

MACQUARIE COAL

GLENCORE

Macquarie Coal Annual Review 2019

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Appendices

Appendix A – 2019 Closure Activities
Appendix B – 2020 Closure Activities
Appendix C – 2019 Wind Roses
Appendix D – Macquarie Coal Annual Review Plan
Appendix E – Assessment Against Closure Criteria

Title Block

Name of Operation	Macquarie Coal
Name of Operator	Oceanic Coal Australia Pty Ltd
Development consent / project approval #	Teralba surface facilities B/52-73TR Stockton Borehole Colliery at MCPP DA 88-4-2005 WWU overland coal conveyor 89/0012 Westside Mine haul road DA 91/00557 Lachlan Colliery at WWU and approval for extension to surface facilities DA 90/0725 MCPP DA 90/0725 Modification for construction of new ballast borehole at WWU 90/725/B Westside Mine open cut coal mine DA 90/0242 WWU ballast borehole facility and hopper BA/98/02188 Addition to WWU ventilation fan installation BA/98/02182 Mining within ML 1567 at Teralba DC/01/03498/1R WWU regional office records room DC/02/02090/1M Westside mine southern extension development DA 125-5-2002 LW11 borehole pump shed at Westside Mine and borehole pumping shed for LW11 borehole WWU DA 2434/2005 Operate sewage treatment system at WWU OSSM/141/2002 UGM occupation of Teralba Southgate DA/1174/2010 Installation of new ballast borehole adjacent to existing ballast borehole at WWU DA 90/0725C WWU Continued Operations PA 09_0203 Extraction of additional LW panels LW 51 and LW 52 at WWU PA 09_0203 (MOD 1) Operate sewage treatment system at MCPP OSSM/668/2000
Name of holder of development consent / project approval	Oceanic Coal Australia Pty Ltd
Mining lease #	CCL 718, CCL 725, CCL 760, ML 1336, ML 1451, ML 1438, ML 1567, ML 1532, MPL 323 and PLL 153
Name of holder of mining lease	Macquarie Coal Joint Venture Participants
Mining lease #	CCL 729
Name of holder of mining lease	Oceanic Coal Australia Pty Limited
Water licence #	20BL169793, 20BL173331, 20BL173511, 20BL173332, 20BL168748 and 20BL168704
Name of holder of water licence	Oceanic Coal Australia Pty Ltd
MOP/RMP start date	1 February 2017
MOP/RMP end date	31 December 2030
Annual Review start date	1 January 2019
Annual Review end date	31 December 2019

I, Ben Clibborn, certify that this audit report is a true and accurate record of the compliance status of the Macquarie Coal site for the period 1 January 2019 to 31 December 2019 and that I am authorised to make this statement on behalf of Oceanic Coal Pty Ltd.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, \$1 million and for an individual, \$250,000.

b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or \$22,000, or both).

Name of authorised reporting officer

Ben Clibborn

Title of authorised reporting officer

Environment and Community Manager

Signature of authorised reporting officer



Date

31 March 2020

1 Statement of Compliance

During the reporting period the Macquarie Coal site, which incorporates the Macquarie Coal Preparation Plant (MCP), Teralba Colliery, Westside Mine and West Wallsend Colliery (WWC) had a very high level of compliance with its major approvals. A summary of compliance against the most high-level approvals is provided in **Table 1-1**.

Table 1-1 – Statement of Compliance

Relevant Macquarie Coal Approvals	Compliance (Yes/No)
4B/52-73TR	Y
DA 88-4-2005	Y
89/0012	Y
DA 91/00557	Y
DA 90/0725	Y
DA 90/0725	Y
90/725/B	Y
DA 90/0242	Y
BA/98/02188	Y
BA/98/02182	Y
DC/01/03498/1R	Y
DC/02/02090/1M	Y
DA 125-5-2002	Y
DA 2434/2005	Y
OSSM/141/2002	Y
OSSM/668/2000	Y
DA 1174/2010	Y
DA 90/0725C	Y
PA 09_0203	Y
PA 09_0203 (MOD 1)	Y
EPL 1360	N
20BL169793	Y
20BL173331	Y
20BL173332	Y
2BL168748	Y
2BL168704	Y
20BL173531	Y
20BL173511	Y
CCL 718	Y
CCL 725	Y
ML 1336	Y
CL 532	Y

Relevant Macquarie Coal Approvals	Compliance (Yes/No)
ML 1451	Y
ML 1438	Y
ML 1567	Y
ML 1532	Y
PLL 153	Y
CCL 760	Y
ML1459	Y
MPL323	Y
CCL 729	Y

Where non-compliances were identified during 2019, these are summarised in **Table 1-2** and discussed further in **Section 11**. The non-compliances are separated into the categories as defined by the Annual Review Guideline (2015) presented in **Table 1-3**.

Table 1-2 – Non-Compliances

Relevant Approval	Condition #	Condition Description	Compliance Status	Comment	Relevant Section of Annual Review
EPL1360	M2.2	'For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns.	Non-Compliant	Unable to obtain sample at EPA Point 8 as the dust gauge holder had fallen over.	Section 11

Table 1-3 – Compliance Status Categories

Risk Level	Colour Code	Description
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-Compliant	Non-compliance with potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences, but is likely to occur
Low	Non-Compliant	Non-compliance with potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-Compliant	Non-compliance which does not result in any risk of environmental harm

Section 6 provides detail on environmental performance for aspects including noise, blasting, air quality, biodiversity, heritage and subsidence. Additional detail on the management of water at Macquarie Coal is in **Section 7**, while non-compliances that are not administrative (low, medium and high risk of environmental consequences) are covered in **Section 11**.

2 Introduction

2.1 Mine Operation

Macquarie Coal is located in the Lake Macquarie region of New South Wales (NSW), which is situated in the local government area of Lake Macquarie City Council (LMCC) (see **Figure 2-1**). Macquarie Coal (MC) encompasses West Wallsend Colliery (WWC), MCPP (Macquarie Coal Preparation Plant), the former open-cut Westside Mine and the former Teralba Colliery (Northgate and Southgate sites).

Teralba Colliery was an underground coal mine. Infrastructure at Teralba Southgate remains in use, leased to UGM Engineers Pty Ltd whilst mining operations at Westside Mine were completed in early 2012, and mining ceased at WWC Colliery in 2016. When WWC was still operating coal was washed and loaded onto trains at the MCPP and transported to Newcastle Port for export or to domestic power stations via rail.

The sites forming Macquarie Coal are owned by the Macquarie Coal Joint Venture (MCJV). Oceanic Coal Australia Limited (OCAL) is the major participant in the MCJV, holding 80 per cent of ownership. OCAL ownership is 70% as OCAL and an additional 10% by virtue of its ownership of OCAL Macquarie. Other participants of the joint venture include Marubeni Coal Pty Ltd. (17%) and JFE Mineral (Australia) Pty Ltd. (3%). OCAL is wholly owned by Glencore Australia Pty Ltd.

This consolidated Annual Review details the operational and environmental management activities for Macquarie Coal (MCPP, WWC, Teralba Colliery and Westside Mine). The Annual Review covers the period 1 January 2019 to 31 December 2019 for all sites. *The Annual Review has been prepared in accordance with the requirements of the Annual Review Guideline* (NSW Government, 2015). This report also meets the requirement for Environmental Management Reports or Rehabilitation Reports required under the various mining tenements.

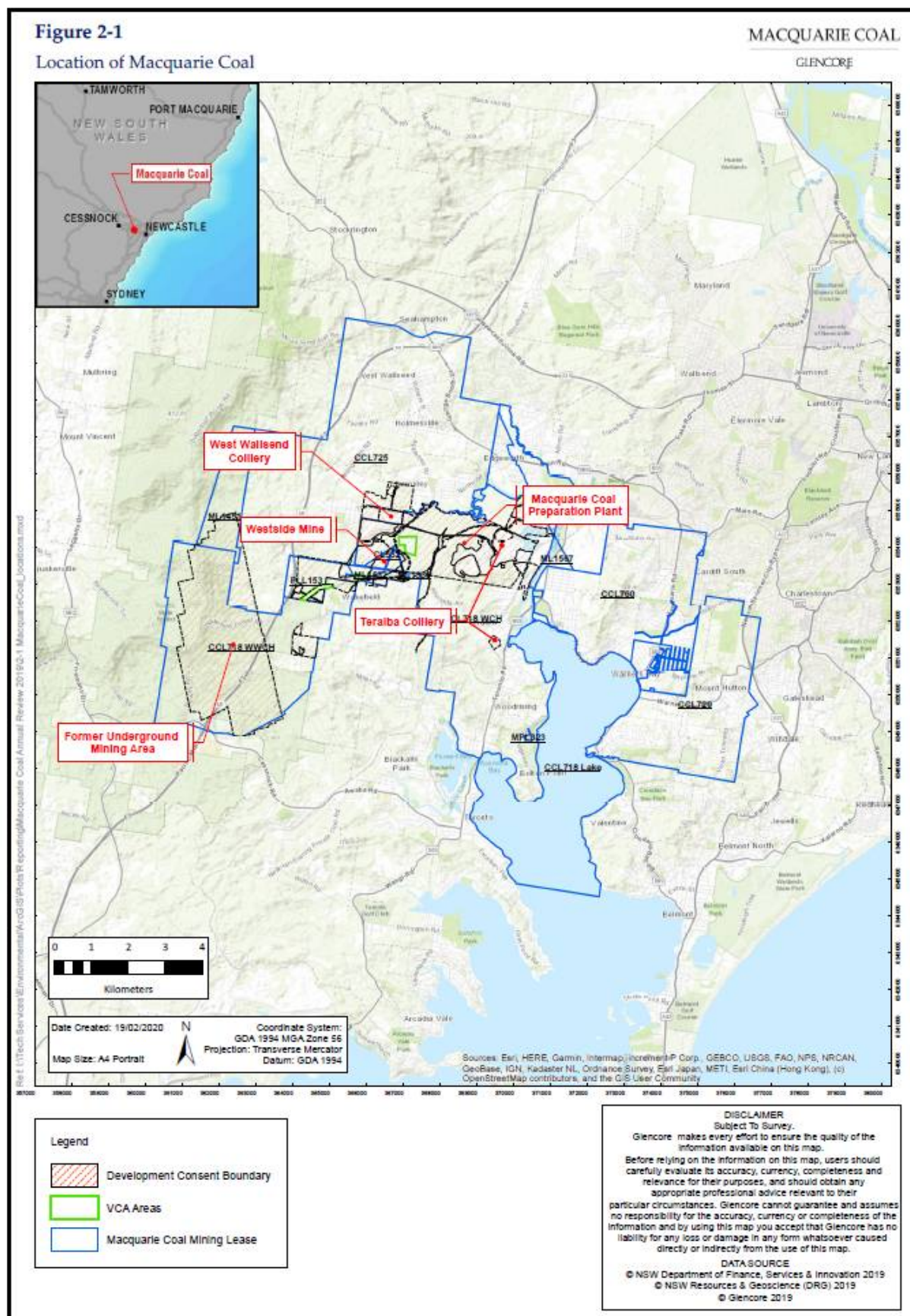
2.2 Mine Contacts

The contact details for the personnel responsible for environmental management and community relations of Macquarie Coal during the 2018 calendar year are provided in **Table 2-1**.

Table 2-1 – Primary Contacts for Macquarie Coal

Contact	Position	Contact Details
Ben Clibborn	Macquarie Coal Environment and Community Manager	(02) 4941 2163
Mark Munro	Operations Manager	(02) 4941 2108
Hamish Stuart	Mine Closure Project Manager	(02) 4941 2162

Figure 2-1 – Location of Macquarie Coal



3 Approvals

Macquarie Coal operations are regulated by a range of consents, mining tenements, and licences which are summarised in the following sections.

3.1 Development Consents

Macquarie Coal operates under several development consents granted by the Department of Planning and Environment (DPE) and Lake Macquarie City Council (LMCC). The details of these approvals are provided in **Table 3-1**.

Table 3-1 – Development Consents

Issuing / Responsible Authority*	Development Consent	Date of Issue	Expiry	Comments
LMCC	B/52-73TR	10 Jul 1973	NA	Mining operation and surface facilities at Teralba Colliery
DPE	Development Consent DA 88-4-2005	21 Jul 1981	Not specified	Original development consent for the (former) Stockton Borehole Colliery (incl. washery operation and surface facilities) at MCPP. Conditions of consent modified on 3 June 1994.
LMCC	89/0012	4 May 1989	Perpetuity	WWC overland coal conveyor
LMCC	DA 91/00557	20 Dec 1991	Perpetuity	Westside Mine haul road
LMCC	DA 90/0725	28 Feb 1991	Perpetuity	Lachlan Colliery (Includes No. 3 ventilation shaft) at WWC and approval for extension to surface facilities incl. coal stockpiles (located within the Lachlan Colliery DA boundary) at MCPP
DPE	Development Consent DA 90/0725	28 Feb 1991	Not specified	Ensures the landscape and scenic quality of the locality at MCPP is maintained
LMCC	90/725/B	28 Feb 1991 Modification determined 15 Apr 2010	Perpetuity	Modification for construction of new ballast borehole at WWC
LMCC	DA 90/0242	18 Jul 1990	Perpetuity	Westside Mine open cut coal mine, access road, office amenities and maintenance buildings
LMCC	BA/98/02188	18 Jun 1999	Perpetuity	WWC ballast borehole facility and hopper
LMCC	BA/98/02182	4 Jun 1999	Perpetuity	Addition to WWC ventilation fan installation
LMCC	DC/01/03498/1R	21 Jan 2002	Not specified	Mining within ML 1567 at Teralba
LMCC	DC/02/02090/1M	5 Sept 2002	Perpetuity	WWC regional office records room

Issuing / Responsible Authority*	Development Consent	Date of Issue	Expiry	Comments
DPE	DA 125-5-2002	23 Jan 2003	1 Feb 2026	Westside Mine southern extension development
LMCC	DA 2434/2005	29 Dec 2005	Perpetuity	LW11 borehole pump shed at Westside Mine and borehole pumping shed for LW11 borehole WWC
LMCC	OSSM/141/2002	20 Oct 2010	30 Sept 2019	Approval to operate a sewage treatment system at WWC
LMCC	OSSM/668/2000	20 Oct 2010	30 Sept 2021	Approval to operate a sewage treatment system at MCPP
LMCC	OSSM/14/2017	20 Nov 2017	20 Nov 2022	Approval to install a new system onsite effluent disposal WWC
LMCC	OSSM/15/2017	2 Jul 2018	30 Sep 2021	Approval to operate a system of sewage management MCPP
LMCC	DA/1174/2010	18 Sep 2010	18 Sep 2015*	UGM occupation of Teralba Southgate.
LMCC	DA 90/0725C	15 Apr 2010	Perpetuity	Installation of new ballast borehole adjacent to existing ballast borehole at WWC
DPE	PA 09_0203	25 Jan 2012	31 Dec 2021	WWC continued operations project approval
DPE	PA 09_0203 (MOD 1)	21 Oct 2014	31 Dec 2021	Modified to include the extraction of additional LW panels LW 51 and LW 52 at WWC

*Does not need renewal

3.2 Mining Tenements

Mining operations at Macquarie Coal are undertaken within Consolidated Coal Lease (CCL) 718, CCL 725, Mining Lease (ML) 1336, CL 532, ML 1451, ML 1438, ML 1567, ML 1532, PLL 153, CCL 760 and CCL 792. Details of these mining tenements are provided in **Table 3-2**.

