ENVIRONMENTAL ASSESSMENT

Duralie Extension Project

APPENDIX N
REHABILITATION AND LANDSCAPE MANAGEMENT STRATEGY

GLOUCESTER COAL

ResourceStrategies

APPENDIX N

DURALIE EXTENSION PROJECT

REHABILITATION AND LANDSCAPE MANAGEMENT STRATEGY

PREPARED BY
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EXECUTIVE SUMMARY

Duralie Coal Pty Ltd (DCPL) is the owner and operator of the Duralie Coal Mine (DCM). DCPL is a wholly owned subsidiary of Gloucester Coal Ltd. The DCM is located approximately 10 kilometres (km) north of Stroud and 20 km south of Stratford in the Gloucester Valley in New South Wales (NSW). The Duralie Extension Project (the Project) would be an extension of the DCM and would involve open pit mining at a rate of up to 3 million tonnes per annum.

This document describes rehabilitation and landscape management measures that would be used at the DCM during the life of the Project. It also provides a description of how the site would be progressively rehabilitated and integrated into the landscape and the measures that would be put in place for the long-term protection and management of the site following cessation of mining.

The site would be progressively rehabilitated and integrated into the landscape in consideration of the following general principles:

- to create physically and chemically stable landforms which are consistent with the local surrounding environment;
- to minimise land disturbance, where practicable, through progressive rehabilitation and mine planning;
- to provide visual amenity through tree and shrub establishment, mounding and/or bunding;
- to create flora and fauna corridors and habitats;
- to establish permanent, self-propagating vegetative cover; and
- to achieve final land uses that meet community and regulatory expectations and infrastructure needs in consideration of the pre-mining landuse (i.e. predominately grazing) and conservation values.

A comprehensive monitoring regime would be put in-place to track the progress of rehabilitation initiatives towards the fulfilment of these objectives. DCPL would aim to achieve a balanced rehabilitation outcome, with the creation of final landuse of grazing and woodland habitat.

Upon cessation of mining operations, it is expected that tenure of the mining leases would be maintained by DCPL until such time as the relevant statutory requirements are achieved (e.g. fulfilment of mining lease conditions). Central to lease relinquishment would be the confirmation of safety issues and the demonstrated application of adequate control measures to facilitate sustainable landscapes.

N1 INTRODUCTION

N1.1 BACKGROUND AND PURPOSE

Duralie Coal Pty Ltd (DCPL) is the owner and operator of the Duralie Coal Mine (DCM). DCPL is a wholly owned subsidiary of Gloucester Coal Ltd (GCL). The DCM is located approximately 10 kilometres (km) north of the village of Stroud and 20 km south of Stratford in the Gloucester Valley in New South Wales (NSW) (Figure N-1). Another GCL subsidiary, Stratford Coal Pty Ltd (SCPL), owns and operates the Stratford Coal Mine (SCM), which is located some 20 km to the north of the DCM.

The Duralie Extension Project (the Project) would be an extension of the DCM and would involve open pit mining at a rate of up to 3 million tonnes per annum (Mtpa). The general arrangement of the Project is shown on Figure N-2.

The purpose of this document is to provide a Rehabilitation and Landscape Management Strategy for the Project that addresses relevant Director-General's Environmental Assessment Requirements (EARs), as follows:

> ***Rehabilitation/Mine Closure -*** *including a detailed description of the proposed rehabilitation/mine closure strategy for the mine, taking into consideration any relevant strategic land use planning or resource management plans or policies, and the scope for integrating this strategy with any biodiversity offset strategy for the mine.*

This Rehabilitation and Landscape Management Strategy has been prepared cognisant of the following documents and guidelines:

- *Leading Practice Sustainable Development Program for the Mining Industry - Mine Rehabilitation* (Department of Industry, Tourism and Resources, 2006a).
- *Leading Practice Sustainable Development Program for the Mining Industry - Mine Closure and Completion* (Department of Industry, Tourism and Resources, 2006b).
- *Australian Coal Mining Practice* – Monograph 12, 3rd Ed. In press (Australasian Institute of Mining and Metallurgy, 2009).
- *Strategic Framework for Mine Closure* (Australian and New Zealand Minerals and Energy Council and the Minerals Council of Australia, 2000).
- *Development of Rehabilitation Completion Criteria for Native Ecosystem Establishment on the Coal Mines in the Hunter Valley,* Australian Coal Association Research Program Project C13048 (Australian Centre for Minerals Extension and Research, 2005).
- *Maintenance of Geomorphic Processes in Bowen Basin River Diversions - Stage 1*, Australian Coal Association Research Program Project C8030 (ID&A Pty Ltd, 2000).
- *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales* (NSW Department of Mineral Resources, 1999).
- *Rehabilitation by Design – Practice Notes* (NSW Minerals Council, 2007).

This Rehabilitation and Landscape Management Strategy has been peer reviewed by Emeritus Professor Clive Bell of the Australian Centre for Minerals Extension and Research at the University of Queensland.

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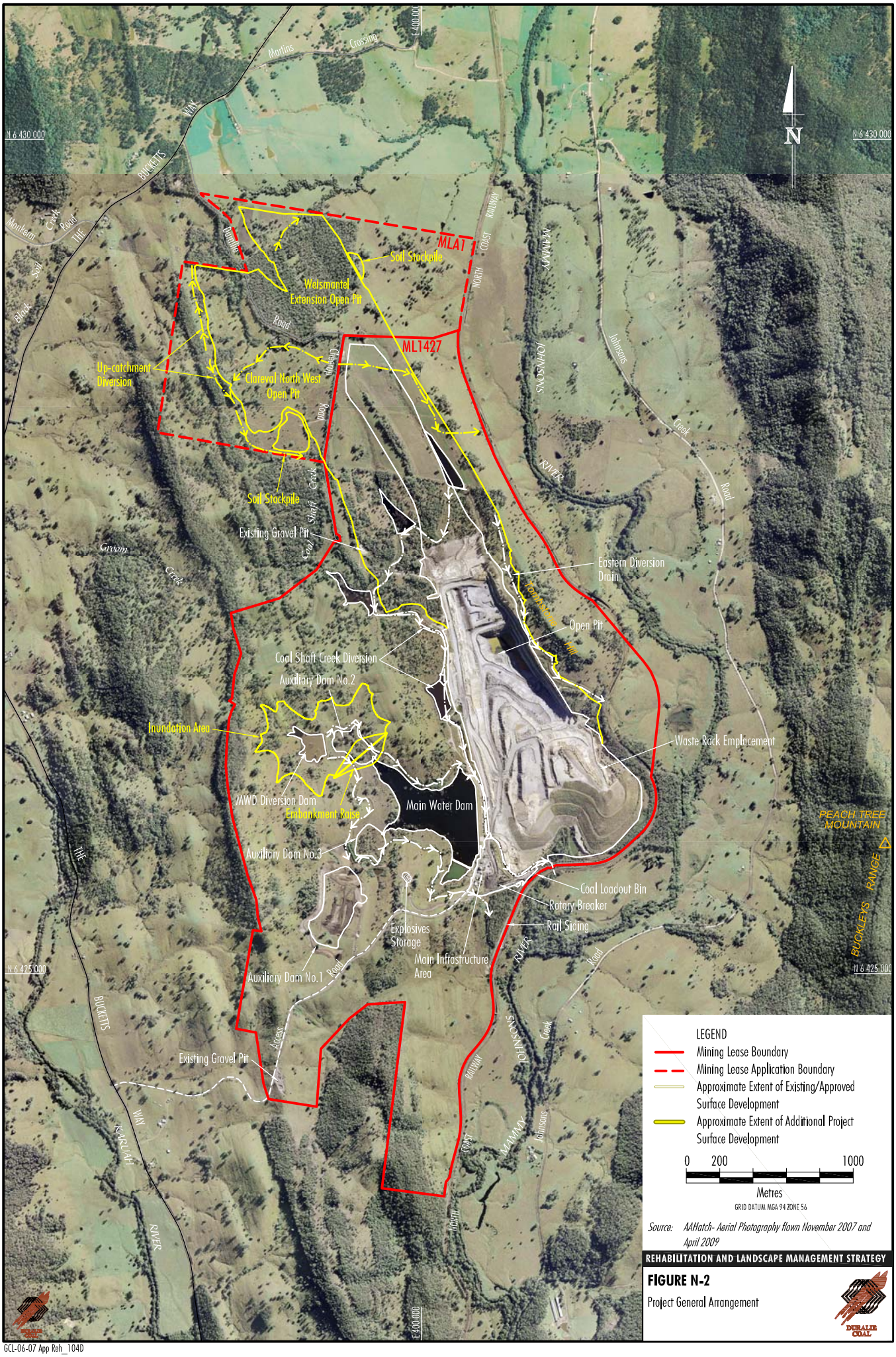

REHABILITATION AND LANDSCAPE MANAGEMENT STRATEGY

FIGURE N-2

Project General Arrangement

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N1.2 PROJECT OVERVIEW

The main activities associated with development of the Project would include:

- continued development of open pit mining operations at the DCM to facilitate a run-of-mine (ROM) coal production rate of up to approximately 3 Mtpa, including:
  - extension of the existing approved open pit in the Weismantel Seam to the north-west (i.e. Weismantel Extension open pit) within Mining Lease (ML) 1427 and Mining Lease Application (MLA) 1; and
  - open pit mining operations in the Clareval Seam (i.e. Clareval North West open pit) within ML 1427 and MLA 1;
- ongoing exploration activities within existing exploration tenements;
- progressive backfilling of the open pits with waste rock as mining develops, and continued and expanded placement of waste rock in out-of-pit waste rock emplacements;
- increased ROM coal rail transport movements on the North Coast Railway between the DCM and SCM in line with increased ROM coal production;
- continued disposal of excess water through irrigation (including development of new irrigation areas within ML 1427 and MLA 1);
- raising of the existing approved Auxiliary Dam No. 2 from relative level (RL) 81 metres (m) to approximately RL 100 m to provide significant additional on-site storage capacity to manage excess water on-site;
- progressive development of dewatering bores, pumps, dams, irrigation infrastructure and other water management equipment and structures;
- development of new haul roads and internal roads;
- upgrade of existing facilities and supporting infrastructure as required in line with increased ROM coal production;
- continued development of soil stockpiles, laydown areas and gravel/borrow pits;
- establishment of a permanent Coal Shaft Creek alignment adjacent to the existing DCM mining area;
- ongoing monitoring and rehabilitation; and
- other associated minor infrastructure, plant, equipment and activities.

