Delta coal	Doc Owner: **Dave McLean (Mine Manager, Great Southern Energy Pty Ltd)**
	Doc No: **ENV0028-1**

CHAIN VALLEY COLLIERY AND MANNERING COLLIERY

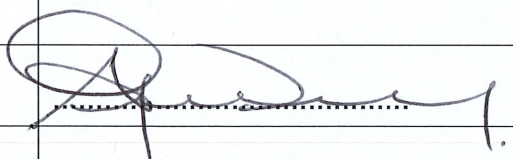
Mining Operations Plan

Rehabilitation Management Plan

2018-2020

Amendment 1

Table 1 MOP Title Block

Name of Mine/s	Chain Valley Colliery and Mannering Colliery
MOP Commencement Date	01/10/2018
MOP Completion Date	31/12/2020
Name of Mining Authorisation / Authorisation holder(s)	Consolidated Coal Lease 706 (part), Consolidated Coal Lease 707, Mining Lease 1051, Mining Lease 1052, Mining Purposes Lease 337, Mining Purposes Lease 1349, Mining Purposes Lease 1389, Mining Purposes Lease 1400 and Mining Lease 1308 - Great Southern Energy Pty Ltd Mining Lease 1632 and Mining Lease 1370 - Centennial Myuna Pty Ltd (part sublease to LakeCoal Pty Ltd and Fassi Coal Pty Ltd novated to Delta Coal) Consolidated Coal Lease 719, Consolidated Coal Lease 721 – Centennial Mannering Pty Ltd (sublease to LakeCoal Pty Ltd and Fassi Coal Pty Ltd novated to Delta Coal) Consolidated Coal Lease 722 – Centennial Munmorah Pty Ltd (sublease to LakeCoal Pty Ltd and Fassi Coal Pty Ltd novated to Delta Coal)
Name of Mine Operator	Great Southern Energy Pty Ltd (trading as Delta Coal)
Name and Contact Details of the Mine Manager (or equivalent)	Dave McLean (Mine Manager) Phone: 02 4358 0800, Email: dmclean@deltacoal.com.au
Name and Contact Details of the Environmental Representative	Chris Armit (Environment and Community Coordinator) Phone: 02 4358 0883, Email: carmit@deltacoal.com.au
Name of Representative of the Authorisation Holder	Steve Gurney
Title of Representative of the Authorisation Holder	Secretary – Great Southern Energy Pty Ltd
Signature	
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Version	1

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1 Introduction

1.1 History of the Operations

1.1.1 Chain Valley Colliery

Chain Valley Colliery is an underground coal mine (colliery) situated in the Newcastle coalfields of New South Wales, at the southern end of Lake Macquarie (Figure 1). Chain Valley Colliery is located directly adjacent to the Vales Point Power Station. The below table outlines the key mining and ownership milestones over the site's 58 year history.

Table 1.1 Chain Valley Colliery History of Operations

Year	Key Mining and Ownership Milestones
1960	J&A Brown and Abermain Seaham Collieries Ltd commence site clearing, drift/shaft sinking
1962/1963	Coal Production for Wallarah seam / First coal delivery to Vales Point Power Station Mining methods commenced – Bord and Pillar first workings, partial and full secondary extraction
1963-1994	Ownership - J&A Brown and Abermain Seaham Collieries Ltd, Coal & Allied.
1980s	Peak employment of 380 people
1994	Wallarah Coal Joint Venture (WCJV)
1997	Wallarah Seam workings discontinued
1994 - 2002	WCJV – owned by Ingwe Coal, Billiton and BHP Billiton
2002 - 2006	WCJV – 80% LakeCoal Pty Ltd (Excel Coal Pty Ltd) and Sojitz Corporation
2006	Fassifern Seam workings commenced
2006 - 2009	Peabody owned 100% LakeCoal
2008	Great Northern Seam workings discontinued
2009	LDO, AMCI own LakeCoal
2011	20% Sojitz share of WCJV acquired by LDO through Fassi Coal Pty Ltd Commencement of Miniwall Mining Method
2016	RWE NSW Pty Ltd acquired percentage in Joint Venture
2019	Great Southern Energy Pty Ltd acquired all Chain Valley Colliery assets from LakeCoal and became the operator
Present	First workings and Miniwall Mining Method in Fassifern Seam

1.1.2 Mannering Colliery

Mannering Colliery is an underground coal mine located directly adjacent to the Chain Valley Colliery (Figure 1). The below table outlines the key mining and ownership milestones over the site's 58 year history.

Table 1.2 Mannering Colliery History of Operations

Year	Key Mining and Ownership Milestones
1960	Commencement of operations as Wyee State Coal Mine
1961	Commence Coal Production in Great Northern and Fassifern seams / First coal delivery to Vales Point Power Station Mining methods commenced – Bord and Pillar first workings, partial and full secondary extraction
1999	Great Northern Seam workings discontinued
2002	Mining operations ceased. Centennial Coal company purchased from PowerCoal Pty Ltd
2005	Mine renamed Mannering Colliery, recommenced production in Fassifern Seam
2012	Underground mining operations ceased
2013	LakeCoal Pty Ltd became the operator
2014	Development Consent Approval to develop tunnel link between Chain Valley Colliery and Mannering Colliery
2015	Underground Link Road and conveyor enables coal mined from Chain Valley Colliery to be conveyed to Mannering Colliery
2015 – Present	Underground coal conveyance and surface coal handling activities to Vales Point Power Station
2019	Great Southern Energy Pty Ltd acquired all Mannering Colliery assets and subleases from Centennial and became the operator

1.1.3 MOP History

The below table outlines the key MOP periods for Chain Valley since 2008.

Table 1.3 Recent History of MOPs for Chain Valley and Mannering

Year	Key Mining and Ownership Milestones
2008-2015	Chain Valley MOP – Bord and Pillar extraction Great Northern and Fassifern Seams
2013-2015	Chain Valley MOP – Miniwall mining in Fassifern Seam
2015-2018	Chain Valley MOP – Miniwall mining in Fassifern Seam 2 Amendments for Miniwall mine plan changes
2018-2020	Chain Valley and Mannering MOP – Continue first workings and secondary extraction by miniwall mining methods in the Fassifern seam 1 Amendment for Miniwall mine plan changes, demolition of legacy surface structures and construction activities associated with pollution reduction programs.

Figure 1.1: Chain Valley Colliery and Mannering Colliery Surface Locations

1.2 Current Consents, Authorisations and Licences

The consents relevant to this MOP are identified in **Table 1.2**. Chain Valley Colliery and Mannering Colliery are Level 1 Mines as they are both coal mines in environmentally sensitive areas of state significance and are classified as State Significant Development. The Chain Valley Colliery Holding and details of leases for Chain Valley Colliery are shown in **Plan 1A**. All mining proposed within the term of this MOP is within the Chain Valley Colliery Holding, with all leases relevant to that Holding identified in

Table 1.3. Mannering surface facilities are included within CCL 721 which was the principle mining lease for Mannering's prior workings. Refer to Plan 1A for lease areas and Plan 1C for existing workings. Delta Coal hold two Environmental Protection Licences (EPLs) for Chain Valley Colliery and Mannering Colliery, issued by the Environment Protection Authority (EPA) under the Protection of the Environment Operations Act 1997. (Table 1.3) A copy of the current EPL's are publically available on the NSW EPA licensing website. Lake Coal holds two water licences for Chain Valley Colliery and Mannering Colliery which permit extraction of groundwater for mine dewatering (Table 1.4).

Table 1.2: Consent details

Approval	Issued / Modified Date	Approval Authority	Project
SSD-5465	Originally issued 23 December 2013 MOD 1 Issued 27 November 2014 MOD 2 Issued 16 December 2015	Minister for Planning under Environmental Planning and Assessment Act 1979.	Chain Valley Colliery – Extension Project MOD 1 for linkage to Mannering MOD 2 increased to 2.1Mtpa production and reorientation of Miniwall panels in Northern Mining Domain
MP 06_0311	Original Issued 12 March 2008 MOD 1 Issued 25 October 2012 MOD 2 Issued 27 November 2014 MOD 3 Issued 3 December 2015 MOD 4 Issue 4 August 2016	Minister for Planning under Environmental Planning and Assessment Act 1979.	Mannering Colliery – Continuation of Mining Project. MOD 1 for extension of the approved Project Site. MOD 2 for linkage to Chain Valley Colliery MOD 3 increase coal handling from Chain Valley to 1.3Mtpa. Extension of Approval to 2022 MOD 4 recommission rotary breaker

Table 1.3: Leases

Mining tenement	Holder	Grant date / Renewal date	Lease expiry date	Applicability
EL8428	Delta Coal	7 Dec 2015	7 Dec 2020	Future mine extension area
ML 1051	Delta Coal	7 July 1941	7 July 2022	Part of the area approved under SSD-5465.
ML 1052	Delta Coal	7 July 1941	7 July 2022	Part of the area approved under SSD-5465.
MPL 1349	Delta Coal	5 October 1967	5 October 2028	Mining purposes lease for the Chain Valley pit top area.
CCL 706 (part)	Delta Coal	24 January 1990	29 April 2022	Incorporates historical workings within the Fassifern, Wallarah and Great Northern Seams which are, and would continue to be utilised for passive operational activities.
CCL 707	Delta Coal	3 July 1989	30 December 2023	Incorporates historical workings within the Fassifern, Wallarah and Great Northern Seams which are, and would continue to be, utilised for passive operational activities and the Summerland Point ventilation shaft site.
ML 1308	Delta Coal	4 May 1965	4 May 2022	Mining lease for the mine drift entries.
MPL 337	Delta Coal	30 January 2016	30 January 2037	Mining purposes lease for a portion of the electricity cable on the bed of Chain Valley Bay connecting the pit top switchyard to the ventilation shaft site at Summerland Point.
MPL 1389	Delta Coal	14 May 1970	14 May 2031	Mining purposes lease for a portion of the electricity cable on the bed of Chain Valley Bay connecting the pit top switchyard to the ventilation shaft site at Summerland Point.
MPL 1400	Delta Coal	6 November 1970	6 November 2031	Mining purposes lease for a portion of the electricity cable on the bed of Chain Valley Bay connecting the pit top switchyard to the ventilation fan at Summerland Point.
CCL 719 (part)	Centennial Mannering	3 July 1989	11 December 2029	Part CCL 719 subleased to LakeCoal (novated to Delta Coal) which incorporates historic workings within the Wallarah and Great Northern Seams utilised for passive operational activities.
CCL 721	Centennial Mannering	28 June 1989	29 July 2026	Incorporates part of the proposed mining area, refer Plan 1A. Part sublease to LakeCoal (novated to Delta Coal) incorporated into Chain Valley Colliery Holding. Includes Mannering surface facilities.

Mining tenement	Holder	Grant date / Renewal date	Lease expiry date	Applicability
ML1632	Centennial Myuna	13 April 2013	13 October 2022	Incorporates part of the proposed mining area, refer Plan 1A. Part sublease to (novated to Delta Coal) LakeCoal incorporated into Chain Valley Colliery Holding.
CCL 722 (part)	Centennial Munmorah	28 June 1989	05 July 2019	Incorporates part of the proposed mining area, refer Plan 1A. Part sublease to LakeCoal (novated to Delta Coal) incorporated into Chain Valley Colliery Holding.
ML1370 (part)	Centennial Myuna	26 Sep 1995	7 Mar 2033	Incorporates part of the proposed mining area, refer Plan 1A. Part sublease to LakeCoal (novated to Delta Coal) incorporated into Chain Valley Colliery holding.

Table 1.4: Environmental Protection Licences

Premises	EPL Number	Date of Issue	Issued to
Mannering Colliery	191	06/04/2000	Delta Coal
Chain Valley Colliery	1770	10/11/2000	Delta Coal

Table 1.5: Water Licences

Site	Water Licence Number	Extraction Volume	Additional Information
Mannering Colliery	20BL172016	450 ML/year	Issued under Water Act 1912
Chain Valley Colliery	20BL173107	4443 ML/year	Issued under Water Act 1912

1.3 Land Ownership and Land Use

The Chain Valley and Mannering pit top surface operational areas are on land owned by Sunset Energy (trading as Delta Electricity) and form part of the Vales Point Power Station buffer zone. The land is occupied under compensation agreements with Sunset Energy. In addition to the two pit top areas there are two remote surface sites associated with the Chain Valley Colliery Holding, i.e. the main ventilation fan site for Chain Valley (at Summerland Point and situated on land owned by Delta Coal) and a downcast shaft site for Mannering (adjacent to the Vales Point Ash Dam and situated on land owned by Sunset Energy). Land ownership details of the surface facilities sites are shown on **Plan 1E**.

The Chain Valley Colliery holding lies within two separate local government areas (LGAs), namely the City of Lake Macquarie LGA and Central Coast LGA (an amalgamation of the former Wyong and Gosford City LGAs). First workings and secondary extraction to be undertaken during the term of this MOP will be confined to areas under Lake Macquarie, and as such no impact to freehold land is anticipated from underground extraction.

The Chain Valley and Mannering Colliery pit top areas have been used as mining infrastructure areas for the last 58 years. The pit top facilities are primarily situated within Zone SP2 (Infrastructure – Electricity generating works) and Zone E2 (Environment Conservation). The Chain Valley ventilation shaft site is listed as Zone E1 – National Parks and Nature Reserves. Zoning of the aforementioned lands under the Wyong Shire Council Local Environmental Plan 2013 is shown on Plan 1F. Current land-uses surrounding these sites and above the old and proposed workings include; natural waterways, infrastructure, public recreation, National Parks and nature reserves and low density residential (Plan C).

Table 1.6: Land Ownership

Lot	Deposited Plan	Owner	Description
A	368634	Sunset Energy	Overlies proposed first workings linkage connection
100	1065718	Transgrid	Overlies proposed first workings linkage connection
102	1065718	Sunset Energy	Overlies proposed first workings linkage connection
20	1113256	Sunset Energy	Overlies proposed first workings linkage connection
7329	1148149	The State of New South Wales (reserve)	Overlies proposed first workings linkage connection
A	379918	Sunset Energy	Chain Valley pit top facilities area
B	379918	Sunset Energy	Chain Valley pit top facilities area
C	349733	Sunset Energy	Chain Valley pit top facilities area
A	187570	Sunset Energy	Chain Valley pit top facilities area
1B	339441	Sunset Energy	Chain Valley pit top facilities area
1	226133	Great Southern Energy	Chain Valley ventilation shaft and fans site
1	379203	Sunset Energy	Mannering downcast shaft site

Lot	Deposited Plan	Owner	Description
102	1170291	Sunset Energy	Mannering surface facilities site

1.4 Stakeholder Consultation

1.4.1 General Consultation

As stated in its Environment and Community Policy, Delta Coal is committed to communicating and engaging with the community and other stakeholders regarding its activities. Consistent with this commitment, community consultation is ongoing and includes the websites (www.chainvalleymine.com.au and www.manneringmine.com.au), an information line (1800 687 557 and the Chain Valley Colliery and Mannering Colliery community consultative committees (CCC).

Delta Coal, and previously LakeCoal and Centennial Mannering, have consulted with local and state government agencies over many years in association with applications for approvals or modifications; preparation of previous MOPs and the various management plans required under the Project Approval/development consent including the preparation of the Chain Valley Rehabilitation Management Plan and in relation to other regulatory matters.

1.4.2 Consultation on Mining Activities Specific to this MOP

Mining activities proposed during the term of this MOP are generally consistent with the Environmental Impact Statements (EIS) for Chain Valley Colliery and Mannering Colliery as modified. Consultation with the following individuals, groups and government departments was undertaken as part of the development of the EIS and/or subsequent modification applications.

- Mannering Colliery and Chain Valley Colliery CCC
- Department of Planning, Industry and Environment - DPIE
- Central Coast Local Health District;
- Central Coast Medicare Local;
- Hunter Medicare Local;
- Lake Munmorah and Chain Valley Bay Community Precinct Committee;
- Gwandalan and Summerland Point Community Precinct Committee;
- Australian Government - Department of Environment and Energy - DoEE (formerly Commonwealth Department of Sustainability, Environment, Water, Population and Communities);
- NSW Office of Environment and Heritage (NOW) - including the Heritage Branch);
- NSW Environment Protection Authority (EPA);
- NSW Division of Resources and Geoscience within the DPIE (formerly Division of Resources and Energy within the Department of Trade and Investment, Regional Infrastructure and Services);
- Department of Primary Industries (including the NSW Office of Water, NSW Forestry, Agriculture and Fisheries sections, Catchments and Lands (Crown Lands Division);
- NSW Department of Transport (including the Centre for Transport Planning, and Roads and Maritime Services);
- Subsidence Advisory (formerly the Mine Subsidence Board)
- NSW Health;
- Hunter Central Rivers Catchment Management Authority;
- Gosford/Wyong Councils' Water Authority;
- Central Coast Council (formerly Wyong Shire Council);

- Newcastle City Council; and
- Lake Macquarie City Council

Details of the consultation and outcomes can be found in both the EIS and Response to Submissions documents and the various modification applications. Additional consultation and public exhibition of proposed modifications to the Chain Valley and Mannering Project Approvals was undertaken as required .

Delta Coal personnel routinely consult with the primary landowner, Sunset Energy, on matters relevant to its landholding and Delta Coal's operations and obligations, including the rehabilitation plans included within this MOP.

1.4.3 Consultation during development of this MOP

In accordance with the respective operational consents, LakeCoal (prior to Delta Coal asset purchase) consulted with the following stakeholders during development of the MOP:

- Department of Planning and Environment.
- Office of Environment and Heritage.
- EPA.
- DPI Water (formerly NSW Office of Water).
- Central Coast Council (formerly Wyong Shire Council).
- Lake Macquarie City Council.
- The Mannering Colliery and Chain Valley Colliery CCC.

No recorded correspondence relating to feedback on the previously distributed MOP was provided to Delta Coal. Delta Coal will distribute a copy of this amended MOP to stakeholders and note feedback received within the next revision of this MOP. If any significant matters that are raised by the stakeholders that warrant a change to the activities to be undertaken within the term of this MOP, Delta Coal will consult with DPIE to address the matters appropriately through either amendment to the MOP or by other means acceptable to DPIE.

1.4.4 Consultation for detailed mine closure and rehabilitation

Key stakeholders will also be consulted during the development of a detailed Mine Closure Plan.

Through any future consultation, it is expected that the following principles would be considered;

- Planning for mine closure could assist in mitigating the consequent reduction in access to useful infrastructure. With advanced and careful planning, it may be possible to develop capacity to maintain certain infrastructure facilities and services for future community or local government ownership or as part of arising business development opportunities.
- Planning for mine closure should be raised with the community as early as possible prior to the design phase of the closure. The planning should consider how to minimise the adverse impacts of mine closure and to optimise the opportunities for community development.
- An early and effective community engagement strategy should be established and the community engaged.
- Planning for mine closure should ensure that the future public health and safety of the community is not compromised; the community's resilience to the adverse impacts of mine closure is strengthened; and the community can maximise opportunities for consequential land use and retain mining infrastructure of value to the community.

It is expected that ongoing consultation with relevant stakeholders will occur throughout the life of the MOP through forums such as the community consultative committee meetings, the development of various management plans, annual reviews and regulatory inspections.

In addition, development of the detailed Mine Closure Plan would include, where relevant, consideration of documents such as the North Wyong Shire Structure Plan (NSW Department of Planning & Infrastructure, October 2012).

2 Proposed Mining Activities

2.1 Project Description

As this MOP relies on two separate approvals, the activities proposed in this MOP reflect the current limitations of these approvals, primarily the limit on mining operations under the Mannering approval MP06_0311, to 30 June 2022.

Whilst Delta Coal has approval to undertake mining operations, i.e. extraction, processing, handling, storage and transportation of coal until 30 June 2022, the nominated term of this MOP extends until 31 December 2020. It is anticipated, however, that both the duration of the Project Approval and MOP approvals will be extended beyond 30 June 2022 as this date also represents the currently approved project life of Mannering Colliery. An extension to this agreement would also be sought during the term of the MOP once future mine planning has been completed.

A summary of approved operations as permitted by Chain Valley Development Consent and Mannering Project Approval is provided in **Table 2.1**.

