GLOBAL SOIL SYSTEMS
Environmental and Land Management Consultants
Windaf Pty Limited ACN 059 448 323 and Windaf Pty Limited ACN 059 448 823
trade as GLOBAL SOIL SYSTEMS

Donaldson Coal Mine
Erosion and Sediment Control Plan

Prepared for:

Donaldson Projects Pty Limited

Prepared by:

R. Masters
Principal,
Global Soil Systems

Global Soil Systems Project No: DON 1-3
Issue No. 3
Copy No. 1

GLOBAL SOIL SYSTEMS
Environmental and Land Management Consultants
Windaf Pty Limited ACN 059 448 323 and Windaf Pty Limited ACN 059 448 823
trade as GLOBAL SOIL SYSTEMS

DOCUMENT CONTROL SHEET

Project No: DON 1-3

Title: Donaldson Coal Mine Erosion and Sediment Control Plan

Project Manager: Rod Masters

Author: Rod Masters

Client: Donaldson Projects Pty Limited (DPPL)

Client Contact: Mr. Mark McPherson

ISSUE AND AMENDMENT CONTROL HISTORY

Issue	*Date*	*Description*	*By*	*Checked*
# 1 (Draft)	16.03.00	Issued to DPPL for comment	GSS	
# 2 (Draft)	21.03.00	Issued to DLWC Dr. S. Perrens for comment	GSS	
# 3 (Final)	20.04.00	Final issue to DPPL	GSS	

Distribution: **Master:** **Global Soil Systems**
Copy 1: Mr. Mark McPherson (DPPL)

CONTENTS

CONTENTS

Continued

1.0 BACKGROUND

Donaldson Projects Pty Ltd (DPPL) proposes to develop the Donaldson Mine at a site 2 km west of the intersection of Weakleys Drive and John Renshaw Drive at Beresfield, NSW. The proposed mine site is located within ML 1461.

DPPL submitted a Development Application (DA) and an accompanying Environmental Impact Statement (EIS) to both Cessnock and Maitland City Councils for the small open cut mine in March 1998. A Commission of Inquiry for the Donaldson Coal Mine Project was held in November 1999 and Development Consent was granted for the Project by the Minister for Urban Affairs and Planning on 26 October 1999.

DPPL have engaged Global Soil Systems (GSS) to prepare an Erosion and Sediment Control Plan (ESCP) to satisfy the requirements of the Department of Urban Affairs And Planning (DUAP) and the Department of Land and Water Conservation (DLWC) so that rehabilitation of post-mining landforms at the Donaldson site can be implemented whilst minimising on-site erosion and off-site sedimentation.

The following ESCP provides concepts and strategies for erosion and sediment control to be implemented at the Donaldson site and addresses the following conditions in accordance with the Project's Development Consent issued by DUAP:

EROSION AND SEDIMENT CONTROL

66 *The Applicant shall prepare and implement an Erosion and Sediment Control Plan(s) for the development (including the haul road and the relocation of utilities and services) to the satisfaction of DLWC and submit these Plans to the EPA as part of applications for a licence under the Protection of the Environment Operations Act. The Plan(s) shall be prepared prior to the commencement of work in the relevant areas. The Applicant shall make copies of all Erosion and Sediment Control Plan(s) available to the Director-General, Councils and the Community Consultative Committee within 14 days of approval.*

67 *The Erosion and Sediment Control Plan(s) shall include consideration and management of erosion and sedimentation of watercourses and waterbodies, including Woodberry Swamp.*

2.0 NATURE OF THE DEVELOPMENT

DPPL proposes to develop an open cut mine using the truck and shovel method to recover a total of 22.1 million tonnes of "Run of Mine" (ROM) coal. Initially all coal to be washed from the Donaldson Mine will be processed at the existing Bloomfield wash plant. This will enable the washing characteristics of Donaldson coal to be tested and fully defined to enable the effective design and construction of the Donaldson washery. All ROM coal will be washed to yield approximately 1.5Mt of saleable coking and thermal coal annually.

The mining lease covers an area of 533 ha. It is likely that approximately 300 ha within the Project site will be disturbed by mining operations during the life of the mine. The Project site is made up of degraded bushland, the degradation being caused by unfettered public access allowing substantial amounts of rubbish to be dumped in the Project area.

The proposal involves the recovery of coal from four seams: the Beresfield, Upper Donaldson, Lower Donaldson and Big Ben seams. Coal will be mined from two distinct pit areas, the Northern and Western pits. Operations will commence in the northern half of the site and progress to the western half.

3.0 SITE CONDITIONS

The Project area is predominantly comprised of rolling low hills which occur to the west and north, with alluvial flats occurring in the site's eastern portion. There is an elevational change of approximately 70 m occurring across the site. A local high point of 80 m is located in the south-western corner of the site. Slopes within the site vary from gently (5 to 10 %) to steep (up to 20 %). In a few isolated locations slopes reach 25 %.

The Project site represents a large tract of bushland within the Maitland area, but has been degraded by past and existing land uses. The site is fragmented by an extensive network of four-wheel drive tracks, two large transmission reserves, and a large water pipeline. The site lies within a remnant of the original native vegetation with patches of native vegetation regrowth. The dominant vegetation type of the Project site is open forest with Spotted Gum (*Corymbia maculata*) dominating the canopy.

Soils within the site are generally shallow to moderately drained Yellow and Red Podzolic Soils. Some moderately deep, imperfectly drained Yellow Soloths occur on midslopes. Uniform Loams are adjacent to the creeks within the Project area.

The Project area contains three classes of land capability. The majority of the area has been classified as Class VI land. The area is not suitable for cultivation on a regular basis owing to considerably biophysical limitations such as light textured shallow soils and relatively steep slopes. Two distinct ridge zones and two depositional areas adjoining Weakleys Flat Creek and Scotch Dairy Creek have been classified as Class IV land because of low slope gradient and a greater depth of topsoil. All land within and adjacent to Four Miles, Weakleys Flat and Scotch Dairy Creeks has been classified as Class VII land which is best protected by the existing vegetation.

4.0 EROSION AND SEDIMENT CONTROL

Proposed works for erosion and sediment control at the site are illustrated in *Figure 1.*

4.1 Minimal Disturbance

Land disturbance will be minimised by clearing the smallest practical area of land for the shortest possible times. This will be achieved by:

(i) limiting the cleared width to that required to accommodate any excavation plus areas required for overburden emplacement and topsoil stockpiling; and

(ii) programming the works so that only the areas which are actively being excavated are cleared.

General clearing and grubbing will not be undertaken until earthwork operations are ready to commence and will be limited to the area required for immediate excavation. Vegetation removal during the mine's construction period will be limited to the haulage road alignment, the north western quadrants of the Northern Pit, the out-of-pit emplacement area and the infrastructure area.

All proposed erosion and sediment control measures will be implemented in advance of, or in conjunction with, clearing and grubbing operations. Prior to clearing commencing, the limits of clearing shall be marked by pegs placed at intervals on each side of the disturbed area. All operations will be planned to ensure that there is no damage to any trees outside the limits.

4.2 Diversionary Works

Diversion banks, bund walls, drains and culverts will be utilised throughout the site to minimise erosion, divert run-on water around the disturbed areas and re-direct contaminated runoff into sediment dams.