Table 3-2 – Mining Tenements

Issuing / Responsible Authority*	Development Consent	Date of Issue	Expiry	Comments
Department of Planning & Environment (DPE) – Resources Regulator (RR)	CCL 718	16 Sept 1991	10 Jan 2030	Consolidated Coal Lease for WWC, MCPP and Teralba
RR	CCL 725	16 Sept 1991	10 Oct 2029	Main mining lease for existing and future workings. Applies to WWC and Westside Mine.
RR	CCL 729	16 Sept 1991	12 May 2007*	Consolidated Coal Lease

Issuing / Responsible Authority*	Development Consent	Date of Issue	Expiry	Comments
			pending renewal	
RR	ML 1336	2 Nov 1993	2 Nov 2035	Applies to WWC and Westside Mine
RR	CL 532	6 May 1996	1 Nov 2018**	Westside Mine
RR	ML 1451	17 Jun 1999	16 Jun 2020	WWC Western Extension
RR	ML 1438	1 Feb 1999	31 Jan 2020	WWC Small Infill Area
RR	ML 1567	21 Jan 2002	12 Sept 2026	Teralba Colliery
RR	ML 1532	26 Feb 2003	25 Feb 2024	Westside Mine
RR	PLL 153	30 Apr 2007	29 Mar 2024	Westside Mine
RR	CCL 760	29 Jul 2009	4 Jul 2021	Teralba Colliery
RR	ML 1459	14 Sept 2001	23 July 2017**	MCP
RR	MPL 323	6 Apr 1991	6 Apr 2020	Applies to WWC

*Renewal pending

**Expired

3.2.1 Mining Operations Plan Status

During 2019 Macquarie Coal operated under a Closure Mining Operations Plan (MOP). The Plan covers various aspects including mine closure planning and execution, stakeholder consultation, environmental issues management, post mining land use, status of closure at end of MOP, forward works plan, performance indicators and rehabilitation implementation. During the year the MOP was amended (Amendment B). MOP Amendment B was prepared to include the provision of importing coal ash (including fly ash and pond ash) from the Eraring Power Station for use in stabilizing the TSF and rehabilitating the area to a free draining land form. The ash will be delivered to the TSF by pneumatic tanker (for fly ash) and truck (for pond ash) from the Eraring Power Station, which is owned and operated by Origin Energy.

3.2.2 Extraction Plan Status

Extraction of coal ceased at WWC in May 2016. During the 2016 reporting period extraction was undertaken in accordance with the DPE approved Long wall (LW) 51 and 52 Extraction Plan. Any outstanding extraction plan commitments are now included in the MOP which outlines subsidence remediation and management during the rehabilitation process.

Condition 6.2.4 of the West Wallsend Colliery Continued Operations Project (PA 09_0203) requires WWC to undertake remediation works within the Sugarloaf State Conservation Area (SSCA) to the value of \$50,000.00 per annum over the life of the Project, in consultation with OEH. Following consultation with OEH, Macquarie Coal paid OEH \$50,000.00 for remediation works in September 2019.

3.3 Licences

Macquarie Coal holds an Environment Protection Licence (EPL 1360), Sugarloaf State Conservation area licences, water licences, groundwater licences and Dangerous Goods Notifications as listed in **Table 3-3**. WWC also has two licences for coal quality drilling activities, which include one licence for five boreholes and one licence for eleven boreholes. A separate EPL (EPL 4033) was held for Westside Mine however this EPL was relinquished on 6 September 2018, and EPL 1360 was varied to incorporate Westside's boundary.

Table 3-3 – Macquarie Coal Licences

Issuing / Responsible Authority*	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
NSW Environment Protection Authority (EPA)	EPL 1360	Current licence version issued 13 December 2019	Anniversary Date: 31 Dec	Consolidated EPL held for WWC, MCPP, Westside Mine and Teralba Colliery
Department of Industry (DoI) Water	Water Licence 20BL169793	12 Aug 2010	11 August 2020	Held for WWC
DoI Water	Water Licence 20BL173331	21 Sept 2012	Perpetuity	Groundwater monitoring bores above LW operations
DoI Water	Water Licence 20BL173332	21 Sept 2012	Perpetuity	Groundwater monitoring bores above LW operations
Department of Land & Water Conservation	Groundwater licence 2BL168748	17 March 2003	Perpetuity	Held to monitor the water level and chemistry at 3 boreholes at Westside
DoI Water	Groundwater licence 2BL168704	2 May 2013	1 May 2018*	For extraction of groundwater from the Westside open-cut mining void
DoI Water	Groundwater licence 2BL173511	17 May 2013	Perpetuity	Groundwater monitoring bore
DoI Water	Radiation Management Licence RML5061069	-	9 Dec 2016**	Replaced RML27914
NSW EPA	Radiation Licence RL27533	-	November 2012	Not renewed as two radiation sources disposed offsite to a licenced facility
National Parks and Wildlife Service (NPWS)	Subsidence Management Activities	21 March 2016	21 March 2021	Held for Sugarloaf State Conservation Area (SCA)
NPWS	Licence for use of grouting as remediation method	Valid for life of operation	Valid for life of operation	Held for WWC

*Renewal pending

**Not renewed

4 Operations Summary

4.1 Mining Operations

The extent of mining operations at Macquarie Coal is shown on **Figure 2-1** and discussed in the following sections.

4.1.1 Exploration

No exploration activities were undertaken for Macquarie Coal during the 2019 reporting period.

4.1.2 Land Preparation

Land preparation activities were undertaken at the West Wallsend Colliery during 2019. Earthworks (shaping) were undertaken after demolition of pit top infrastructure was completed.

4.1.3 Clay Mining

No clay mining activities have taken place since the cessation of mining in 2012. No clay mining was undertaken for Macquarie Coal during the 2019 reporting period.

4.1.4 Mining Operations

No mining operations were undertaken during the reporting period. Macquarie Coal mined the last coal from WWC's Long wall (LW) 52 in May 2016. A summary of coal production and waste material production is provided in **Table 4-1** below.

Table 4-1 – Production and Waste Summary for 2018 and the Next Reporting Period

Material	Approved Limit (Source – PA 09_0203) tpa	Previous Reporting Period (actual 2018) (t)	This reporting period (actual 2019)	Next reporting period (Forecast 2020)
Waste Rock / Overburden		0	0	0
ROM Coal / Ore	5,550,000	0	0	0
Coarse Rejects (MCP)		0	0	0
Processing Waste & Fine Rejects (Tailings) (MCP)		0	0	0
Saleable Product (MCP)		0	0	0

During the reporting period there was no coal production and there is no forecast production, with the cessation of operations at Macquarie Coal.

4.1.5 Mine Closure

Mine closure works across WWC, MCP and Teralba Northgate and Southgate have been underway since mining at West Wallsend ended in June 2016. Mine closure works undertaken during 2019 included:

- Shaping of land to final land form design.

A schedule summarising these closure works is included in **Appendix A**.

Demolition of all redundant infrastructure at WWC (pit top) was complete at the end of 2017, except for the substation. During 2019, no demolition works were undertaken at WWC.

Consultation regarding mine closure was undertaken during the reporting period and will continue to be undertaken with relevant stakeholders, including the LMCC and the Community Consultative Committee (CCC), which has several local community members as CCC members.

Macquarie Coal's workforce (full time employees) has not changed in 2019 compared with the previous reporting period. The number of contractors varies throughout the year depending on the processes being undertaken on site. **Table 4-2** below details employment information as required by the Stockton Borehole consent (1981).

Table 4-2 – Employment Information During the Reporting Period

Employee Type	This reporting period (actual 2019)	Male	Female	Local Government Area				
				NCC	LMCC	MCC	CCC	WCC
Full Time Employees	9	8	1	3	2	2	1	1
Part Time Employees	1	0	1	1	0	0	0	0
Contractors (approximate)	35	-	-	-				

4.2 Other Operations

4.2.1 Coal Handling and Preparation Plant

The Coal Handling and Preparation Plant (CHPP) did not operate during the year, with the last tonnes of coal processed during mid-2016 and the last coal train loaded on 19 October 2016. Earth works were undertaken at the CHPP during the reporting period.

4.2.2 Tailing Storage Facility

The Tailings Storage Facility (TSF) at MCPP is the sole tailings storage area for Macquarie Coal. When coal washing ceased in June 2016, closure works commenced at the TSF.

Weekly inspections of the TSF are undertaken. Monitoring of the phreatic water on the TSF is also undertaken.

A Surveillance Inspection of the TSF to assess the stability of the TSF embankments, appurtenant structures and surrounding areas was undertaken during 2019. The Inspection identified no issues.

Regular testing has been undertaken to understand the strength and crust development, Phase 1 capping of the tailings dam commenced in 2019.

4.2.3 Construction

No construction was undertaken during the reporting period.

4.2.4 Demolition

No demolition was undertaken during the reporting period.

4.2.5 Waste Management

General Waste

Waste management practices are based on the waste management hierarchy whereby waste is minimised in the first instance, reused/recycled in the second instance and disposed of as a last resort. Macquarie Coal currently has a total waste management system which includes training, segregation, disposal and reporting. Waste is removed from site by a licenced contractor. All general and recycled waste generated during 2019 were managed in accordance with the Waste Management section Environmental Management Strategy.

No changes to the waste management system were made during the reporting period.

WWC are required to monitor waste generated by the operation in accordance with Condition 25 of Schedule 4 of Project Approval (PA 09_0203, as modified). **Table 4-2** outlines the approximate volumes of waste generated and recycled at WWC during the 2019 reporting period. Waste statistics are not provided for Teralba and Westside Mine as Teralba's operator (UGM) manage their own waste and Westside did not produce any general waste or recyclables during 2019.

Table 4-2 – Summary of General Waste and Recyclables at WWC during 2019

Waste Statistic	Tonnes		%	
	2018	2019	2018	2019
Total Waste Disposed Offsite to Landfill	74.6	353.7	10.5	46.6
Total Waste Recycled	632.6	404.5	89.5	53.4
Total Waste Generated Onsite	707.1	758.2	100	100

Compared to last year, 279.1 more tonnes of waste was disposed to landfill and 228.1 less tonnes of waste was sent for recycling. More waste was recycled in 2018 than 2019 due to demolition activities.

Demolition Waste

All demolition waste generated is being disposed of via a licenced waste contractor with a significant amount able to be recycled.

Oil and Grease Containment and disposal

Minimal volumes of oils are stored onsite due to the low volumes of machinery used during mine closure, and care and maintenance activities. All oils, greases and detergents stored onsite are contained within bunded, covered concrete storage areas with no bulk oil storage occurring onsite.

No diesel fuel is stored on-site. Supplies were used up prior to the bulk diesel storage tanks being removed, as part of decommissioning. Light vehicles use fuel cards to refuel. Diesel for mobile equipment is supplied on an as needed basis.

Any 'wash down' areas are located so that oils, greases and sediment must drain through an oily water separator before treated 'wash-down' waters are reused or discharged from the site. All waste oil is placed in storage tanks for recycling. A licensed waste contractor collects any oil captured by the separator, along with other waste oil, on an as required basis. In addition, an oil absorbent boom is fitted upstream of the licenced discharge point at MCPP as a contingency should any hydrocarbons bypass the system.

During the reporting period no waste oil was taken from WWC for recycling.

Effluent Treatment and Disposal

Sewage plants treat all sewage and bathhouse water produced at MCPP and WWC. These sewage treatment plants are serviced by a licenced contractor, as required. During 2018, the existing sewage plant at WWC was replaced with a transpiration system.

Sewage and bathhouse water at the Teralba Southgate site is disposed to the council sewer system. There are no sewage treatment systems at Teralba Northgate as these have been decommissioned.

Hazardous Material Management

Storage of hazardous materials at Macquarie Coal is undertaken in accordance with the relevant legislative requirements, along with the relevant sections of the West Wallsend Colliery Environmental Management Strategy.

No explosives are stored at Macquarie Coal.

Coarse Reject Material

Coarse reject material ceased to be produced in 2016, when operations at the MCPP stopped.

Coarse reject material was not emplaced on the eastern REA in 2019.

Fine Reject Material Tailings

Fine reject material was produced only until May 2016, when the site stopped generating tailings. At the time, this material was pumped to the MCPP tailings dam for disposal.

4.3 Next Reporting Period

4.3.1 Rehabilitation

During 2020 the following rehabilitation works will be undertaken at Macquarie Coal:

- Rehabilitate the north western dam wall face of the REA; and
- Undertake subsidence remediation in SCA.

Rehabilitation monitoring will be undertaken in early 2020 at Westside Mine and MCPP. Rehabilitation maintenance works will also be undertaken at Westside Mine (refer to **Section 8.11.3**).

Capping of the TSF commenced in late 2019. An initial 2.5m capping will be placed on hard zones on TSF, consisting of the eastern third of the TSF. The remaining sections of the TSF will be capped when efficient to do so or with fly ash if the trial of fly ash proves to be suitable.

4.3.2 Mine Closure Works

Mine closure works planned for 2020 include:

- Demolish electrical infrastructure at WCC;
- Investigate the level of contamination within MCPP Dam 3;
- Investigate the level of contamination within the surface dam at Teralba Southgate;
- Remove power lines at the MCPP Maturation Ponds;
- Remove the Teralba North Gate EDL Plant; and
- Continue capping of the tailings dam.

These works will involve the transport of material to and from the site, with works undertaken by specialist contractors. **Appendix B** provides an overview of these works.

Following the removal of electrical infrastructure demolition works will be completed at West Wallsend.

5 Actions Required from Previous Annual Review

The 2018 Macquarie Coal Annual Review was submitted to DPE Compliance Section and the Resource Regulator on 29th March 2019. DPE did not provide any such feedback on the Macquarie Coal 2018 Annual Review. The Resource Regulator (RR) acknowledged receipt of the Annual review via email on 5 December 2019, however, did not provide any such feedback. The Resource Regulator undertook a site inspection on 1 April 2019.

6 Environmental Performance

6.1 Meteorology

Condition M5.1 of EPL 1360 and the Westside Mine consent require continuous meteorological monitoring. Macquarie Coal has one meteorological monitoring site as shown in **Figure 6-1**.

6.1.1 Rainfall Monitoring

Monthly recorded rainfall data for Macquarie Coal is provided in **Table 6-1**.

Table 6-1 – Monthly Rainfall Recorded at Macquarie Coal during 2019

Month	Rainfall (mm)
January	40
February	69.6
March	267.4
April	47.2
May	16.8
June	142.2
July	26.8
August	158.2
September	100.2
October	24
November	21.2
December	0.2
Total	913.8mm

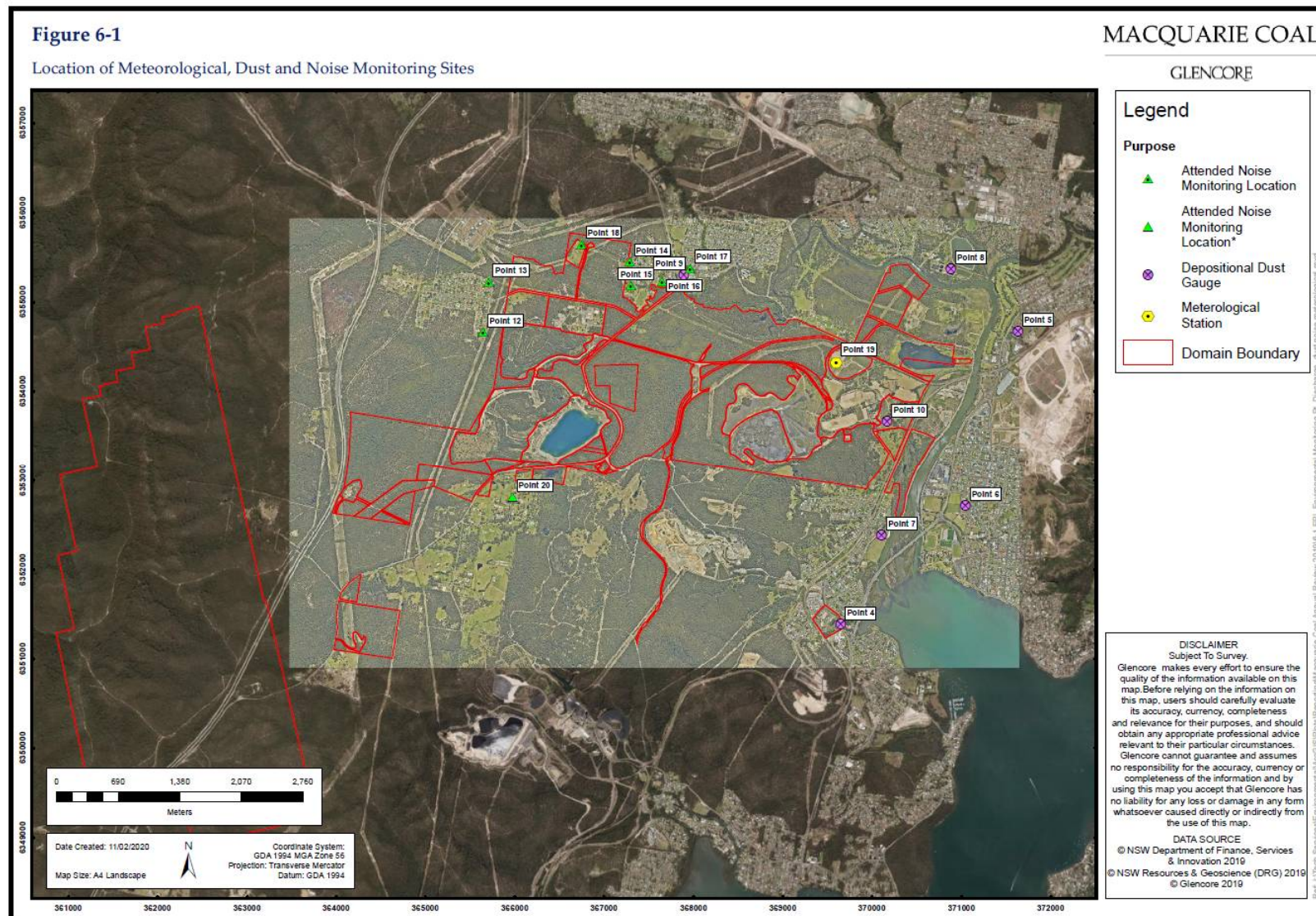
In 2019, 913.8 mm of rainfall was recorded at Macquarie Coal, 215 mm less rainfall than 2018. Rainfall for 2019 was quite variable during the year, with the largest monthly rainfall recorded as 267.4 mm in March.

