



Tasman Extension Project Environmental Impact Statement

SECTION 5

REHABILITATION AND MINE CLOSURE

TABLE OF CONTENTS

5	REHABILITATION AND MINE CLOSURE	5-1
5.1	REHABILITATION STRATEGY FOR THE EXISTING TASMAN UNDERGROUND MINE	5-1
5.2	REHABILITATION STRATEGY FOR THE PROJECT	5-2
5.2.1	Rehabilitation and Mine Closure Goals	5-2
5.3	REHABILITATION OF THE PROJECT	5-2
5.3.1	Existing Tasman Underground Mine Infrastructure	5-4
5.3.2	New Pit Top Facility	5-4
5.3.3	Upcast Ventilation Shaft Site	5-5
5.3.4	Mine Access Road and Internal Roads	5-5
5.3.5	Other Service Infrastructure Areas	5-6
5.3.6	Mine Subsidence Impacts	5-6
5.3.7	Exploration Areas	5-7
5.4	GENERAL REHABILITATION PRACTICES AND MEASURES	5-8
5.4.1	Vegetation Clearing Measures	5-8
5.4.2	Soil Stripping and Handling Measures	5-8
5.4.3	Selection of Native Plant Species for Revegetation and Bushland Establishment	5-8
5.4.4	Erosion and Sediment Control Measures	5-9
5.4.5	Land Contamination Management	5-9
5.4.6	Weeds and Pest Control	5-9
5.4.7	Bushfire Management	5-9
5.5	REHABILITATION MANAGEMENT PLAN	5-9
5.5.1	Rehabilitation and Revegetation Monitoring	5-10
5.5.2	Completion Criteria	5-10
5.6	MINE CLOSURE PLAN AND LEASE RELINQUISHMENT	5-11

LIST OF TABLES

Table 5-1	Rehabilitation and Mine Closure Goals for the Project
Table 5-2	Proposed Key Rehabilitation Completion Criteria

LIST OF FIGURES

Figure 5-1	Conceptual Final Landform Rehabilitation
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5 REHABILITATION AND MINE CLOSURE

This section summarises the proposed approach to rehabilitation and mine closure at the Project. It describes how the Project would be rehabilitated and the measures which would be undertaken to achieve the Project's rehabilitation and mine closure goals following cessation of mining.

5.1 REHABILITATION STRATEGY FOR THE EXISTING TASMAN UNDERGROUND MINE

The Tasman Underground Mine EIS (Newcastle Coal Company Pty Ltd, 2002) and the current Mining Operations Plan (MOP) (1 April 2012 to 1 April 2019) outline the approach and objectives for rehabilitation of the existing Tasman Underground Mine. The current MOP details the 'intended actions' Donaldson Coal proposes to take to achieve defined rehabilitation planning criteria. The rehabilitation planning criteria have been based on the Australia and New Zealand Minerals and Energy Council (ANZMEC) and Minerals Council of Australia's (MCA) (2000) *Strategic Framework for Mine Closure*.

The EIS (Newcastle Coal Company Pty Ltd, 2002) and current MOP provide that rehabilitation activities at the existing Tasman Underground Mine will largely be undertaken following the completion of mining to achieve a final land use of native vegetation conservation.

Rehabilitation objectives for final landform features at the existing Tasman Underground Mine outlined in the current MOP include:

- *the creation of a nil maintenance, geotechnically stable, safe and vegetated landform which blends with the surrounding natural landscape;*
- *re-establishment of approximately 4.7ha of Class VI and 2.9ha of Class VII land including 1.8ha of native vegetation; and*
- *a nil increase in the pre-mining visual impact of the site from both local and distant vantage points.*

A description of the rehabilitation concepts for the key components of the exiting Tasman Underground Mine and the measures that are proposed to achieve the rehabilitation objectives and final land use is provided below.

Pit Top Area

The existing pit top area would be decommissioned or placed under care and maintenance following completion of underground mining of the Fassifern Seam, subject to necessary approvals under the NSW *Mining Act, 1992*. During any care and maintenance phase, the existing pit top area would be securely fenced to restrict unauthorised access. The mine adits would be maintained should access to the Fassifern Seam or other coal seams be required in the future. It is expected that any care and maintenance period would not exceed 15 years.