N1.3 INTERACTION WITH THE MINING, REHABILITATION AND ENVIRONMENTAL MANAGEMENT PROCESS

The results of rehabilitation initiatives undertaken to date at the DCM are documented in the Annual Environmental Management Report (AEMR) and the Mining Operations Plan (MOP) in accordance with the NSW Department of Industry and Investment's Mining, Rehabilitation and Environmental Management Process (MREMP). The MOP would continue to be periodically reviewed and updated during the mine life to incorporate the rehabilitation concepts and activities.

In accordance with the MREMP, mine closure details would be presented in the MOP incorporating the Project. The mine closure details described in the MOP would be based on principles outlined in this Rehabilitation and Landscape Management Strategy.

N1.4 DOCUMENT STRUCTURE

This Rehabilitation and Landscape Management Strategy is structured as follows:

Section N1 Provides the background to the Project and the purpose of the document.

Section N2 Presents a review of the rehabilitation strategy including short-, medium- and long-term objectives.

Section N3 Outlines a case study of rehabilitation activities undertaken to date at the SCM.

Section N4 Provides a description of rehabilitation activities for each domain/mining area.

Section N5 Outlines the general rehabilitation practices and measures intended to achieve rehabilitation objectives.

Section N6 Details rehabilitation monitoring to be undertaken for the Project.

Section N7 Provides specific discussion on final void water balances, safety, water quality and rehabilitation.

Section N8 Outlines long-term protection and management measures beyond the cessation of mining.

Section N9 References.

N2 REHABILITATION STRATEGY, PRINCIPLES AND OBJECTIVES

Rehabilitation of the existing DCM is undertaken progressively and has the following general principles:

- to create physically and chemically stable landforms which are consistent with the local surrounding environment;
- to minimise land disturbance, where practicable, through progressive rehabilitation and mine planning;
- to provide visual amenity through tree and shrub establishment, mounding and/or bunding;
- to create flora and fauna corridors and habitats;
- to establish permanent, self-propagating vegetative cover; and
- to achieve final land uses that meet community and regulatory expectations and infrastructure needs in consideration of the pre-mining land use (i.e. predominately grazing) and conservation values.

The above principles would continue to be applied for the Project. Table N-1 describes short-term, medium-term and long-term objectives that describe how the site would be progressively rehabilitated and integrated into the landscape. The rehabilitation and revegetation concepts for the Project described in this document build upon, and are consistent with, these objectives.

Table N-1
Short-term, Medium-term and Long-term Objectives

Short-term Objectives	Medium-term Objectives	Long-term Objectives
• Minimisation of disturbance areas. • Conservation of sufficient soil resources for rehabilitation via appropriate soil management. • Provision of sediment control measures. • Rapid stabilisation of newly constructed infrastructure by topsoiling, seeding and fertilising. • Appropriate waste rock management including delineation and controlled placement of rock wastes on the basis of acid forming potential. • Recovery of items suitable for providing alternative habitat for displaced fauna (e.g. tree hollows). • Progressive backfilling of the open pit. • Direct placement of topsoil resources where areas on the waste rock emplacement are available for topsoil application.	• Creation of landforms which are geotechnically stable and visually consistent with the surrounding environment. • Minimisation of erosion through the design and construction of contour drainage and additional sediment control dams. • Appropriate selection of tree and pasture species for progressive rehabilitation. • Encouragement of seed propagation through placement of topsoil, utilisation of soil ameliorants as required (e.g. gypsum, lime), seeding and fertilising. • Evaluation of availability of soil resources for rehabilitation completion by routinely calculating a soil balance. • Improvement of habitat in rehabilitated areas through noxious weed management, feral animal control and restriction of cattle and vehicle access. • Revegetation monitoring with remediation where monitoring indicates the need.	• Creation of landforms which are geotechnically stable and visually consistent with the surrounding environment. • Creation of final land use of grazing and woodland habitat. • Reconstruction of Coal Shaft Creek using design principles which provide for long-term stability including a stable vegetative covering. • Management of cattle through fencing to allow controlled grazing within particular rehabilitated areas. • Provision of access tracks for light vehicles, tractors, etc. • Retention of water management infrastructure for use as agreed with the relevant landholders. • Decommissioning of sediment control structures if they are no longer serving an ancillary purpose (e.g. stock watering). • Gradual removal and decommissioning of redundant site infrastructure. • Maintenance of the quality of surface water runoff to appropriate standards. • Revegetation monitoring with remediation where monitoring indicates the need.

N3 CASE STUDY – STRATFORD COAL MINE REHABILITATION

Rehabilitation conducted to date at the SCM is relatively more advanced that that conducted to date at the DCM. This section provides an overview of rehabilitation activities at the SCM to provide an indication of rehabilitation outcomes at the DCM and context to this Rehabilitation and Landscape Management Strategy.

Rehabilitation at the SCM commenced in 1995. Rehabilitation currently includes some 182 hectares (ha) of rehabilitation to pasture and 13 ha rehabilitation to woodland. Example photographs of SCM rehabilitation are shown on Plate N-1.

The rehabilitation principles at the SCM include:

- minimisation of erosion and reinstatement of pre-mining land capability;
- the generation of a final rehabilitated landform which is consistent with general landforms in the area and which would blend in with the hills to the east;
- providing a landform which is suitable for the primary final land uses of grazing, forestry and faunal habitat enhancement;
- mine planning and overburden handling operations to minimise rehandling, reshaping and contouring;
- minimising the amount of disturbed land awaiting rehabilitation; and
- providing for the safe and environmentally acceptable disposal of Coal Handling and Processing Plant rejects.

A focus of rehabilitation activities to date has been the restoration of pasture and integration with surrounding agricultural enterprises. Grazing activities have been undertaken on rehabilitation areas at the SCM since 2004. The areas are grazed by beef cattle, with stocking rates in accordance with *Beef Stocking Rates and Farm Size - Hunter Region* (Department of Primary Industries [DPI], 2006).

Grazing activities are undertaken by third party agistees, however, GCL is responsible for maintenance of fencing, cattle yards and dams and also for weed and pest control. In addition, GCL retains contractual control over rehabilitated areas to remove stock if the grazing practice is not acceptable.

Cattle grazing on rehabilitated areas are healthy and have performed well on rehabilitated pastures to enable their sale locally through the Gloucester Sale Yards. The grazing activities also promote additional economic activity in the local area through suppliers and veterinary services.

Monitoring to date indicates that the rehabilitation landforms at the SCM are showing continued evidence of stability with no significant erosion or gross failure (e.g. landslips). Woodland revegetation areas are performing well, with woodland areas exhibiting adequate growth and vigour. Pasture areas are performing well and productive grazing activities are undertaken as discussed above.

Areas rehabilitated to woodland at the SCM have been targeted to provide visual screening and amenity, stock shelter (i.e. grazing wind-breaks and shade) and wildlife habitat enhancement. Local endemic native vegetation species have been used wherever possible based on trialling of various species in the initial rehabilitation areas.

Stratford Coal Mine Rehabilitation -
Examples of Duralie Extension Project Rehabilitation Concepts

Stratford Waste Rock Emplacement Looking South-East - Rehabilitation to Grazing and Woodland

Stratford Eastern Emplacement Looking East South-East (Water Dam) - Rehabilitation to Grazing

Stratford Eastern Emplacement Looking North - Rehabilitation to Grazing

Stratford Waste Rock Emplacement Looking South - Rehabilitation to Grazing and Woodland

Stratford Waste Rock Emplacement - Rehabilitation to Woodland

Stratford Waste Rock Emplacement - Rehabilitation to Grazing and Woodland

N4 REHABILITATION OF THE DURALIE COAL MINE

Rehabilitation activities at the DCM to date have focused on the southern portion of the existing out-of-pit waste rock emplacement. Approximately 16 ha of the waste rock emplacement has been successfully rehabilitated, with a further 5 ha shaped, dressed with topsoil and seeded (refer to Plate N-2). In addition, DCPL has also planted vegetation screens at strategic locations to assist with the screening of mine landforms and infrastructure.

The following sub-sections describe the rehabilitation concepts for key mine landforms, and the details of the planned rehabilitation concepts for each landform.

N4.1 WEISMANTEL EXTENSION AND CLAREVAL NORTH WEST OPEN PITS

N4.1.1 Overview

Mining of the existing Weismantel open pit commenced in 2003. Conventional open pit mining operations are conducted within the Weismantel open pit. The open pit is progressively back-filled with waste rock as mining progresses.

For the Project, open pit mining operations would continue in the Weismantel coal seam with the development of the Weismantel Extension open pit to the north (Figure N-2). Backfilling would continue to be conducted as the open pit extends to the north.

Following cessation of Weismantel Extension open pit mining activities, the remaining final void would be used to store mine water. Following the completion of mining activities at the DCM, it would be expected that the Weismantel Extension final void would continue to fill, until an equilibrium level is reached. The filling behaviour of the Weismantel Extension final void is discussed below.

In addition to the mining of the Weismantel Extension open pit, the Project would also include mining of the Clareval North West open pit. Development of the Clareval North West open pit would commence by approximately Year 2 of the Project and would occupy the western portion of MLA 1 (Figure N-2).

Similar to the Weismantel open pit, the Clareval North West open pit would be progressively backfilled with waste rock as the open pit is developed within a final void remaining to the north. The integrated final rehabilitated landform is shown on Figure N-3 and comprises the abovementioned final voids, and the rehabilitated backfilled open pits integrated with rehabilitated out-of-pit waste rock emplacements.