The Bureau of Meteorology (BOM) long term rainfall data is publicly available for the reporting period at nearby monitoring station at Edgeworth (061393). Total rainfall at the Edgeworth monitoring location during the reporting period was 866 mm, note there was no data available for November and December 2019.

6.1.2 Wind Monitoring

Wind velocity and direction are measured at Macquarie Coal weather station by a cup anemometer and wind vane instruments. Monthly wind roses for Macquarie Coal during 2019 are attached as **Appendix C**. The dominant wind direction is from the south and east during all months except for June and August 2019, when winds shifted to a north-westerly direction.

Figure 6-1 – Location of Meteorological, Dust and Noise Monitoring Sites



6.2 Noise

6.2.1 Environmental Management

Macquarie Coal recognises the impacts of noise on the local community and implements management measures at all of its sites.

Noise monitoring and noise control measures are implemented at WWC in accordance with the Noise Management section of the West Wallsend Colliery Environmental Management Strategy and MCPP Environmental Management Plan. MCPP's EMP was prepared in accordance with the 1981 development consent, Section 5.3 of the Environmental Impact Assessment report and a former approval under the Noise Control Act 1975 (No. 270712C6 – 4/9/1980). Noise management at WWC complies with PA 09_0203, EPL 1360 and 2013 WWC Noise Compliance Report. Noise monitoring sites are shown on **Figure 6-1**. Attended and unattended (continuous) noise monitoring is undertaken.

Noise monitoring is no longer required at MCPP and Westside mine, as authorised by DPE.

6.2.2 Environmental Performance

6.2.2.1 Noise Assessment Criteria

The DA (DA 88-4-2005) for the MCPP (washery and surface facilities) establishes limits for noise emissions at the site. The DA also sets environmental noise criterion for the site of LA90 50dB at surrounding residences.

Project specific noise assessment criteria applicable to WWC is detailed within Condition 2 of Schedule 4 of PA 09_0203 for day, evening and night time periods, and summarised in **Table 6-2**.

Table 6-2 – Noise Assessment Criteria for WWC (dB)

Receiver Area	Location	Day	Evening	Night	
		L _{Aeq} (15 min)	L _{Aeq} (15 min)	L _{Aeq} (15 min)	L _{Aeq} (11 min)
R1	Killingworth (main)	39	39	39	49
R2	Killingworth (north)	41	41	41	49
R3	Barnsley (west)	40	40	40	49
R4	Barnsley (southwest)	41	41	41	49
R5	Barnsley (south)	37	37	37	49
R6	Barnsley (main)	35	35	35	49
R7	Barnsley (59 Charlton Street)	44	44	44	49
R8	Any residence in Wakefield	35	35	35	51

Table 6-3 outlines the noise assessment criteria at MCPP.

Table 6-3 – Noise Assessment Criteria for MCPP (dB)

Location	Monitoring Location	MCPP L _{A90} (15 min) (dB)
A1	Railway Street, Teralba	50
A7	Racecourse Road, Boolaroo	50
A9	Northern end of Racecourse Road	50
A11	Link Road opposite MCPP rail loop	50
A12	Eastern end of Cliffbrook Street, Barnsley	50
A14	Intersection of Railway & Victoria Streets, Teralba	50
A19	Intersection of Creek Reserve Rd & Second St, Boolaroo	50
A20	15 Read Place, Teralba	50

6.2.2.2 Noise Monitoring Results

Noise assessments were undertaken at WWC by EMM Consulting Pty Limited (EMM) during the 2019 reporting period, on a quarterly basis. The monitoring results are outlined in **Table 6-5**. There were no exceedances of the WWC noise criteria during the 2019 reporting period. This was the same as the three prior years.

Noise monitoring reports can be viewed/downloaded on the WWC website: <http://www.westwallsendcolliery.com.au>

6.2.3 Comparison against Predictions

A noise assessment for WWC was prepared in 2010 by Umwelt, as part of the WWC Continued Operations Projects approved in 2013. The assessment predicted 'Target Project Specific Noise Levels' throughout the life of the continued operations project. 'Target Project Specific Noise Levels' were modelled at locations considered to be representative of the nearest sensitive receptors, with different levels for day, evening and night time operations. All predictions were measured as dB(A) LAeq (15min). There was no dB(A) LAeq (11min) predictions. The project specific noise criteria for WWC are provided in **Table 6-4**. There were no exceedances of the 'Target Project Specific Noise Levels' during the reporting period¹.

Table 6-4 – Project Specific Noise Criteria

Location	Time Period	Project Specific Noise Criteria (dB(A))
M1 – The Trongate (South) Killingworth	Day	39 _{LAeq, 15min}
	Evening	39 _{LAeq, 15min}
	Night	39 _{LAeq, 15min}
M1 – The Trongate (North) Killingworth	Day	40 _{LAeq, 15min}
	Evening	40 _{LAeq, 15min}
	Night	39 _{LAeq, 15min}
M3 – Bendigo Street Barnsley	Day	41 _{LAeq, 15min}

¹ Even though the site is no longer operating a comparison between noise measurements made in 2019 and predictions made in 2013 (for an operating site) has been made, as these are the most relevant predictions for such a comparison.

Location	Time Period	Project Specific Noise Criteria (dB(A))
M5 – Wakefield Road, Wakefield	Evening	41 _{L_{Aeq}, 15min}
	Night	39 _{L_{Aeq}, 15min}
	Day	50 _{L_{Aeq}, 15min}
	Evening	45 _{L_{Aeq}, 15min}
	Night	40 _{L_{Aeq}, 15min}

Note: *Day period is 7.00 am – 6.00 am, Evening is 6.00 pm – 10.00 pm, Night is 10.00 pm – 7.00 am

6.2.4 Incident and Improvements

No noise complaints were received during the 2019 reporting period and there were no non-compliances with the EPL 1360 during the reporting period.

Noise monitoring will continue during the next reporting period.

Table 6-5 – WWC Maximum Noise Monitoring Results for 2019 (dB)

Receiver Area	Q1 - 2019				Q2 - 2019				Q3 - 2019				Q4 - 2019			
	Day		Evening		Night		Day		Evening		Night		Day		Evening	
	L _{Aeq}		L _{Aeq}		L _{Aeq}		L _{Aeq}		L _{Aeq}		L _{Aeq}		L _{Aeq}		L _{Aeq}	
	(15 min)	(15 min)	(15 min)	(1 min)	(15 min)	(15 min)	(15 min)	(1 min)	(15 min)	(15 min)	(15 min)	(1 min)	(15 min)	(15 min)	(15 min)	(1 min)
R1	<34	-	-	-	IA	-	-	-	IA	-	-	-	IA	-	-	-
R2	<35	-	-	-	IA	-	-	-	IA	-	-	-	IA	-	-	-
R3	IA	-	-	-	IA	-	-	-	IA	-	-	-	IA	-	-	-
R4	IA	-	-	-	IA	-	-	-	IA	-	-	-	IA	-	-	-
R5	IA	-	-	-	IA	-	-	-	IA	-	-	-	IA	-	-	-
R6	IA	-	-	-	IA	-	-	-	IA	-	-	-	IA	-	-	-
R7	<35	-	-	-	IA	-	-	-	IA	-	-	-	IA	-	-	-
R8	IA	-	-	-	IA	-	-	-	IA	-	-	-	IA	-	-	-

IA = Inaudible

NM = Not measurable

Note: No operations occurred during the evening or night during 2019. Monitoring is not normally required at R7 as it is the subject of a private agreement. However, monitoring was undertaken during 2019 as the agreement had lapsed. Levels in this table are not necessarily the result of activity at WWU.

6.3 Blasting

No blasting occurred at Westside Mine, Teralba Colliery, MCPP or WWC during 2019.

6.4 Air Quality

6.4.1 Environmental Management

6.4.1.1 Monitoring System

Macquarie Coal implements control strategies to mitigate air quality impacts in accordance with the air quality section of the WWC Environmental Management Strategy, EPL 1360, EPL 4033 (prior to 6 September 2018) and Westside's DA 125-5-2002. Macquarie Coal also operates a monitoring system to monitor air quality impacts on surrounding communities. Air quality monitoring locations are shown by **Figure 6-1**.

Air quality monitoring is undertaken at seven locations across WWC and MCPP, with depositional dust monitoring undertaken on a monthly basis.

Monthly PM₁₀ and quarterly Total Suspended Particulate Matter (TSP) monitoring was undertaken at Westside prior to relinquishing the EPL (4033) in September 2018. Monthly depositional dust monitoring (ash and insoluble solids) is no longer undertaken at Westside.

6.4.2 Environmental Performance

6.4.2.1 Air Quality Criteria

Condition 5.1.1 of DA 125-5-2002 and Condition 11, Schedule 4, of PA 09_0203 outlines the criteria for TSP, PM₁₀ and depositional dust levels for WWC and Westside Mine. These criteria are provided in **Table 6-6**.

Table 6-5 – Particulate Matter Criteria for WWC and Westside Mine

Pollutant	Criterion (Long Term)	Criterion (Short Term)	Maximum Increase
Total Suspended Particulate Matter (TSP)	90 µg/m ³ (annual mean)	-	-
Particulate Matter <10µm (PM ₁₀)	30 µg/m ³ (annual mean)	50 µg/m ³ (24 hour average)	-
Deposited Dust (annual average)	-	-	2 g/m ² /month (total deposition) 4g/m ² /month

EPL 1360 and EPL 4033 (applicable only before 6 September 2018) do not specify ambient dust criteria limits.

6.4.2.2 Results

Table 6-7 summarises the average monthly depositional dust monitoring results for WWC/MCPP for the 2019 reporting period.

Table 6-6 – 2019 Annual Average Depositional Dust Monitoring Results at WWC/MCPP

Monitoring Site	Insoluble Matter Deposited (g/m ² /mth)	Ash Deposit (g/m ² /mth)	Criteria
EPA Point 4	1.5	0.8	4.0
EPA Point 5	1.6	0.8	4.0
EPA Point 6	1.3	0.9	4.0
EPA Point 7	2.1	1.6	4.0
EPA Point 8	1.8	1.2	4.0
EPA Point 9	1.5	0.8	4.0
EPA Point 10	1.2	0.8	4.0

These monitoring sites are located within land owned by OCAL.

There was no exceedance of ash at Macquarie Coal during 2019. There was also no exceedance of Insoluble Matter during the reporting period.

PM₁₀ and TSP levels were recorded at Westside Mine during 2018. A summary of the high volume air sampling results (PM₁₀ and TSP) for 2018 are provided in **Table 6-8**. TSP was only recorded at EPA Point 13 on March 2018 and June 2018. PM₁₀ was also only recorded at EPA Point 13 from January 2018 to August 2018. TSP and PM₁₀ measurements were no longer required to be undertaken at the Westside Mine after 6 September 2018, after the Westside EPL 4033 was relinquished and the varied EPL 1360 (that now covers Westside) does not have these monitoring requirements.

Table 6-7 – Summary of High Volume Air Sampling Results for Westside - 2018 Annual Averages

Monitoring Site	PM ₁₀ (µg/m ³)	TSP (µg/m ³)	Consent Criteria
EPA Point 13	-	29.2	90
EPA Point 18	13	-	90

A summary of trends for high volume air sampler PM₁₀ and TSP results at Westside Mine between 2017 and 2018 are provided in **Table 6-9**.

Table 6-8 – Trends for PM10 and TSP (Annual Averages) at Westside Mine

Monitoring Site	PM ₁₀ (µg/m ³)		TSP (µg/m ³)		Consent Criteria
	2017	2018	2017	2018	
EPA Point 13	-	-	25.9	29.2	90
EPA Point 18	11.3	13	-	-	90

PM₁₀ at EPA point 18 was at similar levels from 2017 to 2018. TSP increased slightly at EPA Point 13 from 2017 to 2018. All measurements were well below criteria.

The annual average historical trends for depositional dust results at Westside Mine, WWC and MCPP between 2010 and 2019 are provided in **Table 6-10**. Depositional dust is no longer required to be measured at Westside Mine.

Table 6-9 – Historical Trends for Depositional Dust (Annual Average)

Site	Gauge No.	EPA Point	Year (g/m ² /mth)									
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Westside Mine*	D5	EPA Point 7	1.4	1.0	1.0	0.8	0.8	0.8	0.8	-	-	-
	D10	EPA Point 8	1.8	1.2	1.3	1.4	1.0	0.9	0.9	0.8	-	-
	D11B	EPA Point 9	1.2	0.7	0.7	0.8	0.5	0.7	0.9	0.6	-	-
	D13AA	EPA Point 10	1.3	0.7	0.8	0.8	0.6	0.7	0.8	0.8	-	-
	D18	EPA Point 11	1.4	0.5	1.5	0.9	1.4	0.9	2.9	1.5	-	-
	D20	EPA Point 12	1.2	0.8	1.1	1.0	0.6	0.9	0.9	1.2	-	-
	D21	EPA Point 17	1.0	0.8	0.6	0.7	0.5	0.6	0.8	1.0	-	-
WWC / MCPPP	D1	EPA Point 4	1.1	0.6	0.8	1.0	0.8	1.2	0.7	0.7	0.7	1.5
	D2A	EPA Point 5	0.8	1.5	0.8	1.2	0.8	0.6	0.7	0.9	0.7	1.6
	D3	EPA Point 6	1.0	0.9	0.7	0.8	0.8	0.6	0.8	0.8	0.7	1.3
	D4	EPA Point 7	1.6	1.5	0.6	0.6	0.6	1.0	0.8	0.8	0.8	2.1
	D5	EPA Point 8	0.9	0.9	1.0	0.8	0.9	0.7	0.8	0.7	0.9	1.8

Site	Gauge No.	EPA Point	Year (g/m ² /mth)									
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	D6	EPA Point 9	1.9	0.9	1.6	1.0	0.8	0.6	0.9	0.9	0.9	1.5
	D7	EPA Point 10	0.7	1.7	0.8	0.5	0.7	0.6	0.9	0.5	2.1	1.2

* Depositional dust monitoring is no longer undertaken at Westside Mine.

The historical depositional dust results between 2010 and 2019 show that all levels had been consistent across the nine years, with the exception of a marked increase in levels at WWC/MCPP EPA Point 10 during 2018 and marginal increases from across all monitoring sites in 2019, possibly due to dry conditions and several regional bush fire events.

6.4.3 Incidents and Improvements

There was one non-compliance during 2019, a sample was unable to be collected from EPA Point 8 in August and September 2019 as the dust gauge holder had fallen over.

There were no complaints relating to air quality during 2019.

6.4.4 Comparison against Predictions

An Air Quality Assessment (Environ, 2010) was undertaken as part of the WWC Continued Operation project, approved as PA 09_0203 on 25 January 2012. Section 6.2 of the Air Quality Assessment outlines the predicted emissions for TSP and PM₁₀ during the life of the project.