Table 2.1: Summary of approved operations

Aspect	Mannering Colliery	Chain Valley Colliery
Mining and reserves	Extraction of up to 1.1 Mtpa of ROM coal from the site.	Extraction of up to 2.1 Mtpa of ROM coal from the site.
Mining methods	Bord and pillar mining methods where coal recovery is limited to first workings only.	First workings and secondary extraction by miniwall mining methods
Project life	Mining operations until 30 June 2022	Mining operations until 31 December 2027.
Surface infrastructure	Utilisation of existing surface infrastructure.	Utilisation of existing surface infrastructure and upgrades as identified in the EIS.
Coal processing	No coal processing other than use of coal crushing facility (including the rotary breaker) to reduce the size of ROM coal.	No coal processing other than use of coal crushing facility to reduce the size of ROM coal.
Hours of operation	24 hours, 7 days a week.	24 hours, 7 days a week.
Product coal transport	Handling and transport no more than 1.3 Mtpa of ROM coal from the site. All coal supplied directly to Vales Point Power Station via a purpose built dedicated overland conveyor which is operated, maintained and located on land held by Sunset Energy.	A maximum of 660,000 tonnes per year to PWCS for export, transported during restricted haulage hours on public roads. A maximum of 180,000 tonnes per year to domestic customers (other than Vales Point Power Station), transported on public roads during restricted haulage hours. Coal deliveries to Vales Point Power Station to occur via private road or via conveyor connection with Mannering Colliery

Aspect	Mannering Colliery	Chain Valley Colliery
Underground Linkage	Development and operation of an underground linkage within the Fassifern Seam to Chain Valley Colliery enabling coal to be transferred from Chain Valley Colliery to Vales Point Power Station via Mannering facilities.	Development and operation of an underground linkage within the Fassifern Seam to Mannering Colliery enabling coal to be transferred from Chain Valley Colliery to Vales Point Power Station via Mannering facilities.

Figure 2.1 shows the boundaries applicable to the Chain Valley Development Consent and Mannering Project Approval.

Extraction of miniwall S1 commenced in late July 2018. Coal extraction operations are continuing for the Northern Mining Area (miniwall extraction via first workings development) with all coal being transferred to the Vales Point Power Station via Mannering Colliery's surface facilities and the Mannering Colliery to Vales Point Power Station overland conveyor.

Extraction Plan approval of miniwall blocks S2 and S3 was received 2 July 2019, with extraction of miniwall S2 commencing in September 2019.

Delta Coal is also finalising submission of an extraction plan for miniwall S4 following additional geotechnical studies and refinement of geological modelling. It is proposed that extraction of miniwall S4 will commence by August 2020.

Delta Coal is currently in the process of finalising modifications to both the Chain Valley Colliery and Mannering approvals to permit the following activities on site:

- an increase in the coal handling limit at Mannering Colliery to 2.1Mt per annum to be consistent with the approved production at Chain Valley Colliery
- an increase in the volume of coal transported underground between Chain Valley and Mannering Colliery to reflect the current approved production limit.
- Change in the defined mining method utilized at Chain Valley Colliery

It is expected that a new MOP will be submitted for mining operations beyond the proposed MOP term which will reflect the new modification approvals should they be granted by the Department.

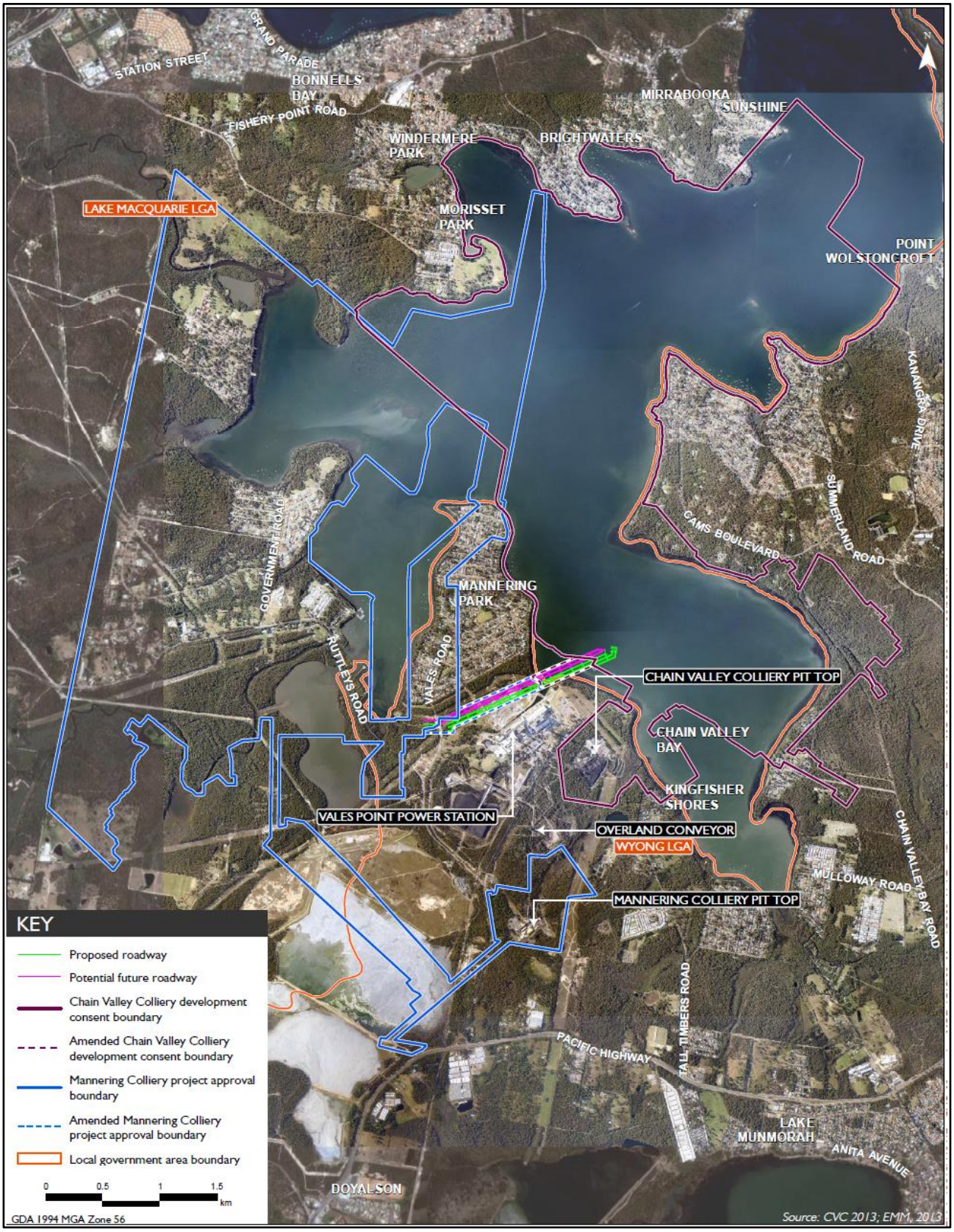

Figure 2.1: Approval boundaries

2.2 Asset Register

Delta Coal has identified various domains applicable to this MOP in accordance with the ESG3 guidelines. The primary domains are shown on **Plan 2** and **Plan 2A** with secondary domains shown on **Plan 4**. **Table 2.2** provides a brief description of the features within each domain. Further detail on the domain selection is provided in Section 5.1.

Table 2.2: Domain Units

Domain Code	Domain Overview
1A	Incorporates the following areas; • Majority of the pit top at Chain Valley (areas not within the high voltage transmission line easement); • Mannering pit top area (including ventilation shaft and fan site) ; and • Chain Valley ventilation shaft and fan site. Post-mining land use for this domain is generally a return to native bushland as part of Sunset Energy buffer lands for Vales Point Power Station.
1B	Incorporates the Mannering and Chain Valley downcast shaft site locations. Post-mining land use for this domain is to provide grassed open space consistent with surrounds and in consideration of future land uses.
2A	Area of the coal stockpiles and some coal handling facilities within the pit top areas. Post-mining land use for this domain is generally a return to native bushland as part of Sunset Energy buffer lands for Vales Point Power Station.
3A	Area of the water management structures within the pit top areas. Post-mining land use for this domain is generally a return to native bushland as part of Sunset Energy buffer lands for Vales Point Power Station.
3B	Area of the water management structures within the pit top areas. Post-mining land use for this domain is to provide grassed open space consistent with surrounds and in consideration of current and future land uses (as a high voltage transmission line easement).
3C	Area of the water management structures within the pit top areas, including the pollution control dams and previous water supply dam for firefighting. Post-mining land use for this domain is retention of suitable water management structures for their ecological function and water supply value, where consistent with the overall post-mining land use as part of Sunset Energy buffer lands for Vales Point Power Station.

Table 2.3 lists the size of each domain, the major items of infrastructure within the domain and, where relevant, any specific the activities required to demolish and remove the assets.

Table 2.3: Domain Asset Register

Domain Code	Domain Area	Assets Items	Key Demolition and Removal Activities
1A	17.5 ha	Chain Valley pit top: • Men and materials drift • Conveyor drift • Workshop and store • Control room • Bunded storage areas and sumps • Air compressors (and containing shed). • Operations office • Bathhouse • Carpark • Aerated wastewater treatment system and septic systems • Training office • Administration office • Potable water tanks • Old haulage shed • Haulage room and switch room • Switch yard/Sub-station • Tube bundle monitoring room • Cable belt switch room • Cable belt drive and building • ROM, 250t product and final product bins • Conveyors and gantries • Diesel storage containers • Weighbridge and associated sheds • Hardstand area • Chemical storage sheds • Cable shed • Oil water separator • Upcast shaft site and main ventilation fans • Ventilation fan switchroom • Fencing Mannering pit top: • Main office block • Bath house, inclusive of report room and lamp cabin • Tube bundle monitoring room • Engineers offices • Cable shed • Workshop, inclusive of store and fire station • Men and materials drift • Number 1 winder room (men and materials) • Conveyor drift • Number 2 winder room (conveyor) • Coal crushing facility (including rotary breaker) • General conveyor and gantries • 1000t final product bin	General demolition/removal of structures Sealing, Backfilling and capping of drifts and shafts. Backfilling of tunnels and excavations Management of potentially contaminated soil. Management of combustible material. Disconnection from AusGrid 11kV supply Disconnection from Central Coast Council water supply Disconnection of telecommunications services

Domain Code	Domain Area	Assets Items	Key Demolition and Removal Activities
		• Overhead stack out gantry • Reclaim tunnel and conveyor • Drainage structures • Material storage areas • Substation and switch room • Storage sheds • Diesel workshop • Stonedust storage shed • Diesel storage shed • Pollution control sumps • Sewage pump station • Oil water separator and underground storage tank • Water tanks • Unpaved hardstand • Mine ventilation fans and upcast shaft • Powerpoles and overhead lines • Concrete hardstand • Paved bitumen carpark and roads • Perimeter Security Fencing • Various surface and underground services include electricity, potable water and telecommunications	
1B	0.17 ha	Mannering downcast shaft site; • Downcast shaft • Fencing Chain Valley pit top area (within the high voltage transmission line easement); • Sediment dams • Drainage structures • Downcast shaft • Fencing	Sealing, Backfilling and capping of shaft. General demolition. All dams/ponds and associated drainage structures to be backfilled, re-profiled or removed.
2A	4.9 ha	Mannering coal stockpile area; • Coal stockpile area Note: the associated coal handling infrastructure at Mannering (e.g. bin, conveyors, gantry and reclaim tunnel) is incorporated into the 1A domain. Chain Valley coal stockpile area; • Coal stockpile area • CPP facilities and switch room • 250 tonne product bin • 1000 tonne product bin • Weighbridge • Concrete sumps and subsurface drainage	Recovery and disposal of coal material from stockpile. Management of combustible material. Disconnection of services General demolition/removal of structures. Management of potentially contaminated soil.
3A	1.7 ha	Chain Valley pit top area; • Sediment dams	Removal of drainage and monitoring infrastructure

Domain Code	Domain Area	Assets Items	Key Demolition and Removal Activities
		• Drainage structures Mannering water management: • Pond 1, Pond 2, Pond 3 • Geofabric Bags (with coal fines)	All dams/ponds to be backfilled. Recovery and disposal of coal material from geofabric bags.
3B	2.2 ha	Chain Valley water management (within the high voltage transmission line easement)	All dams/ponds to be backfilled.
3C	1.3 ha	Chain Valley water management: • Dam 3 • Dam 11 • Dam 13 Mannering water management: • Pond A. • Pond B • Former Firefighting Supply Dam.	Dams to be retained for ecological functions and water supply following mine closure Modification and use of dams/ponds as appropriate for use as sediment dams during rehabilitation. Firefighting Supply Dam to be retained without modification.

2.3 Activities over the MOP term

Activities to be undertaken over the MOP term of 01 October 2018 to 31 December 2020 are summarised below.

2.3.1 Exploration

No surface exploration drilling is currently planned. There may be some underground exploration drilling activities associated with the current approved mining area and seam/s.

2.3.2 Construction

The surface facilities at both the Chain Valley Colliery and Mannering Colliery pit tops have largely remained in place since their construction in the 1960s. No major new construction activities are proposed during the term of this MOP. However, a number of potential minor upgrades and modifications to surface infrastructure at the Chain Valley pit top that were approved as part of the Mining Extension Project (SSD-5465), may be undertaken during the term of this MOP. Any new constructions or alterations will be undertaken in accordance with the respective approvals in place at each site.

Generally, the construction works to be undertaken during the term of this MOP will be of a relatively minor nature and be focused on maintaining continuity of operations as approved. With the exception of the installation or extension of existing asset protection zones as approved under SSD-5645 (Mod 2), there is no land clearing proposed for any of the possible surface upgrades and installations to be undertake (or potentially to be undertaken) during the term of this MOP. As part of the EPL1770 Pollution Reduction Program, a sewerage pumping and pipeline system is being planned for construction from CVC pit infrastructure to either Tall Timbers road or Mannering Colliery. Construction activities may commence within the MOP period subject to establishment of an appropriate consent pathway.

2.3.3 Mining operations

Mining activities within this MOP term will be consistent with those approved under the Chain Valley Development Consent (as modified) and the Mannering Project Approval (as modified).

First workings and secondary extraction by miniwall mining methods will continue within the Chain Valley Development Consent area.

Mining activities within the Mannering approval boundary will be limited to those required to operate the underground linkage and supporting tunnel network to allow coal conveyance, travel and ventilation to the Mannering pit top.

2.3.3.1 Extraction Plan

An extraction plan covering Miniwall Panel's S2 and S3 is currently approved by the DPIE. A further extraction plan is being prepared to cover Miniwall Panel S4 prior to the commencement of secondary extraction. Plan 2 shows the existing and proposed mine development at the end of the MOP term. All the mining proposed in the MOP period is to be undertaken in the Fassifern seam, of which all the secondary extraction is to be undertaken below Lake Macquarie. Geotechnical design is undertaken to determine the size of pillars formed in the development panels and secondary extraction geometries as a part of the Extraction Planning process. The first and secondary extraction geometries take into consideration overlying workings, surface features, resultant subsidence, inrush potential, pillar creep and windblast.

2.3.4 Overburden/Rock Emplacement

A negligible amount of waste from the processing plant in the form of rock, timber, steel and plastic from the Mannering CHP is managed by the waste management contractor. The waste is removed from site to a licensed waste management facility.

2.3.5 Processing residues and tailings

It is planned that Mannering Colliery will process the ROM coal from Chain Valley Colliery during the MOP period. Both Chain Valley Colliery and Mannering Colliery have Coal Handling Plants which can crush and size the ROM coal but no washing of coal takes place. Therefore no reject or tailings emplacement areas are designated on site. Any minor fine coal accumulations are collected in sediment traps and drains and are returned to the product coal stockpile.

2.3.6 Waste Management

Both Chain Valley Colliery and Mannering Colliery have a total waste management contractor engaged for both operations. This is to allow for the efficient management and reporting of waste, and also greater recycling through the sorting of waste brought to the surface from underground. The recyclable material is separated out of the general waste into allocated bins for paper, steel and timber. Purpose built oil drainage bins are placed in the Oil Storage Sheds and the wash down bay for the collection of waste oil. Waste oil is removed from site by the Waste Management Contractor as per the waste tracking guidelines. Waste material from the Coal Handling Plant refuse bin is classified as general waste and transported to the appropriate waste facility by the waste contractor. There is no coal processing waste stored on site.

2.3.7 Decommissioning and Demolition activities

Following the acquisition of assets from LakeCoal, Delta Coal has sought to review existing legacy plant and structures so as to reduce risk to workers and other persons.

Delta Coal aims to commence removal of legacy coal handling plant, unused coal bins, former mine cottages and other plant within the existing surface footprints of the Chain Valley Colliery and Mannering Colliery operations during the remaining period of this MOP.

2.3.8 Temporary Stabilisation

There are no temporary stabilisation works scheduled for the term of the MOP.

2.3.9 Progressive rehabilitation and completion

There are no rehabilitation activities scheduled for the term of the MOP.

2.3.10 Material production schedule during MOP term

Material production for the MOP term is summarised in **Table 2.4**.

Table 2.4: Material Production Schedule during the MOP Term

Material	Unit	Year 1 1 Oct 2018 – 31 Dec 2018	Year 2 1 Jan 2019 – 31 Dec 2019	Year 3 1 Jan 2020 – 31 Dec 2020
Stripped topsoil	m^3	N/A	N/A	N/A
Rock/overburden	m^3	N/A	N/A	N/A
ROM coal	Mt	0.3	1.3	1.8
Reject material	Mt	N/A	N/A	N/A
Product	Mt	0.3	1.3	1.8

3 Environmental Issues Management

3.1 Environmental Risk Assessment

As the Chain Valley and Mannering pit tops and mining areas were previously located within separate Colliery holdings and operated under separate approvals (and associated conditions) granted under the EP&A Act, operations, separate risk assessments have previously been undertaken. **Table 3.1** summarises the multiple environmental risk assessments which have been completed since 2014 pertaining to the domains applicable to this MOP.

Table 3.1: Summary of Recent Environmental Risk Assessments

Type	Project	Date	Summary
Preliminary environmental risk assessment	Mannering Underground Linkage (MOD 2) and Chain Valley Underground Linkage (MOD 1)	April 2014	Documented within the *Mannering Colliery Modification 2 Environmental Assessment* (EMM, 2014a) and *Chain Valley Colliery Modification 1 Statement of Environmental Effects* (EMM, 2014b) All risks were rated low. However, it was considered that a more detailed assessment of potential subsidence and groundwater impacts was warranted given the nature of the proposed modification.
Detailed operational environmental risk assessment (LakeCoal)	Mannering operations (including underground linkage)	July 2014	A detailed risk assessment (in accordance with AS/NZS ISO 31000 and MDG1010) was undertaken to identify hazards and assess the environmental and community related risk associated with the planned operation of Mannering Colliery. All aspects with potential environmental impacts, following the implementation of controls, were considered to have a low risk. Details of risk management controls are provided within Section 3.2
Environmental risk assessment	Chain Valley Colliery and Mannering Colliery MOP	March 2015	Undertaken as part of the preparation of the 2015 – 2018 MOP. With the exception of Surface Water - *Discharge from the site water management system resulting in contamination of water resources* and Hazardous Materials - *Explosives remain following closure and present public safety risk* which had a Medium Risk Level, all residual risks were ranked as low.
LakeCoal Consolidated Site BBRA	Chain Valley Colliery and Mannering Colliery	August 2018	Undertaken as part of the site wide consolidation project following the completion of the underground link road between Chain Valley Colliery and Mannering Colliery.

Type	Project	Date	Summary
Environmental risk assessment	Chain Valley Colliery and Mannering Colliery MOP	August 2018	Undertaken as part of the preparation of the 2018 – 2020 MOP. Summary of key aspects included within this MOP document. **Section 3.2** provides an overview of the environmental risks and controls identified from the most recent assessment.
Environmental risk assessment	Chain Valley Colliery and Mannering Colliery MOP Amendment 1	Dec 2018	Undertaken as part of the preparation of the 2018 – 2020 MOP Amendment 1. Summary of key aspects included within this MOP document. **Section 3.2** provides an overview of the environmental risks and controls identified from the most recent assessment.