The final landform concept for the existing Tasman Underground Mine pit top area as described in the currently approved MOP will be native vegetation conservation, except for the areas within the electricity transmission line easements. These areas would be returned to grassland in accordance with Ausgrid's and TransGrid's requirements.

At the completion of underground mining of the Fassifern Seam, or the end of a care and maintenance period, rehabilitation activities at the exiting Tasman Underground Mine would involve the removal of surface infrastructure and roads (except for portions of the sealed mine access road and adit access road), draining any water storages, reshaping, topsoiling and revegetating the area to create a stable vegetated landform consistent with the surrounding landscape. Topsoil would be imported to the site for rehabilitation works and/or subsoil would be ameliorated through the addition of gypsum.

The existing ventilation fan would be required to remain operational during a care and maintenance period to provide adequate ventilation of the underground workings and to allow for future/ongoing use.

At the completion of underground mining of the Fassifern Seam, or the end of a care and maintenance period, the existing infrastructure would be removed from the adit and the site re-profiled and topsoiled in accordance with the existing Flora and Fauna Management Plan. The adit would be sealed in accordance with Mine Design Guideline (MDG) 6001 *Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams* (Mine Safety Operations, 2012).

The site would then be ripped and revegetated with a stabilising sterile cover crop and native tree and shrub seed and/or tubestock to create a stable vegetated landform consistent with the surrounding landscape.

Mine Access Road and Internal Roads

The mine access road and associated culverts and rip rap would be retained to maintain drainage patterns and for ongoing use.

All other portions of roads would be rehabilitated by removing the bitumen surface of any sealed roads and reshaping the ground surface to create a stable free draining landform. The revegetation methods would be consistent with those used for the pit top area and ventilation shaft site described above and in the existing Flora and Fauna Management Plan.

Mine Subsidence Effects

Only minor impacts on surface features from mine subsidence have been reported as a result of the existing Tasman Underground Mine. Notwithstanding, should mine subsidence effects requiring remediation be observed during or following completion of mining in the Fassifern Seam, remediation measures for streams and other natural surface features within the existing Project area would be similar to those proposed for the Project (Section 5.3.6).

5.2 REHABILITATION STRATEGY FOR THE PROJECT

The rehabilitation strategy for the existing Tasman Underground Mine would continue to be applied for the Project. The Project rehabilitation program would include:

- progressive rehabilitation of minor Project surface disturbance areas; and
- rehabilitation of surface disturbance areas at the cessation of the Project (i.e. the new pit top facility and ventilation shaft site).

Minor Project surface disturbance areas that would be progressively rehabilitated include those associated with surface exploration activities, access tracks, environmental monitoring and management activities (e.g. installation of monitoring equipment) and mine subsidence surface impacts. Surface works would be sited, where practicable, to minimise the amount of disturbance and vegetation clearance required (i.e. positioning sites to avoid the removal of trees).

Prior to closure a detailed Mine Closure Plan would be developed in consultation with relevant authorities and stakeholders (Section 5.6).

Subsidence monitoring lines would be restricted to slashing of vegetation and lopping of branches to achieve line of sight, where practicable.

Surface disturbance areas requiring rehabilitation at the cessation of the Project would include the new pit top facility, ventilation shaft site and any residual surface disturbance areas. Figure 5-1 shows a conceptual simulation of the rehabilitated final landform.

5.2.1 Rehabilitation and Mine Closure Goals

Similar to the existing Tasman Underground Mine, the final land use of Project surface disturbance areas would be native vegetation conservation (except for areas within electricity transmission line easements).

Table 5-1 describes the rehabilitation and mine closure goals for the Project. These rehabilitation and mine closure goals are based on Donaldson Coal's rehabilitation experience and the approved Mine Closure Plan (Donaldson Coal, 2010c) for the Donaldson Open Cut Mine. The rehabilitation concepts and measures outlined in Section 5.3 would be consistent with these goals.

Donaldson Coal's objective for mine closure for the Project is that the status of the Project at relinquishment would be to the satisfaction of the relevant Minister(s) and that all relevant mining tenement and Project consent conditions would have been met. Disturbed land would be considered suitable for surrender when the completion criteria for final land use, landform reconstruction, landform stability, revegetation have been met or if the relevant Minister(s) otherwise accept the rehabilitation status.