Clean water diversion banks will be constructed to separate clean run-on water from contaminated catchments thus minimising the extent of dirty water catchments. Runoff from disturbed areas such as overburden dumps will be conveyed to sediment control dams by diversion banks. All major diversion bank locations are provided in *Figure 1.* Design parameters (e.g. channel width and grade, bank height, batter gradient) will be determined in consultation with DLWC prior to construction. A typical configuration for the

proposed diversion banks is provided in ***Appendix 1***. The clean water diversion banks adjoining the overburden dump will be constructed prior to the commencement of dumping. The banks will be removed in year 7 so that runoff from the backfilled pit area will enter sediment dam C (refer Section 4.3). Longitudinal or table drains and culverting will be responsible for effective access road and haul road runoff control.

All longitudinal drainage will be revegetated upon completion. Where drainage gradients exceeds 1%, reinforced grass and/or mitre drainage at 50 to 80 metre intervals will be utilised to reduce flow velocity and increase drain stabilisation.

Crossfall drainage at 3% either side of the road crown will be responsible for immediate water shed from the road surface thus ensuring trafficability and minimal sediment movement from the road surface.

The culverting systems (including pits, sumps and headwalls) will be either pre-cast or cast in-situ according to best practice installation and construction. Lengths of 100mm diameter subsoil drain will be laid in the invert of pipe trenches at the discharge end of culverts terminating at pits and headwalls. The drainage pipe will be sealed at the upstream end and enclosed in seamless tubular filter fabric.

All banks/drains will be graded to ensure free flow of water and have a grade of approximately 1%. Drains will be constructed to lead water discharging from stormwater culverts permanently clear of the work. Outlet drains will follow existing watercourses or low points in the natural surface;

Bund walls located on the eastern perimeter of the North Pit and on the southern perimeter of the West Pit (refer ***Figure 1***) will contribute to diversion of contaminated runoff to either sediment dams or to the active pit areas.

Graded banks will be constructed throughout the majority of reshaped overburden areas to minimise erosion and re-direct runoff to stabilised waterways and water disposal areas. All dirty runoff from these areas will enter sediment dams prior to discharge to natural watercourses. Graded bank locations are not provided in ***Figure 1*** because the specific locations will be determined after detailed survey of final landforms has been undertaken.

During construction of the haul road leading from the Project area to the Bloomfield wash plant, fill areas will be terminated as road sections approach each drainage depression so that a culvert can be installed in each depression to allow unimpeded surface drainage of clean runoff through the road

alignment. Sediment filter fencing will be strategically located around fill termination points and will not be removed until construction of each culvert is completed (refer Section 4.3). Road construction will then continue over the culvert.

4.3 Sediment Controls

Sediment control dams will be constructed to intercept sediment-laden runoff prior to discharge into the natural drainage system. Seven dams will be constructed on the periphery of the disturbed area. The dam locations are shown in ***Figure 1***.

The capacity of each dam has been derived from DLWC's (formerly the Department of Conservation and Land Management) *"Urban Erosion and Sediment Control Technical Handbook, 1992"* using Table 3.6(a) Sediment Basin Sizes - NSW Coastal Zone.

The design capacity of each dam has been calculated assuming the following:

- slope gradient category of 10 - 15%.
- high erodibility (K = 0.04)

The design characteristics of each dam are provided in ***Table 1***.

TABLE 1
SEDIMENT DAM DESIGN CHARACTERISTICS

Dam No	Catchment Area (ha)	Design Capacity (ML)	Minimum Surface Area (m^2)
A	37	13.5	7,400
B	3	1.1	600
C	40	14.6	8,000
D	9	3.3	1,800
E	12	4.4	1,200
F	4	1.5	800
G	6	2.2	1,200

All sediment dams will have a perforated riser pipe, or a similar draw-down device, incorporated in the wall for a primary outlet as illustrated in ***Appendix 2***. Water quality in each dam will be regularly monitored to ensure that water quality at least equals that of the receiving waters (Four Miles, Weakleys Flat and Scotch Dairy Creeks and Woodberry Swamp).

All runoff from the contractor's hardstand area will report to a primary pollution control sump prior to discharging to the Mine Water Dam (refer ***Figure 1***). The sump will have a total capacity of 3,000m^3 (includes 700m^3 of settling zone). The surge capacity of the sump has been designed in accordance with a 1 hour duration, 1 in 10 year storm event. Design details are provided in ***Appendix 3***. The proposed Mine Water Dam will have a nominal capacity of 250ML.

Sediment filter fences will be erected on either side of Four Mile Creek to prevent sediment from adjoining overburden dumps entering the Creek (refer ***Figure 1***).

During construction of haul roads, sediment filter fencing will be strategically located around fill termination points as the road alignment approaches drainage lines. The silt fencing will not be removed until construction of each culvert is completed. Road construction will then continue over the culvert.

Straw bale sediment filters will be located immediately below each pipe culvert to entrap as much sediment as possible. Temporary sediment trapping devices may be required during construction to filter sediment-laden runoff from small areas (0.5 ha or less).

4.4 Powerline and Water Pipeline Relocation Easements

Sections of the 11kV powerline and the water pipeline will be relocated in years 2 and 4 respectively. Clearing will be undertaken according to powerline clearing guidelines provided in ***Appendix 3***. Erosion and sediment control measures for relocation of power and water services are provided below.

The disturbance of topsoil and vegetation along the power and water pipeline relocation will be limited to the minimum practicable.

Where significant disturbance of the ground surface is necessary, topsoil will be removed from the easement and stockpiled as work commences. On completion of work, topsoil will be respread over exposed subsoil and the disturbed areas will be stabilised by establishing suitable pasture species.

In certain areas, diversion channels will be constructed to control runoff and so reduce the erosion hazard. This will apply to pipeline trench lines and access tracks which follow steep terrain, and above significant areas of disturbance which are exposed to runoff from land upslope.

Spoil from the pipeline trench will not be stored or discarded in, or adjacent to, drainage lines. Soil used to backfill the trench will be compacted. Trench backfilling will occur at a level higher than the adjacent ground surface to allow for subsequent settlement.

Where a trench line is located in dispersible soils, the erosion hazard is increased. To prevent tunneling occurring in the backfill, mixing gypsum with the fill as it is returned to the trench will be undertaken. This process will be followed by careful compaction. Topsoil will be spread over the backfill when it has been replaced in the trench line, and seed and fertiliser supplied. On steep slopes, the sown areas will be protected with a mulch of hay and bitumen. Check banks will be constructed to divert runoff away from these areas.

Service tracks will be graded to a crown and/or constructed with crossfall drainage and trafficable cross banks to provide efficient surface drainage and so prevent runoff eroding them or adjacent land.

Cut and fill batters associated with service tracks will be formed to a safe slope and stabilised by vegetation. Stabilisation will be assisted by spreading topsoil and/or by applying a chemical or an organic mulch over the exposed batter surface.

Access across drainage lines will be protected with a diversion channel immediately above the access cut. If the access is longer than 15m a further diversion half-way down the length of the access track will be located to direct runoff into the table drain.

5.0 REVEGETATION

Native forest vegetation cover occurs over most of the lease. It is proposed to re-establish a similar cover to the majority of the post-mining landform. Native vegetation will largely be established using directly applied seed and from seed within respread topsoil. Supplementary tree planting will be undertaken where specific species combinations are required.

The revegetation programme will re-establish native forest/shrub/ground cover and will stabilize reshaped areas. Revegetation will also visually screen disturbed areas and will re-establish habitat for native fauna.