Environ (2010) predicted the total TSP and PM₁₀ emissions for the Continued Operations Projects to be 72.7 tpa for TSP and 19.1 tpa for PM₁₀. During the 2018 reporting period an average level of 29.2 µg/m³ (2.92 tpa) for TSP and 13 µg/m³ (1.3 tpa) for PM₁₀ was recorded. The levels of both TSP and PM₁₀ are well below the predicted concentration levels.²

6.5 Mine Subsidence

6.5.1 Environmental Management

6.5.1.1 Mine Subsidence Management

For over 30 years subsidence monitoring has been undertaken at West Wallsend Underground, the only underground operation that makes up Macquarie Coal. Subsidence predictions have been developed from this monitoring. WWC has a long history of working with infrastructure owners relevant to subsidence impacts and has established existing subsidence management and extraction plans with the respective surface feature stakeholders above its mining area.

² Even though the site is no longer operating a comparison between 2018 air quality measurements (TSP and PM₁₀ emissions) and predictions made in 2010 (for an operating site) has been made, as these are the most relevant predictions for such a comparison.

A process for the management of WWC's mining impacts in the Sugarloaf State Conservation Area continues to be implemented. WWC have developed and implemented a Public Safety Management Plan (PSMP) for LW 43, LW 46, LW 51 and LW 52, in accordance with Condition 5(l) of Schedule 3 of PA 09_0203, as part of the relevant WWC Extraction Plans for these long walls.

The intent of these PSMP's is to outline how public safety will be managed and to ensure the public are excluded from Subsidence Affected Surface Zones (SASZ). The management plans have been prepared in accordance with the PA 09_0203.

The LW 51 and LW 52 PSMP provides a framework that allows for the re-establishment of a safe and stable landform and requires a review of Public Safety management, subsidence impact monitoring results and the effectiveness of remediation activities. Consultation with RR (Resource Regulator) and DPIE (formerly OEH) will also determine if ongoing remediation and monitoring is required before returning the land back to full use as a State Conservation Area.

Subsidence remediation in the Sugarloaf State Conservation Area using liquefied sand commenced in February 2019. Approximately 33% of subsidence cracks located near Wakefield Forest Road and Aubs Ridge Road have been filled. Macquarie Coal is currently consulting with DPIE (formerly OEH) regarding the application of a sand binding product on top of sand filled subsidence cracks to prevent erosion. Remediation works are expected to be completed in 2021.

Weekly inspections and post remediation inspections of subsidence impacted areas are undertaken by a Macquarie Coal Representative. The public are currently prevented from accessing the subsidence affected sections of the Great North Walk (GNW) and Sugarloaf Range Road (SRR).

In addition, monitoring of subsidence remediation works is undertaken in accordance with the Long Term Monitoring Plan Methodology for LW 38 to LW 52 – Steep Slopes. Subsidence monitoring at WWC includes monitoring of subsidence impacts on landscape features and the monitoring of stream geomorphology for surface streams within the Continued Underground Mining Area at the monitoring sites shown on **Figure 6-2**.

6.5.2 Baseline Condition Assessment

A detailed subsidence assessment was completed for the West Wallsend Continued Operations Project Mod 1 Environmental Assessment (Umwelt, 2014). The assessment determined there are no cliffs, cliff terraces, minor cliffs or rock features above LW51 and LW52 (Umwelt, 2014).

6.5.3 Environmental Performance

In accordance with the Land Management Plan and PSMP and Schedule 3, Condition 5 of PA 09_0203 post mining inspections of landscape features are conducted. The following inspections were conducted in 2019:

- The Longwall 41 Vertical Block Movement (VBM) was inspected by a senior surveyor in February 2019 and September 2019. The inspection of the VBM identified that the geological feature at LW41 VBM has had little to no movement over during 2019.
- On-going post-remediation inspections have been carried out on LW38, 39, 40, 41, 42, 43, 45, 51, 52. These were the subsidence cracks remediated with aggregate and sand in the SSCA. The inspection concluded that there was no evidence of slumping and that grasses and other lower storey flora were growing in the remediated areas.

Macquarie Coal has consulted with DPIE (Formerly OEH) regarding subsidence remediation works in the SSCA and the following was undertaken in 2019:

- Subsidence Remediation Plan approved for Quarry Trail and Wakefield Forest Road area of SSCA;
- After consulting with the Registered Aboriginal Parties (RAPs), an Archaeological due diligence survey was carried out on July 2019 in the LW41 VBM track and Jungle track area to determine a suitable sand pump site location; and

- Track works have been undertaken on sections of the SSCA at Quarry Trail off Wakefield Road, Wakefield Forest Road, Aubs Ridge Road and Sugarloaf Range Road.

Subsidence Remediation with liquefied sand commenced on January 2019 in the Quarry Trail section of the Sugarloaf State Conservation Area. A bushfire at Quarry Trail and associated post fire safety concerns resulted in an unexpected relocation of the sand plant to Wakefield Forest Road in February 2019. As of December 2019, approximately 33% of subsidence cracks have been remediated with sand at Quarry Trail, Wakefield Forest Road and Aubs Ridge Road. Remediation work are expected to continue until 2021.

i. Incidents and Improvements

There were no subsidence incidents in 2019.

Consultation is ongoing with DPIE (Formerly OEH) regarding the use of the sand binding products in 2019.

WWU provided DPIE the results of additional testing and the independent analysis that has been conducted from 2018. Conditional approval of two sand binding products has been provided by DPIE. WWU has since provided DPIE further test results of these products following the conditional approval which included leachate analysis.

ii. Comparison against Predictions

Based on the West Wallsend Continued Operations Project Mod 1 Environmental Assessment by Umwelt (2014) "maximum surface cracking widths of between 110 millimetres and 250 millimetres may potentially occur within the limits of mining and in areas with moderately undulating terrain (i.e. slopes <18degrees). Cracks of up to approximately 830 millimetres may occur on ridge crests due to rigid body rotations of steep slopes. Similar size 'scarps' or VBM's could also develop as a result of subsiding a steep slope by the same order of magnitude."

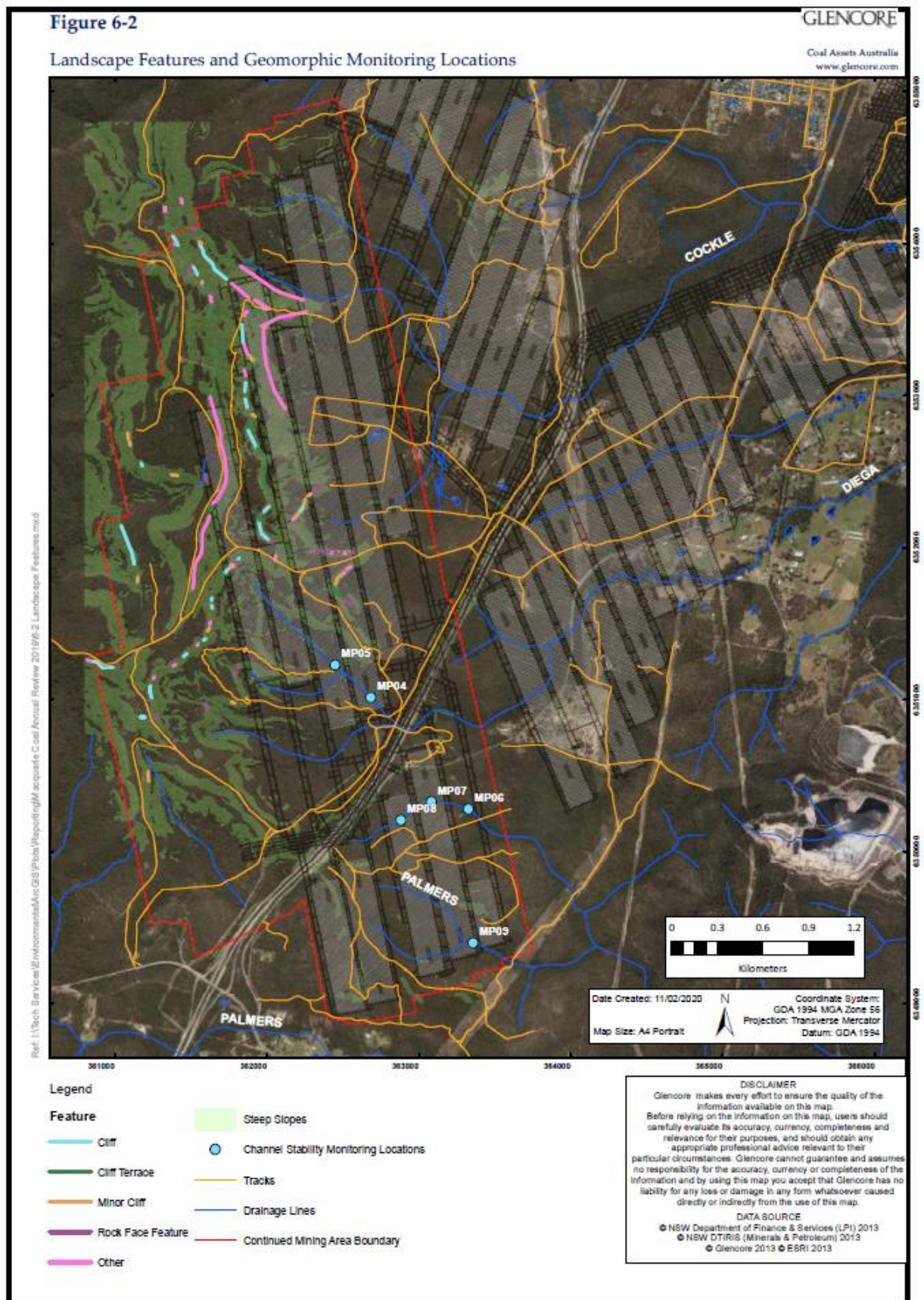
As mining ceased in 2016 no new cracks were formed, so comparison to predictions not applicable. See below **photos 1** and **2**, examples of subsidence cracks in the SSCA before and after remediation.



Photo 1: Subsidence crack

Photo 2: Post remediation

Figure 6-2 – Landscape Features and Geomorphic Monitoring Locations



6.6 Flora and Fauna

6.6.1 Environmental Management

6.6.1.1 Biodiversity Management

A Biodiversity Management Plan (Glencore, 2015b) was prepared for WWC's LW 51 and LW52, in accordance with PA 09_0203. In line with Section 7 of the Biodiversity Management Plan, monitoring is undertaken on an annual basis at five (5) sites. As LWs 51 and 52 were the final longwall panels to be mined, no new monitoring sites are to be established at the site (Kleinfelder, 2019a).

Biodiversity monitoring is also undertaken at Westside Mine in accordance with the Westside *Ecological Due Diligence Assessment*. A total of 13 monitoring sites have been established, 7 are currently actively being monitored within the Westside Mine development consent area as some of the areas within the older northern rehabilitation have achieved completion criteria and been signed off by RR. One of these sites were established within remnant vegetation and the remaining 6 are within areas of rehabilitation. Refer to **Section 8.9.1** for the results from this monitoring.

Monitoring is conducted at the MCPP, in accordance with the OCAL Biodiversity and Land Management Plan, specifically Section 5.1. Monitoring at the MCPP has been conducted every spring-summer since 2005 (with the exception of 2012) (Kleinfelder, 2019c). Monitoring is undertaken at one permanent monitoring point (quadrat). Fauna surveys are undertaken and nest box monitoring is undertaken where possible (Kleinfelder, 2019c).

6.6.1.2 Voluntary Conservation Agreement (VCA) Areas

A Conservation Management Plan (Umwelt, 2005) has been approved by OEH to establish Voluntary Conservation Agreement (VCA) areas (VCA areas A, B and C) for the conservation of 18 hectares of Sydney Coastal Estuary Swamp Forest Complex and five sub-populations of *Tetratheca juncea* covering an area of approximately 13.6 hectares. The conservation areas also conserve the habitat of other endemic flora and fauna species, including threatened species known to occur in the area of disturbance.

The Conservation Management Plan requires each of the VCA areas be monitored. Monitoring includes monitoring of *Tetratheca juncea* populations at four monitoring sites, floristic monitoring within VCA area C, weed mapping and a fauna habitat assessment. Monitoring of the VCA Areas was undertaken on 29-30 October 2019.

6.6.1.3 Threatened Species

Flora listed as threatened species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or *Biodiversity Conservation Act 2016* (BC Act) have not been identified at MCPP and Teralba Colliery, since monitoring commenced at these sites in 2005. Threatened flora species have also not been identified at Westside Mine.

Threatened fauna species have not been identified at Teralba Colliery. Threatened species monitoring is undertaken at WWC and MCPP.

6.6.2 Environmental Performance

Details regarding flora and fauna monitoring undertaken at Macquarie Coal during the reporting period or previously are provided below.

6.6.2.1 Biodiversity Monitoring - WWC

Biodiversity monitoring was undertaken in Sumer 2019/2020 and a newly established monitoring site in Domain 6 at West Wallsend Colliery pit top. The monitoring program was designed to establish a baseline of the flora assemblages within the pasture areas in the Pit Top management area. A summary of the monitoring results is provided in the section below:

Thirty-four flora species were identified within the plot (Q1) and 33 flora species were identified on the transect (T1). Twenty of the thirty-four species identified in the plot were exotic. Thirty-three species were identified on the transect (T1) which included Twenty exotic species.

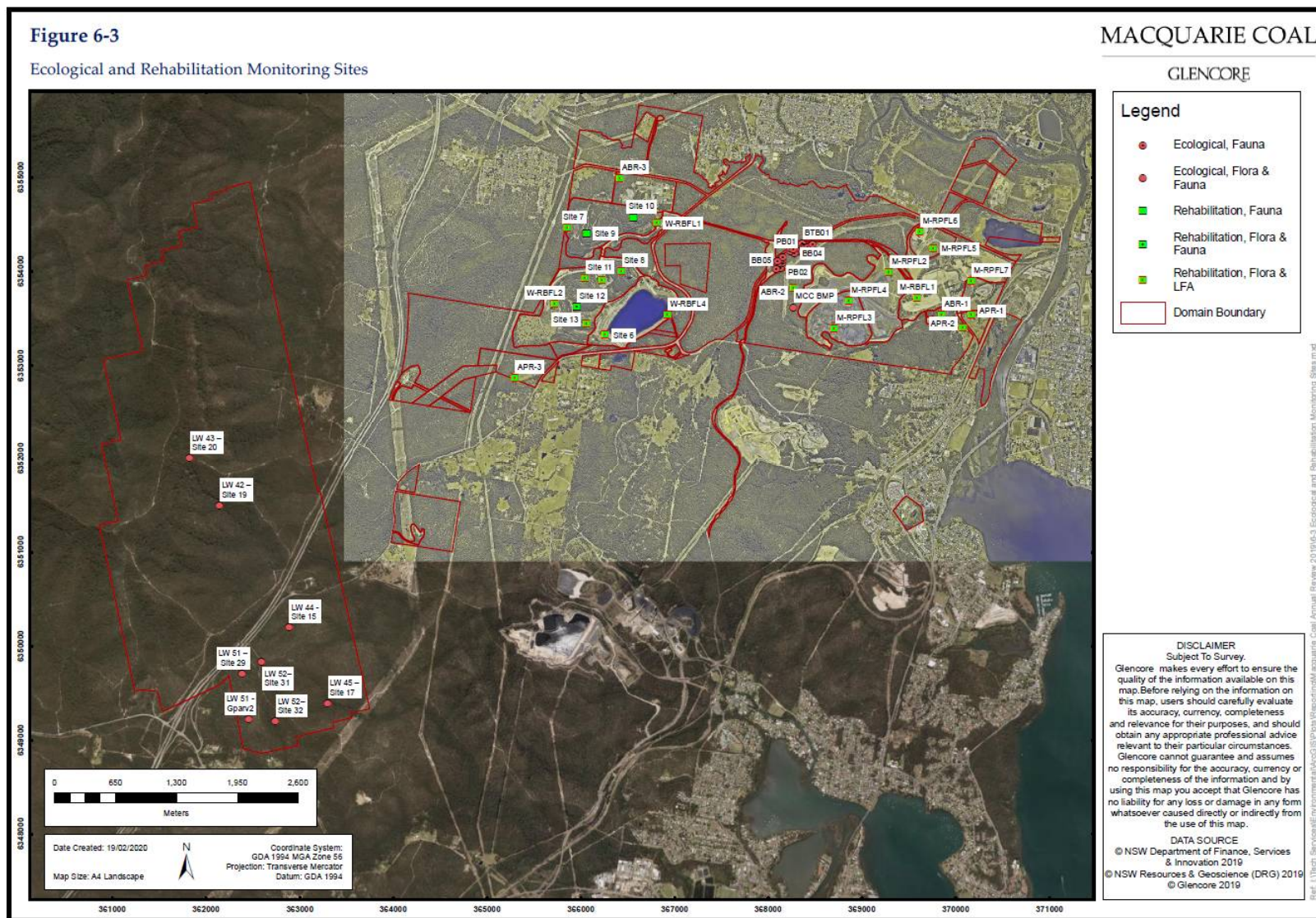
Although the canopy layer was absent there is natural regeneration of canopy species within the plot, with one Eucalyptus sapling present. The midstorey consisted of occasional *Glochidion ferdinandi* (Cheese Tree) and *Homalanthus populifolius* (Bleeding Heart). The shrub layer contained occasional *Acacia longifolia* subsp. *longifolia* (Sydney Golden Wattle), and *Breynia oblongifolia* (Coffee Bush). The ground layer is dominated by exotic species including: *Hyparrhenia hirta* (Coolatai Grass), *Coryza bonariensis* (Flaxleaf Fleabane), *Verbena bonariensis* (Purpletop), *Setaria sphacelata* (South African Pigeon Grass) and *Ambrosia tenuifolia* (Lacy Ragweed).