5.3 REHABILITATION OF THE PROJECT

This section describes the rehabilitation concepts for each of the key Project components. At the completion of mining, the key Project components requiring rehabilitation would include:

- existing Tasman Underground Mine infrastructure;
- new pit top facility;
- upcast ventilation shaft site;
- mine access road and internal roads; and
- other service infrastructure areas.



Source: Donaldson Coal (2012) and Ardill Payne & Partners (2012)

TASMAN EXTENSION PROJECT

FIGURE 5-1
 Conceptual Final Landform Rehabilitation



**Table 5-1
Rehabilitation and Mine Closure Goals for the Project**

Short-term	Long-term
<ul style="list-style-type: none"> Minimise minor Project surface disturbance areas by progressively rehabilitating and restricting vegetation clearance to the minimum required. Remediate mine subsidence surface impacts where technically feasible and in consideration of other relevant factors (Section 5.3.6) as soon as practicable once detected. Use topsoil resources stripped from disturbance areas during the construction phase of the new pit top facility to create the visual bund and stabilise road and dam embankments. Plant vegetation on visual bund to allow growth and screening to occur prior to the commencement of disturbance activities. Revegetate road and dam embankments as soon as practicable by seeding or using mulch to minimise erosion and weed infestation. Install erosion and sediment controls (e.g. filter fencing and bales) prior to the commencement of soil stripping. Stabilise walls surrounding boxcut and access road to boxcut entrance. 	<ul style="list-style-type: none"> Create generally stable landforms that are appropriately drained with minimum erosion and soil movement. Drain and infill water storage dams at the cessation of mining and re-profile. Infill boxcut and reshape walls to achieve a slope gradient that is stable and supports vegetation. Once boxcut infill material has settled, deep rip surface, apply gypsum (if necessary), spread with topsoil and revegetate. Rip re-profiled area and spread with stored topsoil (e.g. sourced from reworking the visual bund), imported topsoil and/or ameliorated (gypsum treated) subsoil. Revegetate re-profiled areas with native tree and shrub species characteristic of the vegetation communities present prior to disturbance to re-establish vegetation consistent with the surrounding landscape. Use native tree and shrub species seed sourced from the local area to create a dense and diverse mixture of local native understorey and over-storey species. Remediate mine subsidence surface impacts where technically feasible and in consideration of other relevant factors (Section 5.3.6).

Areas that would be progressively rehabilitated during operation of the Project would include:

- mine subsidence surface impacts (if necessary);
- environmental monitoring and management areas; and
- exploration areas.

A description of the rehabilitation concepts and measures relevant to the key Project components and progressive rehabilitation areas is provided in the sub-sections below.

5.3.1 Existing Tasman Underground Mine Infrastructure

The rehabilitation of existing Tasman Underground Mine infrastructure, including the existing pit top, is described in Section 5.1.

5.3.2 New Pit Top Facility

At mine closure, rehabilitation works at the new pit top facility are anticipated to include:

- Removal of underground infrastructure such as mining equipment and service infrastructure.
- Sale of underground mining equipment or transfer to other Donaldson Coal mines.

- Removal of pit top buildings (e.g. bathhouse and administration facilities, workshop, washdown and stores buildings and other site services buildings).
- Removal of ROM coal handling infrastructure (e.g. coal conveyer equipment).
- Removal of other infrastructure (e.g. above ground diesel tanks, waste oil tanks and sumps).
- Testing and remediation of any contaminated soil by removal or encapsulation on-site, where required.
- Draining and backfilling mine water storage dams and surface runoff dam and removal of any contaminated material.
- Sealing of mine entrance in accordance with MDG 6001 (Mine Safety Operations, 2012), filling of boxcut by pushing in walls and reshaping wall slopes to achieve a gradient that is stable and supports vegetation.
- Removal of concrete slabs.
- Removal of bitumen surfaces, pipelines, powerlines and associated services.
- Reworking of the intersection with George Booth Drive in consultation with the RMS and Cessnock City Council.
- Re-profiling the area in accordance with the agreed final landform design.