Prior to mining, existing native vegetation will be cleared, mulched and stockpiled for later use. Topsoil will then be stripped to prescribed depths and either stockpiled for later use or respread onto recontoured areas. Seed will be collected from existing native vegetation from all areas, with higher initial priority on those areas to be cleared.

Following mining, disturbed areas will be reshaped, prior to applying topsoil and mulch. The surface will then be cultivated to incorporate the mulch prior to artificial seeding of native tree/pastures and exotic pasture species. These activities will be closely co-ordinated with erosion and sediment control works and habitat reinstatement. Well proven mine rehabilitation and bushland regeneration techniques will be employed together with innovative technology such as smoke treatment of seed and topsoil to enhance the germination and establishment of native vegetation.

5.1 Seed Collection

Native seed collection and propagation will be undertaken to enhance the regeneration of indigenous vegetation within the areas of disturbance.

As much native tree and shrub seed as possible will be collected from the mine lease prior to clearing of vegetation. This seed will be used for both direct seeding of reshaped areas and for nursery propagation of seedlings. Direct seed application will be used to bolster seed contained naturally in respread topsoil. This will greatly assist the re-establishment of local species and genetic strains. As many native species flower and seed irregularly, advanced collection will ensure as much seed as possible will be collected prior to vegetation clearing. A high priority will be placed on seed collection from areas of imminent disturbance. Seed will be collected from undisturbed sites throughout the life of the mine and will be collected by qualified and experienced seed collectors. Where suitable species or sufficient quantities are

unavailable, alternative local sources (preferably from the Hunter Valley) will be used.

Wherever practicable, tree felling will be timed to coincide with maximum seed harvest. The collection strategy will necessitate careful monitoring of plant flowering and seeding cycles.

5.2 Vegetation Removal

Prior to any clearing, areas proposed for disturbance will be harvested for commercial timber. As the area has been regularly harvested for timber over a long period of time, harvesting commercial timber will mainly be used for mining timber, fence posts and firewood.

Remaining live trees and shrubs will be mulched, stockpiled and respread onto reshaped and topsoiled areas. This activity will present numerous advantages including the addition to the soil of any remnant seed in the mulch, organic soil conditioning and the reduction of surface erosion due to the binding effects of the mulch. A similar operation is currently being effectively undertaken at Mount Owen Mine near Ravensworth in the Upper Hunter Valley.

Where possible, mulched vegetation will be immediately respread onto reshaped, topsoiled areas. Mulch will be stockpiled for subsequent spreading on areas that are unavailable for immediate application. Where available, large hollow trees will not be mulched and will be hauled back onto specific areas for habitat reinstatement.

5.3 Topsoil Management

A soil survey of the Donaldson Project area was conducted by GSS in July 1998. The survey revealed that the structural and textural properties of soils within the study area are the most significant limiting factors for determination of topdressing suitability.

The recommended stripping depths for the Red and Yellow Duplex Soils vary between 0.1 and 0.35m. Depositional soils within and immediately adjoining the creek systems in the study area will be stripped to a depth of approximately 0.5m.

During the soil survey a Potential Acid Sulfate Soil (PASS) assessment was conducted. The pH (H_2O_2) PASS screen tests produced decreased pH recordings However, low Total Potential Acidity (TPA) and Potential

Oxidisable Sulfuric Acid (POSA) levels reveal that, while oxidisable sulfur probably exists (<0.01% oxidisable sulfur) in subsurface sediments of the depositional loams adjoining the creeks, an acid sulfate soil hazard is unlikely particularly if the soil acidity is ameliorted with agricultural lime during the rehabilitation process. Prior to soil stripping, PASS testing will be undertaken to determine specialised handling and management of acid soils if required.

Suitable topsoil will be stripped and respread onto reshaped areas. Topsoil will be spread to a minimum depth of 100mm. Where suitable areas are unavailable for immediate respreading, topsoil will be stockpiled to a maximum depth of 3 metres, revegetated, and subsequently applied when the areas become available. The period of storage will be minimised in order to reduce the detrimental effects of storage on any native seed in the soil. As mining progresses, the need to stockpile topsoil will decline. After Year 3 of mining operations, the majority of topsoil reserves will be stripped and respread without the need to stockpile.

Topsoil containing weeds or exotic grasses will be separated from uncontaminated (forest) topsoil. Introduced species can readily kill young germinating native plants. Topsoil containing exotic pasture species will be used on batters and steeper slopes where improved pasture species will be sown for stabilization purposes.

5.4 Site Preparation

Thorough site preparation will be undertaken to ensure rapid early growth of seedlings. All proposed seeding and tree planting areas will be ripped to a depth of 400 - 500 mm. To minimise erosion, ripping will be undertaken on the contour and the tines will be lifted for approximately 2 m every 20 m to reduce the potential for channelised erosion. Best results will be obtained by ripping when soil is moist and when undertaken immediately prior to sowing.

5.5 Direct Tree Seeding

A mixture of native trees and shrubs will be sown onto many disturbed areas following topdressing and site preparation. Tree seeding will complement natural regeneration from seed contained within the soil bank. The mix will include many of the major tree and shrub species that were identified in the Donaldson EIS. A flora species list is provided in ***Table*** 2. Seed will be appropriately pre-treated in order to break dormancy restrictions. In addition to traditional methods of treatment, all seed will be treated with recently developed "smoke" technology in order to achieve earlier germination, more robust seedlings, wider and more uniform germination, increased germination

rates and the germination of difficult species. Subject to sufficient follow up rain very high initial tree densities can be expected. These high densities will quickly help stabilise and screen the site and will result in healthy mature tree stands over time. By varying the sowing rate it is intended to create, over time, a mosaic of variable species and plant densities representative of that currently occurring in the area. Growth rates of between 1 and 2 m/yr can be initially expected for many of the more dominant trees and shrubs.

The native tree and shrub seed mix will be sown at a total combined rate of approximately 6 kg/ha. Seed will be mixed with DAP fertiliser at 100 kg/ha. Tree seed and fertiliser will be broadcast evenly onto topdressed areas. It will not be buried. Seeding will be conducted in late spring, summer and early autumn giving superior results due to higher ground temperatures.

TABLE 2
PROPOSED TREE AND SHRUB SPECIES LIST

Category	Species Name	Common Name
Groundcover	Imperata cylindrica	Blady Grass
	Themeda australis	Kangaroo Grass
Low Trees and Shrubs	Acacia ulicifolia	Prickly Moses
	Acacia linifolia	Wattle
Large Trees	Allocasuarina torulosa	Forest Oak
	Eucalyptus paniculata	Grey Ironbark
	Corymbia maculata	Spotted Gum
	Eucalyptus acmeniode	White Mahogany
	Corymbia gummifera	Red Bloodwood
	Eucalyptus punctata	Grey Gum
	Eucalyptus crebra	Narrow-leaved Red Ironbark
	Eucalyptus fibrosa	Broad-leaved Ironbark

5.6 Tree Planting

Tree planting will largely be undertaken where it is desired to increase the dominance of a certain species or where weed competition restricts the use of direct seeding.

5.7 Species

A broad range of species, representing the original pre-European vegetation of the area, have been previously identified (refer ***Table*** 2). Many of these species will be re-established. To meet the consent conditions for the Project,

plantings and direct seeding will include native groundcovers, herbaceous plants, shrubs and trees endemic to the area.