Long-term Final Voids

At the cessation of mining, final voids would remain in the Clareval North West and Weismantel Extension open pits (Figure N-4). The approximate depths and areas of final voids are provided in Table N-2.

Table N-2
Details of Project Final Voids

Final Void	Depth (m)	Area (ha)	Catchment Area (ha)
Clareval North West Open Pit	190	47	47
Weismantel Extension Open Pit	90	10	28

Source: *Surface Water Assessment* (Gilbert & Associates, 2009) (Appendix A of the EA).

A Duralie Coal Mine Waste Rock Emplacement Revegetation Looking North-West

B Duralie Coal Mine Waste Rock Emplacement Looking North-East

C Duralie Coal Mine Waste Rock Emplacement Revegetation Looking North

D Duralie Coal Mine Waste Rock Emplacement Revegetation Looking West

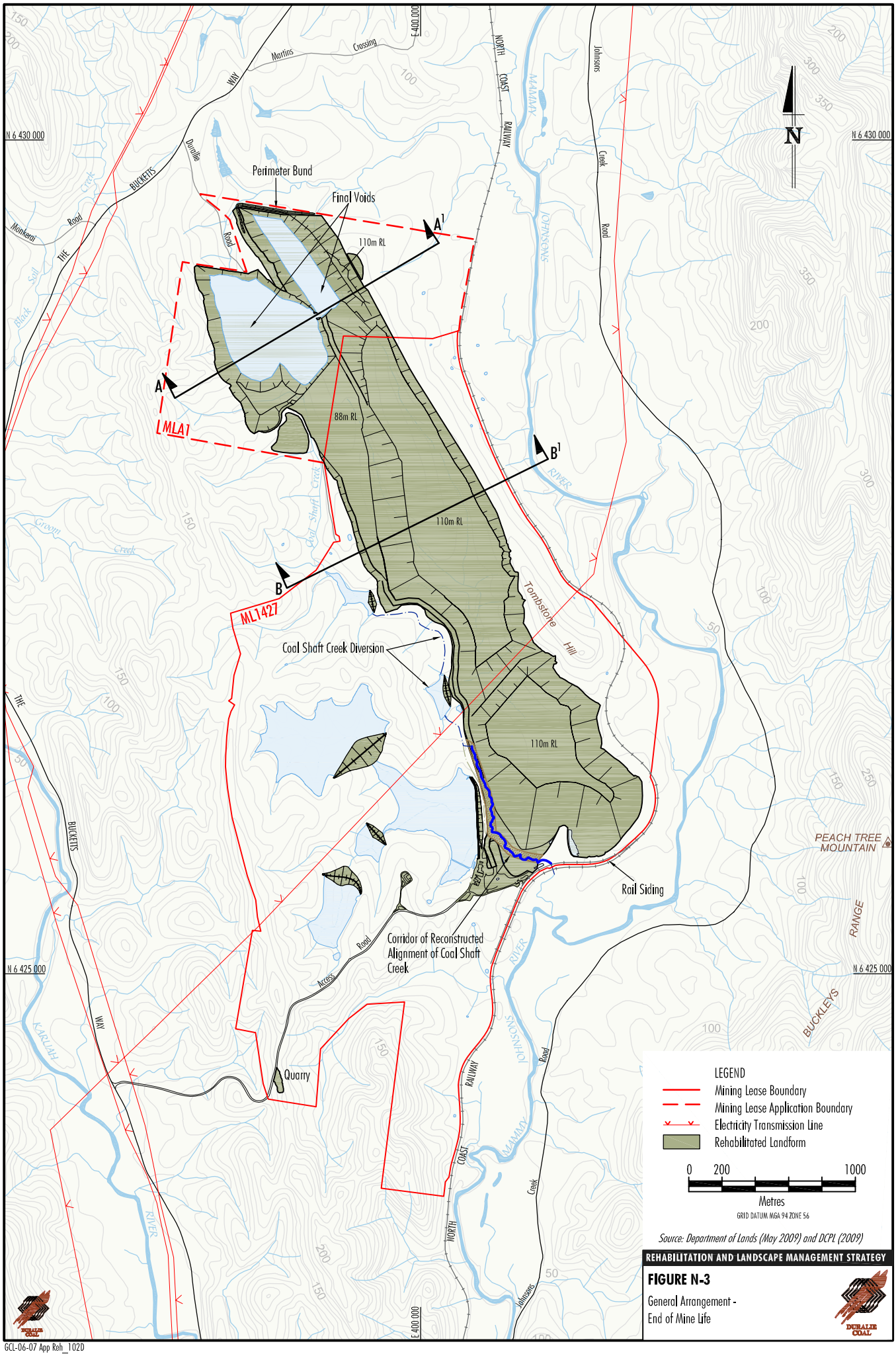
REHABILITATION AND LANDSCAPE MANAGEMENT STRATEGY

PLATE N-2

Duralie Coal Mine Rehabilitation

DURALIE COAL

DURALIE COAL



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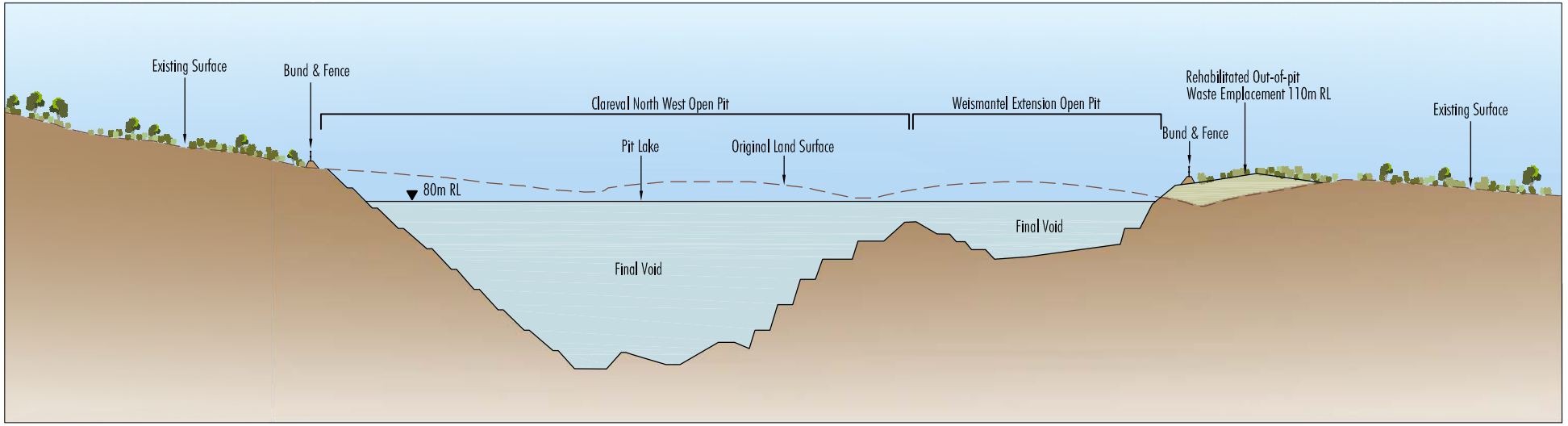
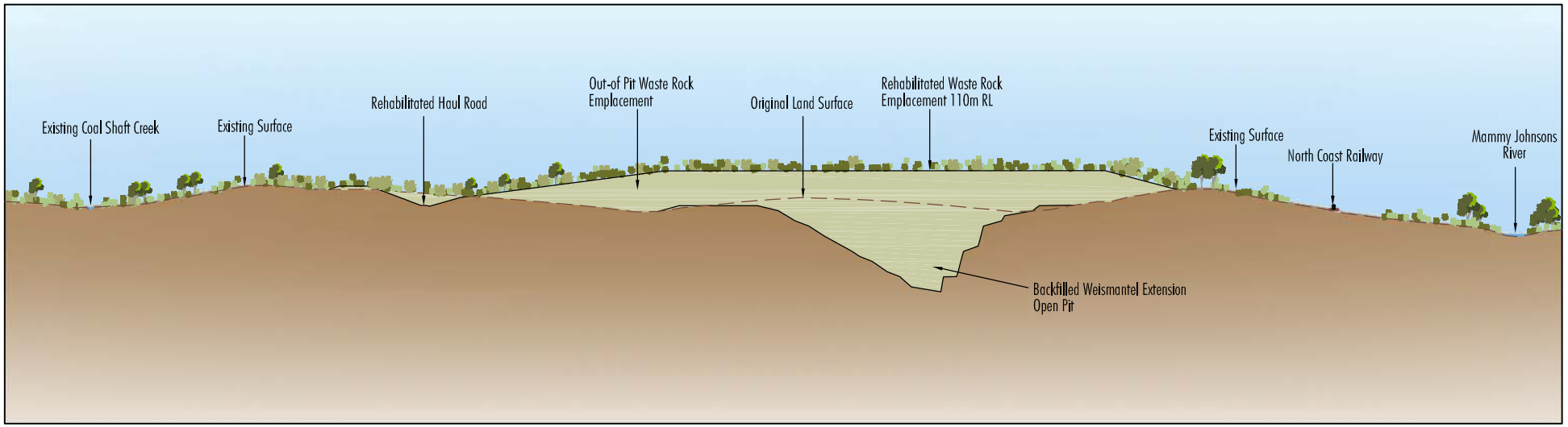


A — Final Voids - Post Mining — A[1]



B — Backfilled Weismantel Extension Open Pit — B[1]

Not to Scale
Source: DCPL (2009)

REHABILITATION AND LANDSCAPE MANAGEMENT STRATEGY

FIGURE N-4

Typical Cross-Sections - Final Voids and Backfilled Open Pit

Inflows to the final voids would comprise incident rainfall, runoff and groundwater (including waste rock emplacement infiltration). The surface catchment of the final voids would be reduced to a practicable minimum by the use of upslope diversions and contour drains around their perimeter. A final void water balance model was developed in Appendix A of the EA for the combined final voids to predict the long-term behaviour of the final void pit lake.