- Topsoiling of re-profiled areas with stored topsoil (e.g. sourced from reworking the visual bund and including application of gypsum if necessary), imported topsoil and/or ameliorated subsoil.
- Ripping and revegetating the area in accordance with the Rehabilitation Management Plan (RMP) (Section 5.5) using a sterile cover crop and native tree and shrub species characteristic of the vegetation communities present prior to disturbance to re-establish vegetation consistent with the surrounding landscape. Revegetation methods would include hydroseeding and direct planting of tubestock.

The portion of the new pit top facility within Ausgrid's electricity transmission line easement would be maintained as grassland in accordance with Ausgrid's requirements (noting that a portion of the easement would be excavated for the box cut).

Maintenance and monitoring programs would be developed to assess the performance of the rehabilitation at the rehabilitated pit top facility. Monitoring would be undertaken to confirm vegetation is establishing and to determine the requirement for the implementation of maintenance measures (e.g. implementation of weed control measures or replanting/reseeding).

The RMP (Section 5.5) would detail the monitoring methodology that would be used and the rehabilitation indicators and completion criteria against which rehabilitation performance would be assessed. Rehabilitation and revegetation monitoring and rehabilitation completion criteria are further described in Sections 5.5.1 and 5.5.2, respectively.

5.3.3 Upcast Ventilation Shaft Site

Infrastructure at the upcast ventilation shaft site would include the upcast ventilation shaft and associated fan, fan house, switch room, transformer and fencing. At mine closure, rehabilitation works at the upcast ventilation shaft site are anticipated to include:

- removal of infrastructure;
- remediation of any contaminated soil by removal or encapsulation on-site;
- filling and sealing the upcast shaft in accordance with MDG 6001 (Mine Safety Operations, 2012);

- re-profiling the site in accordance with the final landform design;
- topsoiling of re-profiled areas with stored topsoil (e.g. sourced from reworking the visual bund and including application of gypsum if necessary), imported topsoil and/or ameliorated subsoil; and
- ripping and revegetating the site in accordance with the RMP using a sterile cover crop and native tree and shrub species characteristic of the vegetation communities present prior to disturbance to re-establish vegetation consistent with the surrounding landscape. Revegetation methods would include hydroseeding and direct planting of tubestock.

Maintenance and monitoring programs would be developed to assess the performance of the rehabilitation at the rehabilitated upcast ventilation shaft site. Monitoring would be undertaken to confirm vegetation is establishing and to determine the requirement for the implementation of maintenance measures (e.g. implementation of weed control measures or replanting/reseeding). Rehabilitation and revegetation monitoring and rehabilitation completion criteria are further described in Sections 5.5.1 and 5.5.2, respectively.

The development of monitoring programs and rehabilitation completion criteria would be based on Donaldson Coal's rehabilitation experience at the Donaldson Open Cut Mine, as documented in the approved Mine Closure Plan (Donaldson Coal, 2010c).

5.3.4 Mine Access Road and Internal Roads

Following the construction phase of the Project, the mine access road embankments would be topsoiled using topsoil stripped from disturbance areas during the construction phase and revegetated to create a stable landform.

At mine closure, the sealed mine access road and other internal roads would be removed (except for the roads/tracks within the electricity transmission line easements to be retained for use by Ausgrid). The bitumen road surface would be removed and disposed off-site. The road embankments would be reshaped to form a free draining landform generally consistent with the topography of the area prior to the Project.

Consistent with the rehabilitation concept for the new pit top facility, the re-profiled area would be topsoiled with stored topsoil (e.g. sourced from reworking the visual bund and including application of gypsum if necessary), imported topsoil and/or ameliorated subsoil. The area would then be revegetated using a sterile cover crop and native tree and shrub species characteristic of the vegetation communities present prior to disturbance to re-establish vegetation consistent with the surrounding landscape.

The intersection of the pit top access road with George Booth Drive may be reworked, subject to consultation with RMS and Cessnock City Council.

5.3.5 Other Service Infrastructure Areas

Electricity infrastructure to the Project including powerlines and poles would be removed in accordance with the relevant service providers guidelines. As described in Section 5.3.2, the portion of the new pit top facility within Ausgrid's electricity transmission line easement would be maintained as grassland in accordance with Ausgrid's requirements (noting that a portion of the easement would be excavated for the box cut) and any established access tracks with this easement would be retained for use by Ausgrid.