The list of species represented in ***Table*** 2 will provide the basis for determining the species and associations for the reafforestation programme. Diversity analysis will be regularly undertaken to compare the success of the revegetation programme.

Revegetation measures will include:

- Use of all of the Eucalyptus, Acacia, Corymbia and Allocasuarina species shown in ***Table*** 2.

- Re-establishment of the main forest types including the following associations:

  Spotted Gum - Ironbark
  Mahogany - Ironbark
  Mixed Eucalypt
  Bloodwood - Mahogany
  Grey Gum - Mahogany

5.8 Fencing

During each stage of mining, existing forested areas not required within the current calendar year will be delineated and separately fenced. Stock will be excluded from all lease areas.

5.9 Weed Control

Weeds present one of the most significant problems to the creation of forest ecosystems. Weeds have been introduced into this area along corridors such as roads and power/water easements. Illegal dumping of garden wastes has contributed to the problem. Effective control of introduced species within rehabilitated areas will be a critical and essential component of proposed revegetation plan. A weed control programme will be developed as part of the Plan of Management for bushland areas.

5.10 Pasture Establishment

Native pasture species such as *Imperata cylindrica* (Blady Grass) and *Themeda australis* (Kangaroo Grass) will be encouraged. Patchy germination of these species will occur in areas selected for tree and shrub establishment where exotic pasture species will be excluded.

All steep slopes, water disposal areas, road drains and other structural works will be sown with exotic pasture species to provide effective groundcover thus minimising erosion. The species mix will be formulated in consultation with the DLWC, however, will generally be in accordance with the specification provided in ***Table 3***.

TABLE 3
REVEGETATION SPECIFICATION

Species	Rates (kg/ha)	
	Spring/Summer	Autumn/Winter
Japanese Millet	15	5
Ryecorn/Oats	5	15
Rhodes Grass	10	10
Couch Grass	10	8
Perennial Ryegrass	5	10
White Clover	10	10
Starter fertiliser (sowing)	300	300
Maintenance fertiliser (following Spring/Autumn)	100	100

DAP fertilizer will be applied at sowing and maintenance fertilising will be conducted on an "as required" basis. Reseeding will be completed if initial vegetation efforts fail.

Temporary soil stockpiles will be sown with a cover crop/fertiliser mixture consisting of Japanese Millet (Spring/Summer) or Cereal Rye/Oats (Autumn/Winter) at 50 kg/ha and Starter fertiliser at 250 kg/ha.

Hydroseeding (of exotic pasture species) and straw mulching will be conducted to establish groundcover rapidly on steep batters, e.g. within the infrastructure area, haul road cut and fill batters, etc.

5.11 Visual Screening and Noise Abatement Bund

The proposed location of the bund along John Renshaw Drive (and extending northwards along the edge of the mine high wall) is shown in ***Figure 1***. A conceptual cross-sectional profile of the bund and bushland buffer strip is shown in ***Appendix 5***. Scheduling of bund construction will be in accordance with expansion of the mine as shown in ***Figure 1***.

The bund adjoining John Renshaw Drive will be 4 metres high as shown in ***Appendix 5***. The remainder of the bund wall will be 8 metres high. The gradient of the outside batter of the bund will be reduced to 30° to facilitate revegetation.

The bund will be revegetated according to the requirements of the DLWC. Tree species will be included in the seed mix. Species to be used will be the same as for general mine rehabilitation (refer ***Tables 2 & 3***).

5.12 Bushfire Management

A Bushfire Management Plan for the Donaldson site will be developed prior to the commencement of mining.

5.13 Works Scheduling

Rehabilitation work will be undertaken progressively as soon as reshaped and topsoiled areas become available.

Rehabilitation will consist of seed collection, reshaping of overburden, topsoiling, mulching, site preparation, revegetation and maintenance. The staging of rehabilitation works over the life of the mine is shown in ***Figure 1***. Areas affected by mining, which are not intended to be rehabilitated, include the internal mine access road (of value for bush fire control) and retained sediment control dams. Rehabilitation of the final void will involve contouring to reduce slope angles, application of topsoil and revegetation. Permanent bunds will be topsoiled and revegetated.

6.0 REJECTS DISPOSAL

Some 0.22Mt of coarse reject and 0.11Mt of fine reject material is anticipated to be produced annually from the Bloomfield coal washery following washing at a production rate of 2.3Mt of ROM coal. Geochemical and physical characterisation of both coarse reject and tailings was undertaken by Environmental Geochemistry International (EGI). The total sulfur content of coal reject is approximately 1%. EGI concluded that all reject material is likely to be potentially acid forming with little neutralizing capacity for the life of mine. Therefore, the recognition and control of Acid Mine Drainage (AMD) from coal reject materials are key issues that will confront the Donaldson Coal Mine.

The fundamental principle to minimize AMD potential is the isolation of the source material from either of the key ingredients of AMD - air or water. Current technology and practice indicates that the concepts of encapsulation or entombment (in accordance with general landfilling principles) comply with these objectives.

The generic engineering process related to design and implementation of AMD control measures includes such steps as materials characterisation and quantification, evaluation of performance/design criteria, definition of the solution and performance auditing. This process will be applied at Donaldson as a proactive approach to design. The approach involves the formulation and implementation of controls in anticipation of an AMD problem. The design of such preventative measures will be applied at the onset of development of coal reject containment areas and will continue throughout the life of the mine.

6.1 Coarse Coal Reject

Whilst coal washing is being carried out at Bloomfield, coarse coal reject will be encapsulated within the overburden dumps.

Benign overburden materials will be used to encapsulate coarse reject, thereby isolating the reject from air and water. Typically, a deep basal layer of overburden will be formed with perimeter containment wings formed using similar materials. Each cell formed will be utilized for placement and containment of coarse reject. The surface of the cell will be covered using overburden in a staged manner. The design issues related to the concept include:

(1) Achieving low permeabilities by compression within the encapsulation zones, particularly the surface, which is subject to direct rainfall;

(2) Providing adequate surface water management in and around each encapsulation cell to avoid periods of inundation of coarse reject during the operation; and

(3) Providing a competent foundation/basal layer to reduce seepage throughflows and protect downstream groundwater and/or surface water resources.

The encapsulation option is shown conceptually in ***Appendix 6.***

6.2 Fine Coal Reject

While ever ROM coal is being prepared at the Bloomfield wash plant, tailings will be disposed in existing empoundment areas at Bloomfield Colliery.

6.3 Rejects Co-Disposal

Upon commissioning of the Donaldson coal washery, all coal reject will be disposed "in-pit" using a co-disposal system whereby a slurried mixture of fine and coarse reject fractions will be pumped to the pit. A series of cells will be constructed using overburden. Individual cells will contain reject and be sequentially capped. Conceptually, each cell will comprise a relatively small volume of reject to enable rapid filling, followed by a period of drying, then covering. Sequential cells will be developed to meet the process requirements of the wash plant. The specific requirements of the system include:

(1) The use of low permeability materials to form each cell, and reduce cell volumes to control water management aspects and to minimize ongoing seepage potential;

(2) Providing adequate surface water management in and around the encapsulation cell; and

(3) Assessing the potential connection between the pit and the local groundwater system, and to ensure limited 'cross flow' from the encapsulation zone to the aquifer.