The results of the water balance for the final voids indicate that the voids would slowly fill over time and would become an integrated pit lake after approximately 40 years post-mining. Water levels would continue to rise for up to 120 years post-mining before reaching an equilibrium level at approximately 80 m RL (Appendix A of the EA).

Heritage Computing (2009) (Appendix B of the EA) indicates that natural groundwater flow direction is expected to be restored from generally north-west to south-east. There would be no deleterious effect on the groundwater resource or on the quality of groundwater, because water quality in the surrounding groundwater is in many cases of a poorer quality than what is predicted from the final void. Therefore it is not predicted that groundwater quality will be impacted by final void water quality after mining.

Figure N-4 shows a cross-section taken through the Clareval North West open pit and the Weismantel Extension open pit final voids.

N4.1.2 Proposed Actions

The main rehabilitation components to the Clareval North West open pit and the Weismantel Extension open pit are the rehabilitation of the backfilled waste rock emplacement and the management of the final voids. Proposed actions in relation to these aspects are provided in Sections N4.2 and N7, respectively.

N4.2 WASTE ROCK EMPLACEMENT

N4.2.1 Overview

Waste rock at the DCM has been progressively placed in both in-pit and out-of-pit waste rock emplacements. Waste rock at the DCM is predominantly non-acid forming (NAF) with some potentially acid forming (PAF) waste rock located near the currently mined (Weismantel) coal seam (Environmental Geochemistry International, 2009 [Appendix I of the EA]).

The current DCM waste rock emplacement has a surface area of some 66 ha and a maximum approved height of approximately 110 m RL. PAF waste rock is currently placed in ‘cells’ in the out-of-pit waste rock emplacement that are lined with low-permeability material or below the post-mining recovered groundwater table in the in-pit waste rock emplacement. Monitoring results from the open pit sump indicate that the waste rock management methods have been successful in controlling acid generation from the open pit floor and waste rock emplacement (Appendix I of the EA).

The waste rock emplacement would continue to be developed for the Project. Similar to the existing situation, Project waste rock would be predominantly NAF, with some PAF material located near the coal seam (Appendix I of the EA). The existing waste rock management methods would continue to apply for the Project.

Appendix I of the EA also assessed the potential for element enrichment of waste rock associated with the Project. The results indicated that there is no significant enrichment of metals or metalloids in the waste rock apart from Sulphur (which is discussed above in terms of acid forming potential).

The reshaped waste rock emplacements to date have not displayed evidence of excessive gullying, tunnelling or any other evidence of instability relating to soil sodicity, indicating that sodicity of the waste rock is not an issue for current operations nor is likely to be for the Project.

The final landform would consist of integrated in-pit and out-of-pit waste rock emplacements. The maximum height of the existing/approved waste rock emplacement of 110 m RL would be unchanged. The final landform would be of a similar scale to the existing Tombstone Hill. Figure N-4 provides a cross-section showing the integration of the backfilled Weismantel open pit and out-of pit waste rock emplacement.

The closure concept and rehabilitation strategy for the waste rock emplacement for the Project involves:

- management of PAF material in accordance with existing site practices (i.e. encapsulation within cells of low permeability material or placement of PAF material below the post-mining groundwater table);
- grading the final surface of the waste rock emplacement to blend in with the natural topography of the area, with an overall outer batter slope of 1 (vertical):4 (horizontal);
- maintenance of operational erosion and sediment controls until establishment of stable final landforms;
- installation of drainage works (i.e. contour drains with grade 1 percent (%) flattening to 0.6%) and ponds to channel runoff safely to constructed outlet areas; and
- progressive rehabilitation of outer batters.

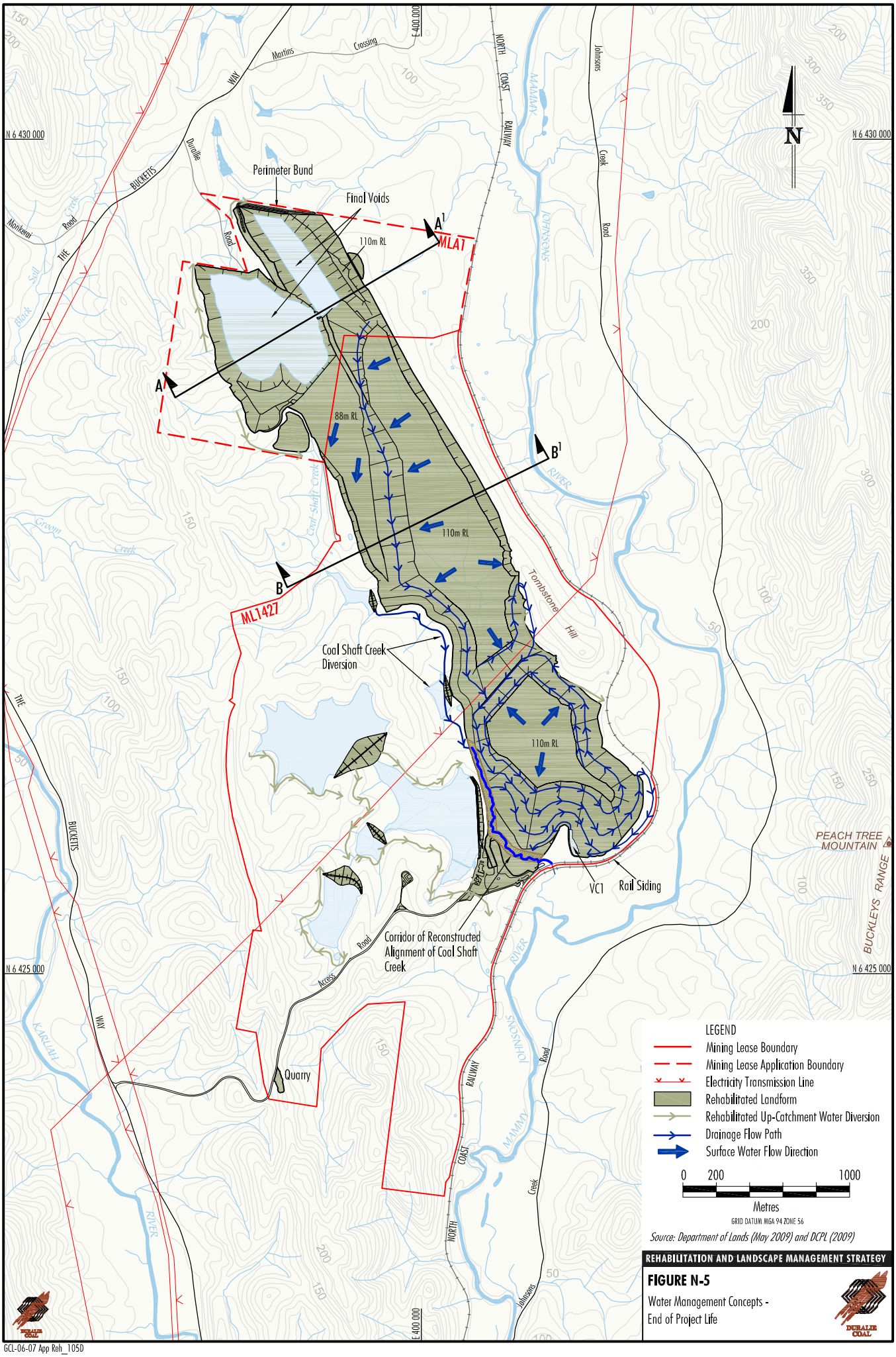
Water Management

The post-mining water management strategy presented in the *Duralie Coal Environmental Impact Statement* (the Duralie Coal EIS) (DCPL, 1996) proposed re-establishing Coal Shaft Creek which would incorporate the final void as a permanent lake and construction of a channel linking the void to the river (Woodward-Clyde, 1996). The current post-mining water management concepts are shown on Figure N-5.

The top surface of the waste rock emplacement would be designed as an extension of the Tombstone Hill and would generally drain towards the south to Coal Shaft Creek. Rock lined channels would be installed along the edge of the top surface to provide a stable means for surface water runoff to drain from the top of the waste rock emplacement (Woodward-Clyde, 1996).

Consistent with the DCM EIS (Woodward-Clyde, 1996), on the batters of the waste rock emplacement, surface water runoff would flow perpendicularly down the slope to the toe of each batter where it would be re-directed by contour drains. The contour drains would be grass-lined, and wherever practicable, would discharge to the natural ground surface. If required, hydraulic control structures would be constructed to allow water to be safely discharged down the slope to the existing ground level (Woodward-Clyde, 1996).

As part of development of the waste rock emplacement, waste rock would be placed against the Tombstone Hill ridgeline to the east of the waste rock emplacement area (Figure N-5). In the northern portion of the waste rock emplacement, drainage from the eastern batter of the waste emplacement (total batter area 0.4 km^2) would drain eastwards towards Mammy Johnsons River (Appendix A of the EA).



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Rock lined channels would be used at the base of the waste rock emplacement to direct runoff into natural creek lines (e.g. Coal Shaft Creek).

The existing sediment dams (and any new sediment dams constructed as part of the Project) downstream of the waste rock emplacement would be retained until the revegetated surface of the waste rock emplacement is stable and the runoff water quality is similar to runoff from similar landforms outside the mining leases.

In the long-term, it is possible that seepage of groundwater may occur from the rehabilitated waste rock emplacement. To prevent movement of undiluted water to Mammy Johnsons River during the recession of runoff events, consistent with Appendix B of the Duralie Coal EIS (Woodward-Clyde, 1996), clay cut-off walls would be constructed along the southern end of the toe of the waste rock emplacement at the invert of the original Coal Shaft Creek channel and the main drainage channel and its banks would be engineered to reduce direct seepage out of the waste rock emplacement to negligible levels. These works would be undertaken in conjunction with the reconstruction of Coal Shaft Creek.