5.3.6 Mine Subsidence Impacts

As described in Section 5.1, only minor impacts on surface features from mine subsidence have been reported as a result of the existing Tasman Underground Mine. A Subsidence Assessment (Appendix A) has been undertaken for the Project which indicates that mine subsidence impacts may include:

- surface cracking;
- sub-surface fracturing above the panels;
- surface gradient changes;
- ponding;
- general slope stability and erosion;
- valley uplift and closure; and
- far-field horizontal displacements and strains.

The above mine subsidence related impacts are assessed in detail in Appendix A. The Subsidence Assessment also provides a detailed description of the measures that would be implemented to remediate these impacts (Appendix A).

Remediation would be undertaken as required during Project operations and prior to relinquishment of the mining lease to minimise hazard to persons and fauna and long-term potential environmental impacts. A summary of the subsidence remediation measures that would be implemented in relation to the surface features across the Project area is provided below.

The requirement and methodology for any subsidence remediation techniques would be determined in consideration of:

- potential impacts of the unmitigated impact, including potential risks to public safety and the potential for self-healing or long-term degradation;
- potential impacts of the remediation technique, including site accessibility; and
- consultation with relevant stakeholders.

5.3.6.1 Streams

The mine layout would be designed to achieve negligible environmental consequence to 3rd order streams, including negligible diversion of flows and negligible change in the natural drainage of pools (Section 2.6.3).

Based on the implementation of the SCZs, surface cracking is unlikely to occur within 1st and 2nd order streams with a depth of cover of less than 80 m (i.e. SCZs would be implemented for 1st and 2nd order streams where the depth of cover to the stream is less than 80 m [Table 2-3 of Section 2.6.3]) and is very unlikely to occur along the 3rd order portion of Surveyors Creek 2 (Appendix A). Therefore, surface cracking along streams is likely to be limited to 1st and 2nd order streams with greater than 80 m depth of cover (Appendix A).

Mine subsidence impacts on streams located in the Project area may potentially include ponding, erosion and sedimentation resulting from tilting or surface gradient changes and stream bed cracking.

A range of remediation techniques may be used depending on the size and location of the crack or subsidence impact. Remediation techniques may include knick point controls, erosion control measures and/or grouting. A description of these techniques is provided below.

Monitoring would be undertaken to identify the need and subsequent success of the stream remediation measures.

Knick Point Controls

Tilting of sufficient magnitude can alter knick points of a stream and re-concentrate runoff leading to scour and erosion or alter water distribution.

Donaldson Coal would implement an adaptive management approach for assessing stream knick points. Adaptive management would involve regular monitoring and periodic evaluation of potential consequences and appropriate remediation measures.

Log sills can be installed at knick points for controlling stream bed degradation. Log sills are buried, multi-log structures, which span the width of the stream channel and are keyed into both banks. Log pins are driven vertically into the bed of the stream to stabilise the sill. Geo-fabric is used in the sub-surface portion of the log sill to reduce the risk of undercutting. Log sill knick point controls (rather than rock grade or coir log controls) are considered appropriate for remediating subsidence related impacts on streams located within the Project area (Appendix D).

Erosion Control

Erosion control measures may include using tracked equipment to stabilise banks subject to soil slumping. Bank stabilisation may be achieved by using rock or other appropriate materials and revegetating using brush matting, seeding or tubestock.

Cracking Restoration

Various restoration techniques may be used to remediate mine subsidence impacts to streams within the Project area. Notwithstanding, as described in the Subsidence Assessment (Appendix A), impacts to streams are considered unlikely or to be minor in nature. It is expected that remediation by infilling or grouting with techniques utilising hand-held equipment would suffice.

Monitoring

The Project would involve surface water monitoring to identify the need and subsequent success of the stream remediation measures described above. As described in Section 4, surface water monitoring would include:

- water quality monitoring;
- flow monitoring;
- pool level monitoring; and
- visual inspections.

5.3.6.2 Other Natural Surface Features

In addition to the stream remediation measures described above, rehabilitation measures of surface cracks, surface gradient changes or slope instability and erosion on other natural features may include:

- filling of cracks and minor erosion holes;
- installation of sediment fences downslope of subsidence-induced erosion areas;
- stabilisation of erosion areas using rock or other appropriate materials; and
- revegetation using brush matting, seeding or tubestock.