Common native ground layer species included: *Typha orientalis* (Broadleaf Cumbungi), *Cynodon dactylon* (Couch) and *Oplismenus aemulus* (Australian Basket Grass). The shrub and midstorey layers recorded a cover 10.2%. The total ground layer cover was recorded as 85.2%.

The transect area was assigned an overall estimated ground layer cover of 70%. The stockpile in the centre of the transect area and occasional bare patches are the two factors which reduced this score. The shrub and canopy layer cover were not assessed during this monitoring event.

No threatened species listed under the Biodiversity Conservation Act 2016 (BC Act) or the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) were recorded at either of the monitoring locations.

Figure 6-3 – Ecological and Rehabilitation Monitoring Sites



6.6.2.2 Biodiversity Monitoring - MCPP

Biodiversity monitoring was undertaken at MCPP during January 2020 (Kleinfelder, 2020a). Floristic surveys were conducted at the permanent monitoring quadrat, established in 2005. Fauna surveys were not undertaken. The results of this monitoring are reported below.

The floristic diversity of the plot has progressively increased since 2005 to 2014. Since then, the (2014-2019) survey results have fluctuated slightly each year with a downward trend. This is indicative of a dynamic plant community, and its response to dry climatic conditions.

The vegetation within the plot is in good condition, which is consistent with the condition noted since 2005.

Habitat values of the vegetation are considered to be moderate, and have remained consistent since the 2005 surveys. There is a high level of leaf litter and some fallen timber providing suitable habitat for a range of ground-dwelling fauna species. The lack of mature hollow-bearing trees provides minimal breeding habitat for arboreal species, however, the plot offers some foraging opportunity.

6.6.2.3 Biodiversity Monitoring Results – Westside Mine

Biodiversity monitoring was undertaken at Westside mine by Kleinfelder in Summer 2019/2020. The results of the biodiversity monitoring are included in the Rehabilitation **Section 8.9.1**, as only the rehabilitation sites are monitored at this site during Summer 2019/2020.

In 2019, 108 nest boxes were installed at Westside as previous monitoring had indicated that many of the existing boxes were in a state of non-repair. These will be monitored during future biodiversity monitoring events.

6.6.2.4 Voluntary Conservation Area (VCA) Monitoring Results - Westside Mine

Monitoring of the VCA was undertaken at by Kleinfelder in October 2019 (Kleinfelder, 2019d). The results are as follows:

***Tetratheca juncea* Monitoring**

The *Tetratheca juncea* monitoring showed that most of the plants recorded across the sites appeared to be in good health and were also in flower or bearing fruits. However, there are some trends of declining clump number and size at some of the sites.

Since the 2012 annual monitoring surveys, a bushfire has burnt through Site 1A resulting in the removal of above ground parts of all *T. juncea* clumps at the site. However, the majority of the *T. juncea* clumps at this site have re-sprouted from the existing rootstock following the fire; the high proportion of re-sprouting plants indicates effective recovery and resilience of the population to fire. During the 2019 survey, sixteen *T. juncea* clumps were observed, the same number as noted at the first monitoring event during 2007. Seven of the plants that were present in 2018 were not recorded in 2019, however three clumps were re-identified, and two new clumps were recorded. Of the 16 clumps recorded in 2019, 13 were observed to have flowers present and 11 clumps were bearing fruits.

Since the 2016 annual monitoring surveys, a bushfire has burnt through Site 4A resulting in the removal of above ground parts of all *T. juncea* clumps observed during the 2017 monitoring event. Prior to the fire, during the 2016 monitoring survey a total of 19 clumps had been observed; one previously recorded in the 2018 survey and one new clump. Both clumps had flowers and seed present. Only two clumps were observed during the 2019 surveys; one previously recorded in 2018 and one new clump. Both clumps had flowers and seeds present.

At Site 3B two *T. juncea* were observed during the 2019 survey, three less than the number observed in 2018 and at the baseline survey in 2007. The highest number of clumps observed at the site was 9 in 2010. Of the two clumps recorded in 2019 both clumps were observed to have flowers present and one also had seeds.

Five *T. Juncea* were observed during the 2019 survey at Site 4B, the same number observed in the 2018, and an increase of one clump compared to the first monitoring event during 2007. Of the five clumps recorded in 2019 all clumps were observed to have flowers present and one clump bearing fruit. During the 2019 survey two clumps recorded in 2018 were not observed, and one new clump was identified.

While there is an overall decrease in the number of clumps recorded across the four sites in 2019 (with the exception of 4B which remained the same), the survey showed good general health of the clumps, many of which had flowers and were bearing fruit.

Vegetation and Habitat Condition (VCA Areas A, B and C)

Overall, the results of the 2019 monitoring surveys indicate the condition of vegetation and fauna habitats within VCA Areas A north of the powerline easement, B and C is high and remains relatively unchanged since previous surveys. The area south of the powerline easement in Area A has been affected by fire and as such has low fauna habitat and vegetation condition until this area regenerates. This is a natural process and is necessary for the success of many native flora species; however, monitoring should be undertaken to ensure weed species do not impact on the area and suppress regenerating vegetation. Native plant species diversity was relatively high within all transects in VCA Area C during the 2019 surveys.

Generally, VCA Areas A and B are free of weeds. However, there are some exotic grasses present along the powerline easements that intersect VCA Area A, while the majority of VCA Area C has a low density of weeds.

Monitoring Results vs Baseline

The number of native species recorded within each transect in the Westside Mine's VCAs has increased since the baseline survey in 2007, with relatively small year-to-year variation in native species richness due to climatic change and a dry winter and spring period.

6.6.3 Performance against Predictions

No monitoring was required during the reporting period, monitoring was only required up until 2 years post mining, mining ceased in 2016, however the 2018 Annual Review shows a summary table of comparison between predicted and actual impacts.

6.7 Weeds and Pests

6.7.1 Environmental Management

A weed management program is undertaken at Macquarie Coal that incorporates weed monitoring, management and reporting. Weed control is undertaken at the site and is considered essential to ensure an effective weed management program. Weed control is undertaken in accordance with the annual Weed Action Plan (WAP) (Kleinfelder, 2018). The WAP was updated in for 2019/2020.

6.7.2 Environmental Performance

Weed management activities were undertaken at Westside mine during 2019. Three management zones; Westside Rehabilitation Zone, Westside VCA & Westside South were treated to meet mine closure criteria as outlined in the MOP and to minimise overall weed infestations throughout Westside Mine lands and surrounding lease holdings. The management of weeds was in line with the Weed Action Plan (WAP).

Weed management activities were also undertaken at WWC, adjacent the North East Dam, around the Pit Top Dam and other previously disturbed areas where weeds were evident.

Pest management was not required at Macquarie Coal during 2019.

6.7.3 Incidents and Improvements

Weed monitoring, management and reporting will continue to be undertaken throughout 2020.

6.8 Archaeology and Heritage

6.8.1 Environmental Management

Aboriginal Heritage

The site was surveyed for the existence of Aboriginal relics (Dyall, 1981) as part of supplementary studies undertaken for the Stockton Borehole Colliery Development Environmental Impact Statement (prepared by BHP Steel Environmental Engineering Section, 1980). A comprehensive Aboriginal archaeological study was also conducted by Umwelt and the Koombahtoo Local Aboriginal Land Council (LALC) for the Westside Mine Southern Extension EIS (Umwelt 2002). A further archaeological survey was undertaken with the Koombahtoo Aboriginal Land Council prior to the relocation of Wakefield Road in July and August 2004. Cultural Heritage sites located within Macquarie Coal boundaries are shown in **Figure 6-4**.

Macquarie Coal has an Aboriginal Cultural Heritage Management Plan (ACHMP) which covers the operations (Umwelt, 2019). Macquarie Coal submitted the ACHMP to DPI&E via the major approval portal on 7 January 2020, it is currently pending approval. The ACHMP defines Macquarie Coal's approach to continuing to maintain open and ongoing communication between Macquarie Coal and all Aboriginal stakeholders. Where clearance works are required to be undertaken at Macquarie Coal outside of existing approved disturbance areas, due diligence archaeological surveys will be undertaken to identify any Aboriginal cultural heritage sites in the area, prior to the commencement of works.

Cultural heritage control measures are also incorporated into the Westside Mine Environmental Management Plan. Management of cultural heritage sites is also undertaken in accordance with relevant legislation and guidelines.

Extensive consultation has been undertaken with the RAPS through the Aboriginal Advisory Council (AAC). WWC has committed to providing funding over the life of the project to assist with the management of aboriginal cultural and archaeological sites/values within the SSCA. Macquarie Coal has engaged a third party consultant to assist the RAPS with developing a program to disburse these funds. The progress of projects and allocation of funding is reviewed at each AAC meeting.

Historic Heritage

An assessment of the historic heritage (Umwelt, 2002) within and in the vicinity of the Westside Mine Southern Extension identified a number of potential historic sites. These relics primarily related to former mining related activities and each site was assessed according to its scientific, social, educational and aesthetic values, on both local and regional scales. All sites were found to be of low significance and did not justify preservation or salvage.

A Heritage Assessment was also undertaken by Weir Phillips Heritage in 2015, and no items of historical heritage significance were identified to be protected from demolition across Macquarie Coal.

Condition 5(k) of Schedule 3 of the PA09_0203 requires the development of a Heritage Management Plan. In order to satisfy the condition for the management of historical heritage items, an historical heritage management section was included within the LW 51 and LW 52 Extraction Plan.

6.8.2 Environmental Performance

In accordance with the ACHMP, WWC held an Aboriginal Advisory Committee (AAC) meeting on 17 June 2019. This meeting was attended by representatives of Awabakal Descendants Traditional Owners Aboriginal Corporation (ADTOAC) and Awabakal Traditional Owners Aboriginal Corporation (ATOAC) and Awabakal Local Aboriginal Land Council (ALALC). During the meeting a number of items were discussed; including the update to the ACHMP, ACHMP activities completed since the last meeting, ACHMP forward work plan, Cultural Heritage Values Projects and an operational and mine closure update was provided.

West Wallsend Colliery committed to providing \$200,000.00 over the life of the project to assist with the management of Aboriginal cultural and archaeological sites/values within the Sugarloaf State Conservation Area (SSCA). In 2019, Macquarie Coal provided \$25,000.00 to Cacatua General Services to fund an Aboriginal Heritage Funding Specific Project.

In November 2019 Macquarie Coal received a funding application from the Awabakal Local Aboriginal Land Council (ALALC) for their Aboriginal Cultural Heritage Values Project. This project will be presented to West Wallsend Colliery's Aboriginal Advisory Committee (AAC) at the next meeting. Following the determination of this project at the meeting, approval will be sought from the Department of Planning, Industry and Environment prior to disbursing funding.

During 2019, due diligence inspections were undertaken at the proposed subsidence pump sites 10A and 11A and along the jungle track off Aubs Ridge Road. Artefacts discovered during this inspection were recorded and salvaged.

6.8.3 Incidents and Improvements

No reportable incidents occurred at Aboriginal heritage and historic heritage sites during the reporting period. Annual meetings and the necessary due diligence inspections will continue during 2020, in accordance with the ACHMP.

6.9 Visual and Lighting

6.9.1 Environmental Management

Visual amenity is impacted from the Macquarie Coal operation through the visual effect of site disturbance and emplacement areas and dust generation. Operations were not undertaken at night time therefore there were no stray light impacts from the site.

Measures currently implemented by Macquarie Coal to maintain visual amenity include:

- Permanent and temporary rehabilitation of parts of the reject emplacement area and tailings dam wall; and

- Use of arboreal screens.

Macquarie Coal's lighting infrastructure changed in 2018, with buildings (lighting) removed (demolished) as part of the closure works at the site. Light towers were also not used during 2019, with night works not undertaken during the reporting period.

6.9.2 Environmental Performance

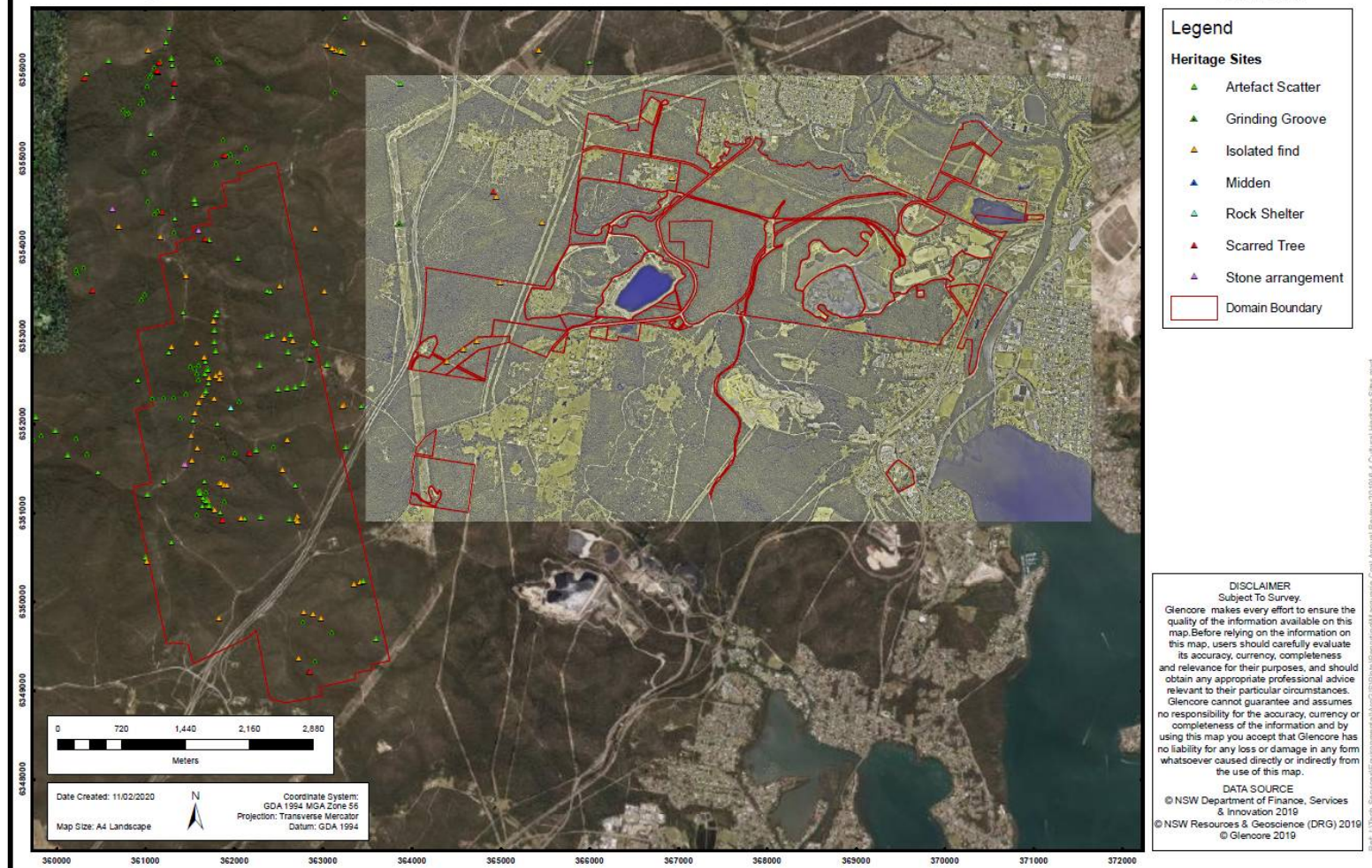
During the 2019 reporting period, no complaints were received relating to lighting or the visual amenity of the site.