Revegetation

The revegetation objective for the waste rock emplacement is to provide areas of woodland and pasture on the waste rock emplacement surface and batters. The woodland areas would be linked to a broader habitat enhancement strategy as discussed in Section N4.6. In addition, trees would be placed around the perimeter of the reprofiled waste rock emplacement to facilitate screening of potential views of the Project.

An irrigation system has been installed on the existing rehabilitated areas on the waste rock emplacement. This system would be extended as rehabilitation progresses to the north over the life of the Project. It is anticipated that irrigation would assist with the early establishment of sown pasture and trees on rehabilitated areas.

As vegetation on rehabilitated areas becomes mature, the irrigation would be managed to allow vegetation to adjust to the natural rainfall regime that it would encounter after the irrigation is ceased following mine closure. Replacement of trees and fertilisation of rehabilitated areas would be undertaken should vegetation monitoring indicate the need.

Similarly, prolonged irrigation of mine water has the potential to elevate salinity levels in the rehabilitated waste rock emplacement. An assessment of the potential salinity implications of irrigation of mine water was undertaken by Agricultural Water Management (2009) (Attachment AB of Appendix A of the EA). Agricultural Water Management (2009) noted that the waste rock emplacement is likely to have a greater permeability than the *in-situ* soils of the area, and is therefore likely to have less potential for salinity impacts, as follows:

> *… the waste rock emplacements would generally consist of disturbed coarse and medium grained sandstones with minor siltstone and conglomerate. A layer of topsoil would be spread over the waste rock during rehabilitation. The waste rock emplacements would have higher permeabilities and therefore higher leaching potential than soils Types B, C, D and E.*
>
> *Given the above, irrigation rates for the waste rock emplacement could be greater than any of the other soil types assessed, although more detailed analyses would be required to assess whether the higher permeabilities of the waste rock emplacements would enable more irrigation to be applied.*
>
> *…*
>
> *Given the percolation rate has a strong effect on the leaching of salts, it is considered that the potential salinity impacts on the waste rock emplacement would be less than the potential impacts on the other soils assessed.*

Vegetation monitoring would be undertaken to record any dieback or loss of vigour as a result of irrigation, where effects such as these are recorded appropriate management measures would be put in-place (e.g. soil rejuvenation by light cultivation).

N4.2.2 Current Rehabilitation Status

To date some 16 ha of the waste rock emplacement has been rehabilitated. In addition, some 5 ha has been reprofiled, treated with topsoil and seeded for rehabilitation. An irrigation system has been installed on rehabilitated areas.

N4.2.3 Proposed Actions

Rehabilitation actions for the waste rock emplacements and estimated timing for completion are provided in Table N-3.

Table N-3
Rehabilitation Action Plan for the Waste Rock Emplacements

Action	Estimated Timing for Completion
Progressive re-profiling of the batters and waste rock emplacement surface.	Throughout the Project
Progressive topsoil placement and drainage works construction.	Throughout the Project
Progressive revegetation of the batters and waste rock emplacement surface.	Throughout the Project

N4.3 COAL SHAFT CREEK

N4.3.1 Overview

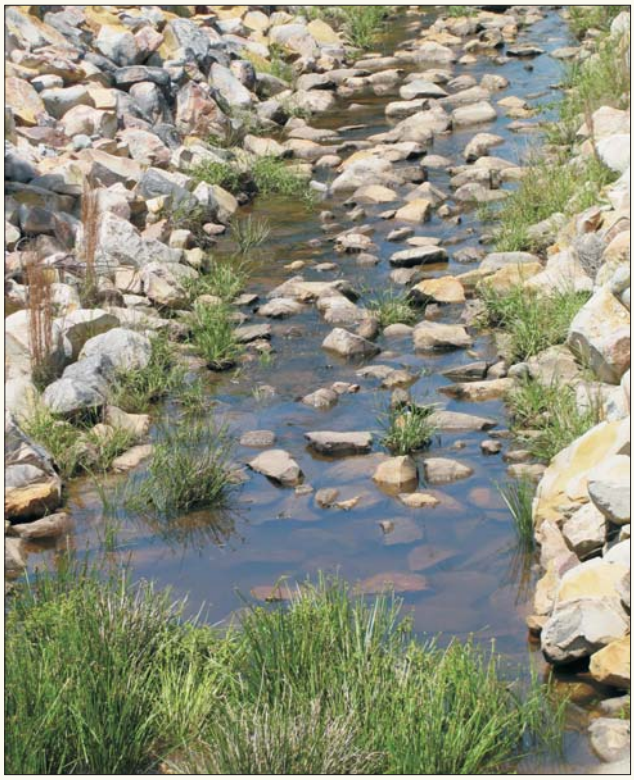
A significant component of site water management at the DCM is the Coal Shaft Creek Diversion (Figure N-5). Prior to the commencement of mining, Coal Shaft Creek traversed a large proportion of the DCM coal deposit. The staged construction of the diversion has allowed the DCM to be developed. The diversion was completed in three stages and a number of photos of the existing diversion are shown on Plate N-3. A portion of the final alignment of the Coal Shaft Creek Diversion would be constructed over the waste rock emplacement. The development of the in-pit waste rock emplacement in the southern end of the mining excavation is occurring in such a manner as to facilitate the ultimate construction of the re-established Coal Shaft Creek through this area (DCPL, 2008).

Proposed Design Components – Reconstructed Coal Shaft Creek

The proposed design for the post-mining alignment of Coal Shaft Creek would comprise a reworked section of the existing Coal Shaft Creek Diversion channel, a drop-down section outside the in-pit waste rock emplacement, and a reconstruction of the creek within a corridor over the in-pit waste rock emplacement at the southern end of the Weismantel open pit extent (Figure N-3) (Appendix A of the EA).

Throughout the Project life, further analyses would be conducted into the geotechnical, hydrological and hydraulic design of the final alignment focussing on long-term stability, seepage management and the creation of habitat. The outcomes of these analyses would be incorporated into the final detailed design of the post-mining alignment and reconstruction of Coal Shaft Creek (Appendix A of the EA).

Coal Shaft Creek Diversion Looking Upstream



Coal Shaft Creek Diversion Looking Downstream

Coal Shaft Creek Diversion Looking Downstream to Dam 1

Coal Shaft Creek Diversion Looking Upstream from Haul Road Culvert

REHABILITATION AND LANDSCAPE MANAGEMENT STRATEGY

PLATE N-3

Existing Coal Shaft Creek Diversion (2009)

DURALIE COAL

The final design of the post-mining alignment of the Coal Shaft Creek would be documented in a Coal Shaft Creek Reconstruction Plan as part of the overall site water management reporting process. A description of the components of the proposed design for the reconstructed Coal Shaft Creek is provided below.

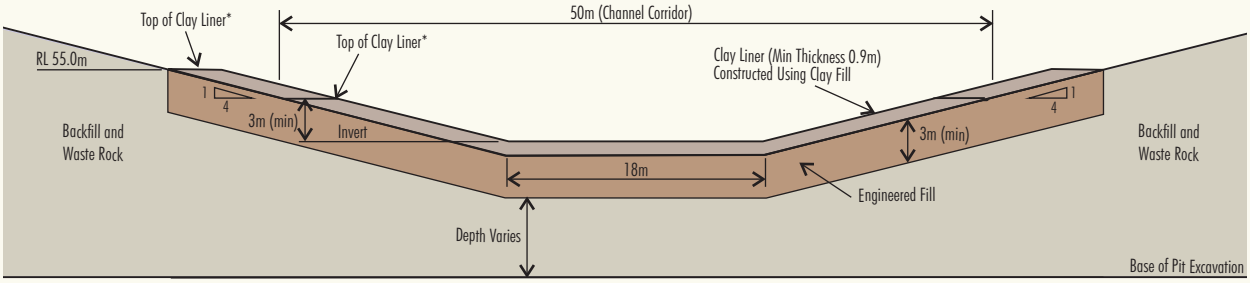
The upper section of the Coal Shaft Creek Diversion would be retained as a primarily engineered structure; however sediments and vegetation (additional to that which already exists) would establish within the channel over time. The existing channel would be reworked, if required, to improve its longer term stability (e.g. minor reinforcement and other maintenance) and geomorphologic and ecological function. The banks of the diversion would continue to be revegetated throughout the mine life and following the completion of mining to enhance stability and create fauna habitat (Appendix A of the EA).

A drop-down section, to lower the level of the diversion approximately 20 m, would be constructed between the reworked section of the existing Coal Shaft Creek Diversion channel and the re-established alignment over the in-pit waste rock emplacement. The drop-down section would be constructed from the diversion channel through the ridge line north of the existing MWD. The aim would be for excavation into hard rock to facilitate long-term stability and to minimise on-going maintenance. Long-term maintenance and monitoring of the drop-down section would be conducted if required (Appendix A of the EA).

The final alignment of Coal Shaft Creek over the in-pit waste rock emplacement would be designed and constructed within the corridor shown on Figure N-3. The creek would be designed with a meandering channel within a reconstructed 50 m wide corridor, which would generally replicate the original meandering geometry. In general accordance with *Maintenance of Geomorphic Processes in Bowen Basin River Diversions - Stage 1*, Australian Coal Association Research Program Project C8030 (ID&A Pty Ltd, 2000), the reconstructed creek design would aim to mimic pre-mining (surveyed) creek cross-sections as far as possible and adopt a design with a “main” flow channel, with overbank areas for large flows, with the main channel sized similar to the pre-mining creek capacity (Figure N-6). The channel would include an engineered low permeability zone (Figure N-6) which would restrict the movement of water between Coal Shaft Creek and the waste rock emplacement (Appendix A of the EA).