3.2 Environmental Risk Management

Delta Coal are committed to operating in an environmentally responsible manner through the Company's Environment and Community Policy. Environmental management is supported through the implementation of the following approved management plans.

Chain Valley Colliery

- Chain Valley Environmental Management Strategy
- Chain Valley Noise Management Plan
- Chain Valley Air Quality Management Plan
- Chain Valley Biodiversity Management Plan
- Chain Valley Water Management Plan
- Chain Valley Heritage Management Plan
- Chain Valley Built Features Management Plan
- Chain Valley Rehabilitation Management Plan
- Chain Valley Colliery Seagrass Management Plan
- Chain Valley Benthic Communities Management Plan
- Chain Valley Road Transport Protocol, which includes the Coal Haulage Traffic Management Plan and Coal Haulage Driver Code of Conduct
- Chain Valley Miniwall S1-N1 Extraction Plan (inc. Appendices). Note: this includes a revised Seagrass Management Plan and Benthic Communities Management Plan
- Chain Valley Miniwall S2-S3 Extraction Plan (inc. Appendices). Note: this includes a revised Seagrass Management Plan and Benthic Communities Management Plan
- CVC Pollution Incident Response Management Plan

Mannering Colliery

- Mannering Environmental Management Strategy
- Mannering Environmental Monitoring Program
- Mannering Air Quality Management Plan
- Mannering Noise Monitoring Program

- Mannering Water Management Plan
- Mannering Land Management Plan
- Mannering Colliery Non-Indigenous Heritage Management Plan
- Aboriginal Cultural Heritage Management Plan
- Mannering Colliery Pollution Incident Response Management Plan

3.2.1 Specific Risk relating to Rehabilitation

Table 3.2 identifies where each of the specific items listed in Section 3.2.1 of the ESG3 guideline are addressed in this document, and the relevant risk rankings assigned to this item within the MOP 2018 – 2020 Risk Assessment. The sections referred to in Table 3.2 contain detail on the controls referred to within the Risk Assessment.

Table 3.2: Specific Risks relating to Rehabilitation

Environmental issue (from Section 3.2.1 of the ESG3 guideline) or site risk assessment	Initial Risk Level (based on existing controls) (low, medium, high or critical)	Residual Risk Level (based on proposed controls) (low, medium, high or critical)	Where addressed in this document
Geology and geochemistry	Medium	Low	Section 3.2.1
Landform Stability	Low	Low	Section 3.2.10
Material prone to spontaneous combustion	Medium	Low	Section 3.2.2
Material prone to generating acid mine drainage	Low	Low	Section 3.2.3
Mine Subsidence	Low	Low	Section 3.2.4
Erosion and sediment control	Medium	Low	Section 3.2.5 and Section 3.2.11
Soil type(s) and suitability (Growth Medium)	Medium	Low	Section 3.2.6
Flora	Medium	Low	Section 3.2.7
Fauna	Medium	Low	Section 3.2.8
Marine ecology (Benthic and Seagrass)	Low	Low	Section 3.2.5
Weed proliferation	Low	Low	Section 3.2.7
Pest animals	Low	Low	Section 3.2.9
Overburden characterisation	N/A	N/A	N/A
Slopes and slope management	Low	Low	Section 3.2.10
Air quality	Low	Low	Section 3.2.11
Surface water	Medium	Medium	Section 3.2.12
Ground water	Low	Low	Section 3.2.12
Contaminated land and hydrocarbon management	Medium	Low	Section 3.2.13

Environmental issue (from Section 3.2.1 of the ESG3 guideline) or site risk assessment	Initial Risk Level (based on existing controls) (low, medium, high or critical)	Residual Risk Level (based on proposed controls) (low, medium, high or critical)	Where addressed in this document
Hazardous materials	Medium	Medium	Section 3.2.14
Greenhouse gases, methane drainage / venting	Low	Low	Section 3.2.15
Blasting	N/A	N/A	N/A – no surface blasting activities.
Noise	Low	Low	Section 3.2.16
Visual and lighting	Low	Low	Section 3.2.17
Heritage (Aboriginal and European)	Low	Low	Section 3.2.18
Bushfire	Medium	Low	Section 3.2.19
Other – Site security and unauthorised access	Low	Low	Section 3.2.20
Other – Waste (general)	Low	Low	Section 3.2.21

3.2.2 Geology and geochemistry

Coal processing wastes are not produced as coal extracted does not require washing or additional treatment, and all ROM coal production equates to product coal. Some waste materials (timber, plastic, steel concrete and rock) is recovered from the site rotary breaker, magnets and screens which is transferred to a waste facility. The surface facilities areas and surrounds are predominantly in-situ, and are not on emplaced overburden/interburden and hence there are no significant issues created by geochemistry of wastes.

Current approved mining operations are located within the Fassifern Seam, which is part of the Boolaroo Formation within the Newcastle Coal Measures. Overlying the Fassifern Seam are the Great Northern, Wallarah and Vales Point Seams (and their associated conglomerates and tuffs), which are part of the Moon Island Beach Formation within the Newcastle Coal Measures. Historically, mining has occurred within one or more of the Wallarah, Great Northern and Fassifern Seams at the various mines throughout the Lake Macquarie region.

Previous workings within the Wallarah, Great Northern and Fassifern seams in conjunction with various geophysical surveys in the area, provide a solid base of data regarding regional and local structural features which have been considered as part of the future mine design.

The coal resource within the Fassifern seam has a low sulphur content which makes it suitable for both export and domestic power generation markets. Within the approved mining area, the Fassifern Seam lies at depth of around 150 to 210 metres (based on known and inferred contour data). The Fassifern seam is approximately 4.5 to 5.5 metres thick, with the immediate roof and floor comprising a tuffaceous claystone of varying hardnesses. Mining involves the extraction of a 3.5m section of coal (approximate) beneath the A and B plies. The A and B plies, which comprise approximately 1.0 to 1.2 metres of inferior coal, are left on the roof (Seedsman 2011) dependant on mining conditions. Up to approximately 0.8m coaly shale is left in the floor. The general geology within the Chain Valley Colliery area is shown on **Figure 3.1**.

There are no recognised aquifers within the stratigraphic sequence, except for the coal seams themselves.

Water quality monitoring will continue in accordance with the Water Management Plan and EPL requirements which will identify any water quality issues associated with potential leachate from unexpected geochemistry of the coal materials on-site.

Figure 3.1: General Stratigraphic Column within Colliery Holding area (not to scale)

3.2.3 Material prone to spontaneous combustion

The R70 self-heating rate value recorded for a sample from the middle of the Fassifern Seam is 3.03 ^{o}C/h. This rates the coal as having medium intrinsic spontaneous combustion reactivity for New South Wales conditions. This value is consistent with the rank and type of coal and agrees with previous test results obtained for the Fassifern Seam at Chain Valley Colliery. The self-heating rates of the samples from the Chain Valley Colliery are significantly lower than coals from the Hunter Valley, and are also lower than Spring Creek Mine in New Zealand and San Juan Mine in New Mexico.

Moist adiabatic benchmark tests of the samples from Chain Valley Colliery indicate that self heating is controlled by the moisture in the coal and the initial start temperature. Heating development to thermal runaway would take in the order of 48 to 72 days for the middle of the Fassifern Seam, but the top and bottom of the seam show self-heating over a protracted period, before any possible thermal runaway could take place. Similarly, the higher ash content Chain Valley Rider Seam also shows a protracted delay in self-heating due to its lower intrinsic reactivity.

While the laboratory R70 analysis of the Fassifern seam coal at Chain Valley indicates a medium propensity for spontaneous combustion, propensity to spontaneously combust is only one factor in a complex chain of conditions that can create spontaneous combustion in underground coal mines. There are no known underground spontaneous combustion incidences in the Fassifern seam of neighbouring mines or insitu at Chain Valley Colliery. Accordingly, the risk of spontaneous combustion is considered to be low. Coal stockpiling is kept to a minimum and is managed in such a way as to limit risk of combustion.

The incidence of underground spontaneous combustion is addressed within the site specific Spontaneous Combustion Principal Hazard management plan (PMHMP 00009 - Spontaneous Combustion). Underground controls to mitigate risk of spontaneous combustion include:

- The mine has no known recorded insitu spontaneous combustion events in its 50+ year history at Chain Valley Colliery. A heating was discovered and managed at Mannering Colliery in June 2015.
- Spontaneous combustion is considered at the mine design phase.
- Trigger Action Response Plans have been developed to identify and manage any deviation from normal operating conditions with respect to indicators of spontaneous combustion.
- The mine monitors gases using a multipoint tube bundle gas analysis system.
- The mine conducts regular underground inspections by Mining Officials.

Surface incidence of spontaneous combustion is considered a minimal risk given seam characteristics and limited stockpiling activities undertaken.

There are some combustible materials throughout the site (predominantly within dam embankments) which, while not prone to spontaneous combustion, still pose a combustion risk when exposed to external heat sources such as bushfires.

Following cessation of mining:

- All remaining saleable coal material will be recovered.
- An assessment of combustion risk over surface areas within all domains, specifically focusing on Domain 2 (Coal Stockpile Area) will be undertaken and recommended actions will be implemented.

Bushfire risk is addressed within Section 3.2.18.

3.2.4 Material prone to generating acid mine drainage

The surface facilities areas and surrounds predominantly comprise in-situ materials, i.e not emplaced overburden/interburden. No geochemical issues have been identified, with water monitoring undertaken in accordance with both EPL 191 and EPL 1770 indicating no acid mine drainage at the monitoring points.

Water quality monitoring will continue in accordance with the site Water Management Plans and EPL requirements which will identify any water quality (AMD) issues arising from coal materials or other materials on the Chain Valley and Mannering sites.

3.2.5 Mine Subsidence

Currently, and during the term of this MOP, all secondary extraction is planned to occur beneath Lake Macquarie. For the proposed mining during the term of the MOP the total maximum vertical subsidence is modelled to result in generally <780mm of subsidence. There are no threatened or endangered species or ecological communities impacted by the subsidence and negligible environmental impacts are expected due to mining restrictions (seagrass protection barrier and high water subsidence protection barrier) which eliminate impact to the foreshore or land based areas.

Monitoring in accordance with the approved Extraction Plan for S1 and N1 which includes a Seagrass Management Plan and Benthic Communities Management Plan will be undertaken throughout the term of the MOP. An Extraction Plan was submitted and approved for the S2 and S3 Miniwall panels subsequent workings proposed in this MOP in the Northern Mining Area. An Extraction Plan for S4 is planned to be submitted prior to S4 extraction.

No secondary extraction is proposed within the High Water Mark Subsidence Barrier (HWMSB), a protection zone around the Lake Macquarie foreshore defined by a 35 degree angle of draw from the high water mark to the seam. Additionally, a Seagrass Protection Barrier (SPB) will be maintained to protect the seagrass communities around the perimeter of the lake: a 26.5 degree angle of draw has been used from mapped the seaward edge of seagrass communities to determine the extent of the barrier. This same SPB definition has been applied for the Fassifern seam workings for more than 10 years and to date no subsidence or impact to the seagrass communities has been identified through monitoring. Recent updates to the subsidence models for miniwall extraction within the Fassifern seam have accounted for the increase in measured subsidence above that predicted in the miniwall 1 to 12 area. Taking this and the subsidence development mechanisms into consideration, the mine plan for the Northern Mining Area has increased chain pillars sizes to ensure subsidence remains within currently approved limits.

3.2.6 Erosion and sediment control

Erosion and sediment control is managed within the overall water management system for each pit top in accordance with the respective Water Management Plans as described in Section 3.2.12. The Water Management Plans incorporate an Erosion and Sediment Control Plan.

There are no significant changes, clearing or construction work proposed during the term of the MOP that would create potential erosion and sediment control issues. Water quality monitoring and reporting is undertaken in accordance with Chain Valley and Mannering EPLs and Water Management Plan requirements to ensure water discharges comply with the total suspended solids; limit as defined in the EPLs, currently 50 mg/L.

The detailed mine closure plan will include details on the erosion and sediment controls to be implemented for closure activities and identify structures to remain following mine closure. This will be prepared in accordance with “Blue Book” requirements.

3.2.7 Soil type(s) and suitability

Due to the disturbed nature of the pit top areas there is potential for poorly structured soils or soils with high clay content to be present. Either condition is likely to hamper growth of new plantings by reducing opportunities for root growth and establishment. Where poor conditions are evident and final soil profile allows, unsuitable soil profiles will be supplemented with VENM, growth medium materials or suitable top soil distributed from existing stockpiles onsite.

There is no land clearing proposed during the term of this MOP as all activities are within the disturbed footprint of existing infrastructure areas and do not require land clearing. Subsequently, the MOP does not include procedures for any soil stripping associated with the nominated construction activities.

Due to the age of the sites and soil management practices adopted historically, only limited amounts of previously stripped and stored topsoil are available for the rehabilitation of the pit top areas.

Growth media development is detailed within Section 5.3.3.

3.2.8 Flora

There are no proposed surface disturbance activities outside of the current approved development consent or Project Approval footprints and the key consideration in relation to flora is the establishment and maintenance of vegetation communities in the post mining landform (see Section 5.3)

Whilst threatened flora species are known to occur within the region, none have been recorded on site. It is noted that existing vegetation communities which adjoins the Chain Valley and Mannering infrastructure areas are primarily as follows.

- Mannering pit top - Broad-Leaved Scribbly Gum Open Forest.
- Mannering downcast shaft - Managed exotic grassland.
- Chain Valley pit top - Coastal Open Woodland and managed exotic grassland (within existing high voltage power line easements).
- Chain Valley upcast shaft - Swamp Sclerophyll Forest.

Sunset Energy, as owner of the land, have indicated that the preferred final land use option for the Mannering and Chain Valley infrastructure areas is to provide an additional buffer zone for Vales Point Power Station by the demolition and removal of all infrastructure followed by the establishment of vegetation generally consistent with surrounding bushland.

To further assist with definition of the rehabilitation criteria, the following actions are proposed during the term of this MOP.

- Development of analog sites for specific pit top areas by 31st December 2020 (for both Mannering and Chain Valley Colliery)
- Further definition of completion criteria and performance measures, following development of analog sites, prior to 31st March 2020.

Due to the prior disturbance of the pit top facilities, past conditions have been conducive to the spread of weeds. To control weed populations, weed management is undertaken in accordance with the weed control programs outlined in the Land Management Plan for Mannering and within the Biodiversity Management Plan for Chain Valley. These works are undertaken by suitably qualified contractors who spray weeds or undertake other treatment measures in the correct window periods. The primary focus of weed management activities is the control or elimination of those weeds listed under the Noxious Weeds Act, 1993. Declared noxious plants are those that have a detrimental effect, or cause serious economic loss to agriculture or harm to the environment and have the likelihood of spreading from their present location(s) to other areas.

As identified in the Land Management and Biodiversity Management Plans weed control, has and will continue to focus on:

- Lantana;
- Blackberry;
- Crofton Weed;
- Pampas Grass;
- Bitou Bush;
- Fireweed;
- Bamboo; and
- Scotch Thistle.

Site inductions also specifically identify that no unauthorised clearing is to occur.

3.2.9 Fauna

There are no proposed surface disturbance activities outside of the current approved development footprint and the key consideration in relation to fauna is the establishment and maintenance of vegetation communities in the post mining landform, which is addressed in Section 5.3.

Previous environmental assessments and field surveys have identified the following in the vicinity of the surface facilities areas.

- Through database searches - 28 terrestrial or wetland fauna species listed under the *Environmental Protection and Biodiversity Conservation Act 1999* and/or the *Threatened Species Conservation Act 1995*, comprising:

- *Environmental Protection and Biodiversity Conservation Act 1999*: 14 species (three endangered species and eleven vulnerable species); and

- *Threatened Species Conservation Act 1995*: 17 species (seven endangered species, ten vulnerable species) and one endangered population,

  with 3 species listed under both pieces of legislation.

The likelihood of the listed species occuring in the pit top areas and surrounding areas was assessed on the basis of their distribution patterns, habitat preferences, and past records, with the following species assessed as having a moderate to high potential to occur in or around the surface facilities areas.

- Amphibians
  Crinia tinnula, Wallum Froglet

- Birds
  Anthochaera phrygia, Regent Honeyeater
  Calyptorhynchus lathami, Glossy Black-cockatoo
  Lathamus discolour, Swift Parrot
  Ninox connivens, Barking Owl
  Ninox strenua, Powerful Owl
  Pandion haliaetus, Osprey
  Tyto novaehollandiae, Masked Owl
  Tyto tenebricosa, Sooty Owl

- Mammals
  Falsistrellus tasmaniensis, Eastern False Pipistrelle
  Miniopterus australis, Little Bentwing-bat
  Miniopterus schreibersii oceanensis, Eastern Bentwing-bat
  Mormopterus norfolkensis, Eastern Freetail-bat
  Petaurus norfolcensis, Squirrel Glider

Pteropus poliocephalus, Greyheaded Flying-fox

All of the above listed species could potentially visit or use the pit top areas due primarily to the range of vegetation communities within and contiguous with the pit top area, including the Lake Macquarie State Conservation Area, and the high mobility of most species listed. Field surveys in 1997 and 2012 have identified the Squirrel Glider (*Petaurus norfolcensis*), Grey-headed Flying Fox (*Pteropus poliocephalus*) and the Osprey (*Pandion haliaetus*) within or adjacent to the surface facilities sites.

During biodiversity surveys and environmental walkover inspections presence of pest animals is noted and management controls are implemented if required.

No clearing activities that would impact threatened fauna are currently proposed during the term of the MOP.

3.2.10 Slopes and slope management

With the exception of constructed dams, the areas within the domains identified within this MOP comprise stable terraces with intervening shallow slopes or retaining walls formed during the site establishment works undertaken in the 1960s and subsequently, with reshaping through the use of localised cut and fill to occur during the shaping of the final landform.

More extensive cut and fill may be required in the vicinity of those dams at both the Chain Valley and Mannering pit tops which are not to be retained in the final landform.

3.2.11 Air quality

Management of air quality is undertaken in accordance with both the Mannering and Chain Valley Air Quality Management Plans, which are implemented to comply with the requirements of MP06_0311 and SSD-5465 respectively, with both depositional dust and real-time particulate monitoring undertaken. Control measures implemented to minimise the potential for dust generation include:

- Induction and training in responsible procedures for environmental protection;
- Vacuum sweeping of roads and paved surfaces;
- Enclosure of numerous conveyor systems and transfer points;
- Use of a water cart;
- Water sprays at various points along the conveyor systems;
- Limiting speeds of vehicles, plant and equipment; and
- Use of tarps/covers for all coal haulage vehicles, whether hauling on public or private roads

Air quality limits are prescribed within the Project Approval and Development Consent, with historic monitoring indicating that levels of dust generation are well below the prescribed limits. Air quality results are obtained monthly and provided within monthly environmental reports which are made available on the Chain Valley and Mannering websites. Annual results are also provided in the Annual Reviews, which are also made publically available on the websites.

Delta Coal will continue to employ the management strategies and mitigation measures that are currently in place to minimise air quality emissions and to monitor air quality in accordance with the approved management plans.

3.2.12 Water Management (Surface and Ground water)

Due to the separate locations of the two pit top areas, water management details vary significantly between the sites, and accordingly and are presented as two discrete subsections below. Section 3.2.11.1 covers the Mannering pit top while Section 3.2.11.2 covers the Chain Valley pit top.

3.2.12.1 Mannering Water Management

Sources of water at Mannering include potable water supply by Central Coast Council, rainfall runoff from the surface facilities and groundwater inflow to the underground mine workings. Generally, the primary water demands at Mannering are for underground operations, dust suppression, machinery wash-down, fire-fighting storage and staff amenities. No coal washing is undertaken at Mannering.

The initial objective of the Mannering water management system is the separation of clean and dirty water, with surface water management based on the following key water management strategies:

- Diversion of clean surface water runoff away from areas disturbed by surface infrastructure;
- Collection of surface water runoff from disturbed areas in catch drains and its direction to sediment traps and settlement ponds for detention and settlement of suspended particles prior to discharge off-site; and
- Collection of runoff from industrial areas in catch drains and direction to the settlement ponds for control of suspended sediment prior to discharge off-site.