6.9.3 Incidents and Improvements

There were no reportable incidents or complaints specific to visual amenity during the reporting period, therefore no improvements are required for 2020.

Figure 6-4

Cultural Heritage Sites



6.10 Spontaneous Combustion

6.10.1 Environmental Management

The last stockpile of coal was removed from the MCPP on 19 October 2016. While stockpiles were at the site they were managed to minimise the risk of spontaneous combustion incidents.

Spontaneous combustion has never been an issue at Macquarie Coal given the composition of the coal.

6.10.2 Environmental Performance

There were no reportable incidents or complaints relating to spontaneous combustion during the 2019 reporting period across Macquarie Coal.

6.10.3 Incidents and Improvements

No reportable incidents relating to spontaneous combustion occurred during the reporting period.

Due to the closure of Macquarie Coal, there will be a negligible chance of spontaneous combustion occurring during 2020. No improvements are therefore required.

6.11 Bushfire

6.11.1 Environmental Management

Macquarie Coal buildings are protected from bushfire by the provision of fire hydrants in appropriate locations. The road and yard watering system can also be employed to reduce bushfire danger.

The Bushfire Hazard Management Plan, updated in 2017, seeks to establish a strategic bushfire management framework as well as guide bushfire management activities. The Bushfire Hazard Management Plan outlines Statutory requirements, results from a Bushfire Hazard Assessment and a Bushfire Risk Assessment, Management Approaches and an Implementation Plan.

During 2019 an annual inspection was undertaken with the NSW RFS Group Captain to assess the fire trails on site and access points for the RFS in the event of a bushfire.

6.11.2 Environmental Performance

There were no complaints associated with Bushfire during the 2019 period across Macquarie Coal.

6.11.3 Incidents and Improvements

During November 2018 there was a fire at Westside and MCPP where approx. 48 Ha of bushland was burnt. An annual inspection with the local RFS captain was undertaken in September 2018 which assessed tracks and access to the site which enabled them to gain access to fight fires which resulted in no infrastructure being lost. Bushfire management and mitigation measures will continue to be undertaken during 2020.

6.12 Methane Drainage, Mine Ventilation and Greenhouse Gas Emissions

6.12.1 Environmental Management

All shafts at WWC have been capped and sealed therefore ventilation no longer occurs at this site. Shafts have also been sealed at Teralba Southgate.

6.12.2 Environmental Performance

In accordance with the Air Quality and Greenhouse Gas sections of the West Wallsend Colliery Environmental Management Strategy and relevant legislation, WWC and MCPP used to report greenhouse gas intensity (t CO₂-e/ROM tonne) and energy use intensity (GJ/ROM tonne) indicators on a monthly basis through the AQS program as part of Glencore National Greenhouse and Energy Reporting (NGER) scheme. However, NGER reporting is no longer required for WWC as none of the National Pollutant Inventory (NPI) substances are triggered for WWC, the site has now been archived with the EPA NPI department. MCPP will continue to report NGER data until there completion of capping works at the tailings dam where it is expected to no longer trigger NGER reporting criteria.

Ongoing emissions will primarily be confined to diesel emissions from rehabilitation and closure activities.

6.12.3 Comparison against Predictions

A Greenhouse Gas and Energy Impact Assessment (Umwelt, 2010) was prepared as part of the WWC Continued Operations Project (PA 09_0203) which was approved on 25 January 2012. Greenhouse gas emissions predicted as a result of the project are provided in **Table 6-12**.

Table 6-10 – Predicted Greenhouse Gas Emissions

Scope	Predictions
Scope 1	Total direct greenhouse gas (GHG) emissions from the proposed WWC operations are 4,296,963.55 t CO ₂ -e. WWC have direct influence over these emissions and will be the subject of management and mitigation plans. The GHG emissions that occur onsite that is a direct result of the projects operations account for only 5.4% of the estimates total direct and indirect operations.
Scope 2	Total indirect GHG emissions that are also required to operate the project are 557,524.84 t CO ₂ -e. WWC have no direct influence over how efficiently these emissions are generated. Management and mitigation measures however can include energy reduction and energy efficiency measures to reduce the indirect emission.
Scope 3	Total indirect and downstream GHG emissions over which WWC have no management or mitigation control is 74,501,697 t CO ₂ -e. These emissions are generated by the offsite transport (rail and shipping) and combustion of WWC thermal coal to generate electricity and coking coal in steel manufacture in domestic and international markets. These emission totals are also expected to be captured by national and global GHG emissions.
Energy	The project will consume an estimated total of 314,195.4 GJ per annum and an estimated 2,827,758.53 GJ of energy from the combustion of diesel oil and purchase of electricity.
Total	The total GHG emissions from the project are 79,356,167.39 t CO ₂ -e. WWC have no direct management or control over the combustion, management efficiency or mitigation measures of 94.6% of the GHG emissions that result from the project. The proposed GHG emissions (Scope 1, 2 and 3) will contribute 0.03% to current GHG emissions and 1.48% to national current GHG emissions.

Note: Predictions are from the WWC Continued Operations Project Environmental Assessment (Umwelt, 2010)

The total predicted GHG emissions for the life of the project were estimated as 79,356,167.39 t CO₂-e. Given the project was operational for a period of four years from 2012 to 2016, the predicted average yearly emissions were correlated to be 19,839,041.85 t CO₂-e.

In May 2016, operations ceased at Macquarie Coal. Only decommissioning activities were undertaken at the site during 2018 and civil earthworks during 2019. Ventilation from shafts at WWC also ceased during 2017, with all shafts capped and sealed at this site. Therefore, less than 19,839,041.85 t CO₂-e (the estimated emissions CO₂-e during normal operations) were emitted from WWC.

6.12.4 Incidents and Improvements

There were no reportable incidents relating to methane drainage, mine ventilation and/or greenhouse gas emissions during the 2019 reporting period.

6.13 Hydrocarbon and Contaminated Land

6.13.1 Environmental Management

All hazardous materials such as hydrocarbons and other contaminated soils are managed in accordance with the waste management section of the approved WWC Environmental Management Strategy. Hydrocarbon storage has been reduced on-site, with only closure works being undertaken at Macquarie Coal.

General activities undertaken at Macquarie Coal to manage potential contamination of land include:

- The use of spill kits and/or absorbent materials if spills occur;
- Bunding of areas where hydrocarbons are managed and/or stored;
- Runoff from bunded areas reports to an oily water separator;
- Reduced amount of hydrocarbon stored on-site; and
- Regular environmental inspections of bunded areas and the oily water separator.

Any contaminated soil will and has been taken to an appropriately licenced landfill for disposal, by a licenced waste contractor.

6.13.2 Environmental Performance

During the reporting period there was no spills or reportable incidents relating to hydrocarbons.

6.13.3 Incidents and Improvements

No reportable incidents relating to hydrocarbons occurred during 2019, therefore no improvements are proposed. Additional hydrocarbon booms were installed at MCPP EPA Point 1 and will continue to be monitored.

Site management practices will continue to be implemented with the objective of incurring minimal hydrocarbon incidences.

6.14 Public Safety

6.14.1 Environmental Management

Macquarie Coal operates under a developed safety management system that outlines mine safety issues and how they are managed; therefore public safety is only deemed a medium risk. All visitors and contractors are required to sign in and out when they enter and leave the site respectively, all contractors are required to be inducted to work at the site and all visitors are to be accompanied by a mine representative.

Safety measures that have been implemented at Macquarie Coal to prevent unauthorised access to the site include, but are not limited to:

- Security patrols undertaken and the site is fenced and signposted;
- 24 hour building security;
- A sign in/sign out procedure for all visitors to the site;
- All visitors and contractors are inducted to site management procedures;
- All visitors to the site are to be accompanied by an official at all times;
- Restricting access to rehabilitated areas by trail bike riders and four wheel drive operators; and
- All visitors to Teralba Southgate site are required to comply with UGM's Safety Management Plan and procedures.

6.14.2 Environmental Performance

Subsidence inspections were undertaken during 2019, in areas accessible by the public. The results from these inspections are provided in **Section 6.5.3**.

6.14.3 Incidents and Improvements

Subsidence inspections and subsidence repair works will be undertaken in 2020 to reduce public safety risk.

7 Water

7.1 Water Management

7.1.1 Water Balance

Annual monitored water flows and water balance for Macquarie Coal during the 2019 reporting period has been presented in **Table 7-1**. A comparison between the 2018 and 2019 Water Balance:

- The stored water decreased by 28.68 ML;
- Inflows decreased by 222.79 ML/year; and
- Outflows decreased by 289.8 ML/year.

Table 7-1 – Macquarie Coal 2019 Water Balance

Component	Volume (ML/year)
Water Inventory and Capacity	
Total estimated water stored on site 1 January 2019	55.68
Total estimated water stored on site 31 December 2019	27
<i>Change in water inventory</i>	28.68
Inflow	
(Precipitation/runoff)	913.8mm
Groundwater inflow to active underground	0
Entrained in ROM Coal	0
Potable supply*	0.41
Edgeworth WWTP to MP1	0
Total Inflows	914.21
Outflows	
Surface Water Discharge (via EPA 1 & EPA 2)	229.20
Environmental Flows	0
Groundwater Seepage	0
Groundwater Reinjection	0
Discharge to Estuary	0
Discharge to Sea/Ocean	0
Evaporation	0
Moisture in air vented from Underground**	0
Loss from amenities	0
Entrainment (in Coarse Rejects, Product Coal & Tailings)	0
Tailings Decant	0
Underground to Westside Mine	0
Total Outflow	229.20
Inputs minus Outputs	685.01

Note: * Hunter Water Corporation supplies potable water to Macquarie Coal. As Teralba Southgate is currently utilised by UGM, potable water is not recorded at Teralba Southgate.

** No air vented from Underground.

7.1.2 Water Take

No groundwater was extracted by Macquarie Coal during the reporting period, as shown by **Table 7-2**.

Table 7-2 – 2019 Water Take

Water Licence #	Water Sharing Plan, Source and Management Zone	Entitlement (ML)	Water Take (ML)	Active Pumping	Total
Groundwater					
20BL169793	WWC/Lot 1024//1077984	360	0	0	0
2BL168704	Westside open-cut mining void/Lot 25//1110268	210	0	0	0

7.2 Surface Water

7.2.1 Environmental Management

Macquarie Coal's surface water management system is illustrated on **Figures 7-1, 7-2, and 7-3**.

The Westside EPL (4033) was relinquished in September 2018, and the WWC and MCPP EPL (1360) was varied in September 2018 to include Westside Mine. For more information regarding licences refer to **Section 3.3**.

Macquarie Coal implements surface water management measures and monitoring in accordance with the surface water section of the West Wallsend Colliery Environmental Management Strategy, the MCPP Environmental Management Plan, Westside's EMP, LW51 and 52 Water Management Plan (WMP), EPL 1360 and EPL 4033 (relinquished in September 2018). Surface water monitoring locations are shown in **Figure 7-4**.