7.0 MAINTENANCE

Erosion and sediment control measures will be maintained in a functioning condition until all earthwork activities are completed and the site rehabilitated.

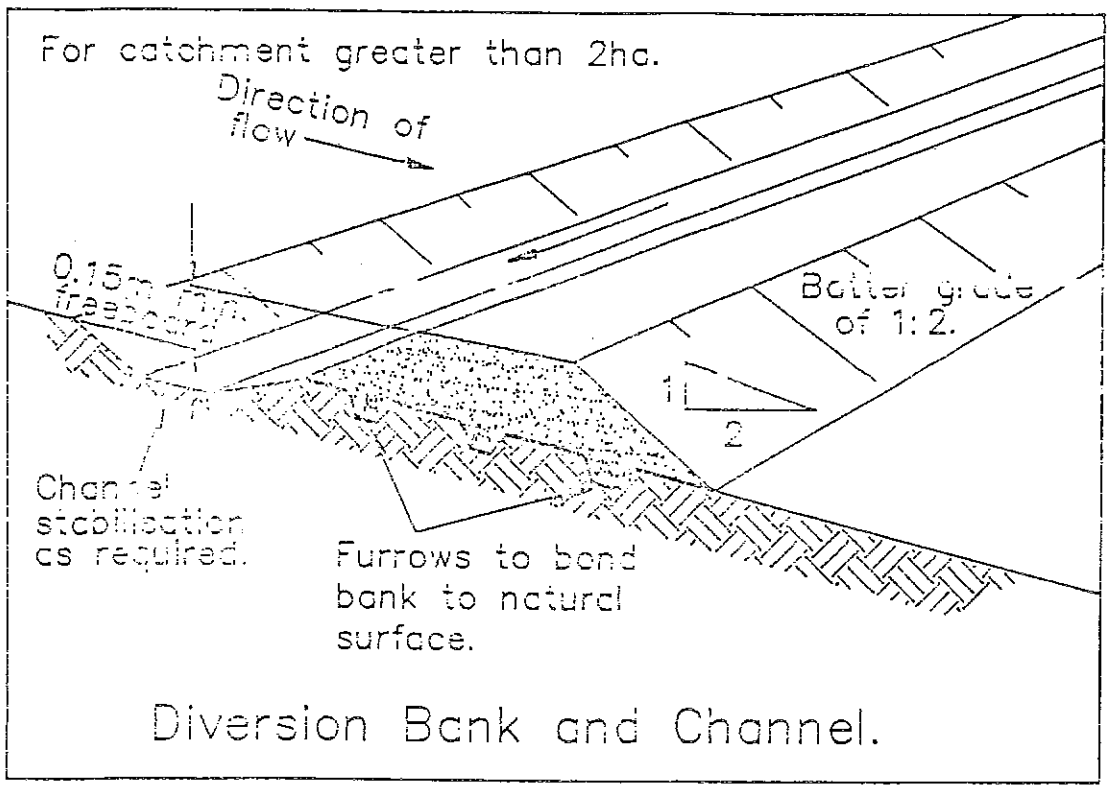
Works will be inspected regularly by a site representative to ensure that control measures operate effectively and to initiate repairs or maintenance as required. Sediment will be removed from the dams when 30% capacity is trapped in the settling zone. All collected sediment will be removed and placed in freshly dumped overburden areas. All devices will be inspected after each storm for structural damage or clogging by silt or other debris and prompt repairs or replacement will be initiated.

Grading of easement roads and access tracks will be restricted to those areas likely to become untrafficable. If rank vegetative growth is restricting drainage, a slasher will be used to reduce the sward.

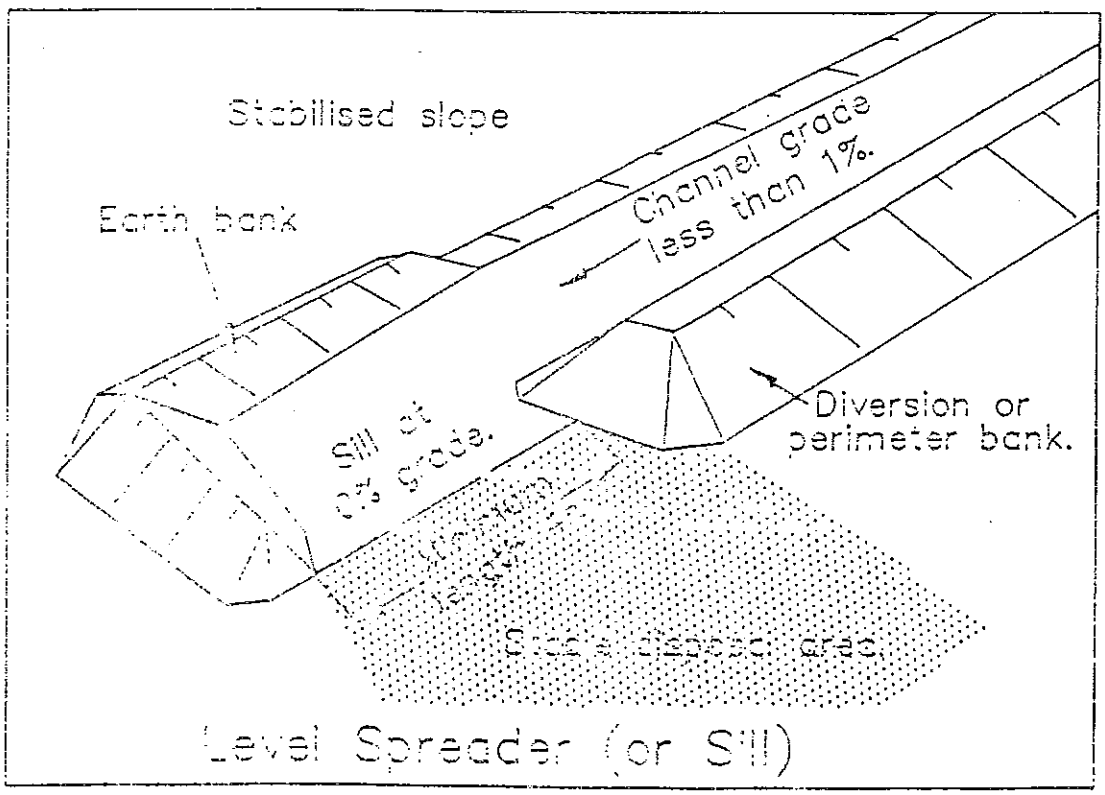
The destruction of shrub and timber regrowth on easements will be undertaken chemically where possible. In general, the maintenance of a vigorous ground cover will minimize erosion along easements.