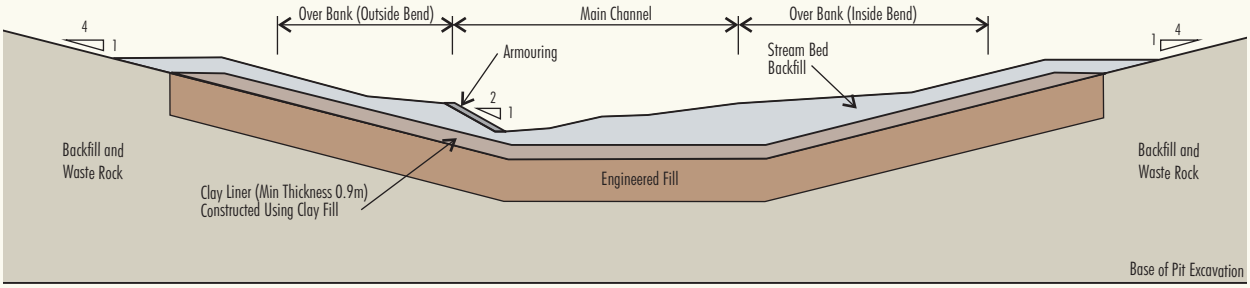
Whilst the design concepts are based on mimicking the natural creek, the reconstructed creek is expected to be dynamic and to evolve into a more natural system over time. This would inevitably result in preferential erosion and deposition in some sections which may (depending on the pattern of flows experienced post commissioning) be initially greater than might be expected in the natural creek. Selection of final form and alignment would be subject to a detailed hydraulic analysis, as part of final design, together with an assessment of the likelihood of bed/bank erosion on the outside of bends under a range of flow conditions (Appendix A of the EA).

The conceptual longitudinal channel profile would also include habitat creation initiatives such as the provision of irregular pool and riffle sequences, use of material recovered from the existing channel or some other suitable source, placement of large boulders and/or timber to form pools upstream and promote aquatic habitat and planting of riverine vegetation on banks to enhance stability (Appendix A of the EA).

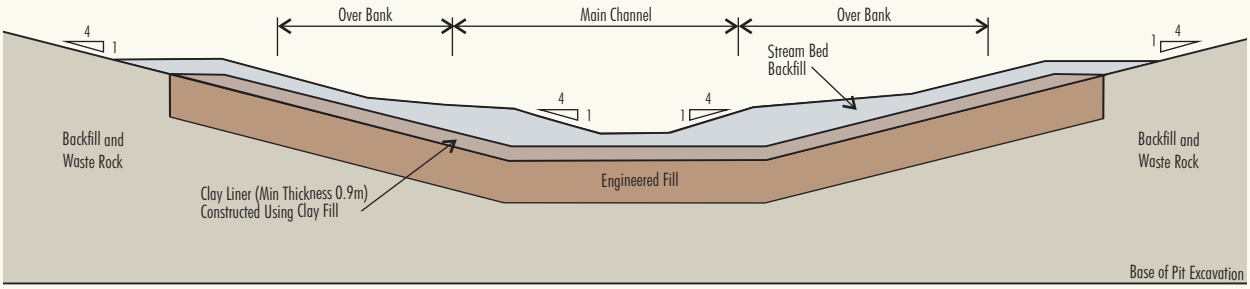


*Channel Corridor Clay Liner to extend up batters to RL 55m or 3m(min) vertically from corridor invert (whichever is greater).

Typical Channel Corridor Section



Typical Section - Reconstructed Creek (Bend)



Typical Section - Reconstructed Creek (Straight)

Source: Allan Watson Associates (2006)

REHABILITATION AND LANDSCAPE MANAGEMENT STRATEGY

FIGURE N-6

Coal Shaft Creek Reconstruction
(Typical Sections)

DURALIE COAL

DURALIE COAL

The channel would be formed progressively from south to north and creek flows would not be reinstated until the completion of mining and/or when vegetation was well established throughout. In concept, the creek would be constructed by (Appendix A of the EA):

- forming the 50 m wide corridor in the waste rock material;
- constructing the clay liner to control leakage from the reconstructed creek to the waste rock and seepage from the waste rock emplacement to the creek;
- forming the channel and banks using material recovered from the existing channel or some other suitable source;
- placement of large boulders and/or timber to form pools upstream and promote aquatic habitat;
- planting of riverine vegetation on the banks to enhance stability; and
- irrigation of vegetation and selective introduction of water of appropriate quality into sections to promote growth of aquatic plants.

N4.3.2 Current Rehabilitation Status

As discussed in Section N4.3.1, a portion of the Coal Shaft Creek Diversion has been constructed and commissioned. This has included stabilisation of the creek channel and temporary erosion controls in accordance with the DCM Erosion and Sediment Control Plan (ESCP) (DCPL, 2002a).

In addition, the development of the in-pit waste rock emplacement at the southern end of the Weismantel open pit has included a corridor for the reconstruction of the Coal Shaft Creek.

N4.3.3 Proposed Actions

Rehabilitation actions for the Coal Shaft Creek Diversion and estimated timing for completion are provided in Table N-4.

Table N-4
Rehabilitation Action Plan for the Coal Shaft Creek Diversion

Action	Estimated Timing for Completion
Reworking of a section of the existing Coal Shaft Creek Diversion.	End of mine life
Construction of the portion of the diversion to be located over the in-pit waste rock emplacement at the southern end of the Weismantel open pit extent and the drop-down section.	End of mine life

N4.4 WATER MANAGEMENT INFRASTRUCTURE

N4.4.1 Overview

In consultation with the regulatory authorities and the community, and considering future local and regional water infrastructure needs, site water dams (e.g. Main Water Dam [MWD], Auxiliary Dams) and accompanying upstream diversion structures may be retained for future use. The final uses of the water storages would be addressed through the MREMP framework (i.e. MOP and AEMR).

Sediment dams would remain pending long-term acceptable water quality and may be kept for stockwater if suitable.

Irrigation infrastructure owned by DCPL would be decommissioned and sold.

N4.4.2 Current Rehabilitation Status

No rehabilitation has been conducted to date.

N4.4.3 Proposed Actions

An action plan would be developed at a later date following consultation with the relevant regulatory authorities and the community regarding the final landuse of water management infrastructure areas.

N4.5 SITE INFRASTRUCTURE

N4.5.1 Overview

The existing infrastructure and services at the DCM would continue to be utilised throughout the life of the Project, with minor additions, upgrades and maintenance works undertaken as required.

Infrastructure located at the DCM that would be removed at the end of the Project life would include:

- workshop buildings and stores;
- heavy vehicle servicing, parking and washdown facilities;
- sewage treatment facilities; and
- dangerous goods storage facilities.

During the decommissioning phase, the priority would be to dismantle and remove fixed equipment and infrastructure for removal from site and re-use at another location, if possible, or recycling. Non-salvageable/non-recyclable and non-contaminated infrastructure would be disposed of at suitable off-site disposal areas (or on-site subject to relevant approvals being obtained).

Once all the equipment and infrastructure components have been removed from an area it would be topsoiled, deep ripped and seeded. Land contamination assessments would be conducted as required, and contaminated soil would be remediated in accordance with the relevant guidelines (including guidelines under section 145C of the *Environmental Planning and Assessment Act, 1979* and the *Contaminated Land Management Act, 1997*).

Some concrete hardstands, administration and ablution buildings, site access roads, sheds, buildings and sediment dams may be retained for alternate post-mining uses. Electricity transmission infrastructure would be retained for future use by landholders unless it is no longer required, in which case it would be decommissioned and removed. The rail siding may also be retained for future infrastructure use if required and if appropriate approvals are obtained.

It is anticipated that some of the internal roads would be retained for use by landholders following the cessation of mining, although this would be subject to consultation with relevant landholders during closure planning.

N4.5.2 Current Rehabilitation Status

Rehabilitation activities have occurred following construction of infrastructure items to minimise erosion.

N4.5.3 Proposed Actions

Rehabilitation would be undertaken following the cessation of mining.

N4.6 INTEGRATION WITH PROJECT OFFSET STRATEGY

N4.6.1 Overview

DCPL proposes an offset area which is located on freehold DCPL-owned land to the east of the Project area (Figure N-7). DCPL currently utilises the proposed offset area land for pastoral purposes.

The offset area is located directly adjacent to DCPL's existing offset area which was proposed as part of the DCM June 2009 modification. DCPL's existing offset area directly adjoins land which has a conservation agreement included in its conditions of tenure. The integration of the proposed offset area with the mine rehabilitation areas is shown on Figure N-7.