Where possible, vegetation would be allowed to regenerate naturally for small disturbance areas. Any revegetation activities would use flora species characteristic of the particular vegetation community in that area and would use seed collected from the local area.

5.3.7 Exploration Areas

Surface disturbance associated with the use of surface drilling rigs and supporting equipment for Project exploration activities would be rehabilitated at the completion of the exploration activities in that area. Rehabilitation measures would include (where appropriate):

- ripping the disturbed area to reduce the effects of surface compaction;
- storing, maintaining and replacing any topsoil removed;
- revegetating the area with species characteristic of the particular vegetation community in the area; and
- sealing the drill holes with bentonite (or equivalent material) and permanently capping and marking the drill hole collars at completion of exploration activities in accordance with Environmental Design Guideline (EDG) 1 *Borehole Sealing Requirements on Land: Coal Exploration* (NSW Department of Trade and Investment Resources and Energy, 2012).

5.4 GENERAL REHABILITATION PRACTICES AND MEASURES

The following sub-sections summarise the general rehabilitation practices and measures that would be implemented at the Project. The success of the rehabilitation practices and measures would be monitored and evaluated throughout the life of the Project and would be used to inform future rehabilitation activities. Rehabilitation monitoring is discussed further in Section 5.5.

5.4.1 Vegetation Clearing Measures

A VCP has been developed for the existing Tasman Underground Mine as part of the Flora and Fauna Management Plan and would continue to be applied for the Project. The VCP describes the measures to be taken to minimise and ameliorate impacts on flora and fauna (including threatened species) during clearing activities.

Key components of the VCP include the clear delineation of native vegetation areas to be cleared, timing and methods to be used for clearing, pre-clearance surveys conducted by a suitably qualified ecologist, seed collection and re-use of cleared vegetation debris in Project revegetation areas.

As described in Section 5.2, subsidence monitoring lines would be restricted to slashing of vegetation and lopping of branches to achieve line of sight, where practicable. Subsidence monitoring lines would be established in consultation with the OEH within the Sugarloaf State Conservation Area and Forests NSW within Heaton State Forest.

The VCP and associated impact mitigation measures would be documented in the Construction Flora and Fauna Management Plan and Biodiversity Management Plan (as part of the Extraction Plan process). Management of potential impacts on flora and fauna as a result of the Project is detailed in Sections 4.8 and 4.9.

5.4.2 Soil Stripping and Handling Measures

The following management measures would be implemented for the stripping of soils at the Project:

- Vegetation disturbance and soil stripping associated with minor Project surface disturbance areas would be undertaken progressively to reduce the potential for erosion and sediment generation, and to minimise the period of soil storage.

- Areas of disturbance requiring soil stripping would be clearly defined following vegetation clearing.
- Wherever practicable, soil would not be trafficked, deep ripped or stripped in wet conditions to avoid breakdown in soil structure.

A representative of the relevant Aboriginal community would be in attendance during any soil stripping operations.

As described in Section 5.2.1, the visual bund would be created using topsoil stripped from Project surface disturbance areas. The visual bund may be used as a long-term soil stockpile for future rehabilitation use. To maintain long-term soil viability of the visual bund, the following key management practices would be used:

- Constructing the visual bund to minimise erosion, encourage drainage, and promote revegetation.
- Sowing a stabilising cover crop once constructed.
- Applying ameliorants such as lime, gypsum or fertiliser where necessary to improve the condition of stripped soil.

Details of available soil resources, stripping and application schedules would be included in the MOP.

5.4.3 Selection of Native Plant Species for Revegetation and Bushland Establishment

Native species to be planted in revegetation areas would be selected based on nearby existing remnant vegetation communities, soil types, aspect, seed availability and site conditions. The list of suitable native plant species to be used in the revegetation of Project disturbance areas would be documented in the RMP and MOPs/Mine Closure Plan.

Disturbed areas would be seeded with a sterile cover crop to assist in soil management and native tree species (collected from the local area). The cover crop would be sown immediately after preparation of the soil surface during the season of Spring, where possible. Native plant fertiliser would also be applied to the area.

5.4.4 Erosion and Sediment Control Measures

An Erosion and Sediment Control Plan has been developed as part of the Site Water Management Plan for the existing Tasman Underground Mine and would be revised to include erosion and sediment control strategies applicable to the Project.