The key features of Mannering Colliery's surface water management system are:

- Settlement Pond A, with a storage capacity of 5.4 megalitres; and
- Settlement Pond B system (comprising Ponds 1, 2 and 3 and Pond B), with a combined capacity of 7.52 megalitres.

Mannering's EPL 191, which includes both volumetric and concentration limits, permits the discharge of water from the site via a licensed discharge point, LDP1 (overflow from Pond B) into an unnamed creek and subsequently Lake Macquarie. LDP1 is licensed to discharge a maximum of 4,000 kilolitres per day. Given that Plan 1D identifies the built features associated with both the Mannering and Chain Valley pit tops, Mannering licenced discharge point LDP1 is shown of Plan 1D with the prefix MC.

All mine water and runoff from the south and east of the surface facilities, with the exception of runoff from the car park area, is directed via drive-in sediment sumps to the Settlement Pond B system. This system comprises four in-series sediment control ponds, being Ponds 1, 2 and 3 and Pond B, and facilitates sediment detention and settlement. The water that passes through this system is discharged off-site via LDP1.

The sediment control dams are proactively kept at low levels to maximise available storage capacity prior to rainfall events, i.e. enable detention and storage of rainfall runoff until it is of a suitable quality to be discharged. Once of a satisfactory quality, a valve is opened on Pond B to release water offsite via LDP1 and then closed to provide storage for the next rainfall event.

Delta Coal undertakes water quality monitoring at LDP1 and a location downstream of LDP1. Monitoring is undertaken in accordance with EPL requirements and currently includes daily analysis of conductivity, oil and grease, total suspended solids and pH during any discharge, with additional monthly monitoring of a broad range of parameters undertaken. Results are reported publically on the Mannering website on a monthly basis with more details and trends provided on an annual basis in the Annual Review, which is also made available on the website.

With the exception of water entering the linkage between Chain Valley and Mannering Collieries which is directed to and managed through the Chain Valley water management system, water released from the coal seams and surrounding strata collects in the Mannering underground workings which, combined with any additional run off from water used in the mining process, is pumped from the workings to the surface The mine water collects water at low points in the workings and passes through an extensive goaf system that allows filtration and settlement prior to pumping to the surface, where real time monitoring for turbidity is undertaken prior to the water being directly pumped to LDP1. If the real time monitoring determines that the water quality is unsuitable for discharge (a turbidity reading of above 40 NTU) then it causes the underground pump to shut down.

3.2.12.2 Chain Valley Water Management

Sources of water at Chain Valley include potable water supply by Central Coast Council, rainfall runoff from the surface facilities and groundwater inflow to the underground mine workings. The primary water demand at Chain Valley is for underground operations, dust suppression, machinery wash-down and amenities. No coal washing is undertaken at Chain Valley.

The most significant input to the Chain Valley water management system is the groundwater pumped from the mine workings, which currently averages around 7ML/day. However, dewatering is expected to reach 10.5ML/day with the full development of the mine as currently approved. Delta Coal holds licence 20BL173107 under the Water Act 1912 for the purpose of mine dewatering up to 4443 ML annually.

The underground mine water originating from the Wallarah, Great Northern and Fassifern Seams and adjacent strata migrates naturally into the underground mine water management network and is pumped to a central underground sump area before being pumped to a purpose UG storage dam. It is then pumped to the surface and mixed with bathhouse wastewater and storm water runoff in the dams to the east of the pit top area, as shown on **Plan 1D**.

The dams act as a series of settling and diffusing ponds prior to the water discharging into an un-named waterway which leads to Lake Macquarie.

Chain Valley Colliery's EPL 1770 permits the discharge of up to 12,161 kilolitres of water per day (85.127 megalitres per week). The water monitoring required under the licence is undertaken on a monthly basis from the monitoring point designated by the licence and shown on **Plan 1D.**

In order to minimise the volume of clean water affected by the Colliery and subsequently reduce the volume of dirty water that requires management, clean run-on water is diverted where possible into clean water drainage lines to be directed off-site. This not only reduces the potential for erosion to occur on disturbed areas, but also reduces the pressure on the dirty and mine water management controls which are required to treat sediment-laden runoff to an acceptable standard prior to discharge.

All surface water runoff potentially containing sediment; septic treated bathhouse wastewater; treated water from the oil water separator and underground mine water is captured by the site sediment control dams prior to discharge under EPL 1770. These dams have been constructed with a mixture of earth, crushed rock, crushed recycled brick and stone and are interconnected through a series of overflow pipes and spillways. The ponds ultimately discharge via an erosion protected discharge point into native vegetation and flow to an unnamed tributary prior to draining into Lake Macquarie on the western shoreline of Chain Valley Bay.

As shown on **Plan 1D**, water is directed through the treatment ponds from a number of main inlet locations. Runoff from the stockpile area is collected primarily by dams D1, D2 and D6 and is combined in D4 and D5 which then discharges into D9. Runoff from the storage yard is directed to D11, D12 and D13 before overflowing into D9. The underground mine water is essentially salt water and results from the infiltration of ground water into the mines workings. This water is pumped to a pit adjacent the compressor house where it combines with the septic treated wastewater from the bathhouse, the treated compressor condensate water and runoff from the ROM bin area. From this pit the water is piped to D8 for settling and diffusion. Water within D8 spills into D7 via a spillway at the southern end of the pond. However, due to the construction materials used, an unknown amount of water also diffuses through the dam wall. The water in D7 flows into D9 in a similar manner. In D9 the underground water is combined with the runoff from other

areas on site. The primary spillway from D9 to D10 is at the northern end of D9. Once in D10, the water travels over a shallow buffer spillway to the main discharge spillway and offsite.

Table 3.3 lists the water storages and sediment dams which form part of the site water management system, together with their capacities as determined by detailed survey undertaken by Pearson and Associates Pty. Ltd in 2009.

Table 3.3: Chain Valley Water Storage Volumes

Dam ID	Storage Capacity (KL)
D1	80.3
D2	50.5
D3	284.1
D4	547.4
D5	770
D6	Unknown
D7	3855.6
D8	2933.3
D9	3796.4
D10	4801.5
D11	296.8
D12	229.1
D13	168.4

In 2015, the spillway at Chain Valley's Licenced Discharge Point was upgraded and now has the capacity to pass the equivalent of a 1:100 year ARI rainfall event.

The ponds provide improvement to the site wastewater and runoff quality through the settlement of fines and suspended solids and prevention of off-site discharge of potential hydrocarbon spills to Lake Macquarie. Based on the volume of the ponds and the average daily discharge, the estimated residence time of the water in the control ponds is currently 1 – 2 days.

Historically theses control ponds have been effective at controlling the water quality to meet to the conditions of the EPL with water quality monitoring undertaken to ensure that an exceedance of any relevant limit is detected and appropriate actions taken to prevent a reoccurrence. Drains and dams that accumulate sediment are scheduled for quarterly cleaning as part of the Colliery's work order system, which ensures adequate storage levels within the dams and the functionality of the drains are maintained.

3.2.13 Contaminated land and Hydrocarbon management

Management of potential land contamination is afforded by the following controls.

- Bunding around the main hydrocarbon storage tank
- Storage of hydrocarbons within bunded areas
- A designated covered and bunded area for the draining and disposal of oil drums
- The use of a washdown sumps and oil separator systems
- Availability of hydrocarbon absorbent material and emergency spill kits
- Weekly inspection of spill kits by Waste contractor
- Training and awareness

A Phase 1 Environmental Site Assessment (ESA) has been completed for the Mannering pit top area which identified areas of potential contamination based on desktop review. While a Phase 1 ESA has not yet been undertaken for the Chain Valley pit top area, given the similarity of the operations, it is likely these findings would be similar.

Phase 2 investigations and assessments are not planned to be carried out until the decommissioning stage at end of mine life. Potential areas of investigation would be those where hydrocarbons and other chemicals are stored and used, such as areas surrounding the diesel storages and the surface workshops. The development of a Remedial Action Plan following the Phase 2 assessment would occur, if required, based on the results from the site assessment.

Any contaminants identified that exceed Australian Standards for the final land use option will be remediated on site or disposed of in an appropriate and safe manner as identified in the remedial action plan that would be developed, if required, following the determination of the extent and quantity of contaminated material needing remediation.

Bulk hydrocarbon materials are stored within dedicated storage areas, with emergency spill stations located nearby.

Training in spill response is provided as part of the induction programs for both Mannering and Chain Valley, prerequisites before undertaking any work at the respective areas. Pollution Incident Response instructions are currently contained in the site Emergency Management Plan to respond to pollution incidents.

3.2.14 Hazardous materials

A hazardous chemicals and dangerous goods register is maintained on- site to assist in management of risks to health and the environment. This register utilises an online chemicals database ‘ChemAlert’ which provides for ease of access to detailed information pertaining to hazardous chemicals and dangerous goods used on-site.

Safety data sheets (SDSs) are indexed on site and kept in the First Aid Room. It is a condition of entry, as specified during the induction process, that no chemicals or hazardous materials are allowed on site unless previously approved and accompanied by an SDS.

Small amounts of explosives will be used underground during the term of this MOP. Storage and use of explosives will be undertaken in accordance with the NSW Explosives Act, 2003, Explosives Regulation, 2013 and Australian standard AS 2187 – Explosives: storage, transport and use. A purpose built explosives

storage shed exists on the surface at the Mannering pit top (as shown on **Plan 1D**). Explosives are preferentially stored underground. No explosives are to remain at premises following closure.

A COALSCAN 2100 ash analyser, a fixed radiation gauge which contains one Am241 source of 3.7GBq and one Cs137 source of 0.185GBq activity, is present at the Mannering pit top. Delta Coal holds a Radiation Management Licence under the Radiation Control Act, 1990 (licence number 5092392) which is renewed annually, with the current licence being valid until the 11th April 2020.

A hazardous materials audit of the Mannering pit top was undertaken in 2012 which identified asbestos present in most of the buildings, as would be expected due to the age of the Colliery. A register of these hazardous materials was also created at the same time, and is available within the report completed by URS titled “Hazardous Materials Survey and Register – Mannering Colliery” (dated October 2012). Similar reports and findings were also prepared for the Chain Valley pit top in 2007 and later re-inspected and updated reports and registers developed in 2012 by AECOM. An Asbestos Management Standard (EMP-D-16025) and Asbestos Register (REG-D16351) are in place to manage the asbestos risks during mining operations. Asbestos risks associated with mine closure will need to be considered following the determination of exactly which, if any, buildings and infrastructure are to remain. Appropriate disposal of asbestos material will be required and clearance certificates obtained from licenced asbestos demolition contractors. All work will be undertaken to conform to Work Cover NSW Guidelines and approval requirements.

3.2.15 Greenhouse gases and ventilation management

The Chain Valley workings are principally ventilated with two main mine ventilation fans located at Summerland Point. The Mannering workings are ventilated by two main mine ventilation fans located at the Mannering pit top area.

Ventilation management for Chain Valley and Mannering is managed through Segregation Ventilation Control Devices, allowing air to ventilate the Link Road between Chain Valley and Mannering. The ventilation control devices have the ability to handle pressure changes from either direction. Should there be a failure of either Chain Valley or Mannering’s main mine ventilation fans, an automated segregation door has been installed with the ability to segregate the mines into two separate ventilation systems. Gas concentration and ventilation (pressure and flow) monitoring will be undertaken within the underground linkage roadways.

Seam gas is predominantly methane and, at both operations, is principally managed through the mine ventilation arrangements which enable methane levels to be maintained at appropriate levels. This is achievable because of the gas reservoir characteristics (predominantly low virgin content) of the Fassifern Seam and other proximate coal seams, in the mining area. No pre- or post-gas drainage is utilized at either mine.

The main sources of greenhouse have been identified as mine ventilation air (methane, carbon dioxide and carbon monoxide), on-site electricity consumption and diesel consumption.

CH_4 and CO_2 emissions from the mines, and emissions from electricity and diesel use are reported as CO_2 equivalents. Monitoring of all necessary parameters to calculate mine ventilation air emissions is undertaken throughout the year, primarily by automated monitoring and data recording systems and from information collected by the Ventilation Officer.

Monitoring and subsequent reporting is undertaken in accordance with the National Greenhouse and Energy Reporting Act, 2007, National Greenhouse and Energy Reporting Regulations, 2008, and the National Greenhouse and Energy Reporting (Measurement) Determination, 2008.

3.2.16 Noise

Both Mannering's Project Approval and Chain Valley's Development Consent have prescribed noise limits at specific receiver locations, with each having a specific Noise Management Plan in place to ensure compliance with prescribed noise limits is achieved.

Noise control at the Mannering pit top facilities is largely managed by:

- the limited amount of surface activities;
- a noise attenuated rotary breaker discharge shute
- directly transferring coal to Vales Point Power Station and minimizing coal stockpiling where practicable
- enclosed transfer points
- noise attenuation on the unenclosed section of the coal transfer house by means of a conveyor curtain to surround the structure;
- the use of noise curtains where possible to dampen impact noise
- use of conveyors to transport all coal from the pit top site; and
- undertaking the primary crushing of coal underground.

Some of the noise management controls in place for the Chain Valley pit top area and ventilation compound include:

- acoustic modifications and attenuation of the main fans;
- coal haulage being undertaken by road registered trucks;
- undertaking primary crushing and sizing of coal underground;
- limiting coal haulage activities on public roads to departures between 5:30am and 5:30pm Monday to Friday and not at all on weekends and public holidays;
- limiting, or not undertaking, coal haulage on private roads at night time periods (10pm – 5:30am) when inversions are more prevalent, i.e. not hauling during these periods during winter months and undertaking restricted haulage movements in spring and autumn months.
- preferential direct loading from the coal bin to avoid stockpiling and rehandling where possible; and
- use of a real time noise monitor, with assessment and response to any noise alarms.

Attended noise monitoring is also undertaken to ensure compliance with existing noise criteria as established by the Project Approval and Development Consent. Currently, monitoring is undertaken monthly in accordance with the approved Noise Monitoring Program for Mannering and quarterly under the approved Noise Management Plan for Chain Valley.

Delta Coal will continue to employ the management strategies and mitigation measures that are currently in place to minimise noise emissions. Quarterly noise monitoring in accordance with the approved plans and reporting results on a quarterly basis on the websites and on an annual basis within each Annual Review will also be continued.

3.2.17 Visual and lighting

Generally the pit top areas and Chain Valley ventilation shaft are well screened by surrounding vegetation which help prevent any stray lighting leaving the site. The Chain Valley and Mannering pit top facilities have also been part of the local environment for nearly 60 and there is no new infrastructure proposed at either that would create a significant visual impact.

Any lighting changes that are made will be completed in accordance with *Australian Standard AS4282 (INT) 1995 – Control of Obtrusive Effects of Outdoor Lighting*.

A lighting audit was undertaken at the Chain Valley and Mannering pit top areas in 2016 to determine visual impacts. The results of illumination readings from locations within the site indicated very low level readings that complied with AS4282:1995.

3.2.18 Heritage (Aboriginal and European)

Aboriginal heritage site survey work for the both the Chain Valley and Mannering pit top areas, as well as proposed mining areas has been undertaken during 2012 and 2013, with registered Aboriginal stakeholder groups invited to attend and participate.

The location of known Aboriginal sites (AHIMS sites) within Chain Valley Colliery Lease Holding, are shown on **Plan 1C**.The risk of impacting on Aboriginal heritage sites is minimal as:

- The areas of the existing Mannering and Chain Valley surface facilities have been heavily disturbed in the past and, in the case of Chain Valley, fencing has been installed around the only identified site. There are no known heritage sites present in or around the Mannering pit top area;
- The site induction details the importance and significance of the Aboriginal heritage and that no clearing is permitted without a permit;
- All monitoring of Aboriginal heritage sites, including those overlying areas of underground workings, is undertaken in accordance with an approved Heritage Management Plan, which has been developed in consultation with Aboriginal groups;
- There are no proposed surface disturbance activities outside of the current approved development footprints; and
- There are no heritage sites within the areas where underground workings are proposed within the term of this MOP.

As identified within the Heritage Management Plans there is only a single Aboriginal heritage site located within the Chain Valley surface facilities site, which is adjacent to the sediment dams. It is not anticipated that this site would be impacted during operation or closure activities.

Searches over the pit top facilities and within the local area, including proposed mining areas, for items of non-indigenous cultural heritage have also been undertaken. While a number of items were identified within the lease holding, none of these items are present over areas where the surface facilities exist, and accordingly would not be impacted by the future decommissioning activities. The closest listed items were the “Bulk Store Building” at 464 Ruttleys Road and the “Wyee Coal Conveyor to Vales Point”.

Due to the age and type of construction of the surface infrastructure facilities, no buildings represent significant heritage value. Consequently, the provisions of the NSW Heritage Act do not apply.

Aboriginal heritage will continue to be managed in accordance with the approved Heritage Management Plans. The Heritage Management Plans applicable to the pit top areas detail procedures, resources, responsibilities and reporting requirements in the event that a heritage item is encountered. These management plans would be applied during decommissioning and demolition of the site.

3.2.19 Bushfire

The pit top areas are surrounded by vegetation mapped by the former Wyong Shire Council as bushfire prone (including Category 1 and Category 2 as well as buffer vegetation).

In October 2013 an intense bushfire swept through the area including the north-eastern boundary of the Mannering pit top site and adjacent to the Chain Valley ventilation fans. As a result of the bushfire, consultation with the Rural Fire Service (RFS) was conducted to identify any previously unforeseen bushfire

hazards and controls to mitigate those hazards to as low as reasonably practicable, whilst at the same time reviewing existing bushfire hazard controls. Actions taken following the fire included a:

- Fire Safety Walk conducted on 14th November 2013 with RFS Fire Mitigation Officer, RFS Inspector / Deputy Fire Control Officer, LakeCoal Fire Officer and LDO Group HSEC Manager;
- Review of Fire Management Risk Assessment (D-16949) conducted on 19th November 2013 with Statutory Officials and Workers; and
- Identification and prioritisation of actions arising from the Fire Management Risk Assessment by risk ranking.

Delta Coal has, and will continue to, implement appropriate controls to assist in the management of bushfires that may impact the mining operations, including:

- Defendable Space - A buffer or Asset Protection Zone (APZ) is provided between areas of vegetation and the main offices, workshops and infrastructure at the pit top and, currently, in areas around the perimeter of ventilation facility. Within the pit top, the APZ is landscaped to minimise fuel loads and reduce potential radiant heat levels, flame, ember and smoke attack to the buildings. The size of the protection zones will take into consideration matters such as the type of vegetation, slope of the land, fuel load source and criticality of the asset to the operation. The APZ areas will be maintained and inspected prior to the start of the fire season (1st October to 31st March). In the event additional bush fire hazard reductions works are proposed, they will be undertaken only after obtaining the requisite Bushfire Hazard Reduction Certificate from the NSW Rural Fire Service. Regular training of mine firefighting crews is also undertaken.
- Access - Fire trails and access roads provide an important line of defence for fighting bushfires. An extensive array of fire trails and tracks are located around the pit top area to provide access for emergency services in case of a bush fire. These also provide access to easements throughout the area which are maintained by TransGrid to provide vertical clearance and buffers for high-voltage transmission lines. Though there is an existing road access to the ventilation facility and some fire trails, the November 2013 risk assessment and review of the October fires incident identified a risk due to access and an inadequate turnaround for fire tankers at the facility. Fire trails will be inspected annually prior to the start of the high fire season by the RFS.
- Water Supply - Existing fire management infrastructure surrounds the pit top areas, with water tanks and a distribution system (100 millimetre diameter water reticulation line). Fire hydrants, fire reels and depots are also placed in strategic positions to enable rapid response to fires on site. Though no reticulated water is available at the ventilation facility, its proximity to Lake Macquarie provides an emergency source of water if required. A water cart, equipped with sprays is also operated on a full time basis on site which could be utilised as an asset for fighting bushfires should it be required.