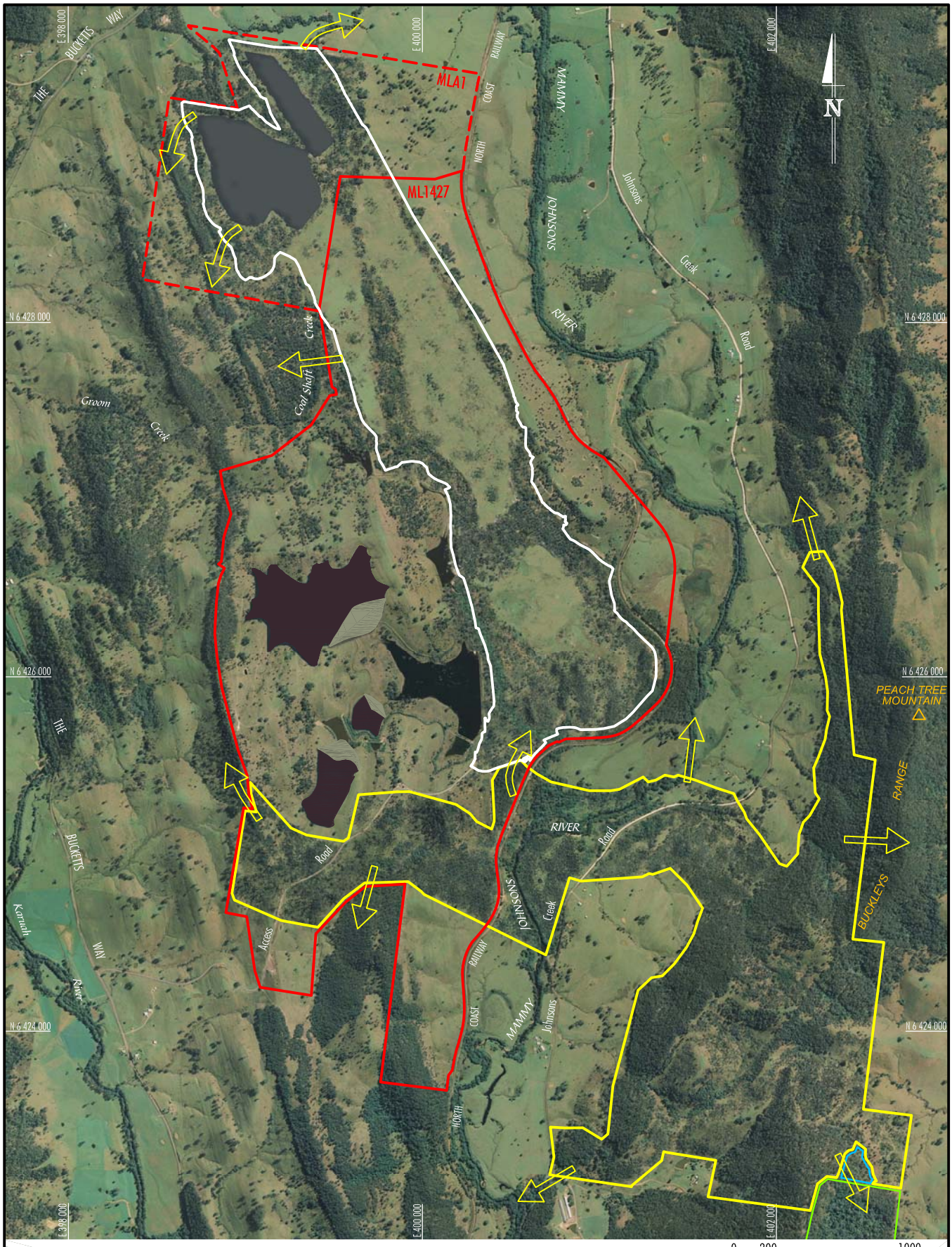
Table N-5 provides a summary of the proposed offset. While approximately 87 ha of natural vegetation communities and 109 ha of derived grassland would be cleared for the Project, it is proposed that significant areas of existing native vegetation communities would be enhanced (some 214 ha) and areas of derived grasslands would be revegetated (some 230 ha).

Table N-5
Summary of the Offset Proposal

Area	Description	Size (ha)
Enhancement Area	Enhancement of existing areas of native vegetation communities through natural regeneration and management for conservation.	214
Revegetation Area	Re-establishment of woodland in derived grasslands by selective planting and fencing for natural regeneration.	230
	Total Area Conserved (ha)	444

The conservation of the proposed offset areas would be secured in perpetuity, and this would occur through a voluntary conservation agreement with the NSW Minister for the Environment. A voluntary conservation agreement provides permanent protection as it is registered on the title of the land.

The proposed offset area traverses two roads and the North Coast Railway. Canopy bridges would be installed to facilitate the crossing of roads by arboreal mammals where there is not existing substantial canopy connection.



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N5 GENERAL REHABILITATION PRACTICES AND MEASURES

N5.1 VEGETATION CLEARANCE MEASURES

The DCM Vegetation Clearance Protocol (VCP) (DCPL, 2002b) provides details on flora and fauna management strategies for clearing activities and is used to minimise the impact of vegetation clearance on flora and fauna. Vegetation immediately adjoining any proposed clearance areas is delineated and clearly marked to avoid accidental damage during vegetation clearance activities or construction works. The VCP also includes a protocol for the management of threatened species encountered during the implementation of the VCP.

Throughout the life of the Project, the VCP would be implemented during all clearing required to facilitate Project mining operations (primarily for the development of the Weismantel Extension open pit and the Clareval North West open pit).

N5.2 SOIL STRIPPING AREAS AND HANDLING MEASURES

Soil stripping and storage is currently undertaken in accordance with the DCM Topsoil Stripping Management Plan (DCPL, 2003). Disturbance areas are stripped progressively (i.e. only as required) so as to reduce erosion and sediment generation, to reduce the extent of soil stockpiles and to utilise stripped soil as soon as possible for rehabilitation. Soil stripping is generally undertaken using a bulldozer.

In accordance with *Leading Practice Sustainable Development Program for the Mining Industry - Mine Rehabilitation* (Department of Industry, Tourism and Resources, 2006a), stripped soil is directly placed on mine rehabilitation areas, where areas on the waste rock emplacement are available for topsoil application. Where stockpiling is necessary, soil stockpiles are managed to maximise long-term viability through implementation of the following practices:

- the surface of the completed stockpiles are left in a “rough” condition to help promote water infiltration and minimise erosion prior to vegetation establishment;
- soil stockpiles have a maximum height of 3 m in order to limit the potential for anaerobic conditions to develop within the soil pile;
- soil stockpiles have an embankment grade of approximately 1V:4H (to limit the potential for erosion of the outer pile face);
- soil stockpiles are seeded and fertilised; and
- soil rejuvenation practices are undertaken (if required) prior to respreading as part of rehabilitation works.

These management measures would continue to be implemented for the Project.

The existing DCM Topsoil Stripping Management Plan (DCPL, 2003) would be reviewed and revised to incorporate Project disturbance areas. Annual soil stripping and stockpiling volumes would continue to be reported within the AEMR.

N5.2.1 Estimated Soil Reserves

A preliminary material balance calculation was conducted to determine the quantity of soil available for rehabilitation. The results of this calculation are summarised in Table N-6. The preliminary material balance demonstrates that there would be sufficient soil available to meet the rehabilitation concepts described in this document. Surplus soil would be dedicated to forming deeper soil profiles within the reconstructed alignment of Coal Shaft Creek over the waste rock emplacement.

Table N-6
Preliminary Duralie Coal Mine Soil Balance

Soil Accounting	Volume (m^3)
Existing soil stockpiles (to June 2009)	128,500
Additional soil to be stockpiled[1]	176,948
Total Available Soil Volume	**305,448**
Soil required for rehabilitation[2]	263,327
Net Soil Surplus	**42,121**

[1] Assuming an average stripping depth of 7 centimetre (cm).
[2] Assuming an average cover depth of 12 cm.
m^3 = cubic metres.

As shown in Table N-6, at the end of June 2009, an estimated 128,500 m^3 of topsoil was held in various stockpiles at the DCM (DCPL, 2009). The major areas where soil has been stripped and stockpiled include the open pit disturbance areas, main infrastructure area, wall footprints for MWD, Auxiliary Dam No. 1 and sediment dams,, the clean water diversion disturbance areas and the site access road.

As part of the Commission of Inquiry for the existing DCM, an additional soil sampling programme was conducted by Veness & Associates (1997). The report identified five soil mapping units based on geological formations. These same geological formations extend into areas to be disturbed by the Project as a result of the proposed extended mining operations. Given the continuity of these geological formations into the additional Project disturbance areas, it is considered likely that the existing soil stripping protocols and depths could continue for the Project disturbance areas (i.e. it is not expected that soil stripping would be limited by a lack of *in-situ* soil resource availability or soil chemistry limitations).

Based on existing soil stockpiles, the approximate disturbance area and rehabilitation to date, there has been an average stripping depth of approximately 9 cm at the DCM. The preliminary material balance presented above assumed an average stripping depth of 7 cm, and therefore is considered conservative.

Detail with respect to the quantification of soil resources, stripping and reapplication schedules and stockpiling inventories would be included as part of the MOP and would be reported in the AEMR.

N5.3 PLANT SPECIES SELECTION

Endemic plant species would be used for revegetation and would predominantly comprise those listed in Table N-7 below. Species listed in Table N-7 would be selectively trialled and, based on performance, used within revegetation areas. Annual cover crops would be utilised to provide short-term stabilisation to revegetation areas.

Table N-7
Indicative Species Proposed for Native Revegetation

Scientific Name	Common Name	Growth Form
Acacia fulva	Velvet Wattle	Erect Shrub/Tree
Allocasuarina torulosa	Forest Oak	Tree
Dodonaea megazyga	-	Erect Shrub/Tree
D. rhombifolia	Broad-leaf Hop-bush	Erect Shrub
Eucalyptus canaliculata	Grey Gum	Tree
E. glaucina	Slaty Red Gum	Tree
E. largeana	Craven Grey Box	Tree
E. punctata	Grey Gum	Tree
E. rudderi	Rudder's Box	Tree
E. tereticornis	Forest Red Gum	Tree
Corymbia maculata	Spotted Gum	Tree
E. crebra	Narrow-leaved Ironbark	Tree
E. tereticornis	Forest Red Gum	Tree
E. paniculata	Grey Ironbark	Tree
E. eugenioides	Thin-leaved Stringybark	Tree
E. moluccana	Grey Box	Tree
Acacia irrorata	Green Wattle	Erect Shrub/Tree
Acacia ulicifolia	Prickly Moses	Erect Shrub
Themeda australis	Kangaroo Grass	Grass

Source: DCPL (1996).

Selection of tree and pasture species would include consideration of the abutting vegetation type, site features (i.e. slope, anticipated ground conditions, availability of water), sowing season and prevailing weather conditions, seed availability, advice from seed suppliers and success or otherwise of earlier sowings.

Further details regarding species selection and pasture sowing techniques would be provided in a revision of the existing Rehabilitation Management Plan (DCPL, 2007).

N5.4 EROSION AND SEDIMENT CONTROL WORKS

The existing ESCP (DCPL, 2002a) would be revised to include erosion and sediment control strategies applicable to the Project.

Erosion control would be achieved by the development and implementation of land stabilisation procedures and protocols. Examples of the protocols and procedures that may be implemented during rehabilitation include:

- the use of stabilising techniques such as meshing, hydromulching and the application of approved rapid germinating pasture grasses in drainage channels; and
- the use of constructed rip-rap and gabion baskets at critical sites such as drainage confluences and outfalls to natural or existing drainage lines.

N5.5 WEED AND PEST CONTROL

Weed control at the DCM is undertaken subject to seasonal factors, weather, scale of infestation and availability of chemical applicator(s). Weeds declared as noxious by the Great Lakes Council are targeted for control (Great Lakes Council, 2009).