Erosion control would be achieved by the implementation of land stabilisation measures and protocols. Stabilising techniques such as meshing, hydromulching and the application of rapid germinating cover crop may be implemented during rehabilitation activities.

During construction of the new pit top facility and upcast ventilation shaft site and during earthworks associated with re-profiling the disturbed areas at mine closure, sediment fences would be placed along the downslope side of all work areas.

A detailed description of the erosion and sediment control measures would be provided in the RMP and MOPs.

5.4.5 Land Contamination Management

Investigations would be undertaken at mine closure to identify and remediate any contaminated soil materials in accordance with the requirements of the NSW *Contaminated Land Management Act, 1997* and any approved Mine Closure Plan.

5.4.6 Weeds and Pest Control

Weed and pest control measures have been developed and are detailed in the Flora and Fauna Management Plan and the Conservation Measures Monitoring Plan for the existing Tasman Underground Mine. These control measures would be included within the RMP developed for the Project.

Weed control measures that would be implemented during progressive rehabilitation activities and at mine closure would include:

- revegetating re-profiled and ripped areas immediately following the site preparation works to minimise establishment of weeds;
- regular monitoring of revegetated areas during the operational phase of the Project;
- identifying and manually removing or spraying weeds to limit the spread of weeds; and
- using approved herbicides in accordance with the DPI and OEH requirements.

The existing Flora and Fauna Management Plan would continue to be applied for the Project. The Flora and Fauna Management Plan includes a vertebrate fauna monitoring program which documents the presence of pest or feral fauna. The requirement for pest control would be 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 would be assessed in consultation with relevant authorities and the method deemed to be most appropriate would be used (e.g. baiting programs). A pest control protocol would be included within the RMP.

5.4.7 Bushfire Management

A Bushfire Management Plan has been developed for the existing Tasman Underground Mine and would be revised to include bushfire management measures applicable to the Project. The Bushfire Management Plan would detail bushfire management measures proposed to be implemented during mining and the measures proposed to protect the rehabilitated areas at mine closure.

5.5 REHABILITATION MANAGEMENT PLAN

A RMP would be developed to guide rehabilitation planning for the Project and describe in detail the rehabilitation strategy, objectives and measures that would be used to achieve the final use and relinquishment of the site. The RMP would be progressively updated over the life of the Project to reflect refined rehabilitation and mine closure goals and updated regulatory requirements relevant to rehabilitation.

In accordance with the *Mining Act, 1992*, rehabilitation would be subject to regulatory authority agreement and approval as part of the Mining, Rehabilitation and Environmental Management Process (MREMP) administered by the DRE (Section 6)¹.

¹ There are provisions of the *Mining Amendment Act, 2008* which would amend the *Mining Act, 1992* to replace the MREMP with the requirement to submit a Rehabilitation and Environmental Management Plan (REMP). Until the commencement of REMP provisions, the structure and content of the Project MOP and AEMR would be developed in accordance with the *Guidelines to the Mining, Rehabilitation and Environmental Management Process* (DPI-MR, 2006) and through consultation with various regulatory and advisory agencies including the DRE, OEH, EPA, DP&I, Cessnock City Council and Lake Macquarie City Council.

The MREMP is a framework that aims to facilitate the development of mining in NSW in a manner such that operations are safe, the environment is protected, the resources are efficiently extracted and rehabilitation achieves a stable, satisfactory outcome (DPI-MR, 2006). The MREMP reporting requirements include the preparation of MOP and AEMR that outline (among other things) the status of rehabilitation performance against regulatory requirements and rehabilitation activities proposed for the Project.

The RMP and rehabilitation planning for the Project would be undertaken in regard to DRE (2011) *Interim Mining Operations Plan Guidelines*.

The RMP would include a detailed description of the rehabilitation and revegetation monitoring methodology and rehabilitation completion criteria. These aspects are discussed in the sub-sections below.

5.5.1 Rehabilitation and Revegetation Monitoring

Ongoing monitoring and maintenance of rehabilitation areas at the Project would be conducted in accordance with any approved success criteria to assess:

- progress of rehabilitation areas; and
- the effectiveness of the rehabilitation techniques being used.