Figure 7-1 – Macquarie Coal Local Hydrology and Catchment Areas

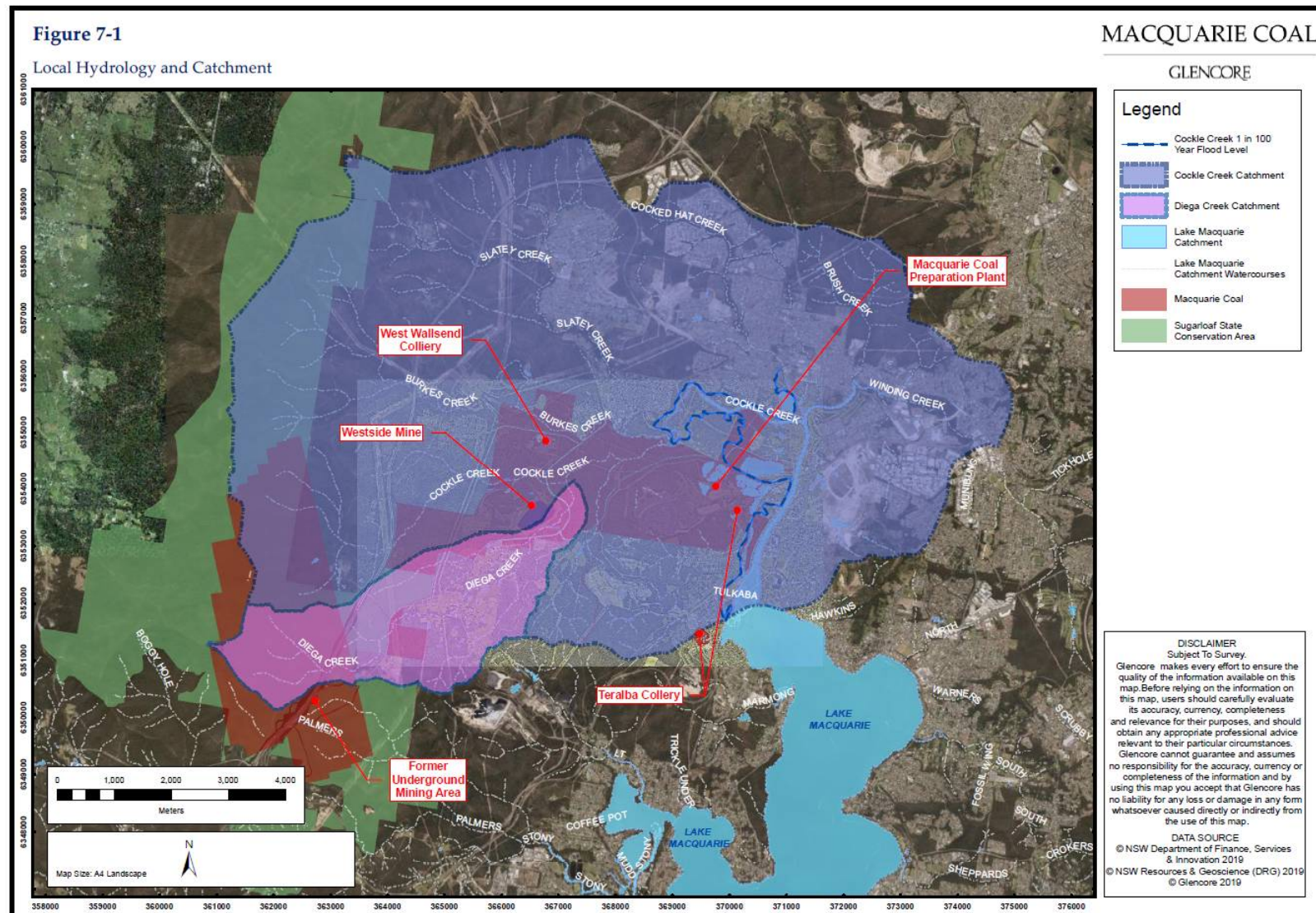


Figure 7-2– Westside Mine Existing Water Management System

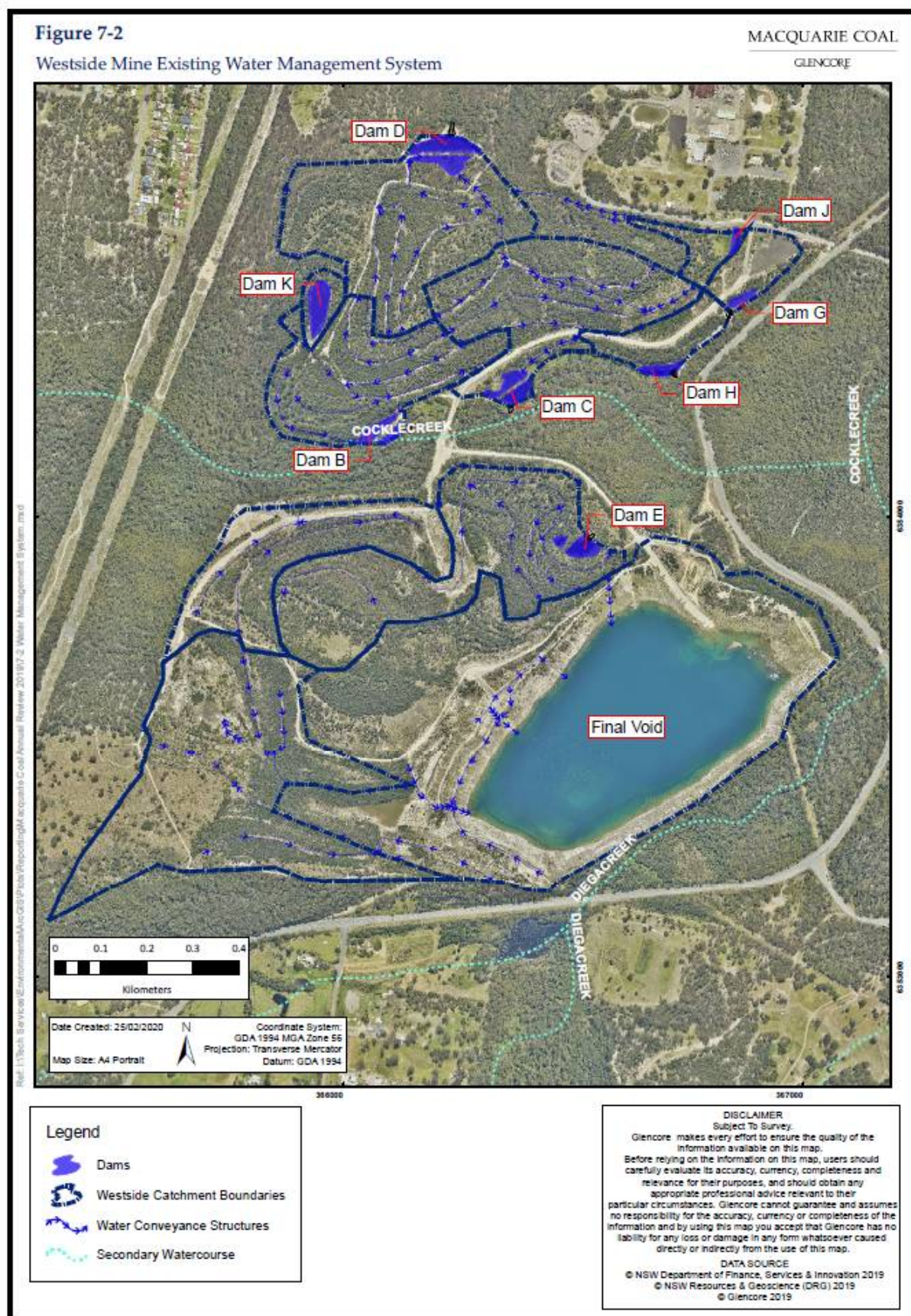


Figure 7-3 – West Wallsend Colliery Existing Water Management System

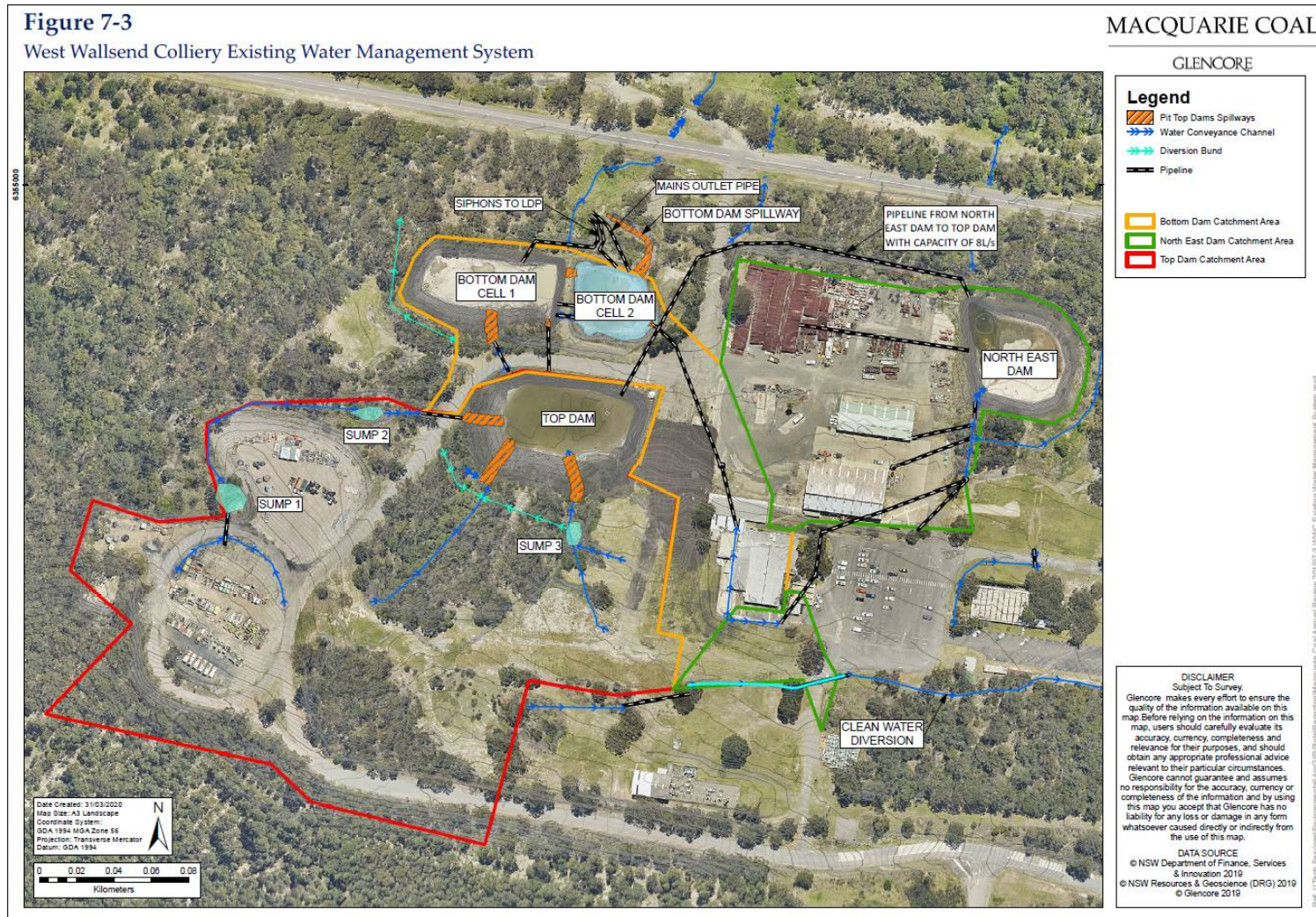
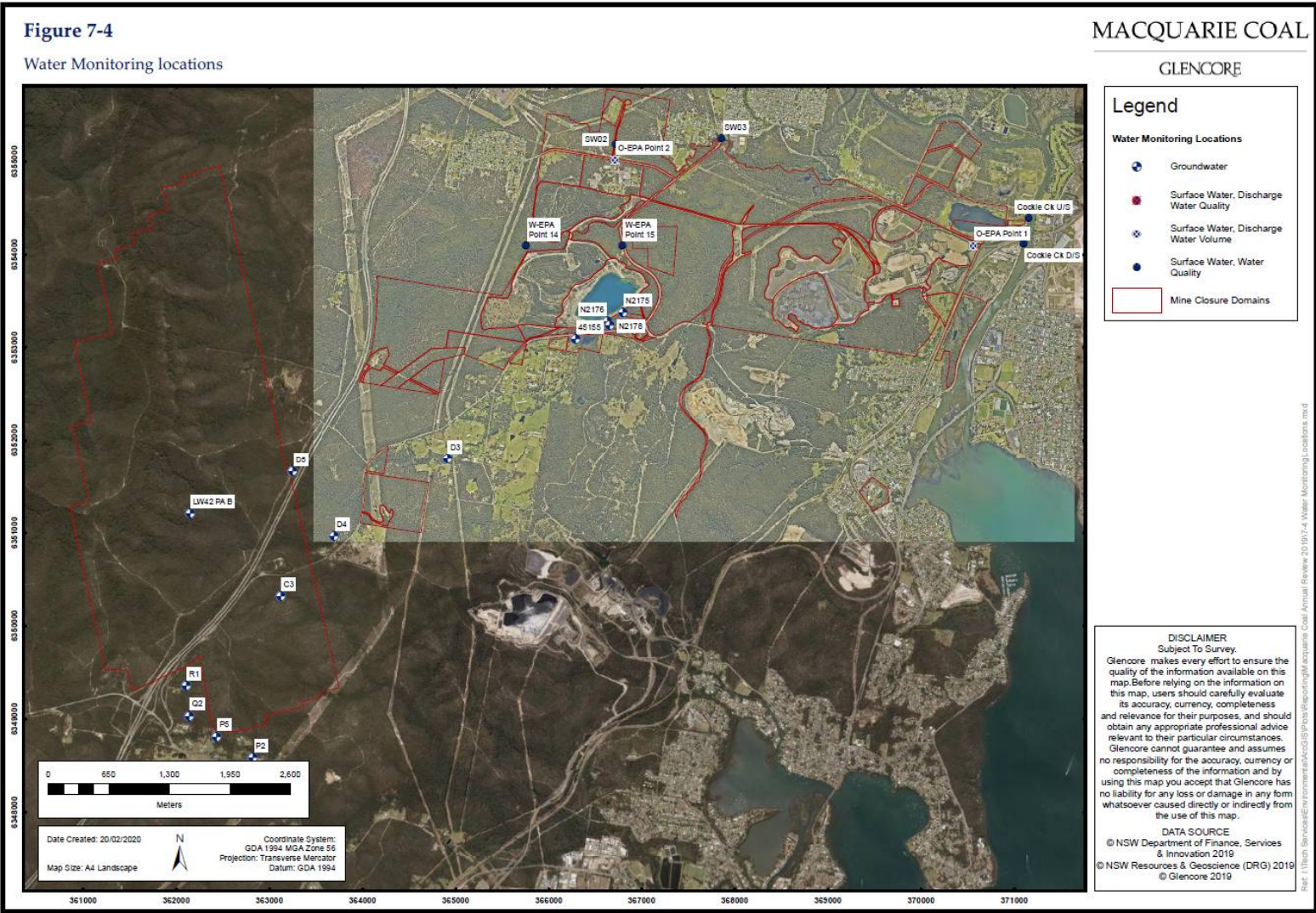


Figure 7-4 – Macquarie Coal Water Monitoring Locations



EPL1360 water monitoring requirements for surface (discharge) water are summarised in **Table 7-3**.

Table 7-3 – EPL1360 Water Monitoring Requirements

Parameter	EPL 1360
pH	EPA Point 1 - Weekly during discharge, within 24 of commencing discharge EPA Point 2 - Monthly during discharge
TSS (mg/L)	EPA Point 1 - Weekly during discharge, within 24 of commencing discharge EPA Point 2 - Monthly during discharge
Conductivity (µS/cm)	EPA Point 1 - Weekly during discharge, within 24 of commencing discharge EPA Point 2 - Monthly during discharge
Oil and Grease (µS/cm)	EPA Point 1 - Weekly during any discharge
Metals Arsenic (total), Boron, Cadmium (total), Chromium (total), Copper (total), Lead (total), Mercury (total), Molybdenum (total), Nickel (total), Selenium (total), Zinc (total)	EPA Point 1 - Weekly during discharge, within 24 of commencing discharge

Note: On 6 September EPL 4033 was relinquished and Westside mine was included in EPL 1360. EPL 1360 does not have any monitoring requirements for Westside.

During 2019, quarterly water quality sampling was undertaken at the Westside Final Void to determine if there was any stratification in the water body. Analysis assessed the quality of water at different depths and aligns with the *Pit Lake Monitoring Guidelines guidance* material published by the NSW Minerals Council.

7.2.2 Environmental Performance

7.2.2.1 EPL1360 Water Monitoring Criteria

The EPL1360 water monitoring criteria for Macquarie Coal is provided in **Table 7-4**.

Table 7-4 – EPL1360 Water Monitoring Criteria

EPL	LDP	pH	TSS (mg/L)	EC (µS/cm)	Oils and Grease (n-Hexane) (mg/L)	Metals (µg/L or mg/L) As (total), B, Cd (total), Cr (total), Cu (total), Pb (total), Hg (total), Mo (total), Ni (total), Se (total), Zn (total)	Volume of Discharge (kL/day)
EPL 1360 WWC, and MCPP	EPA Point 1	6.5-9.0	50	-	-	-	6,000
	EPA Point 2	6.5-9.0	50	10,000	-	-	4,000

Note: Monitoring criteria is not specified for EPL 4033 EPA Points 2 – 4, 6, 14 and 15 as it was relinquished in September 2018.

7.2.2.2 Surface Monitoring

Table 7-5 provides a summary of 2019 surface water monitoring results for Macquarie Coal. Detailed monitoring data is available on the WWC website <http://www.westwallsendmine.com.au>.

Discharge waters were sampled from EPL 1360 EPA Point 1 and EPA Point 2 on a daily and monthly basis, respectively, during discharge events. Discharge events from EPA Point 1 occurred 27 times and discharge events from EPA Point 2 occurred 5 times.

During these discharge events all parameters were below surface water criteria except for TSS at EPL 1360 EPA Point 1 when a rainfall exemption applied to these discharges; when over 51 mm of rainfall was measured at the premises over a consecutive five (5) day period. Therefore, these exceedances are not considered as non-compliances.

A comparison of 2018 and 2019 discharge water quality results is provided below:

EPL 1360 – Point 1

- pH - The average pH result for 2019 remained the same as that recorded in 2018, 8.2 pH;
- TSS - The average and maximum results were higher in 2018, 109 and 984 respectively compared to the average 65.1 and 349 in 2019, noting the exemption applied;
- Conductivity - The average result for both years was very similar; 2018 recording a slightly lower average of 1012 us/cm, compared to 1049us/cm in 2019; and
- Oil and Grease - The average result increased to 34 mg/L in 2019 compared with 19mg/L in 2018.

Table 7-5 – Summary of Water Monitoring Results for Discharge Waters from EPL1360

EPL 1360													
		EPA Point 1						EPA Point 2					
		2018			2019			2018			2019		
Analyte	Unit	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max
pH	pH	7.6	8.2	9	7.8	8.2	8.7	6.6	7.7	8.3	7.3	7.6	8.0
TSS	mg/L	6	115	984	11	65.1	349	3	17.4	39	11	20.8	30
Conductivity	µS/cm	74	1047	1950	282	1049	2430	195	283	432	191	249.6	317
Oil and Grease	mg/L	10	20	29	10	34	250	-	-	-	-	-	-

*Note: Oil and grease sampling not required for EPA Point 2.

EPL 1360 – Point 2

- pH - The average pH result for 2018 was slightly higher 7.9 than that recorded in 2019, at 7.6 pH;
- TSS - The average increased in 2019 to 20.8 mg/L, compared with 16 mg/L recorded in 2018; and
- Conductivity - The average result for 2019 recorded a lower average of 249.6 us/cm compared to 317us/cm in 2018.

7.2.2.3 Due Diligence Monitoring

During the reporting period monthly due diligence testing was undertaken at Cockle Creek Upstream and Downstream. Due diligence monthly monitoring was also undertaken at Burkes Creek during 2019.

Samples from Cockle Creek and Burkes Creek were taken monthly in 2019 with the exception of January and February 2019 for Burkes Creek. The results from this testing is summarised in **Table 7-6**.

Testing shows no exceedances of surface water criteria for any of the sites sampled.