The likelihood of natural control of weeds by competition, grazing and the anticipated follow up germination rate is taken into account when selecting the most appropriate means of weed management.

The requirement for pest control is assessed on the basis of the significance of the pest threat, in terms of species, population size and likely consequence of pest presence. If controls are required, available control methods are assessed and the method deemed to be most appropriate are be utilised (e.g. baiting programmes).

The existing weed and pest control management measures at the DCM would continue to apply for the Project.

N5.6 BUSHFIRE MANAGEMENT

The existing bushfire management regime at the DCM is described as follows:

- Controlled grazing – cattle are grazed on portions of ML 1427 upon which active mining operations are not occurring and appropriate fencing is available. Sustainable stocking levels result in minimal pasture presence and hence low residual fuel loads.
- Hazard reduction burns – in areas where controlled grazing is not possible or appropriate and fuel loads are high, hazard reduction burns may be undertaken. A decision to undertake a hazard reduction burn is only made after consultation with (and approval of) the local Rural Fire Service (RFS) and the approval of the site Environmental Officer. The Environmental Officer considers relevant issues such as alternatives to burning, seasonality, topography (for erosion potential), plant diversity and available habitat.
- Firefighting – it is considered likely that were a bushfire to occur on ML 1427 that the local RFS would be called for assistance. The RFS, if required, would be assisted by mine personnel and mine resources. The mine has a water cart with water canon and fire suppressant foam, trailer mounted fire fighting equipment and earthmoving equipment such as dozers are available if required.
- Reporting – an annual report on bushfire management is provided to the Great Lakes RFS based in Tuncurry.

The existing bushfire management regime would continue to be applied for the Project.

N5.7 ONGOING EVALUATION OF REHABILITATION

Rehabilitation plantings to date have been designed on basis of endemic tree species which were deemed appropriate to the target landform (with consideration given to grade, soil profile, rooting behaviour), habitat potential, seed availability and other factors.

Success in terms of germination, survival and growth rates has been good to date. Ground cover (predominantly grasses) establishment has been adequate. Areas irrigated have shown accelerated growth.

The success of the existing rehabilitation activities would continue to be evaluated throughout the Project and would be used to inform future rehabilitation initiatives.

Rehabilitation investigations and trials would be detailed in the MOP and the AEMR would address the outcomes and results of rehabilitation trials.

N6 REHABILITATION MONITORING

Ongoing monitoring and maintenance of rehabilitation areas at the DCM is conducted to assess:

- progression of rehabilitated land; and
- effectiveness of rehabilitation techniques used (including soil erosion controls, water quality within and outside ML 1427 and revegetation methods).

Monitoring of rehabilitation activities at the DCM is currently undertaken through the implementation of monitoring programmes outlined in the Rehabilitation Management Plan (DCPL, 2007) and the AEMR. Rehabilitation monitoring at the DCM includes the following:

- evaluating spread topsoil profile thickness and quality prior to sowing;
- observing drains and assessment of water quality to determine whether substantial silting of inverts and/or any localised failure of the drain embankment has occurred;
- observing recently topsoiled areas after rain events (particularly on sloping ground) to determine if any significant rilling or loss of topsoil has occurred;
- assessing germination success (diversity and abundance);
- evaluating the behaviour of placed topsoil;
- assessing the degree of vegetative ground coverage achieved over time;
- assessing the survival rate for sown species by type and location;
- recording information on observations (by photographic record, file notation, etc.); and
- evaluating threats posed to rehabilitated areas posed by weed infestation, feral animals, marauding cattle, etc.

Water quality and geomorphic monitoring would also be conducted to monitor the performance of the reconstructed Coal Shaft Creek (Section N4.3.1).

The performance of rehabilitation areas would be monitored using Landscape Function Analysis (LFA) or a similar systems-based approach. LFA is a Commonwealth Scientific and Industrial Research Organisation developed method used to provide indicators of rehabilitation success and allows the assessment of landscape processes. LFA aims to measure the progression of rehabilitation towards a self-sustaining ecosystem through the assessment of landscape function.

Key completion criteria are proposed in Table N-8. These criteria have been developed with regard to *Development of Rehabilitation Completion Criteria for Native Ecosystem Establishment on the Coal Mines in the Hunter Valley,* Australian Coal Association Research Program Project C13048 (Australian Centre for Minerals Extension and Research, 2005).

Table N-8
Key Completion Criteria

Project Component	Key Completion Criteria
Final Landforms	• Safe, stable, adequately drained post-mining landforms consistent with the surrounding landscape as evidenced by comparative photography, water quality monitoring and geotechnical surveys. • Geomorphic stability of drainage features comparable to existing natural drainage features as evidenced by cross-section and long-section surveys and monitoring of erosion.
Final Voids	• Surface water inflows to the final voids minimised through appropriate landforming as evidenced by revision of the water balance based on final as-built mine landforms. • Final voids profiled for long-term stability as evidenced by geotechnical surveys of high walls/end walls. • Perimeter bunding formed.
Rehabilitation and Revegetation Areas	• Woodland/riparian areas on trajectory toward self-sustaining ecosystem[1] and/or measures of ecosystem function (e.g. vegetation cover, landform stability, species diversity) equivalent to reference sites.
Grazing Areas	• Stocking rates of between 1.5 and 4.0 dry sheep equivalents (DSE) per hectare (average 2.8 DSE) in accordance with *Beef Stocking Rates and Farm Size - Hunter Region* (Department of Primary Industries, 2006) (Native unimproved pasture – moderate fertility [no seed or fertiliser added]) as evidenced by monitoring of grazing productivity.

Source: Appendix N.

[1] As measured by LFA or a similar systems-based approach.

Key completion criteria would be reviewed and refined as part of the MREMP.

A meteorological station would be maintained to provide data on climatic conditions such as temperature and rainfall.

The parameters monitored during rehabilitation would be determined in consultation with the DPI-MR and documented in the MOP and AEMR. They would be used as indicators of rehabilitation performance.

The Rehabilitation Management Plan (DCPL, 2007) would be updated to include monitoring programmes designed to assess the performance of the rehabilitation areas applicable to the Project. Monitoring results along with monitoring site locations, parameters and frequencies would be reviewed annually through the AEMR process. Where deficiencies are observed within rehabilitated areas which require remedial works, such works would be undertaken at the earliest possible opportunity, subject to resource availability, season, ground condition and access considerations.

N7 FINAL VOID MANAGEMENT

As discussed in Section N4.1.1, two final voids would be formed at the completion of mining in the Weismantel Extension open pit and the Clareval North West open pit, with these two voids filling and forming an integrated pit lake over time.

The general objectives of management of the final voids would be to provide:

- a landform which is stable and able to be maintained in the long-term;
- acceptable risk in terms of public safety; and
- restriction of access of medium/large fauna.

The sub-sections below describe final void management measures to be implemented for the Project.

N7.1 FINAL VOID WATER BALANCE

The surface catchment of the final voids would be reduced to a practicable minimum by the use of upslope diversions and contour drains around their perimeter. The water balance for the final voids indicates that as mining progresses, the void would act as a groundwater sink, until the aquifer system recovers to an equilibrium level (Appendix B of the EA).

Heritage Computing (2009) (Appendix B of the EA) indicates that the natural groundwater flow direction is expected to be restored from generally north-west to south-east. There would be no deleterious effect on the groundwater resource or on the quality of the water, because groundwater quality in the surrounding groundwater is in many cases of a poorer quality than what is predicted from the final void (Appendix B of the EA).

Further details are provided in Section N4.1.1 and Appendix B of the EA.

N7.2 REHABILITATION OF FINAL VOIDS

The long-term management of the final voids would focus on restricting access for members of the public and medium/large fauna (Section N7.3). The following rehabilitation activities would be undertaken:

- restriction of access via perimeter bunding, fencing and installation of signage, as discussed in Section N7.3;
- a geotechnical assessment would be undertaken to assess geotechnical stability and provide recommendations for the reshaping of final highwalls and endwalls; and
- vegetation screens would be established at strategic locations to provide visual screening and additional access control.

N7.3 RESTRICTION OF ACCESS

Appropriate signage and boundary fencing would be placed along points of public access to ML 1427 and MLA 1. In addition, perimeter bunding would be formed around the final voids in order to restrict access to the high walls and end walls. Bunding would also include tree plantings to assist in screening the void and preventing access over bunds.

Additional methods of preventing access to voids (e.g. fencing) would be designed and implemented in consultation with relevant authorities.

It is anticipated that these measures would also restrict access of medium/large fauna to the voids and final waterbody.

N7.4 WATER QUALITY MONITORING

Monitoring of the final void would be conducted to confirm Gilbert & Associates (2009) findings in regards to the ongoing accumulation of salts. The details of monitoring would be provided in the AEMR in accordance with the MREMP.

N8 LONG-TERM PROTECTION AND MANAGEMENT MEASURES

This Rehabilitation and Landscape Management Strategy provides objectives for the long-term protection of the site (Section N2). These objectives aim to provide a stable landform that facilitates a landuse consistent with the expectation of relevant stakeholders.

There is no relevant strategic land use planning or resource management plans or policies in the Great Lakes and Gloucester Shire Local Government Areas that would apply to the Project.

In general accordance with *Leading Practice Sustainable Development Program for the Mining Industry - Mine Closure and Completion* (Department of Industry, Tourism and Resources, 2006b), a comprehensive monitoring regime would be established to track the progress of rehabilitation initiatives towards the fulfilment of these objectives.

Upon cessation of mining operations, it would be expected that tenure of the mining leases would be maintained by DCPL until such time as the relevant statutory requirements are achieved (e.g. fulfilment of mining lease conditions). DCPL would then seek to relinquish the DCM mining leases.

Central to lease relinquishment would be the confirmation of safety issues and the demonstrated application of adequate control measures to facilitate sustainable landscapes. Assessment of rehabilitation success (i.e. in accordance with established completion criteria) would be conducted in consultation with relevant authorities and stakeholders.

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