The Project rehabilitation monitoring program would be documented in the RMP and would describe the methods that would be used to:

- evaluate spread topsoil profile thickness and quality prior to sowing (i.e. to identify the potential for erosion or dispersion, or presence of salting or hard setting or compacted areas);
- assess germination success in revegetation areas (including recording of diversity and abundance) and revegetation success over time (e.g. survival rate, plant growth, species diversity, weed content, fauna usage);
- assess plant establishment success and ongoing development;
- monitor rehabilitated areas for localised failures or rilling and loss of topsoil after rainfall events;

- evaluate potential threats to rehabilitated areas (e.g. weed invasion, pest species, dispersive soils, erosion); and
- record key rehabilitation information (e.g. taking photographic records, documenting rehabilitation surveys).

Annual surveys of revegetation areas would be undertaken by an appropriately qualified and experienced person to review the success of rehabilitation and identify any additional measures required to achieve ongoing rehabilitation success.

The performance of rehabilitation and revegetation areas following completion of mining would be monitored using Landscape Function Analysis (LFA) or a similar systems-based approach. LFA is a Commonwealth Scientific and Industrial Research Organisation (CSIRO) 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.

A monitoring report would be prepared annually that includes a summary of previous monitoring results, results of the current year's monitoring and any planned remedial works, if required. The monitoring results would be summarised in the AEMR.

5.5.2 Completion Criteria

Key rehabilitation completion criteria would be determined in consultation with relevant government agencies and documented in the MOP and RMP. Specific completion criteria and rehabilitation parameters would be refined over the life of the Project as part of the MREMP and would be used as indicators of rehabilitation performance. The development of rehabilitation completion criteria would be based on Donaldson Coal's rehabilitation experience at the Donaldson Open Cut Mine, as documented in the approved Mine Closure Plan (Donaldson Coal, 2010c).

Key completion criteria are proposed in Table 5-2. 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*, ACARP Project C13048 (Australian Centre for Minerals Extension and Research, 2005).

**Table 5-2
Proposed Key Rehabilitation Completion Criteria**

Project Component	Key Completion Criteria
Final Land Use	<ul style="list-style-type: none"> Final landforms are suitable for final land use and are sustainable in terms of the land use. Land use is compatible with the surrounding land fabric and land use requirements, as far as possible. Site is clean and tidy, and free of equipment and structures, with any waste substances securely and safely contained that have the potential to affect land use or result in pollution.
Final Landforms	<ul style="list-style-type: none"> Safe, stable, adequately drained post-mining landforms consistent with the surrounding landscape as evidenced by comparative photography, water quality monitoring and geotechnical surveys. Final landforms do not present a hazard to persons or native fauna.
Rehabilitation and Revegetation Areas	<ul style="list-style-type: none"> Revegetation areas consistent with approved rehabilitation and mine closure goals. Revegetation areas on trajectory toward self-sustaining ecosystem¹ and/or measures of ecosystem function (e.g. vegetation cover, landform stability, species diversity) equivalent to reference sites. Revegetation areas integrate with surrounding un-disturbed vegetation to provide consolidated areas and wildlife corridors where possible.

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

5.6 MINE CLOSURE PLAN AND LEASE RELINQUISHMENT

Prior to the completion of mining operations, a Mine Closure Plan would be developed in consultation with the relevant authorities and stakeholders. The Mine Closure Plan would document the final mine closure process, final rehabilitation works and post-closure maintenance and monitoring requirements appropriate to agreed completion criteria.

The Mine Closure Plan would be developed in consideration of rehabilitation and mine closure guidelines (e.g. the Commonwealth of Australia [2006a] *Mine Rehabilitation* and Commonwealth of Australia [2006b] *Mine Closure and Completion* documents).

Upon cessation of mining operations, it would be expected that tenure of the mining leases would be maintained by Donaldson Coal until such time as lease relinquishment criteria were satisfied. These criteria would be formulated and prescribed in consultation with relevant authorities and stakeholders.

It is anticipated that mine relinquishment criteria would include, but not necessarily be limited to the following:

- removal of infrastructure, where appropriate and required;
- landform stability and public safety;
- maintenance of downstream water quality;

- establishment of self-sustaining vegetation; and
- fulfilment of mining lease and other statutory approval conditions.

Lease relinquishment criteria would be detailed in the Mine Closure Plan.