APPENDIX 1

DIVERSION BANK CONFIGURATION



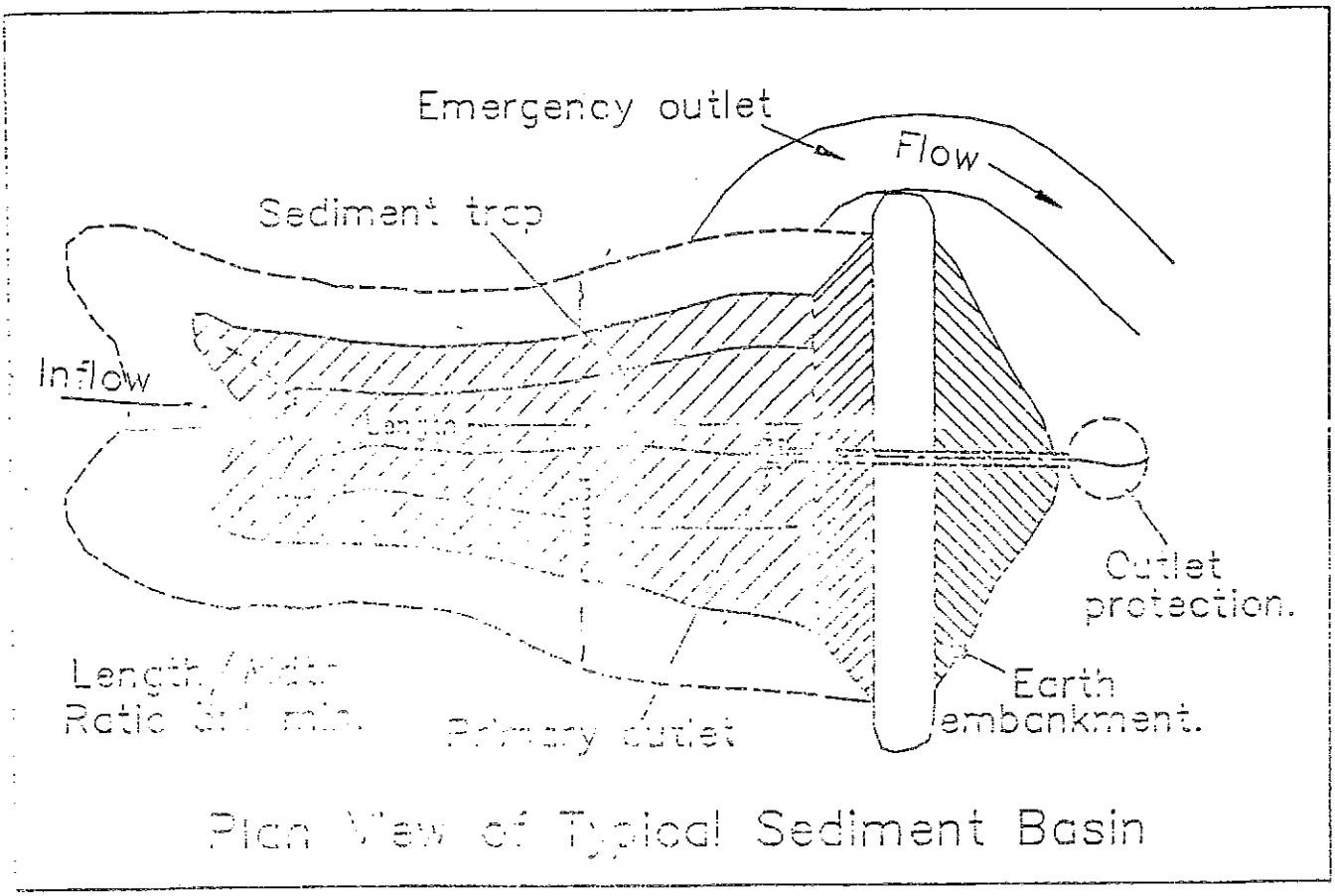
Diversion Bank and Channel.



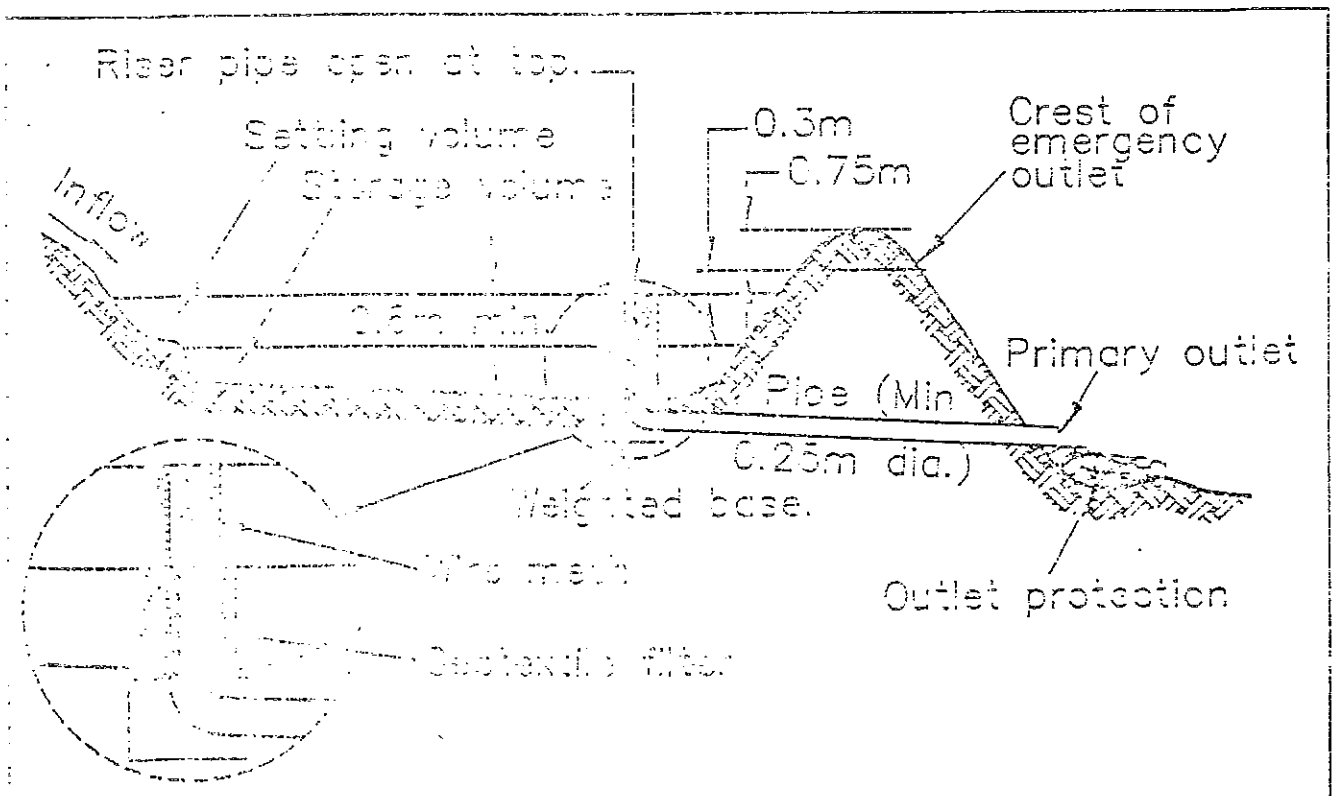
Level Spreader (or Sill)

APPENDIX 2

SEDIMENT DAM PLANS



Plan View of Typical Sediment Basin



Cross Section of Typical Sediment Basin.

APPENDIX 3

HYDROLOGIC CALCULATIONS

The "kinetic wave" equation, described by Ragan and Duru (1972), is best suited to areas with a higher degree of development and impervious surfaces such as the contractor's hardstand area.

The form of the equation is:-

$$t = 6.94\,(L.n)^{0.6}/I^{0.4}.S^{0.3}$$

Where t is overland flow time (minutes)
L is flow path length (m)
n is a surface roughness or retardance coefficient
I is rainfall intensity (mm/h)
S is slope (m/m)

Calculation:

L = 750 m
n = 0.012
I = 134 mm/h
S = 0.03 m/m

$t = 6.94\,(750 \times 0.012)^{0.6} / (134)^{0.4} \times (0.03)^{0.3}$

$t = 10.47$ minutes

Now using $Q = C.I.A$ Calculate the runoff volume (Q) for 1 hour, 1 in 10 year event.