Following the cessation of mining Delta Coal will consider maintenance of applicable controls during rehabilitation establishment (e.g. maintain APZs or other controls until rehabilitation vegetation is adequately established).

3.2.20 Site security and unauthorised access

Public safety is primarily a concern around the surface facilities at the pit top areas, ventilation shaft site and downcast shaft site.

The safety of the public around the ventilation shaft site and downcast shaft site is generally afforded by:

- restricting access;
- the presence of a security fence and signage around the perimeter of the compounds, with locked access gates; and
- security monitoring.

In relation to the pit top areas, there is only one (sealed) access road into each of the areas, with both accesses having a set of lockable gates present which can be closed should the need arise to stop access to the site. These gates may be closed and locked at times of no expected traffic, such as during the night time period, but would otherwise remain open for deliveries, employee and authorised visitor access. Site security also incorporates external fencing, sign posting, lighting, back to base monitoring, regular patrols and static guards as required.

Public access will be monitored and managed during the operation of the mine through the standard incident reporting process which would include reporting of unauthorised access.

A visitor login system on-site ensures that all employees, contractors and authorised visiting members of the public are able to be accounted for when on-site.

3.2.21 Waste (General)

Waste streams are managed in accordance with the relevant site waste management plans

The management of the waste is undertaken through the implementation of a total waste management system, which currently includes the following waste streams:

- General waste;
- Recyclables;
- Scrap steel;
- Oily rags;
- Waste rock
- Air/oil filters;
- Batteries;
- Waste oil; and
- Timber.

The total waste management system also involves weekly site inspections by the waste management contractor to facilitate effective waste management and continual improvement, along with monthly reporting of waste management processes.

Sewage generated by on-site amenities at the Mannering pit top is pumped directly to Mannering Park Waste Water Treatment Works via a dedicated pipeline under a Trade Waste Agreement with the former Wyong Shire Council. Sewage generated at the Chain Valley pit top is currently managed through septic systems and an aerated wastewater management system. However, Delta Coal is currently in the process of obtaining approval to construct a new sewer line t-o the wastewater treatment plant.

Additional details of waste management activities to occur within the term of this MOP are described in **Table 3.4**.

Table 3.4: Waste management activities

Waste Type	Waste management activities
General Waste	All general wastes(including putrescible wastes) and routine maintenance consumables from the daily servicing of equipment are collected on a regular basis by an appropriately licensed contractor for off-site disposal within a waste facility approved to accept such waste. Recyclable material is also collected by a licensed contractor for recycling on an irregular (as needs) basis. Collections of general waste and recyclables are coordinated by the waste management contractors, who also undertake weekly waste inspections at the site.

Waste Type	Waste management activities
Waste Oil and Grease	The generation of waste oils and grease is limited to maintenance of plant and equipment. Waste oils and greases are generally stored at the workshop area, along with parts and packaging (for example, cartridges, filters and waste oil drums), which are collected by a licensed waste contractor on a regular basis for recycling and/or off-site disposal. Oily water is contained within drive-in-sumps and treated by oil-water separators located on the mine surface. Licensed contractors regularly service and maintain the separators and remove all waste hydrocarbons from the site for recycling.
Recyclables	Recyclables are collected in colour coded front-lift bins, 240L MGBs and smaller office bins. The smaller bins are emptied into the front-lift bins which are inspected weekly and serviced as required.
Scrap Steel	Scrap steel bins are provided in the storage yard area, which enable them to be filled with scrap steel during the on-site waste sorting process.
Waste Rock	Waste rock is managed onsite or disposed offsite to a general licenced waste management facility.
Oily rags and oil filters	Oily rags and oil filters are collected in 240L MGBs which are placed in locations that typically generate these waste streams, such as the workshop and service bay. These bins are inspected weekly and serviced as required.
Batteries	Waste batteries are collected either in a colour coded 120L MGB (for smaller batteries such as cap lamp batteries) or stored on a pallet (in the case of large batteries) prior to collection. As with other waste streams, the waste management contractor monitors levels of waste batteries and arranges collection as required.
Timber	A large timber skip is used to ensure segregation of timber from the general waste stream. Timber waste sources typically comprise packaging, broken pallets and disused timber products typically used for temporary underground roof support. The timber bin is monitored weekly and collection undertaken as required.

4 Post Mining Land Use

4.1 Regulatory Requirements

The current consents, authorisations and licences relevant are described in Section 1.3. The conditions and commitments made in relation post mining land use are listed in **Table 4.1**.

Table 4.1: Conditions and Commitments relating to post mining land use

Source	Commitment/Condition
Condition 7 of CCL 721	*Disturbed land must be rehabilitated to a sustainable/agreed end land use to the satisfaction of the Director- General*
Condition 25 of CCL 719	*Upon completion of operations on the surface of the subject area or upon the expiry or sooner determination of this lease or any renewal thereof, the registered holder shall remove from such surface such buildings, machinery, plant, equipment, constructions and works as may be directed by the Minister and such surface shall be rehabilitated and left in a clean, tidy and safe condition to the satisfaction of the Minister.*
Condition 26 of CCL 719	*Subject to any specific condition of this lease providing for rehabilitation of any particular part of the subject area affected by mining or activities associated therewith, the registered holder shall;-* *a) reinstate, level, regrass, reforest and contour to the satisfaction of the Minister, any part of the subject area that may, in the opinion of the Minister, have been damaged or deleteriously affected by mining operations and to ensure such areas are permanently stabilised; and* *b) fill in, seal or fence, to the satisfaction of the Minister, any excavation within the subject area.*
Condition 21 of CCL 722	*If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister any lands within the subject area which may have been disturbed by the lease holder.*
Condition 22 of CCL 722	*Upon completion of operations on the surface of the subject area or upon the expiry or sooner determination of this authority or any renewal thereof, the lease holder shall remove from such surface such buildings, machinery, plant, equipment, constructions and works as may be directed by the Minister and such surface shall be rehabilitated and left in a clean, tidy and safe condition to the satisfaction of the Minister.*
Condition 23 of CCL 721	*If so directed by the Minister the lease holder shall rehabilitate to the satisfaction of the Minister and within such time as may be allowed by the Minister any lands within the subject area which may have been disturbed by mining or prospecting operations whether such operations were or were not carried out by the lease holder.*
Schedule 2, Condition 10 of Project Approval MP 06_0311	*The Proponent must ensure that all demolition work is carried out in accordance with Australian Standard AS 2601-2001: The Demolition of Structures, or its latest version.*
Schedule 3, Condition 13 of Project Approval MP 06_0311	*The Proponent must rehabilitate the site to the satisfaction of the Secretary and DRE. Rehabilitation must be substantially consistent with the Rehabilitation Objectives described in the EA, the statement of Commitments and the following objectives in Table 2 below.*

<table>
<tr><th>Source</th><th>Commitment/Condition</th></tr>
<tr><td></td><td>Table 2: Rehabilitation Objectives
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Mine site (as a whole of disturbed land and water)</td><td>Safe, stable and non-polluting, for the purpose of the intended post-mining land use(s).</td></tr>
<tr><td>Rehabilitation materials</td><td>Material (including topsoils, substrates and seeds of the disturbed area) are recovered, appropriately managed and used effectively as resources in the rehabilitation.</td></tr>
<tr><td>Surface Infrastructure</td><td>To be decommissioned and removed, unless the DRE agrees otherwise.</td></tr>
<tr><td>Portals and ventilation shafts</td><td>To be decommissioned and made safe and stable.</td></tr>
<tr><td>Other land affected by the development</td><td>Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of:
Local native plant species (unless the DRE agrees otherwise); and
A landform consistent with the surrounding environment.</td></tr>
<tr><td>Built features damaged by mining operations</td><td>Repair to pre-mining condition or equivalent unless:
The owners agrees otherwise; or
The damage is fully restored, repaired or compensated under the Mine Subsidence Compensation Act 1961.</td></tr>
<tr><td>Community</td><td>Ensure public safety.</td></tr>
</table></td></tr>
<tr><td>Schedule 3, Condition 13A of Project Approval MP 06_0311</td><td>The Proponent must carry out all the surface disturbance activities in a manner that, as far as practicable, minimises potential for dust emissions and must carry out rehabilitation of disturbed areas progressively, as soon as reasonably practicable, to the satisfaction of the Secretary and DRE.</td></tr>
<tr><td>Schedule 3, Condition 15 of Project Approval MP 06_0311</td><td>The Proponent must prepare and implement a Rehabilitation Plan for the site to the satisfaction of the DRE. This plan must:

(a) be submitted within 3 months of approval of Mod 2 for approval by DRE prior to carrying out any disturbing activities of the development, unless otherwise agreed by the Secretary;

(b) be prepared in accordance with DRE guidelines and in consultation with the Department, OEH, EPA, DPI Water, affected councils, and the mine's CCC.

(c) incorporate and be consistent with the rehabilitation objectives in the EA, Statement of Commitments and Table 2 above;

(d) integrate and build on, to the maximum extent practicable, the other management plans required under this approval; and

(e) address all aspects of mine closure and rehabilitation, including post-mining land use domains rehabilitation objectives, completion criteria and rehabilitation monitoring and management.

The Proponent must implement the approved management plan as approved</td></tr>
</table>

<table>
<tr><th>Source</th><th>Commitment/Condition</th></tr>
<tr><td></td><td>from time to time by the Secretary.

Note: The approved Mining Operations Plan (which will become the REMP once the Mining Act Amendments have commenced) required as a condition of the Mining Lease(s) issued in relation to this project, will satisfy the requirements of this condition for a Rehabilitation Plan.</td></tr>
<tr><td>Schedule 3, Condition 25 of SSD-5465</td><td>The Proponent shall rehabilitate the site to the satisfaction of the DRE. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EIS, and comply with the objectives in Table 7.

Table 7: Rehabilitation Objectives
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Mine site (as a whole)</td><td>• Safe, stable and non-polluting.
• Final land use compatible with surrounding land uses.</td></tr>
<tr><td>Rehabilitation materials</td><td>• Material (including topsoils, substrates and seeds of the disturbed area) are recovered, appropriately managed and used effectively as resources in the rehabilitation.</td></tr>
<tr><td>Surface Infrastructure</td><td>• To be decommissioned and removed, unless DRE agrees otherwise.</td></tr>
<tr><td>Portals and ventilation shafts</td><td>• To be decommissioned and made safe and stable.
• Retain habitat for threatened species (eg bats), where practicable.</td></tr>
<tr><td>Other land affected by the development</td><td>• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of:
- local native plant species (unless the DRE agrees otherwise); and
- a landform consistent with the surrounding environment.</td></tr>
<tr><td>Built features damaged by mining operations</td><td>• Repair to pre-mining condition or equivalent unless:
- the owners agrees otherwise; or
- the damage is fully restored, repaired or compensated under the Mine Subsidence Compensation Act 1961.</td></tr>
<tr><td>Community</td><td>• Ensure public safety.
• Minimise the adverse socio-economic effects associated with mine closure.</td></tr>
</table></td></tr>
<tr><td>Schedule 3, Condition 26 of SSD-5465</td><td>The Applicant shall carry out the rehabilitation of the site progressively, that is, as soon as reasonably practicable following disturbance to the satisfaction of the Secretary and DRE.</td></tr>
<tr><td>Schedule 3, Condition 27 of SSD-5465</td><td>The Applicant shall prepare a Rehabilitation Management Plan for the development, in consultation with OEH, DPI Water, WSC, LMCC, and the CCC, and to the satisfaction of the DRE. This plan must:

(a) Be submitted to the Secretary and the DRE for approval within 12 months of the date of approval of this development consent;
(b) be prepared in accordance with any relevant DRE guidelines and</td></tr>
</table>

Source	Commitment/Condition
	be consistent with the rehabilitation objectives in the EIS and in Table 7; *(c) describe how the performance of the rehabilitation would be monitored and assessed against the objectives in Table 7* *(d) Describe the process whereby additional measures would be identified and implemented to ensure the rehabilitation objectives are achieved;* *(e) Provide for detailed mine closure planning, including measures to minimise socio-economic effects due to mine closure, to be conducted prior to the site being placed on care and maintenance; and* *(f) Be integrated with the other management plans required under this consent.* *The applicant shall implement the approved management plan as approved from time to time by the Secretary.* *Note: The Rehabilitation Plan should address all land impacted by the development whether prior to, or following, the date of this consent.*
Condition 7 of ML 1051, Condition 7 of ML 1052, Condition 7 of MPL 1349, Condition 7 of MPL 337, Condition 7 of MPL 1389, Condition 7 of MPL 1400, Condition 7 of ML 1632, Condition 7 of ML 1370	*Disturbed land must be rehabilitated to a sustainable/agreed end land use to the satisfaction of the Director-General.*
Condition 13 of CCL 706, Condition 13 of CCL 707	*(a) Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director-General and in accordance with the Mining Operations Plan so that:-* • *there is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion.* • *the state of the land is compatible with the surrounding land and land use requirements.* • *the landforms, soils, hydrology and flora require no greater maintenance than that in the surrounding land.* • *in cases where revegetation is required and native vegetation has been removed or damaged, the original species must be re-established and close reference to the flora survey included in the Mining Operations Plan. If the original vegetation was not native, any re-established vegetation must be appropriate to the area and at an acceptable density.* • *the land does not pose a threat to public safety.* *(b) Any topsoil that is removed must be stored and maintained in a manner acceptable to the Director-General.*
SOC's of Project Approval MP 06_0311	*The Mining Operations Plan will be amended to reflect the proposed modification and will include integrated rehabilitation and environmental management.*
SOC's of SSD-5465	*Rehabilitation will be undertaken in accordance with the Colliery's RMP and the MOP in force at the time. Detailed management and monitoring proposals for final rehabilitation will be included within a Mine Closure Plan to be prepared at least two years prior to the cessation of mining activities.*

Further detail on the rehabilitation and final land use commitments made within the relevant Environmental Assessment and Environmental Impact Statements is contained within Section 4.2.

4.2 Post Mining Land Use Goal

The post mining land uses for the Mannering and Chain Valley Colliery pit top facilities and ancilliary infrastructure sites are identified in the *Mannering Colliery Continuation of Mining Environmental Assessment* (Hansen Bailey 2007) and the *Chain Valley Colliery – Mining Extension Project Environmental Impact Statement* (EMM 2013) respectively. Although both post mining land uses are largely consistent, they are differentiated below for clarity.

The principal post mining land use goal for the Mannering pit top area is to return the land to vegetated buffer zone for the Vales Point Power Station. It was noted, however, that the dams and water management structures on site are to be retained where possible to provide natural habitat and a water source for fauna in the area, and that sufficient vehicle access will also be maintained so that these dams can be accessed for future fire-fighting, inspection and maintenance purposes, as relevant.

The above is understood to still be the current landowner's (Sunset Energy's) preferred final land use.; Achievement of this final land use would involve demolition and removal of all Mannering infrastructure followed by revegetation with endemic native plant species consistent with surrounding bushland. Should Sunset Energy wish to utilise any or all of the infrastructure, they will be retained subject to the approval of DPIE and other relevant authorities, as appropriate.

The proposed post mining land use as identified within the EIS for the Chain Valley pit top areas is largely consistent with the above. That is, it is proposed to revegetate the surface facilities areas to a near-native ecosystem compatible with the surrounding vegetation communities. As the goal is to return the areas of disturbance to a native plant community (or communities) aligned with the surrounding bushland, no introduced species (e.g., *Melaleuca armillaris*, *Pinus radiata* and non-endemic eucalypts) would be used in the revegetation program. Rather, the focus of the works would be the use of locally occurring species plant preferentially grown from locally sourced seeds. The Colliery is on land owned by Sunset Energy who will, therefore, be a key stakeholder in determining the vegetation selection and landform of the area.

Further to the above, some areas will be revegetated to grassland where this is consistent with the final land use and surrounds. This applies to the areas within existing high voltage power line easements, where the existing grassland vegetation communities are actively managed to ensure they have no impact to the transmission of electricity for the state. Accordingly, a grassland community is both consistent with other areas within the easement and considerate of future management requirements (as the high voltage power lines will remain following mine closure). One other small area of grassland is proposed at the Mannering downcast shaft site, which is consistent with grassed areas surrounding the site.

The final land use for each of the secondary domains is:

- Domain A - Establishment of a native bushland ecosystem compatible with the surrounding vegetation communities, which includes targeting a final vegetation community comparable to:
  - Broad-Leaved Scribbly Gum Open Forest (for Mannering pit top).
  - Coastal Open Woodland (for majority of Chain Valley pit top).
  - Swamp Sclerophyll Forest (for Chain Valley upcast shaft).
- Domain B - Establishment of grass cover consistent with surrounding grass species for the:
  - Areas of the Chain Valley site that are within existing high voltage power line easements.
  - Mannering downcast shaft site.
- Domain C – Retention of water management structures.

The proposed post mining land use for the domains, consistent with the above, is shown on **Plan 4** and the rehabilitation objectives are discussed in section 4.3.

4.3 Rehabilitation Objectives

The rehabilitation objectives below have been compiled from Condition 13 within Schedule 3 of MP 06_0311 and Condition 25 within Schedule 3 of SSD-5465 and are listed in **Table 4.2**.

Table 4.2: Rehabilitation Objectives

Feature	Objective
Mine site (as a whole of disturbed land and water)	• Safe, stable and non-polluting. • Final land use compatible with surrounding land use.
Surface Infrastructure	• To be decommissioned and removed, unless agreed otherwise with relevant regulatory authority and landowner.
Portals and ventilation shafts	• To be decommissioned and made safe and stable. • Retain habitat for threatened species (e.g. bats), where practicable (Chain Valley pit top facilities only).
Other land affected by the development	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems compriing: - local native plant species (unless agreed otherwise with relevant regulatory authority and landowner); and - a landform consistent with the surrounding environment.
Built features damaged by mining operations	• Repair to pre-mining condition or equivalent unless: - the owners agrees otherwise; or - the damage is fully restored, repaired or compensated under the *Mine Subsidence Compensation Act 1961*.
Community	• Ensure public safety. • Minimise the adverse socio-economic effects associated with mine closure.

5 Rehabilitation Planning and Management

5.1 Domain Selection

Domains have been defined in accordance with the methodology prescribed in ESG3 which defines Primary and Secondary domains as follows:

- The Primary domains (Operational Domains) are to be defined on the basis of land management units within the mine site, usually with unique operational and functional purpose and therefore similar geophysical characteristics (i.e. during mining); and
- The Secondary domains (Post Mining Land Use Domains) are defined as land management units characterised by a similar post mining land use objective (i.e. following mining).

The domains defined for term of this MOP are shown on a number of the MOP plans (**Appendix 1**), listed in **Table 5.1** and discussed in the following sections.

Table 5.1: Primary Domain Codes/Names

Primary Domain Code	Primary Domain Name	Description
1	Infrastructure Area (General)	This relates to the general infrastructure located within the: • Chain Valley pit top area; • Mannering pit top area; • Chain Valley ventilation shaft and fan site; and • Mannering downcast shaft site.
2	Coal Stockpile Area	This relates to the coal stockpile within the Mannering Colliery pit top and the coal stockpile area, including some coal handling facilities within the Chain Valley pit top area.
3	Water Management Area	This relates to water storage and sediment control dams at both the Chain Valley and Mannering Colliery pit top areas.

Table 5.2: Secondary Domain Codes/Names

Secondary Domain Code	Secondary Domain Name	Description
A	Rehabilitation Area (Bushland)	The areas which will be rehabilitated generally to native bushland (as part of the Vales Point Power Station buffer lands)
B	Rehabilitation Area (Grass)	The areas which will be rehabilitated to a grass cover consistent with surrounding grass species.
C	Water Management Area	The areas in which dams or other water management structures will be retained.

A brief description of the features of each domain is included in **Table 2.2** and the assets within each domain area are listed in **Table 2.3**. There are no activities planned to be undertaken or mining related disturbance within other areas of the surface leases outside of the domains nominated above. Accordingly, a primary domain has not been assigned to areas that are not subject to mining related disturbance. It should also be noted that:

- No surface exploration is currently proposed
- Small earthen bunds and soil stockpiles are located at various locations around the sites, primarily at the boundary between the coal stockpile domain and water management domain, i.e. within the primary domains, and a specific domain for soil stockpiles is not currently practical for the sites but would be included in a future MOP following completion of soil characterisation as described in Section 8.1
- Predicted subsidence will not result in any surface environmental impacts requiring remediation or rehabilitation

The specific objectives and rehabilitation methods for each domain are discussed in the following sections.

