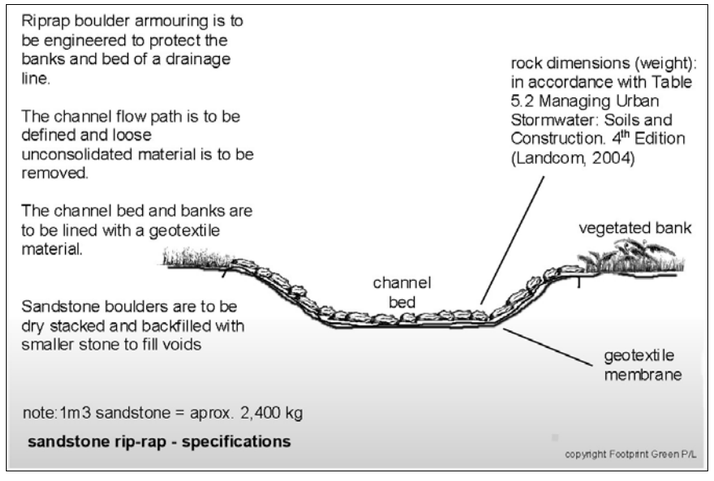
Whenever possible, areas to be seeded should be topsoiled. Prior to topsoiling, the area should be ripped (up to 200mm deep). If topsoiling is impracticable, the area should be ripped using a suitable machine or a chain designed for this purpose. Wherever possible the area should be free of weed growth large stones or other debris.

Typical hydromulch mix

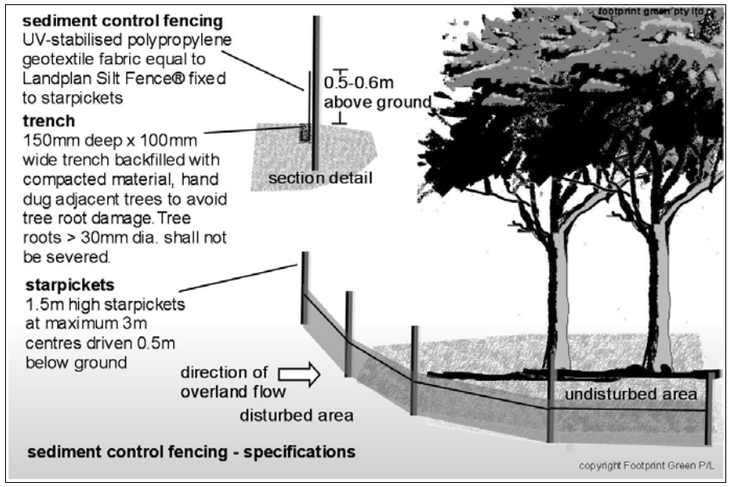
Certified Grass Seed	Minimum 60kg per hectare. The seed mix will vary according to the season, soil condition and client requirement.
Fertiliser	200kg - 500 kg per hectare. Selection will depend on soil analysis results and client requirements.
Wood Fibre Mulch (Dyed green)	2 - 2.5 tonnes per hectare.
Binder	Envirotack at 40kg - 60 kg per hectare or Polymer binder maximum 250 litres 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.

7.4 sandstone rip-rap



7.5 sediment control fencing



7.6 stockpiling of topsoil

Where stockpiling of topsoil cannot be avoided then consideration should be given to:

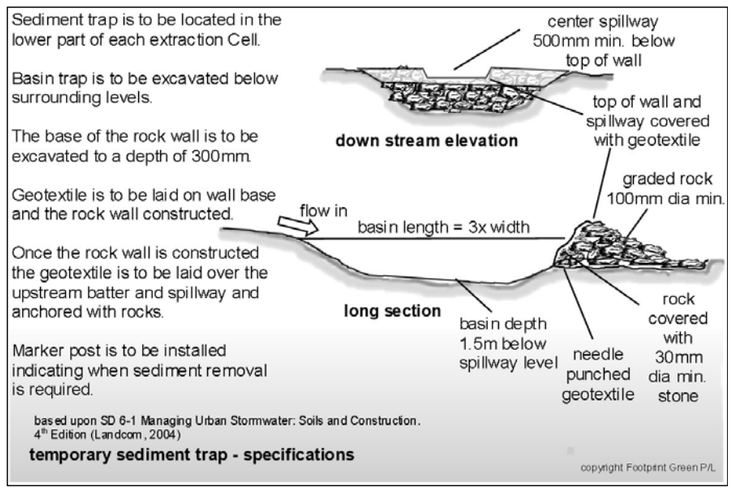
- Reuse of the topsoil as soon as possible;
- Low mounds of topsoil up to 2m high are recommended subject to available area, and
- Stockpiles of topsoil shall be revegetated with a temporary cover crop (refer specification 7.6) to maintain soil microbes;

7.7 temporary cover crop

Depending upon the season, temporary cover crops are to be sown with either:

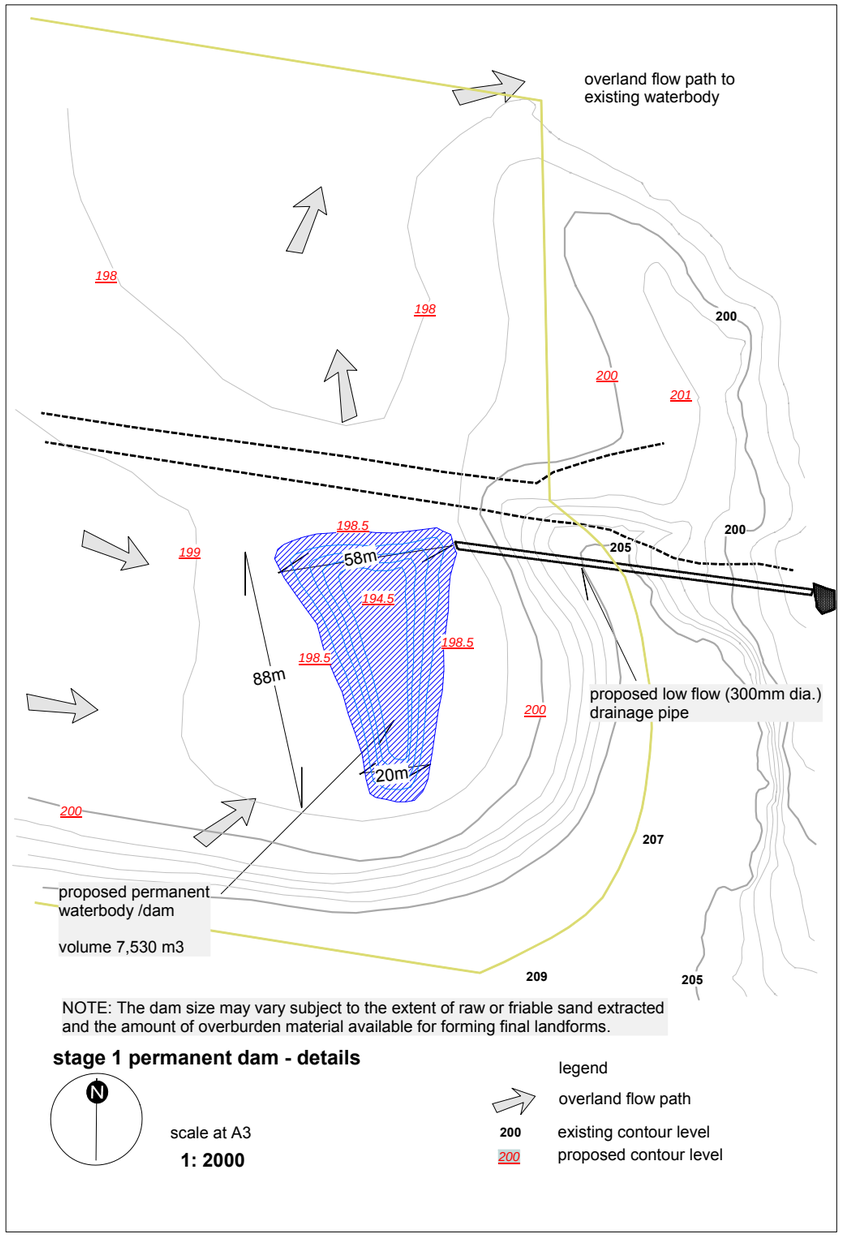
- Autumn/Winter seed mix – Oats @ 30kg/ha and Japanese millet @ 10kg/ha; or
- Spring/Summer seed mix – Japanese millet @ 30kg/ha plus oats @ 10kg/ha.

7.8 temporary sediment trap



7.9 weed control

Weed control is to be undertaken using standard weed control techniques such as physical removal, regular slashing or with the use of Glyphosate based herbicides when necessary (eg. cut & paint, stem scrape, spot spraying).



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project: **quarry rehabilitation plan - lots 1 & 2 in DP 732708 old telegraph road, maroota**

drawing title: **rehabilitation specifications & details**

This monitoring and reporting program primarily focuses on the implementation of this rehabilitation plan. The program below 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 program is based upon the aims of rehabilitation procedures and identifies assessment of key objectives 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. In the event that bush fires occur locally and spread into the areas under rehabilitation or other major catastrophic events occur, a review of this monitoring program and the performance measures will need to be made.

Rehabilitation Monitoring & Reporting						
Aims	**Objectives**	**Assessment Method**	**Survey Parameters**	**Frequency and Timing of Assessment**	**Performance measure**	**Remedial Actions**
Rehabilitation of Agricultural Land - Class 3	Rehabilitation of Agricultural Land	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 or sediment deposition or landform slumping.	- All areas completed or under rehabilitation (hectares). - All earthen bunds - All topsoil stockpiles	Monthly	No evidence of erosion, sediment deposition or landform slumping	Implement soil & erosion controls (refer specifications sheet 8)
	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.	Undertake further soil testing, if necessary undertake soil remediation and application of temporary cover crop or hydromulching with seed (refer specifications sheet 8)

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