Where C = 1 (runoff coeficient)
I = 116 mm/h (rainfall intensity)
A = 2 ha (area)

$Q = 1 \times 116 \times 2$

$Q = 2{,}320\ m^3$

Therefore the runoff volume for the 1 hour, 1 in 10 year design storm is 2,320m³. An additional 30% volume will be incorporated into the pollution control sump's capacity to cater for accumulated sediment storage.

Reference:

Ragan, R.M. And Duru, J.O. (1972). Kinematic wave nomograph for times of concentration. Jour. Hydraulics Division, Amer. Soc. Civ. Engrs, Vol. 98, No. HY10, October, pp. 1765-1771.

APPENDIX 4

POWERLINE CLEARING GUIDELINES

Donaldson Coal Mine
Beresfield

General Powerline Vegetation Management

January 2000

1 INTRODUCTION

During the operation of the Donaldson open-cut coal mine, it will be necessary to relocate the main powerline. The relocation of the powerline will require the disturbance of vegetation and/or fauna habitat for the installation of tower structures/power poles and to provide safety clearances for the electric power lines.

2 MANAGEMENT

2.1 Vegetation Management

The current trend in the management of vegetation during powerline construction and operation is to minimise vegetation clearance. The measures provided below are general measures which apply to the powerline construction and operation industry, and are not specific to the Donaldson site. Only measures which are relevant to the site will be applied. General powerline vegetation management includes:

- tree-lopping (rather than removal) where only the parts of the tree potentially causing a safety issue will be removed. This is particularly feasible when the trees are close to the towers/poles or in gullies where the line can span vegetation with higher clearances;
- scalloped clearing to be conducted in the vicinity of towers/poles and potentially off ridge tops to minimise vegetation clearing at these areas;
- the use of helicopter stringing throughout the line where appropriate, to remove the need to clear a 2m wide area down the centreline, particularly relevant for areas identified as sensitive;
- retention and spanning of sensitive vegetation by adjusting tower/pole locations and/or heights. This is particularly relevant for areas of riparian vegetation;
- native vegetation cover will be maintained and structures located in open land wherever possible, with consideration being given to land use constraints;
- retention of riparian vegetation at rivers and streams and gully vegetation;
- selection of drum and winch sites to minimise clearing of vegetation;
- access tracks will follow existing tracks or previously disturbed areas;
- temporary access tracks located in sensitive areas will be rehabilitated following completion of construction;
- native vegetation which is removed for construction purposes should be retained on site or may be mulched on site to be used for rehabilitation purposes depending on the local circumstances; and
- a qualified arborist should be available during any clearing activities in areas of potential sensitivity or areas requiring particular vegetation management

2.2 Controlled Felling of Trees

Hollow-bearing trees can provide habitat for various fauna species, such as arboreal mammals, owls and microchiropteran bats. In the instance where a hollow-bearing tree

has to be felled during powerline construction, the tree is assumed to provide habitat for fauna.

To minimise the risk of harm to any animal that may inhabit the tree, it is possible to control fell the tree. The main aim of this procedure is to protect individual animals and is an attempt to ameliorate potential impacts on individual animals.

Further details regarding the controlled felling of trees is available, if required.

2.3 Fauna Species Protection Management

The main management measure which can be implemented during powerline construction which minimises the potential impacts on fauna species, is to undertake a pre-clearing survey.

A pre-clearing survey should be conducted in areas which may be affected by construction activities, including stockpiles, truck access and parking and general construction activities such as tower/pole placement. A pre-clearing survey should be undertaken by a qualified biologist.

A pre-clearing survey includes fauna habitat checks of hollow logs and leaf litter on the ground, rocky ledges and ridges, dead stumps, hollow-bearing trees , caves , old car bodies or general rubbish (provides habitat for reptiles and amphibians) and habitat rock.

If significant rocky ledges, caves or habitat rock is located during the pre-clearing surveys further information is available regarding their management. Again the basic premise is to avoid them where possible or minimise the potential for disturbance.

2.4 Hollow-bearing Tree Management

Many fauna species such as nocturnal birds, flying mammals (*ie* fruit-bats and microchiropteran bats), non-flying mammals (*ie* possums and gliders) use hollow-bearing trees as habitat resources for roosting purposes. It is the primary aim of this project to retain hollow-bearing trees. In some instances entire trees or limbs will require removal for safety reasons.

It is noted that the main purpose of the fauna management part of the hollow-bearing tree protocol is to protect individual animals from an animal welfare point of view.

Hollow-bearing management measures include:

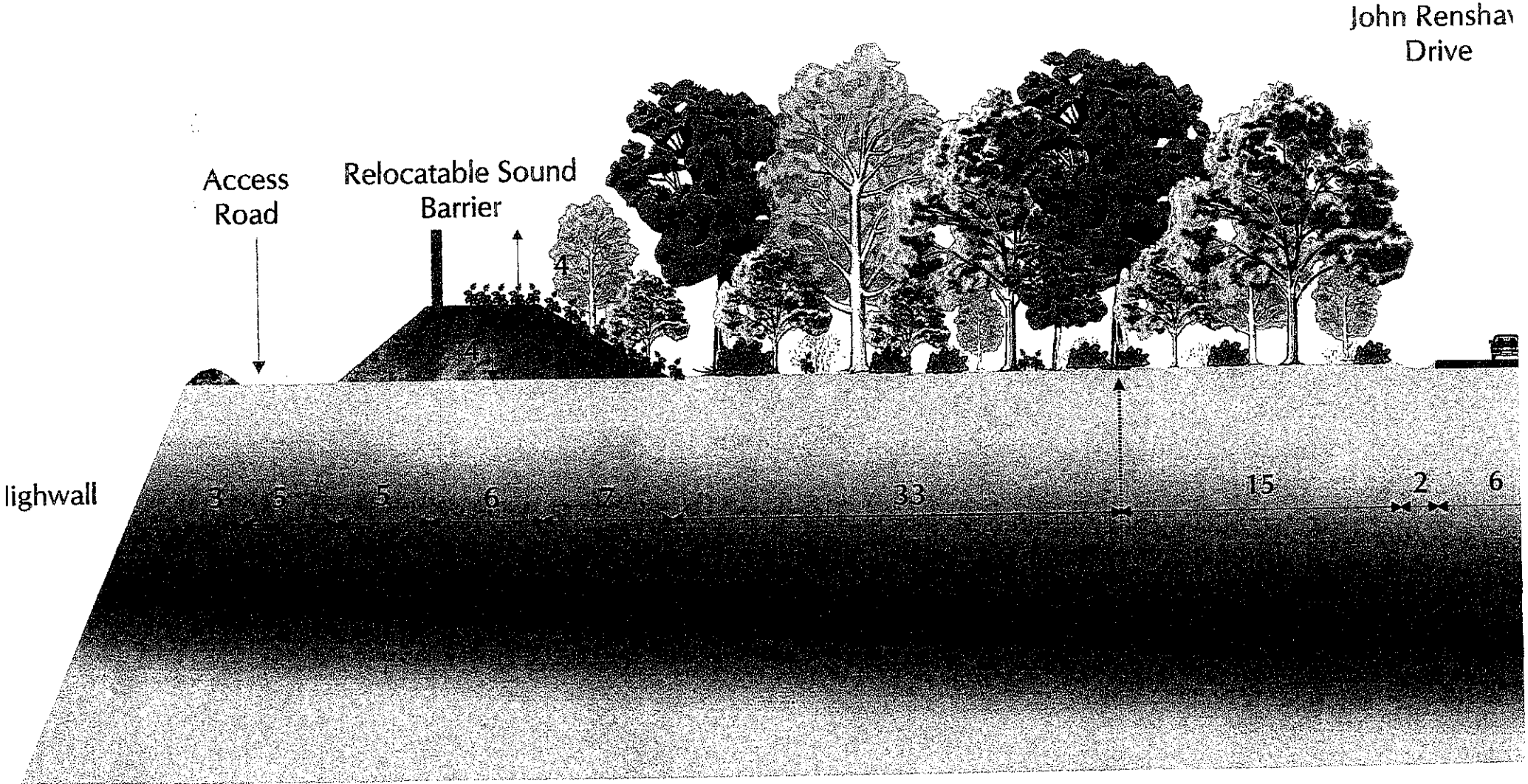
- consultation with a qualified biologist prior to hollow-bearing tree modification or removal regarding the potential for fauna species to occur and the management of the tree. The biologist should be on-site during the modification or removal of hollow-bearing trees.
- retain hollow-bearing trees, by avoidance (raising tower/pole heights or moving their position) where this is practicable;
- where not possible, prior to lopping or felling a hollow-bearing tree, a pre-clearing check is required, immediately prior to clearing (*ie* within a week before clearing activity), to ascertain whether any animals are actually using the limbs as habitat. This should be a visual inspection by the qualified biologist or an appropriately trained individual;
- where full retention is not possible, lopping and ring-barking of the tree will be considered as this will retain the hollows though the tree is no longer living;
- where ring-barking is not an option, the management approach is to lop only those limbs which must be removed and retain the rest of the tree;
- where the limbs which are to be removed contain hollows they should be removed carefully (by lopping) and relocated to another tree of the same species (where practicable) in the vicinity and secured onto a supporting limb or, as the less favourable alternative, place it on the ground as a hollow log;