5.2 Domain Rehabilitation Objectives

Domain specific rehabilitation objectives have been developed based on the requirements of the approval conditions and regulatory requirements (see Section 4). The rehabilitation objectives for each domain are presented in **Table 5.3**.

Table 5.3: Domain rehabilitation objectives

Domain Code	Features	Objectives
1A	Infrastructure - refer to **Table 2.3** for detailed list of features	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Portals and ventilation shafts to be: • decommissioned and made safe and stable, or • where practicable , retained as habitat for threatened species (e.g. bats), (applied to Chain Valley Colliery pit top facilities only). Final land use of site to be compatible with surrounding land use. Establish a final landform that is: • Compatible with surrounding land use and final land use of the site. • Safe, stable and non-polluting. Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of the site (i.e. native bushland). Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species.

Domain Code	Features	Objectives
1B	Downcast shaft	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Portals and ventilation shafts to be decommissioned and made safe and stable. Final land use of site to be compatible with surrounding land use. Establish a final landform that is: • Compatible with surrounding land use and final land use of the site. • Safe, stable and non-polluting. Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of the site (grassed open space for downcast shaft). Establishing managed open space grass comprising typical species as in adjacent lands.
2A	Coal stockpile area - refer to **Table 2.3** for detailed list of features	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Final land use of site to be compatible with surrounding land use. Establish a final landform that is: • Compatible with surrounding land use and final land use of site. • Safe, stable and non-polluting. Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of site (i.e. native bushland). Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species.
3A	Water Management	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Final land use of site to be compatible with surrounding land use. Establish a final landform that is: • Compatible with surrounding land use and final land use of the site. • Safe, stable and non-polluting. Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of site (i.e. native

Domain Code	Features	Objectives
		bushland). Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species.
3B	Water Management	Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Final land use of site to be compatible with surrounding land use. Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of site (i.e. grassed open space). Establishing managed open space grass comprising typical species as in adjacent lands.
3C	Water Management	Site to be safe, stable and non-polluting. Surface infrastructure to be retained for water supply purposes. Final land use of site to be compatible with surrounding land use.

5.3 Rehabilitation Phases

The typical phases of rehabilitation as defined within ESG3 are:

- Decommissioning (including sealing of underground workings, demolition of surface infrastructure, and site remediation);
- Landform Establishment;
- Growth Medium Development;
- Ecosystem and Land Use Establishment;
- Ecosystem and Land Use Sustainability; and
- Land Relinquishment.

The following sub-sections provide a general overview of the rehabilitation to be undertaken within each of these phases as they apply to the domain areas within this MOP.

Table 5.4 provides a summary of the completed phases of rehabilitation for each domain at the end of the MOP term.

Table 5.4: Summary of rehabilitation phases for proposed completion at the end of the MOP (by domain)

Domain / Phase	1A Infrastructure - Bushland	1B Infrastructure - Grass	2A Coal Stockpile - Bushland	3A Water Mgmt. - Bushland	3B Water Mgmt. - Grass	3C Water Mgmt. - Water Mgmt.
Active Mining Area	✓	✓	✓	✓	✓	✓
Decommissioning	X	X	X	X	X	X
Landform Establishment	X	X	X	X	X	X
Growth Medium Development	X	X	X	X	X	X
Ecosystem and Land use Establishment	X	X	X	X	X	X
Ecosystem and Land use Sustainability	X	X	X	X	X	X
Relinquished Lands	X	X	X	X	X	X

As shown in **Table 5.4,** all domains are active mining areas and Delta Coal will not substantially commence rehabilitation actives within the term of this MOP. Accordingly, Section 7.2 does not include details of the proposed rehabilitation activities as there aren't any proposed during the term of the MOP.

To provide an indication of the rehabilitation and methodologies that will be implemented when Delta Coal does commence the rehabilitation phases (under a future MOP), the following sections provide information relevant to each of the rehabilitation phases.

5.3.1 Decommissioning

Decommissioning and Sealing of Underground Workings

Following the recovery of equipment from underground, sealing of the mine entries would be undertaken.

The shaft and drift entries will be sealed as per the DRG guidelines, "MDG 6001: Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams (February 2012)", and any boreholes will be sealed as per the "EDG01: Borehole Sealing Requirements on Land: Coal Exploration (April 2012)" or the latest versions.

Prior to the sealing being undertaken, sealing plans will be prepared in consultation with, and approved by, the Chief Inspector.

Demolition and Removal of Surface infrastructure

All mining related infrastructure, with the exception of items specifically requested by landowners to remain and approved for retention by the relevant authority(ies), will ultimately be removed or made safe for the post-mining land use at mine closure. The infrastructure items and hardstand surfaces within the various domains are listed within **Table 2.3**.

During mine closure the following actions will be taken with respect to the buildings and structures associated with the mining, preparation and transport of the coal:

- Any plant, structures, buildings or conveyors would be preferentially sold and/or relocated for reuse at another mining operation;
- The remaining coal bins, surface conveyor plant, buildings and built structures will be demolished or removed. All demolition is to occur in accordance with *AS 2601-2001: The Demolition of Structures* (or its latest version);
- Concrete pads and footings will be removed to an estimated depth of 300mm below surface levels and disposed of in an appropriate place or recycled, and following removal will be covered with at least 300mm of growth medium;
- Roadways not required for access to the mine site or other areas for purposes such as bushfire management will be rehabilitated;
- Asphalt hardstand will be removed;
- All services not required following mine closure will be disconnected and any stored energy dissipated;
- Mining related power lines within the domains will be removed;
- Mining related surface services will be removed; and
- Buried services encountered during civil works will either be completely removed or removed to 300mm below the final landform level and remain buried. As mentioned above, all services, including buried services would be disconnected and have any stored energy dissipated.

These proposed actions could be subject to change during the mine closure process depending on requests by the landowner for infrastructure to be left in accordance with alternative future land use options. Additionally, it is noted that while services will be disconnected to the majority of the site during decommissioning activities, services may remain connected to a portion of the site for beneficial use during the later rehabilitation phases (such as watering tube stock) and subsequently be disconnected following ecosystem establishment.

The decommissioning phase will also address the following.

- Risks associated with any remaining combustible materials. An assessment of combustion risk will be undertaken and specific controls implemented based on report findings.

- Completion of Environmental Site Assessments, with specific focus on areas around storage tanks, oil storage areas, fuel dispensing locations, service areas, buildings housing powered plant and known locations of hazardous materials.

- Undertaking any necessary contamination remediation, if required, to ensure the land is suitable for use as buffer land for the Vales Point Power Station. As the lands will not be used as "recreation/public space", nor is it planned to be used for "commercial/industrial" purposes which are classifications within the National Environment Protection (Assessment of Site Contamination) Measure 1999, it is proposed that a combination of health based investigation criteria applicable to either of these classifications will be adopted as the rehabilitation criteria should contamination requiring remediation be identified.

Heritage

As identified in Section 3.2.17, there is only a single Aboriginal heritage site relevant which is located within the Chain Valley surface facilities site. This would not be impacted during the decommissioning, or landform establishment.

Asbestos

As noted in Section 3.2.13, hazardous materials surveys and registers are available for each pit top area. Notwithstanding, asbestos risks associated with mine closure will need to be considered following the determination of exactly which, if any, buildings and infrastructure are to remain. Appropriate disposal of asbestos material will be required and clearance certificates obtained from licensed asbestos demolition contractors. All work will be undertaken to conform to SafeWork NSW Guidelines and approval requirements.

Remediation

Contamination remediation will be undertaken if required to ensure the land is suitable for use as buffer land for the Vales Point Power Station. As the lands will not be used as "recreation/public space", nor is it planned to be used for "commercial/industrial" purposes which are classifications within the National Environment Protection (Assessment of Site Contamination) Measure 1999, it is proposed that a combination of health based investigation criteria applicable to either of these classifications will be adopted as the rehabilitation criteria should contamination requiring remediation be identified.

5.3.2 Landform Establishment

Following decommission, final landforms will be developed that are safe, stable, permanent and compatible with subsequent land use as determined through consultation with stakeholders, including landowners and the relevant Government departments.

In the context of this MOP, landform establishment is the process involved in achieving stable landforms including slopes, erosion controls and drainage lines, with integrated landscape features which are compatible with the surrounding landform, whilst ensuring that the areas of native vegetation established link with surrounding vegetation communities.

Landforms to be established during the mine closure and rehabilitation will be contoured to generally match the surrounding topography and to control and direct runoff to sediment basins and natural existing drainage lines. No significant changes to the pre-mining landform will result from the contouring of the land following the removal of all surface infrastructure.

Final contouring of the land will remove terraced areas and provide drainage consistent with the general fall of the land to the north and east. The design of run-off and sediment controls will be incorporated in the final surface planning. General contour design is shown on **Plan 4A**.

Erosion Control

The removal of large areas of sealed surfaces and buildings at mine closure could result in increased sediment load in the runoff during the early stages of the rehabilitation program. Conversely, the removal of the majority of the coal stockpiles, the associated reduction in the batter heights and the removal of historically compacted surfaces will result in increased infiltration rates during the first few months of the rehabilitation program and reduce the amount of runoff reporting to the sediment dams. Control of erosion is important during the landform construction and revegetation program, with the principal objective prior to an adequate cover of vegetation is established achieved being to prevent erosion.

There are 10 basic principles that will be followed to ensure effective soil and water management during the decommissioning phase. These are to:

- Plan for erosion and sediment control with project design and well in advance of earthworks;
- Minimise the area of soil exposure;
- Conserve available topsoil - introduce topsoil or suitable growth medium where required;
- Control water flow;
- Divert clean runoff away from disturbed areas;
- Minimise slope gradient and length;
- Minimise water runoff velocities;
- Trap sediments and pollutants;
- Revegetate disturbed areas as soon as possible; and
- Maintain and monitor erosion controls to ensure the quality of water released is acceptable.

To ensure effective erosion control during removal of structures, contouring, capping and revegetation of the site, the following practices are to be adopted.

- The Water Management Plan will be reviewed prior to closure works being undertaken, or a specific erosion and sediment control plan will be developed for closure works.

- Slopes created through removal of retaining structures are to be left in a roughened state to slow and direct water flow as well as increase infiltration rates;
- Surface runoff is to be directed to existing sediment ponds. Excess water stored in these ponds may be used as irrigation for establishing vegetation or discharged subject to its satisfaction of EPL limits;
- Runoff from areas under development would be directed away from revegetated areas where possible;
- Drainage patterns are to be designed to direct flows through erosion and sediment control structures and so keep the sediment as close as possible to the source;
- Sediment control structures are to be maintained and kept in place until rehabilitation of the relevant catchment area is completed (see further detail below); and
- Other methods of erosion control may be employed as required, including the use of mulching, sediment fence and the installation of hay bale barriers. Where water control is deemed to be a problem and native revegetation may not be able to establish rapidly enough, a fast growing cover crop would be sown.

The primary mechanism for erosion control will be the retention of the current drainage system and sediment dams during the initial stages of the rehabilitation program. Once the primary earthworks and initial revegetation works are completed, including the removal of the hardstand areas, bitumen, concrete and the bulk of the coal stockpiles, a program of dam rationalisation will be undertaken.

Where appropriate, the former dams will be used as receptacles for excavated or crushed inert material. Once these are filled, the wall and batter materials will be used to cap the dams. These surfaces will then be stabilised using a cover crop comprising fast growing sterile species and the seed of longer-lived native species.

At this stage it is intended to fill and cap, or otherwise remove, all dams that are not within Domain 3C as shown on **Plan 4**. A suitable growth medium would be established over decommissioned dams, while at the same time establishing contours which will enable surface flows to enter the natural drainage lines adjacent to the site. It is expected that at the completion of the rehabilitation process, some of the sediment dams would be retained for ecological purposes.

During the detailed closure planning phase, further consideration will, however, need to be to the potential retention and/or construction of small dams or ponds which could either continue to provide habitat or allow fauna to relocate to these areas when the main sediment dams are rehabilitated during closure. At this stage, and as shown on Plan 4, it is proposed to retain all dams within Domain 3C in the final landform.

5.3.3 Growth Medium Development

As noted within Section 4.2 and shown on **Plan 4**, Delta Coal proposes to vegetate the majority of disturbed areas to either bushland or grass compatible with the future land uses. Accordingly, the establishment of the growth medium will be different for the areas proposed for revegetation to a bushland compared to those areas proposed for revegetation to a grassland.

Growth media development incorporates the processes involved to achieve a soil which is capable of supporting a sustainable plant community. It includes consideration of the chemical, physical and biological properties of the media and takes into account the necessity or desirability for specialist treatments such as the importation of appropriate virgin excavated natural material (VENM) or the application of soil ameliorants aligned to the revegetation of the disturbed areas.

Due to the age of the sites and prior soil management practices, only limited amounts of previously stripped and stored topsoil is available for the pit top areas. Suitable amounts of material will however be available to reprofile terraces and fill dam voids, which will be largely completed by undertaking localised cut and fill in

some areas to be rehabilitated. The development of growth medium will rely on re-spreading existing on-site material and/or the importing of suitable material. It is noted however, that there are a substantial number of recycled organics that have been successfully utilised in mine rehabilitation (Kelly, 2006), including fly ash, a ready source of which is available from the nearby Vales Point Power Station. Nevertheless, it is expected that the importation of topsoil or other growth medium material will likely be required to achieve the closure objectives.

As discussed in Section 8.1, during the term of this MOP, Delta Coal will undertake soil characterisation of the existing soil stockpiles and in-situ subsoils to determine the suitability of the material for use in final rehabilitation activities.

Final soil characterisation will occur following cessation of mining, with details of any soil amelioration requirements to be included within the detailed mine closure plan and implemented prior to use of soil in rehabilitation activities. This is further discussed in Section 6 and in the performance criteria tables.

5.3.4 Ecosystem and Land Use Establishment

The objective of the rehabilitation program for the pit top areas is to create a landform and vegetation assemblage generally consistent with those in the local area in order to enhance the buffer zone surrounding the Vales Point Power Station and provide habitat for native fauna. For those areas to be returned to bushland, Delta Coal aims to establish a native bushland ecosystem compatible with that of the surrounding vegetation communities, which includes targeting final vegetation communities comparable to the :

- Broad-Leaved Scribbly Gum Open Forest (for Mannering pit top).
- Coastal Open Woodland (for majority of Chain Valley pit top).
- Swamp Sclerophyll Forest (for Chain Valley upcast shaft).

It should be noted that, for some areas, a grass cover will be established consistent with surrounding grass species (i.e. those areas of the Chain Valley site that are within existing high voltage power line easements and the Mannering downcast shaft site).

Preparation for ecosystem establishment would be able to commence once a decision for mine closure has been made, but prior to the completion of the detailed mine closure plan. This preparation would include undertaking longer lead time activities that will be nominated in the detailed mine closure plan but are already known, such as undertaking native seed collection and propagation of species specifically to be used in ecosystem establishment.

Following mine closure, vegetation will be progressively established as areas are made available following the decommissioning, landform establishment and growth medium development stages. This is to be achieved by establishing endemic tree, shrub and grass species. The specific species to be used in the rehabilitation will be determined in consultation with ecologists familiar with the local area and by suitably competent personnel experienced in native vegetation identification, establishment, seed collection and propagation, which will then inform the detailed mine closure plan to the extent that the species list can be commensurate with the availability of seed from endemic species in the vicinity of the site. These species may include, but not be limited to the following (which have been associated with the vegetation community mapped in the vicinity of the site);

- Dominant tree species: *Eucalyptus haemastoma, Corymbia gummifera, Eucalyptus capitellata, Casuarina glauca and Angophora costata.* Other tree species include *Eucalyptus robusta, Eucalyptus oblonga, Melaleuca sieberi, Melaleuca quinquenervia, Eucalyptus teretcornis* and *Banksia serrata*.
- Understory species (shrubs): *Acacia longifolia, Acacia suaveolens, Acacia terminalis, Hakea bakeriana, Hakea dactyloides, Gompholobium latifolium, Banksia spinulosa var. collina, Isopogon anemonifolius* and *Lambertia formosa*.
- Understory species (herbs): *Patersonia sericea, Hibbertia vestita, Dampiera stricta, Lepidosperma laterale, Stylidium graminifolium, Entolasia stricta, Themeda australis, Anisopogon avenaceus* and *Lomandra obliqua*.

As discussed in Section 8.1, during the term of this MOP, Delta Coal will be implementing a program to establish and monitor analogue/reference sites to inform the development of specific species lists for future rehabilitation.

The preferred method of establishment is by direct seeding, with supplementary tube stock plantings. Cover crops of annual and perennial grasses are to be used where rapid stabilisation of the soil surface is required.

Weed Management

Weed management will be undertake as described in Section 3.2.5, in accordance with the Land Management and Biodiversity Management Plans. It is anticipated that an initial spray control program will be undertaken prior to earth works in order to minimise the subsequent distribution of weed material. For rehabilitation areas, the early control of weeds will minimise competition and maximise early growth and survival of desired species. This can be achieved by physical removal and mulching or by chemical control where appropriate.

As an outcome of community consultation, it is also proposed to remove the existing radiata pines (*Pinus radiata*) from the rehabilitation domains during the rehabilitation and weed control programs undertaken at mine closure.

5.3.5 Ecosystem and Land Use Sustainability

This phase of development includes rehabilitation monitoring as described in Section 8, and the ongoing management of the rehabilitated areas as determined through the rehabilitation monitoring and may include one or more of the following activities, as appropriate.

- Weed and feral animal control.
- Erosion control and rectification works.
- Maintenance fertilizing.
- Re-seeding or replanting.
- Improvements to site security.

6 Performance Indicators, and Completion / Relinquishment Criteria

The specific rehabilitation performance indicators and completion criteria to be applied are listed in **Table 6.1**. This table provides the indicators and criteria which will be used to measure the successful achievement of the nominated rehabilitation objectives.

It should be noted that during the term of this MOP, Delta Coal will be undertaking investigations (including soil characterisation and establish of analogue/reference sites) which will be used to developed more specific indicators and criteria. Further detail on these investigations are presented in Section 8.1.

Table 6.1: Rehabilitation Completion Criteria

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
Phase 1 - Decommissioning							
Domain 1 – Infrastructure Area (General)							
Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Portals and ventilation shafts to be: • decommissioned and made safe and stable, or • where practicable, retained as habitat for threatened species (e.g. bats), (applied to Chain Valley Colliery pit top facilities only). Final land use of site to be compatible with surrounding land use.	No risk to public safety - All plant and equipment removed	All mining related plant and equipment removed from site (unless approved to remain)	Visual inspection and photos of site confirm plant and equipment has been removed. Photos included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	-
	No risk to public safety - All buildings and structures removed	Buildings and structures removed (unless approved to remain). All services terminated and disconnected (power, water and telecommunications) Perimeter fencing to be retained as required to restrict public access. Light vehicle access to remaining dams/ponds to be retained for fire-fighting and maintenance purposes.	Visual inspection and photos of site confirm buildings have been removed. Photos included within Closure Report.		Not Commenced	Post MOP	-
	No risk to public safety - All underground infrastructure (protruding above ground surface) removed.	Visible surface components of buried infrastructure removed (unless approved to remain). Remaining underground material to be capped to depth ≥ 0.3 m.	Visual inspection and photos of site confirm infrastructure has been removed. Photos included within Closure Report.		Not Commenced	Post MOP	-
	No risk to public safety - Access to former workings prevented	All surface entries (drifts and shafts) to mine are sealed in accordance with MDG 6001 (Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams).	Closure report includes evidence that sealing has been completed in accordance with MDG 6001.		Not Commenced	Post MOP	-
	No risk to public safety - All borehole connectivity to former workings sealed	All boreholes to the mine are sealed in accordance with EDG01 (Borehole Sealing Requirements on Land: Coal Exploration).	Closure report includes evidence that sealing has been completed to EDG01.		Not Commenced	Post MOP	-
	Non-polluting - clean-up of potential/actual contamination.	Hydrocarbons less than assessment criteria. Heavy metals less than assessment criteria. No asbestos remains (unless bonded within buildings approved to remain)	Contamination validation report (Phase 2 ESA) completed and identifies any levels of contamination are below the relevant acceptable levels. Contamination validation report appended to Closure Report.		Not Commenced	Post MOP	6
	No risk to public safety - clean-up of combustible material that could pose a fire risk	All combustible material to be removed or managed appropriately (e.g. blending with non-combustibles or capping)	Assessment of combustion risk (to be undertaken following cessation of mining) identifies that materials on site will not pose an unacceptable combustion risk.		Not Commenced	Post MOP	1
	No risk to public safety - removal of explosives	All explosive material to be removed from site.	Closure report includes evidence that explosives removed from site in accordance with Explosives Act 2003		Not Commenced	Post MOP	7
Domain 2 – Coal Stockpile Area							
Site to be safe, stable and non-polluting.	No risk to public safety - All plant and equipment removed	All mining related plant and equipment removed from site (unless approved to remain)	Visual inspection and photos of site confirm plant and equipment has been removed.	Schedule 3, Condition 13 of Project Approval	Not Commenced	Post MOP	-

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority(ies) and landowner. Final land use of site to be compatible with surrounding land use.		Fill or remove underground reclaim tunnel beneath Mannering Coal stockpile	Photos included within Closure Report.	MP 06_0311 Schedule 3, Condition 25 of SSD-5465			
	No risk to public safety - All buildings and structures removed	Buildings and structures removed (unless approved to remain). All services terminated and disconnected (power, water and telecommunications)	Visual inspection and photos of site confirm buildings have been removed. Photos included within Closure Report.		Not Commenced	Post MOP	-
	No risk to public safety - All underground infrastructure (protruding above ground surface) removed.	Visible surface components of buried infrastructure removed (unless approved to remain). Remaining underground material to be capped to depth ≥ 0.3 m.	Visual inspection and photos of site confirm infrastructure has been removed. Photos included within Closure Report.		Not Commenced	Post MOP	-
	No risk to public safety - clean-up of combustible material that could pose a fire risk	Recover all saleable coal material from stockpiles All remaining combustible material to be removed or managed appropriately (e.g. blending with non-combustibles or capping)	Assessment of combustion risk (to be undertaken following cessation of mining) identifies that materials on site will not pose an unacceptable combustion risk.		Not Commenced	Post MOP	1
Domain 3 – Water Management Area							
Site to be safe, stable and non-polluting. Surface Infrastructure to be decommissioned and removed, unless agreed otherwise with relevant regulatory authority. Final land use of site to be compatible with surrounding land use.	Mine water discharges discontinued.	No discharge of underground mine water/water impacted by mining operations	Discharge water flow monitoring and reporting. Pipes that deliver water from underground to surface are disconnected	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	5
	No risk to public safety - All infrastructure removed	Water management structures removed (unless approved to remain). Ancillary surface equipment and infrastructure to be decommissioned and removed All services terminated and disconnected (power, water and telecommunications)	Visual inspection and photos of site confirm surface infrastructure has been removed. Photos included within Closure Report		Not Commenced	Post MOP	-
	No risk to public safety - clean-up of combustible material that could pose a fire risk	All combustible material to be removed or managed appropriately (e.g. blending with non-combustibles or capping)	Assessment of combustion risk (to be undertaken following cessation of mining) identifies that materials on site will not pose an unacceptable combustion risk.		Not Commenced	Post MOP	1
Phase 2 – Landform Establishment							
Domain 1 – Infrastructure Area (General)							
Establish a final landform that is: • Compatible with surrounding landform and final land use of site. • Safe, stable and non-polluting.	Slopes are stable	Cut and fill batters to be re-profiled. Soil stockpiles to be re-spread over site as required for growth media establishment. Re-profiled areas are stable with slopes not exceeding 18°.	No evidence of slumping of slopes. Survey of rehabilitated site confirms no slopes exceed 18°. Final landform survey detail included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	-
	Final landform contours similar to surrounding land contours	Mapping confirms that final landform contours are generally consistent with surrounding land contours	Plans prepared by surveyors and photographs within Closure Report.		Not Commenced	Post MOP	-
	Sediment controls to be implemented to manage surface water	Surface runoff to be directed to sediment control structures prior to discharge (either retained	Visual inspection and photos of dams/drains to confirm flow paths and non-eroding.		Not Commenced	Post MOP	2

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
		sediment dams within Water Management Area or new temporary sediment controls) Diversion channels/drains to remain are stable and non-eroding (based on "blue Book' requirements).	Photos included within Closure Report.				
Domain 2 – Coal Stockpile Area							
Establish a final landform that is: • Compatible with surrounding landform and final land use of site. • Safe, stable and non-polluting.	Slopes are stable	Soil stockpiles to be re-spread over site as required for growth media establishment. Re-profiled areas are stable with slopes not exceeding 18°.	No evidence of slumping of slopes. Survey of rehabilitated site confirms no slopes exceed 18°. Final landform survey detail included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	-
	Final landform contours similar to surrounding land contours	Mapping confirms that final landform contours are generally consistent with surrounding land contours	Plans prepared by surveyors and photographs within Closure Report.		Not Commenced	Post MOP	-
	Sediment controls to be implemented to manage surface water	Surface runoff to be directed to sediment control structures prior to discharge (either retained sediment dams within Water Management Area or new temporary sediment controls) Diversion channels/drains to remain are stable and non-eroding (based on "blue Book' requirements).	Visual inspection and photos of dams/drains to confirm flow paths and non-eroding. Photos included within Closure Report.		Not Commenced	Post MOP	2
Domain 3 – Water Management Area							
Establish a final landform that is: • Compatible with surrounding landform and final land use of site. • Safe, stable and non-polluting.	Slopes are stable	Re-profiled areas are stable with slopes not exceeding 18°.	No evidence of slumping of slopes. Survey of rehabilitated site confirms no slopes exceed 18°. Final landform survey detail included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	-
	Final landform contours similar to surrounding land contours	Mapping confirms that final landform contours are generally consistent with surrounding land contours	Plans prepared by surveyors and photographs within Closure Report.		Not Commenced	Post MOP	-
	Sediment controls to be implemented to manage surface water	Diversion channels/drains to remain are stable and non-eroding (based on "blue Book' requirements). Adequate sediment dams are retained (based on 'Blue Book' requirements). Remaining dams are stable and non-eroding. ESCP to developed and implemented for any structures to be removed that do not report to remaining sediment dams (such as the final pollution control dams to be removed)	ESCP documented. Visual inspection and photos of dams/drains to confirm flow paths and non-eroding. Photos included within Closure Report.		Not Commenced	Post MOP	2
	Surface water discharges to be non-polluting	Off-site discharge to be less than 50 mg/L TSS	Surface water monitoring and reporting for downstream locations in unnamed creek.		Not Commenced	Post MOP	5
Phase 3 – Growth Medium Development							
Domain 1 – Infrastructure Area (General) and *Domain 2 – Coal Stockpile Area* and *Domain 3 – Water Management Area*							

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
Establish soil/growth medium suitable for establishment of vegetation compatible with final land use of site (i.e. Native bushland for all areas except for grassed open space for Mannering downcast shaft and within the high voltage power line easements)	Compacted surfaces deep ripped along contour	Photographs of ripped areas	Photos included within Closure Report.	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	3
	Growth medium replacement to permit vegetation establishment	Depth of growing medium to be ≥ 100 mm. Depth of topsoil to be ≥ 50 mm unless advice of suitable rehabilitation specialist recommends alternate thickness is acceptable. Note: Suitable growth medium depth to be refined following further soil characterisation and establishment of analogue sites (refer to Section 8.1).	Sampling/testing regime following placement and spreading of material to confirm depths and documented in soil analysis report.		Not Commenced	Post MOP	3
	Key growth medium characteristics in range to permit vegetation establishment	Note: Completion Criteria Not Available (suitable growth medium characteristics are to be nominated following further soil characterisation and establishment of analogue sites) (refer to Section 8.1).	Sampling/testing regime following placement and spreading of material to confirm depths and documented in soil analysis report.		Not Commenced	Post MOP	3
Phase 4 – Ecosystem and Land Use Establishment							
Domain A – Rehabilitation Area (Bushland)							
Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species	Vegetation communities to be established to have key species consistent with the adjacent • *Broad-Leaved Scribbly Gum Open Forest* (Mannering Colliery) • *Coastal Open Woodland* (Chain Valley Colliery) • *Swamp Sclerophyll Forest* (Chain Valley Colliery upcast shaft) Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future identification of suitable species list.	Vegetation becomes established Majority (i.e. >50%) of established species are present in surrounding communities Note: Delta Coal to implement a monitoring program including establishment of analogue/reference sites to be used as a basis for future identification of more specific completion criteria. (refer to Section 8.1).	Visual inspection and photos of rehabilitation confirm species established. Monitoring and comparison to adjacent analogue/reference sites Details of monitoring included within Closure Report. Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future identification of more specific monitoring measures. (refer to Section 8.1).	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	4, 8
	The rehabilited area does not constitute an erosion hazard	Any site erosion is insignificant in that it is not resulting in pollution or unstable landforms Surface area cover is generally consistent with adjacent analogue/reference sites	Visual inspection and photos of rehabilitated area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	2
	Weeds and feral animals are not competing or impacting the rehabilitated area	Implementation of weed and feral animal control program to achieve number of weeds/ferals generally consistent with adjacent analogue/reference sites.	Visual inspection and photos of rehabilitated area by suitably qualified specialist. Monitoring and comparison to adjacent analogue/reference sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	4

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
Domain B – Rehabilitation Area (Grass)							
Establishing open space grassland consistent with surrounds.	Vegetation community to be established to have key species consistent with the adjacent managed grassland. Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future identification of suitable species list.	Vegetation becomes established Majority (i.e. >50%) of established species are present in surrounding communities Note: Delta Coal to implement a monitoring program including establishment of analogue/reference sites to be used as a basis for future development of more specific completion criteria (refer to Section 8.1).	Visual inspection and photos of rehabilitation confirm species established. Monitoring and comparison to adjacent analogue/reference sites Monitoring results included within Closure Report. Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future development of more specific monitoring measures (refer to Section 8.1).	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	4
	The rehabilitated area does not constitute and erosion hazard	Any site erosion is insignificant in that it is not resulting in pollution or unstable landforms Surface area cover is generally consistent with adjacent analogue/reference sites	Visual inspection and photos of rehabilitated area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	2
	Weeds and feral animals are not competing or impacting the rehabilited area	Implementation of weed and feral animal control program to achieve number of weeds/ferals generally consistent with adjacent analogue/reference sites.	Visual inspection and photos of rehabilited area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	4
Domain C – Water Management Area							
No ecosystem and land use establishment activities to this domain							
Phase 5 – Ecosystem and Land Use Sustainability							
Domain A – Rehabilitation Area (Bushland)							
Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising local native plant species	Vegetation communities to be established to have key species consistent with the adjacent • *Broad-Leaved Scribbly Gum Open Forest* (Mannering Colliery) • *Coastal Open Woodland* (Chain Valley Colliery) • *Swamp Sclerophyll Forest* (Chain Valley Colliery upcast shaft) Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future identification of suitable species list.	Majority (i.e. >50%) of established species are present in surrounding communities Note: Delta Coal to implement a monitoring program including establishment of analogue/reference sites to be used as a basis for future development of more specific completion criteria (refer to Section 8.1).	Visual inspection and photos of rehabilitation confirm species established. Monitoring and comparison to adjacent analogue/reference sites Details of monitoring included within Closure Report. Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future development of more specific monitoring measures. (refer to Section 8.1).	Schedule 3, Condition 13 of Project Approval MP 06_0311 Schedule 3, Condition 25 of SSD-5465	Not Commenced	Post MOP	4, 8
	Vegetation to be self sustaining	Self-propagation in revegetated areas. Clear trend of • increasing species diversity. • increasing vegetation density			Not Commenced	Post MOP	4

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
		• increasing foliage cover. Note: Delta Coal to implement a monitoring program including establishment of analogue/reference sites to be used as a basis for future development of more specific completion criteria (refer to Section 8.1).					
	The rehabilitated area does not constitute and erosion hazard	Any site erosion is insignificant in that it is not resulting in pollution or unstable landforms Surface area vegetation cover is generally consistent with adjacent analogue/reference sites No further erosion control activities required.	Visual inspection and photos of rehabilitated area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	2
		Absence of gullies >300mm wide or deep and gullies stable.			Not Commenced	Post MOP	2
		Landscape function analysis (or other methodology) shows continued ecosystem function improvements			Not Commenced	Post MOP	2
	Weeds and feral animals are not competing or adversely impacting the rehabilitated area.	Number of weeds/ferals generally consistent with adjacent analogue/reference sites. No further weed control required (other than what would be required for analogue/reference sites)	Visual inspection and photos of rehabilitation area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	4
Domain B – Rehabilitation Area (Grass)							
Establishing open space graslands consistent with surrounds	Vegetation community to be established to have key species consistent with the adjacent managed grassland. Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future identification of suitable species list.	Majority (i.e. >50%) of established species are present in surrounding communities Note: Delta Coal to implement a monitoring program including establishment of analogue/reference sites to be used as a basis for future development of more specific completion criteria (refer to Section 8.1).	Visual inspection and photos of rehabilitation confirm species established. Monitoring and comparison to adjacent analogue/reference sites Monitoring results included within Closure Report. Note: Delta Coal to implement a monitoring program including establishment of analogue sites to be used as a basis for future development of more specific monitoring measures. (refer to Section 8.1).		Not Commenced	Post MOP	4
	Vegetation to be self sustaining	Self-propagation in revegetated areas. Clear trend of • increasing vegetation density • increasing foliage cover. Note: Delta Coal to implement a			Not Commenced	Post MOP	4

Objective	Performance Indicator	Completion criteria	Performance measures/monitoring methodology	Justification / Source	Progress at start of MOP	Expected Completion	TARP Ref No.
		monitoring program including establishment of analogue/reference sites to be used as a basis for future development of more specific completion criteria (refer to Section 8.1).					
	The rehabilitation area does not constitute and erosion hazard	Any site erosion is insignificant in that it is not resulting in pollution or unstable landforms Surface area vegetation cover is generally consistent with adjacent analogue/reference sites No further erosion control activities required.	Visual inspection and photos of rehabilitation area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	2
		Absence of gullies >300mm wide or deep and gullies stable.			Not Commenced	Post MOP	2
		Landscape function analysis (or other methodology) shows continued ecosystem function improvements			Not Commenced	Post MOP	2
	Weeds and feral animals are not competing or adversely impacting the rehabilitated area.	Number of weeds/ferals generally consistent with adjacent analogue/reference sites. No further weed control required (other than what would be required for analogue/reference sites)	Visual inspection and photos of rehabilitation area by suitably qualified specialist. Monitoring and comparison to adjacent control sites Monitoring results included within Closure Report.		Not Commenced	Post MOP	4
Domain C – Water Management Area							
No ecosystem and land use sustainability activities to this domain							
Phase 6 – Land Relinquishment							
All domains	Demonstrated compliance with all of the above	Demonstrated compliance with all of the above	Relinquishment report prepared by suitable qualified and experience person(s)		No Commenced	Post MOP	-

7 Rehabilitation Implementation

7.1 Status at MOP Commencement

Areas of surface disturbance are limited to relatively small areas due to the inherent nature of underground mining and limited coal processing on-site. As no coal beneficiation occurs on-site and, as a result, no coarse reject or tailings is generated, the areas of direct surface disturbance within the Chain Valley and Mannering are able to be maintained at a minimum. As a consequence, the opportunities for the rehabilitation of areas of disturbance have been limited, with the surface features remaining largely unchanged since the 1960s.

At the commencement of this MOP , rehabilitation has not commenced for any of the domains within this MOP. All the domains are expected to be utilised until such a time as mine closure occurs.

The assets within each of the domains are described within Section 2.2, and a brief description for each domain is contained in the sections below.

7.1.1 Primary Domain 1 – Infrastructure Area

This domain includes the:

- Main operational area at Chain Valley (administration, stores, storage areas, workshop, drifts, switchyard, car parking, operations offices, bathhouse etc.);
- Main operational area at Mannering (administration, fans, stores, storage areas, workshop, drifts, switchyard, car parking, operations offices, bathhouse etc.);
- Mannering downcast shaft site (located adjacent to Vales Point Power Station ash dam;
- Chain Valley upcast shaft and ventilation fan site (located at Summerland Point); and
- Chain Valley downcast shaft (located in the north eastern section of the main pit top facilities)

The Chain Valley pit top is gently sloping to the east with no significant changes in surface elevations. Retaining walls are utilised only beneath the winder rope for the man and materials drift. The Chain Valley ventilation shaft site at Summerland Point slopes gently toward the south west, toward Lake Macquarie, with clean water diversion drains in place on the upslope side of the site which direct water around the ventilation fan site compound.

Domain 1 at the Mannering pit top is benched down from the south eastern border with retaining walls (3.5 to 4 m high) separating the carpark from the main operational area, and also separating the main operational area from the coal handling area. The unpaved storage yard is used as a lay down area for equipment and an explosives magazine (not currently utilised). Overall, the domain area falls from south to north and cross contour to the northwest flowing to containment sumps and ponds.

The downcast shaft site is remote to the Mannering Colliery pit top and is located within the boundaries of Vales Point Power Station ash dam area. The shaft site is relatively small with surrounding areas all managed by Delta Electricity.

Representative photos of the domain are presented in **Plate 7.1** to **Plate 7.18**

Plate 7.1: Mannering workshop and winder house

Plate 7.2: Mannering workshop

Plate 7.3: Mannering hardstand area

Plate 7.4: Mannering coal clearance and processing facilities

Plate 7.5: Mannering hardstand (eastern storage area)

Plate 7.6: Mannering main ventilation fans

Plate 7.7: Mannering carpark

Plate 7.8: Mannering retaining wall below main carpark

Plate 7.9: Mannering downcast shaft site

Plate 7.10: Chain Valley workshop

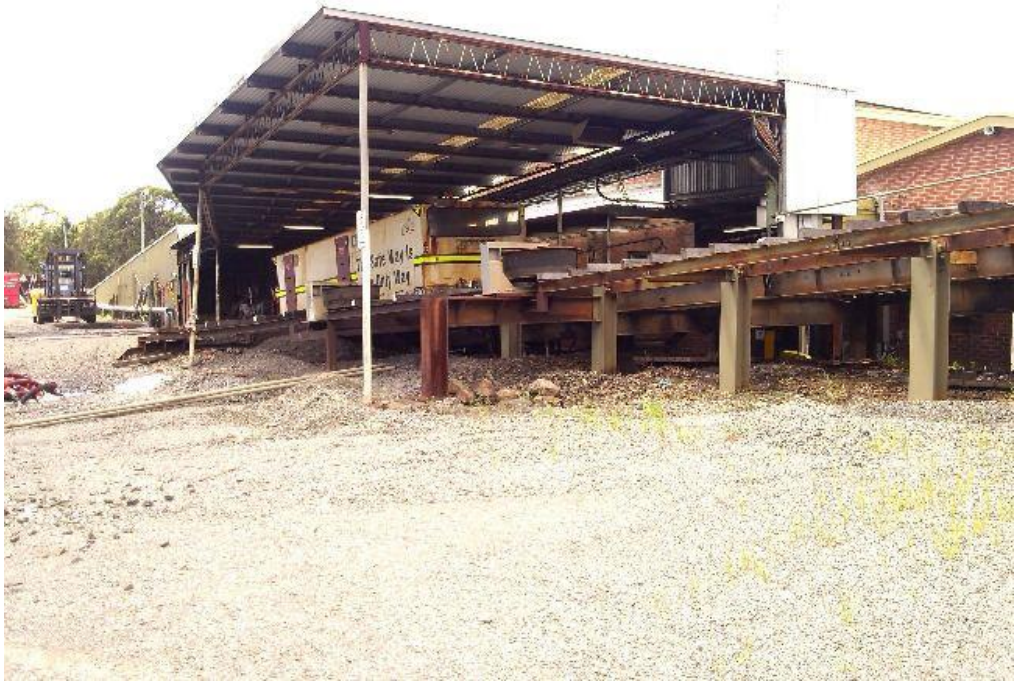

Plate 7.11: Chain Valley men and materials drift

Plate 7.12: Chain Valley storage yard

Plate 7.13: Chain Valley compressor sheds

Plate 7.14: Chain Valley tube bundle monitoring (main winder and switchroom building behind)

Plate 7.15: Chain Valley operations building

Plate 7.16: Chain Valley administration building

Plate 7.17: Chain Valley ROM coal bin and drift belt conveyor

Plate 7.18: Chain Valley main ventilation fans

7.1.2 Primary Domain 2 – Coal Stockpile Area

Domain 2 comprises the coal stockpile area and some associated coal handing facilities within the Chain Valley pit top and the coal stockpile area at the Mannering Colliery pit top.