- where a hollow-bearing tree must be removed entirely it is suggested that the qualified biologist be consulted regarding the seasonal constraints associated with removal of specific hollow-bearing trees and will provide site and circumstance specific solutions. In some instances it may be appropriate to remove the hollow-bearing tree weeks or months in advance or be removed immediately prior to stringing of the transmission line. The hollow-bearing limbs should be removed carefully and either secured onto similar trees or placed on the ground; and
- a qualified biologist (in tree management and fauna handling) and arborist (with relevant experience in the management of native tree species) will be available to provide expert advice.
- ground crew will be provided with training regarding the importance of hollow-bearing trees and how to implement the management approach outlined above.

An additional management measure which will further ensure the minimisation of potential impacts is the training and induction of construction staff regarding the correct management of natural resources such as vegetation and hollow-bearing trees.

APPENDIX 5

BUND CROSS SECTION



Donaldson Bund

Conceptual cross section between
John Renshaw Drive and
Screening Bund - Donaldson Mine

APPENDIX 6

COARSE REJECT ENCAPSULATION

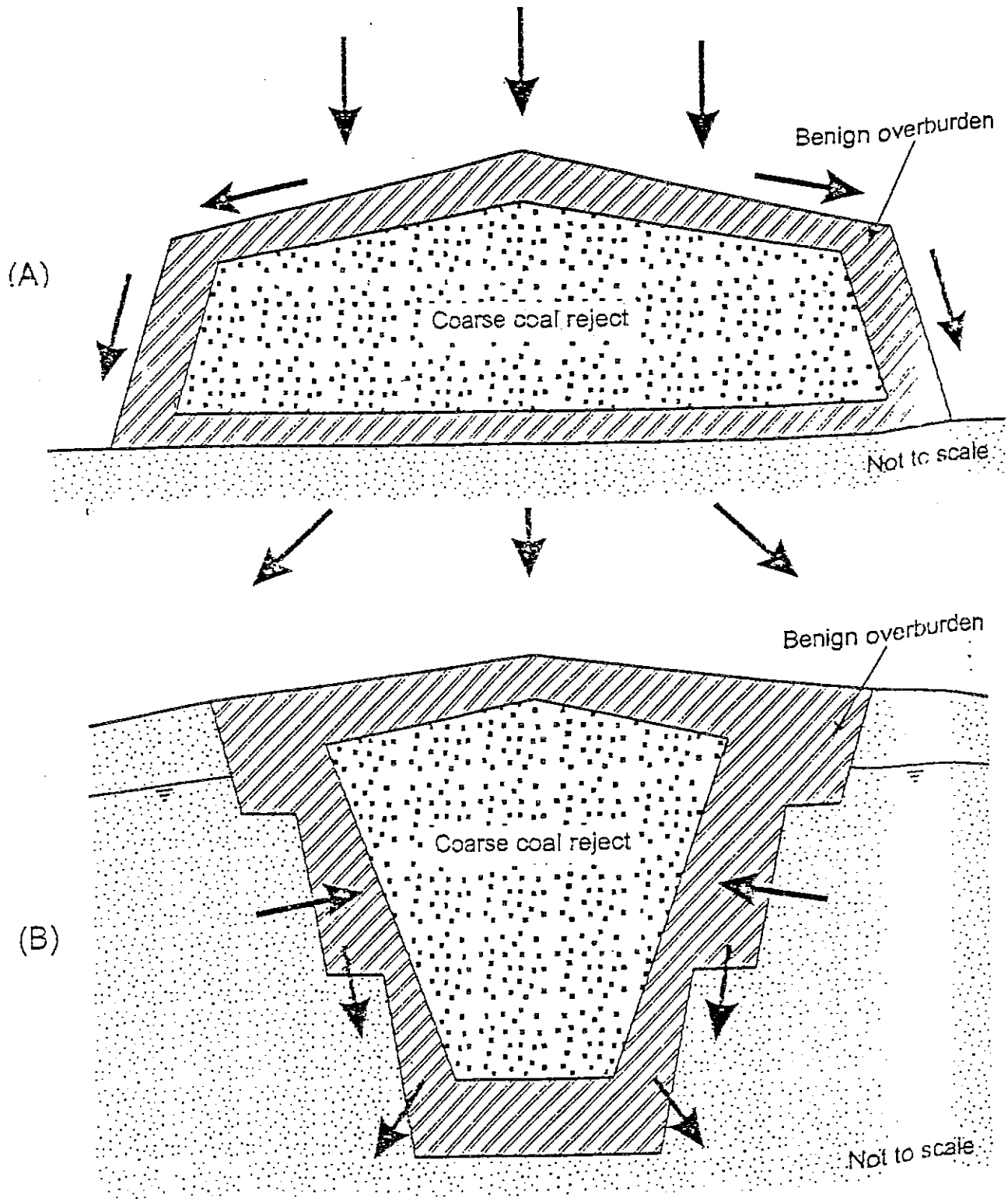


Figure 6. Diagrammatic representation of coarse coal reject encapsulation (A) Within overburden dumps, and (B) In-pit.

Note: Arrows indicate potential water movement.