At the Mannering Colliery the coal stockpile emplacement area has a nominal capacity of approximately 25,000 tonnes and is used to store ROM coal when the Vales Point Power Station is unable to accept the coal or during extended maintenance periods. The coal pad is a constructed area up to 3.5 m higher than the surrounding areas, with high banks on the western and southern boundaries which can be used as backfill for other areas during closure.

This area has drainage including concrete drains and sumps, which ultimately report to the Pond B water control system. A representative photo showing the Mannering coal stockpile area is presented in **Plate 7.19**. Note: The coal handling infrastructure evident in **Plate 7.19** (e.g. bin, conveyors, gantry) and reclaim tunnel are incorporated into the 1A domain.

Chain Valley Colliery has a substantially larger coal stockpile area which has a capacity of approximately 150,000 tonnes and coal is fed onto the stockpile area by the stacker conveyor shown in **Plate 7.20**. Sediment laden water is drained from the coal handling and stockpile area into the sediment dams directly to the east of the stockpile location.

Plate 7.19: Mannering coal stockpile area

Plate 7.20: Chain Valley stacker conveyor

7.1.3 Primary Domain 3 - Water Management Area

The water management area at the Chain Valley pit top area includes dams 1 to 13 (as detailed in Section 3.2.12.2)

Both surface and groundwater are transferred to the sediment dam system, which enables retention and settlement of fines prior to water being discharged offsite. Flows into the dams occur via pumping (groundwater from the underground workings), gravity flow through subsurface drains and surface flows from dirty water drains established around the coal stockpile area to divert water into the dams. The network of sediment dams can be seen on **Plan 4**.

At the Mannering pit top the water management area includes:

- Dirty water management control system (including Pond B, Pond 1, Pond 2, Pond 3); and
- Former Firefighting Supply Dam (Dam 4).

Ponds B, 1, 2, 3 Dam 4 are shown on **Plan 1B**. The Pond B pollution control system, comprising four pollution control ponds (B, 1, 2,and 3) manages runoff from the pit top. The retention and settlement of storm water takes place within these ponds before water is discharged offsite via LDP1 (MC – LDP1, **Plan 1B**).

A representative photo showing the condition of the domain a number of years ago is presented in **Plate 7.21**.

Plate 7.21: Pond B water management control system

7.2 Proposed Rehabilitation Activities during the MOP Term

Mining operations will continue at Chain Valley and, while no coal mining is proposed for Mannering, the Mannering facilities will remain operational throughout the term of the MOP as Mannering receives coal from within the Chain Valley Colliery holding and transfers it to the Vales Point Power Station. As Delta Coal have supply contracts with Vales Point Power Station to 2022, operations at Mannering Colliery are not planned to cease during the term of this MOP, nor are any significant changes to the surface facilities proposed which would permit rehabilitation activities to occur during the term. During the term of this MOP, Delta Coal is seeking to modify Mannering's Project Approval to permit, as a minimum, continued operations at Mannering beyond the 30 June 2022 limit currently nominated in MP06_0311 to align with the current approval for Chain Valley Colliery, that is, until the 31 December 2027.

During the term of this MOP, all domain areas will remain active. As described within Section 2.1, activities at Mannering within the term of this MOP include the operation of the underground linkage including the use the coal handling facilities at the Mannering Colliery pit top. There are no activities to be undertaken or mining related disturbance within other areas of the surface leases outside of the nominated domains.

Due to the continuing need for the infrastructure at both operations, it is anticipated that all areas of surface disturbance will remain active until the cessation of both Chain Valley and Mannering's mining activities, with the subsequent rehabilitation forming part of the mine closure activities.

Rehabilitation activities will not be substantially commenced within the MOP term, and minor activities related to site rehabilitation within the term of this MOP are expected to be limited to:

- Maintenance of the existing surface facilities, including monitoring of weeds and feral animals along with control activities in accordance with the Land Management and Biodiversity Management Plans.

During the term of this MOP, Delta Coal will be undertaking investigations to assist with future rehabilitation activities, including soil characterisation and the establishment of analogue/reference sites. Further detail on these investigations is presented in Section 8.1.

Plan 4 and **Plan 4A** shows the conceptual final landform and revegetation status at the surface facilities for lease relinquishment.

The total area of disturbance (as defined by the extent of the active domain areas of this MOP) at the commencement of this MOP is 27.8 ha, and as there will be no areas available for rehabilitation during the MOP, the 27.8 ha of total disturbance will remain at the completion of this MOP term.

7.3 Summary of Rehabilitation Areas during the MOP Term

The rehabilitation areas are summarised in **Table 7.1** for each domain.

Table 7.1: Rehabilitation areas

Domain Code	Rehabilitation Phase	Area at start of MOP (ha)	Area at end of MOP (ha)
1A	Active	17.5	17.5
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**17.5**	**17.5**
1B	Active	0.17	0.17
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**0.17**	**0.17**
2A	Active	4.9	4.9
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**4.9**	**4.9**
3A	Active	1.7	1.7
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**1.7**	**1.7**
3B	Active	2.2	2.2
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**2.2**	**2.2**

Domain Code	Rehabilitation Phase	Area at start of MOP (ha)	Area at end of MOP (ha)
3C	Active	1.3	1.3
	Decommissioning	0	0
	Landform Establishment	0	0
	Growth Medium Development	0	0
	Ecosystem and Land Use Establishment	0	0
	Ecosystem and Land Use Sustainability	0	0
	Relinquished Lands	0	0
	Total	**1.3**	**1.3**
Total		**27.8**	**27.8**

7.4 Relinquishment Phase achieved during MOP Term

It is not planned for relinquishment of leases to be achieved during the term of this MOP for any domains.

8 Rehabilitation Monitoring and Research

8.1 Rehabilitation Monitoring

8.1.1 Mine Closure Records

Records of mine closure activities will be kept to assist with the monitoring and assessment of rehabilitation success, including:

- Demolition activities;
- Removal and disposal (e.g. quantities, treatment, location) of demolition materials;
- Clearance certificate(s) for asbestos materials;
- Validation of contaminated material management (if required under a Remedial Action Plan);
- Landform establishment (e.g. materials, timing, drainage) and stability;
- Surface preparation (e.g. growth medium source, treatment and depth);
- Revegetation methods;
- Maintenance activities;
- Photographs; and
- Weather conditions.

During the term of this MOP, Delta Coal will commence a program to investigate and maintain records relating to available soil material for use as growth media on-site, including:

- Soil characterisation of existing soil stockpiles on-site
- Subsoil characterisation over domain areas to determine suitability as growth medium

8.1.2 Vegetation Monitoring

In addition to maintaining the above records, vegetation establishment will be assessed in accordance with a site specific rehabilitation monitoring program which will be developed prior to mine closure.

Vegetation monitoring activities will be undertaken periodically at a frequency commensurate with the progress of revegetation, i.e. more frequently following initial revegetation efforts and at a reduced frequency once vegetation is adequately established and natural regeneration is evident.

The monitoring program for the areas undergoing revegetation to a native bushland, will include:

- a quantitative assessment of revegetation success based on landscape function analysis or other similar methodology proposed by specialist consultants;
- monitoring of analogue/reference sites outside the domain (see Section 8.2);
- assessment of weed species present and feral animal occurrence;
- taking photographs from series of fixed photo points which will enable a qualitative/visual analysis of changes in vegetation structure, condition and regeneration over the lifetime of the rehabilitation strategy; and
- general field observations including the identification of significant rehabilitation issues.

8.1.3 Annual Monitoring

Once closure has commenced, annual rehabilitation monitoring will be undertaken to assess the overall rehabilitation success against the established rehabilitation planning criteria (refer Section 6.0) and other commitments made within this MOP, including a review of the above records and monitoring described in Section 8.1.1 and 8.1.2.

It is noted that as rehabilitation of the domains is not planned to be undertaken during the term of this MOP, annual rehabilitation monitoring will not be commenced.

8.2 Research and Rehabilitation Trials and Use of Analogue Sites

Major rehabilitation trials or research programs are considered unnecessary at both operations given the limited disturbance footprint. However, it is expected that the specific rehabilitation methodologies used will be based on experience at other Collieries in the local (Lake Macquarie) area which will be adapted and modified based on the experience obtained during the closure process.

The analogue/reference site(s) for use in the rehabilitation monitoring program (refer Section 8.1.2) have not yet been defined and as such is unable to be detailed at this time. During the term of this MOP, Delta Coal will commence a program to establish and monitor analogue/reference sites, including:

- Development of analogue/reference sites for Mannering including site(s) within the following adjacent vegetation community:
  - Broad-Leaved Scribbly Gum Open Forest (for pit top).

- Grass land (for downcast shaft).

- Development of analogue/reference sites for Chain Valley, including site(s) within the following adjacent vegetation communities:
  - Coastal Open Woodland (for pit top).
  - Swamp Sclerophyll Forest (for upcast shaft).
  - Grass land (for pit top area under high voltage power line).
- Following development of analogue/reference sites, information will be used to further define completion criteria and performance measures for inclusion within the closure MOP

As noted in Section 8.1.2, the site specific rehabilitation monitoring program will be developed prior to mine closure.

9 Intervention and Adaptive Management

9.1 UPDATE FROM NEW RISK ASSESSMENT

Risks to rehabilitation and the management of those risks was addressed in the Risk Assessment undertaken as part of the preparation of this MOP (refer to Section 3). **Table 3.2** lists all the potential threats to rehabilitation, the relevant risk ranking assigned to the item within the Risk Assessment and where each of the items is addressed in this document. **Table 9.1** identifies the key threats to rehabilitation, which are those items from the Risk Assessment with an initial risk ranking of 'medium' or higher.

Table 9.1: Key Threats relating to Rehabilitation

Key threat	Initial Risk Level (based on existing controls) (low, medium, high or critical)	Residual Risk Level (based on proposed controls) (low, medium, high or critical)	Where addressed in this document
Geology/geochemistry and Material prone to spontaneous combustion *Geochemistry of coal materials which may cause combustion risk (through spontaneous combustion or other ignition sources post mine closure – e.g. bushfire)*	Medium	Low	Section 3.2.2
Erosion and sediment control *Water quality impacts to local environment due to less than adequate erosion and sediment control during rehabilitation*	Medium	Low	Section 3.2.6 and Section 3.2.12
Soil type(s) and suitability (Growth Medium) *Insufficient growth medium material available to achieve final land use*	Medium	Low	Section 3.2.6, Section 8.1

Key threat	Initial Risk Level (based on existing controls) (low, medium, high or critical)	Residual Risk Level (based on proposed controls) (low, medium, high or critical)	Where addressed in this document
objectives. *Soils / growth medium pH*			
Flora and Fauna *Failure to establish suitable vegetation communities as per MOP.*	Medium	Low	Section 3.2.7, Section 8.1
Surface water *Discharge from the site water management system resulting in contamination of water resources*	Medium	Medium	Section 3.2.12
Contaminated land and hydrocarbon management *Contamination remains following closure*	Medium	Low	Section 3.2.13
Hazardous materials *Explosives remain following closure and present public safety risk* *Note: No explosives to remain at premises following closure.*	Low	Low	Section 3.2.14
Bushfire *Significant impact to rehabilitation as a result of bushfire occurring prior to successful establishment of re-vegetation*	Medium	Low	Section 3.2.19

9.2 Rehabilitation Trigger Action Response Plan

Table 9.2 presents the Rehabilitation Trigger Action Response Plan (TARP) for each of the rehabilitation threats identified in **Table 9.1**.

Table 9.2: Rehabilitation TARP

Issue	Potential Hazard	Trigger	Action/Response	TARP Ref #
Geology/geochemistry and Material prone to spontaneous combustion	*Geochemistry of coal materials which may cause combustion risk (through spontaneous combustion or other ignition sources post mine closure – e.g. bushfire)*	Assessment of combustion risk (to be undertaken following cessation of mining) identifies materials on site which may pose a combustion risk.	Assessment of combustion risk to include recommendations for management of materials which may posed a combustion risk. Recommendations to be implemented.	1
Erosion and sediment control	*Water quality impacts to local environment due to less than adequate erosion and sediment control during rehabilitation*	Site inspection identifies that erosion and/or controls are not in accordance with completion criteria/ESCP.	Delta Coal personnel investigate to identify inadequate controls, and make recommendations to repair or upgrade site controls (specialist to be engaged as required) to ensure compliance with: • ESCP • Completion criteria. • "Blue Book'. Recommendations to be implemented.	2
Soil type(s) and suitability (Growth Medium)	*Insufficient growth medium material available to achieve final land use objectives.* *Soils / growth medium pH*	Final soil characterisation (to occur following cessation of mining) identifies that growth medium on-site is not adequate to meet completion criteria.	Soil characterisation assessment to include management recommendations such as details of any soil amelioration requirements. Recommendations to be implemented.	3
Flora and Fauna	*Failure to establish suitable vegetation communities as per MOP.*	Vegetation monitoring identifies that vegetation communities established do not meet completion criteria (e.g. not comparable to adjacent/analogue vegetation/final land use objectives).	Notify DPIE. Rehabilitation specialist to be engaged to identify reason for failed vegetation , and recommend actions to improve vegetation outcomes, which may include the following: • Weed and feral animal control. • Erosion control works.	4

Issue	Potential Hazard	Trigger	Action/Response	TARP Ref #
			• Maintenance fertilizing. • Re-seeding or replanting. • Site security. Controls to be implemented in consultation with DPIE. Where feasible controls cannot be identified, revision of the completion criteria should be considered while still ensuring these criteria achieve the domain rehabilitation objectives.	
Surface water	*Discharge from the site water management system resulting in contamination of water resources*	Surface water quality monitoring identifies water parameters outside the completion range criteria and/or EPL.	Notify relevant regulatory authorities (e.g. EPA/DPIE). LakeCoal personnel investigate to identify source of pollution, and make recommendations to repair or upgrade site water management controls (specialist to be engaged as required). Controls to be implemented and details of incident and actions taken or to be implemented provided to relevant regulatory authorities.	5
Contaminated land and hydrocarbon management	*Contamination remains following closure*	Completion of Phase 2 ESAs (to be undertaken following completion of mining) identifies contamination remaining on site.	Remedial action plan to be developed if required based on results of Phase 2 ESAs. Any contamination identified from the site investigations to be remediated in accordance with the requirements identified within the Phase 2 ESA reports and remedial action plan. Validation Report (indicating completion of any required	6

Issue	Potential Hazard	Trigger	Action/Response	TARP Ref #
			remediation work) is provided to DPIE and other relevant stakeholders.	
Hazardous materials	*Explosives remain following closure and present public safety risk.* *Note: No explosives to remain at premises following closure.*	Delta Coal becomes aware that: • explosives are remaining on site. • explosives have not been licensed and/or management not in accordance with Explosives Act 2003.	Trained and competent personnel (WorkCover accreditation) investigate to identify potential remaining explosives. Actions taken to manage any remaining explosives in accordance with Explosives Act 2003.	7
Bushfire	*Significant impact to rehabilitation as a result of bushfire occurring prior to successful establishment of revegetation*	Bushfire occurs on-site and vegetation is destroyed or significantly damaged.	Rehabilitation specialist to be engaged to identify likelihood of bushfire to cause long term damage to establishment of vegetation communities (resulting in failure to establish vegetation). If necessary, provide recommend actions to improve vegetation outcomes, which may include the following: • Maintenance fertilizing. • Re-seeding or replanting. • Site security. • Amended bushfire controls.	8

10 Reporting

All records and monitoring undertaken in accordance with this MOP will be documented within the Annual Review and submitted to DPIE for review of progress against the MOP. The Annual Review will address monitoring outcomes against rehabilitation planning criteria and compliance with regulatory requirements and commitments.

11 Review and Implementation of the MOP

11.1 Review of the MOP

A review of the MOP will be undertaken during the preparation of the Annual Reviews and as conditions change over time which will enable assessment of its continued relevance and adequacy. This MOP will be reviewed, and if necessary revised in response to:

- any changes to the regulatory requirements affecting the site;
- any modifications of the approvals issued under the EP&A Act; or
- any significant proposed changes to the activities described in this MOP or relinquishment criteria.

11.2 Implementation

Delta Coal personnel responsible for the monitoring, review and implementation of this MOP are identified in **Table 11.1**.

Table 11.1: Responsibilities for implementation of the MOP

Position	Responsibility
Mining Engineering Manager	• Allocate adequate resources to undertake activities, including monitoring in accordance with this MOP. • Provide high level oversight to ensure mining activities are undertaken consistent with those identified in the MOP.
Technical Services Manager	• Develop mine plans and manage authority to mine process to ensure mining activities are consistent with the MOP. • Provide input into MOP development and future mine planning to ensure alignment and consistency.
Registered Mine Surveyor	• Develop MOP Plans for mine closure activities in accordance with this MOP. • Develop relinquishment plans for lease relinquishment when closure criteria are achieved.
Environment and Community Coordinator	• Consultation with Technical Services Manager and Registered Mine Surveyor during development of the MOP • Review and update the MOP for consistency with any future approvals or modifications • Coordinate and supervise mine closure activities, monitoring and procedures in accordance with this MOP.

Position	Responsibility
	• Coordinate the environmental monitoring programs in accordance with this MOP • Consult with regulatory authorities and other stakeholders as required. • Report the progress of mine closure and rehabilitation in the Annual Review in accordance with this MOP. • Monitor and report on the implementation of closure and rehabilitation activities to the Manager of Mining Engineering. • Coordinate and supervise mine progressive site rehabilitation in accordance with this MOP

12 References

Mannering Colliery Land Management Plan

Mannering Colliery Air Quality Management Plan

Mannering Colliery Noise Monitoring Program

Mannering Colliery Water Management Plan

Chain Valley Water Management Plan

Chain Valley Air Quality Management Plan

Chain Valley Noise Management Plan

Chain Valley Heritage Management Plan

Chain Valley Biodiversity Management Plan

Chain Valley Rehabilitation Management Plan

EMM (2013), *Chain Valley Colliery – Mining Extension Project Environmental Impact Statement.*

EMM (2015), *Chain Valley Colliery – Modification 2 Statement of Environmental Effectst.*

EMM (2014b), *Chain Valley Colliery – Modification 1 Statement of Environmental Effects*.

EMM (2015), *Mannering Colliery – Modification 3 Environmental Assessment*.

EMM (2016), *Mannering Colliery – Modification 4 Environmental Assessment*.

NSW EPA (18/06/2016) Chain Valley Colliery Environmental Protection Licence (EPL) 1770

NSW EPA (12/05/2017) Mannering Colliery Environmental Protection Licence (EPL) 191

GSSE (2012), *Mannering Colliery - Extension of Mine Project Environmental Assessment*

Hansen Bailey (2007), *Mannering Colliery Continuation of Mining Environmental Assessment*.

Hansen Bailey (2007), *Mannering Environmental Assessment, Response to Submissions*

NSW Trade & Investment (2012), *MDG 6001: Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams*

Seedsman Geotechnics Pty Ltd (2011), *Centennial Mannering Pty Ltd, Section 75W Assessment, Great Northern and Fassifern Seams*

URS (2012), *Hazardous Materials Survey and Register Mannering Colliery*

AECOM (2012), *Asbestos Re-Inspection Survey Report Chain Valley Colliery*

13 Appendices

Appendix 1 – Plans