Table 7-6 – Average Cockle Creek and Burkes Creek Due Diligence Water Testing Results 2019

Analyte	Unit	Upstream Cockle Creek	Downstream Cockle Creek	Upstream Burkes Creek	Downstream Burkes Creek
pH	pH	8.0	7.9	6.9	6.8
TSS	mg/L	13.7	89	11.2	82.5
Conductivity	µS/cm	48,200	48,216	271.4	422.6

*Note: Burkes Creek was not sampled in January and February 2019.

7.2.2.4 Westside Void Water Testing

During 2019, quarterly water quality sampling was undertaken at the Westside Final Void to determine if there was any stratification in the water body. Analysis assessed the quality of water at different depths and aligns with the Pit Lake Monitoring Guidelines guidance material published by the NSW Minerals Council.

The results of this analysis (both field and laboratory) are provided in the following tables. None of the analysis results exceed the former Westside EPL 4033 discharge criteria. Surface and bottom samples ranged from very high to extremely high salinity. Both Suspended Solids and turbidity for all samples were low and suitable for irrigation, stock watering and discharge to the environment.

Table 7-7 – Average Westside Void Water Testing Results (In-field) 2019

Analyte	Unit	Site A (surface)	Site B (Surface)	Site B (Bottom of void)	Site C (surface)	Site C (Bottom of void)	Site D (surface)	Site D (Bottom of void)
Depth	M			13.3		19.835		9.9
Odour		N	N	N	N	Y	N	N
Temp	Deg C	20.13	20.6	20.2	19.9	19.73	20.25	21
pH	pH unit	8.12	8.14	7.94	8.12	7.38	8.13	8.16
EC	µS/cm	2716.50	2691.50	2757.50	2664.50	4340.00	2717.50	2721.00
Water* turbidity		C	C	C	C	S	C	C
Water* colour		C	C	C	C	Gy	C	C
D/O	%	103.73	101.20	105.00	104.50	76.80	104.90	107.07

Table 7-8 – Average Westside Void Water Testing Results (Laboratory) 2019

Analyte	Unit	Site A (surface)	Site B (Surface)	Site B (Bottom of void)	Site C (surface)	Site C (Bottom of void)	Site D (surface)	Site D (Bottom of void)
pH value	pH unit	8.05	8.16	8.07	8.07	7.79	8.10	8.13
Sodium Adsorption Ratio		6.87	6.91	6.89	6.90	9.88	6.91	6.88
EC	µS/cm	2902.50	2900.00	2992.50	2907.50	5957.50	2890.00	2910.00
TSS	mg/L	6.25	8.00	9.50	6.50	30.00	7.50	11.75
Turbidity	NTU	0.83	0.88	1.73	0.93	122.28	0.90	1.08
Total Hardness as CaCO ₃	mg/L	549.75	547.50	560.50	552.00	1302.75	546.50	552.75

7.2.3 Comparison against Predictions and Surface Water Management Plan

The water quality assessment included in the WWC Continued Operations Environmental Assessment stated “potential water quality impacts will be limited to that associated with the EPL”. Water quality monitoring results as required by the EPL are reported in **Section 7.2.2**.

In the surface water management section of the West Wallsend Colliery Environmental Management Strategy baseline water quality monitoring data was provided for water quality at Upstream Burkes Creek. Baseline water quality ranges for Upstream Burkes Creek have been compared against the 2019 average water quality monitoring results for EPL 1360 Point 2, which discharges into Burkes Creek (refer to **Table 7-9**). The Upstream Burkes Creek ranges have not been exceeded during the reporting period. The 2017 results exceeded pH and Fe (dissolved). Note Macquarie Coal is not required to report against dissolved metals and have only provided a comparison against pH, TSS and EC.

Table 7-9 – Comparison against Upstream Burkes Creek Baseline Water Quality Results

Analyte	Unit	Upstream Burkes Creek Baseline	EPL 1360 EPA Point 2 2019 Results
pH	pH	6.3 - 7.9	7.6
TSS	mg/L	5 - 2,200	20.8
Conductivity	µS/cm	129 - 830	249.6

7.2.4 Water Discharge Volume Results

EPL1360 discharge volume monitoring requirements are summarised in **Table 7-10**.

Table 7-10 – EPL1360 Monitoring Requirements

Parameter	EPL 1360
Volume of Discharge (kL/day)	EPA Point 1 - Continuous during discharge
Volume of Discharge (kL/day)	EPA Point 2 - Continuous during discharge

7.2.4.2 Environmental Performance

Table 7-11 provides discharge results for 2019 compared against daily discharge limits.

Table 7-11 – 2019 Discharge Volumes

Discharge Point	Min Daily Discharge (kL/day)	Max Daily Discharge (kL/day)	2019 Discharge Volume (kL)	EPA Discharge Limit (kL/day)
EPL 1360				
EPA Point 1	0.1	5961.7*	202,196.5	6,000
EPA Point 2	3.4	2043.9	27,006.2	4,000

Note: Macquarie Coal no longer discharges from EPA Point 3 and 11 (variation in September 2018) or from any points associated with EPL 4033 as of September 2018 when the licence was relinquished.

*License exemption in accordance with condition L1.2 of EPL1360.

During the year there was 180 days discharge days from EPL 1360 EPA Point 1, none of which exceeded the daily discharge limits. Daily discharge limits were not exceeded during the 48 days that water was discharged through EPL 1360 EPA Point 2.

Compared to last year, 290,060.4 kL more water was discharged from WWC/MCPP (EPL 1360).

7.2.5 Incidents and Improvements

All discharge water quality parameters were below criteria except for TSS at EPL 1360 EPA Point 1, however rainfall exemptions applied to these exceedances, therefore non-compliances did not occur.

Daily discharge volumes were exceeded at EPL 1360 EPA Point 1 during 2019, however, a rainfall exemption also applied. Further details are provided in **Section 7.2.4** above.

One complaint was received during 2019, regarding water discharging from MCPP. The EPA investigated and concluded that the site was operating within the requirements of the EPL.

Water monitoring will continue to be undertaken during 2020.

7.3 Channel Stability Monitoring

Channel stability monitoring is no longer required to be undertaken at WWC. The LW 51 and LW52 Water Management Plan only requires channel stability monitoring to be undertaken 18 months post mining. Mining was completed in May 2016, therefore channel stability was only required till November 2017.

7.4 Erosion and Sedimentation

7.4.0 Environmental Management

Erosion and sediment control at Macquarie Coal is undertaken in accordance with erosion and sediment control section of the West Wallsend Colliery Environmental Management Strategy, the MCPP Environmental Management Strategy and the Westside Mine's Environmental Management Plan. In addition, erosion and sediment control structures are constructed in accordance with the requirements of *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and Volumes 2A, 2C, 2D and 2E (DECC, 2008) (the Blue Book).

Various controls have been implemented across the operation to control erosion and sedimentation. These are detailed in **Section 8.2**, below.

7.4.1 Environmental Performance

During 2019 erosion and sediment controls were implemented in accordance with the various sections of the site's environmental management strategy and plans.

Remediation works to rectify gully and rill erosion at Westside Mine's North Rehabilitation Area was undertaken during the reporting period.

7.4.2 Incidents and Improvements

No erosion and sediment related incidents were recorded at Macquarie Coal during the 2019 reporting period.

7.5 Groundwater

7.5.0 Environmental Management

Condition 4.2.1(a) of the development consent (DA 125-5-2002) specifies that Westside Mine will implement a Groundwater Monitoring Program to monitor the operational and post-operational impacts on groundwater, connected surface water sources and any groundwater dependent ecosystems. The program requires Westside Mine conduct monitoring of groundwater levels at monitoring bores N2175, N2176 and N2178.

Groundwater monitoring is also undertaken at WWC. The monitoring network consists of monitoring bores in the alluvial aquifer/fractured rock at Diega, Ryhope and Palmers Creek. Monitoring is undertaken at four sites (R1, Q2, P4 and P5), with groundwater levels (downloaded bi-annually) and water quality monitoring undertaken quarterly.

Groundwater at R1 has maintained a constant pH and EC level between 5.60-5.69 and 746-779 respectively over the monitoring periods from 2015-2017, no results have been recorded since mid-2017 due to low water levels. Q2 has also recorded a constant pH level between 5.04-5.96 and EC between the range of 825 and 5,410 since the monitoring borehole was reinstated in 2018. The last recorded data for P4 was in 2015, pH 6.20 and EC 505, this borehole has not been monitored since due to a change in ownership of the property. The pH at P5 has ranged from 4.79 to 5.85 and EC ranged from 374 in 2016 to 902 in 2019, no samples have been collected in the later part of 2019 due to low water levels.

Macquarie Coal installed an extensometer at WWC in LW 51 to monitor for height of fracturing and consequently any potential path for loss of surface water to mine workings, in accordance with the LW 51 / 52 groundwater monitoring program. The extensometer was decommissioned on 20 January 2016, with mining finishing at LW 51 in January 2016.

Groundwater monitoring locations for both WWC and Westside are shown in **Figure 7-4**. Groundwater monitoring was not undertaken at MCPD or at Teralba Colliery during the reporting period.

7.5.1 Environmental Performance

Groundwater Extraction

Groundwater extraction results for hardrock/coal and groundwater systems are provided in the 2019 site water balance (refer to **Section 7.1.1**) and discussed in **Section 7.1.2**.

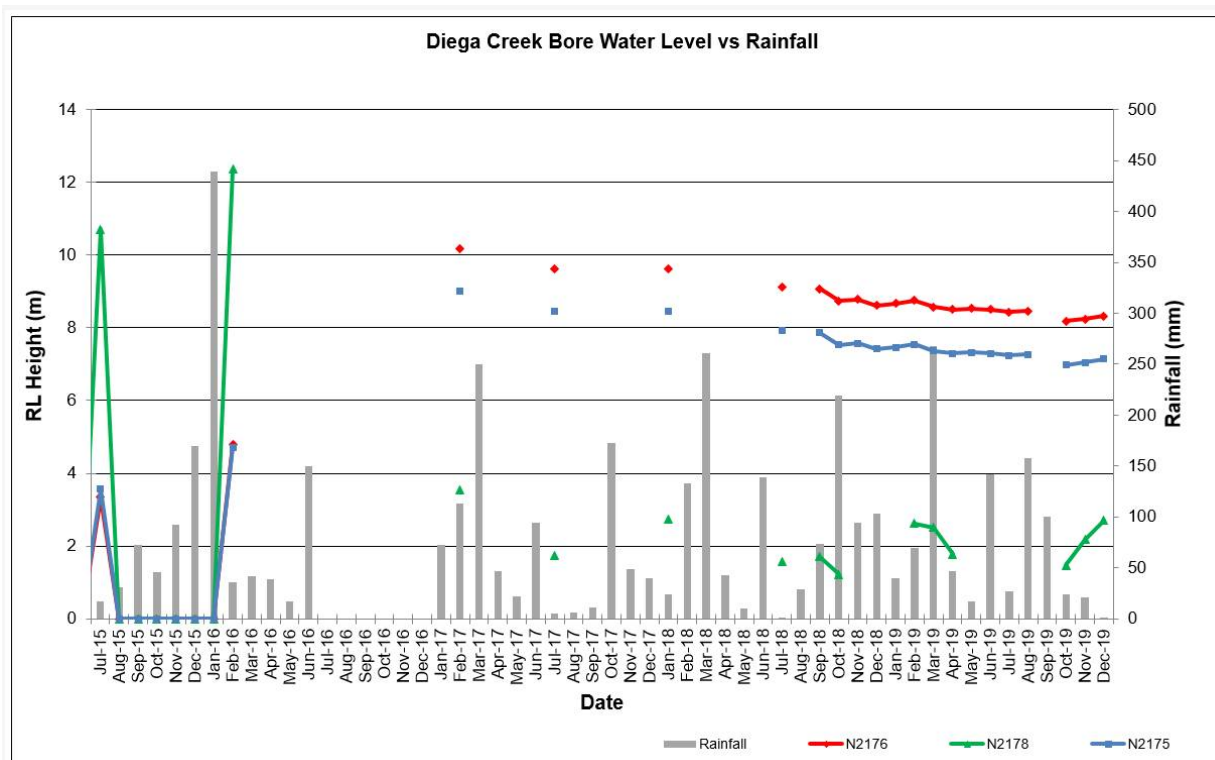
Groundwater Levels

Table 7-12 provides groundwater level data for Westside (Diega Creek boreholes). Groundwater levels in the bores have been on a slight decline since 2014, however have shown a slight increase in 2019 with the exception of N2176. Note: The frequency of groundwater monitoring changed in 2018 to monthly.

Table 7-12 – Historical Westside Groundwater Levels

Site	2014	2015	2016	2017	2018	2019
N2175	14.5	11.2	9.2	9.0	7.8	7.4
N2176	15.1	12.8	10.3	9.9	9.0	8.33
N2178	5.0	6.6	2.0	2.6	1.8	2.71

Figure 7-5 indicates the groundwater levels in Diega Creek fluctuate when rainfall recharges the creek alluvium. The groundwater data indicates that there is no interconnected cracking from the longwall mining in the region of the creek system.

Figure 7-5 – Diega Creek Bore Water Level vs Rainfall

Groundwater Quality

Groundwater quality results for Westside (Diega Creek boreholes) are provided in **Table 7-13**. This is the first year that Westside groundwater quality reporting commenced in 2018, therefore, no trends in data are provided. Groundwater quality criteria is not provided for Westside in the Westside EMP and there is no EPL criteria for the site.

Table 7-13 – Westside Average Annual Groundwater Quality Field Results

Site	pH (Field)	EC (Field)	TSS
Unit	pH unit	µS/cm	mg/L
N2175	6.4	7542	48
N2176	6.6	7907	24
N2178	7.3	1489	114

Groundwater quality results for West Wallsend Colliery boreholes in 2019 are provided in **Table 7-14**.

Site	pH (Field)	EC (Field)
Unit	pH unit	µS/cm
R1	-	-
Q2	5.11 – 5.96	825 - 1,276
P3	No access	
P5	4.79	902

7.5.2 Comparison against Predictions

A groundwater assessment was prepared for the WWC Continued Operations Projects Modification 1 Environmental Assessment (Umwelt, 2014). The assessment predicted that there would be low risk to alluvial groundwater (including Diega Creek) from the Project. The historic groundwater data (provided in the section above) indicates that there are no significant impacts to groundwater from the Project. This is consistent with EA predictions.

7.5.3 Incidents and Improvements

During 2019 there was no incidents relating to groundwater.

During 2020 groundwater monitoring will be undertaken in accordance with site requirements.

8 Rehabilitation

Progressive rehabilitation of disturbed areas is an important aspect of the operations at Macquarie Coal. The objective of this rehabilitation is to restore the land to an appropriate selected final land use.

8.1 Rehabilitation Methods

As part of the rehabilitation cycle, where topsoil is available, it is spread approximately 100 mm thick over rehabilitation areas. The topsoiled and fertilised area is then deep ripped on the contour, with any large rocks brought to the surface being raked aside and reburied.

A mixture of seasonal cover crop (millet in spring, oats in autumn) and various native tree and understorey species are directly seeded by broadcasting.

As Macquarie Coal is in a coastal area, direct seeding is possible all year round. With the regeneration of native tree cover, the rehabilitated site will be consistent with native forest on adjoining land.

Further details regarding rehabilitation is provided in Macquarie Coal Closure MOP which is available on the WWC website: <http://www.westwallsendmine.com.au/en/Pages/home.aspx>

8.2 Erosion Control

Macquarie Coal implements a range of general erosion and sediment controls in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and Volumes 2A, 2C, 2D and 2E (DECC, 2008) (the Blue Book) (SLR, 2018). These general controls have been designed to control and manage erosion and sediment and will be adopted for the mine closure and rehabilitation of the site (SLR, 2018). In summary they include the following:

- Installation of erosion and sediment control measures as the first step in the process for land disturbance (even though most of the mine site is rehabilitated and no further disturbance forecast);
- Minimising all disturbed areas and stabilisation by rehabilitation;
- Utilisation of diversion banks upslope of disturbed areas to direct clean water runoff away from the site. The diversion banks will be designed to ensure effective segregation of sediment-laden runoff and allow clean surface water to return to natural watercourses;
- Utilisation of catch drains to capture runoff from disturbed areas and direct runoff into sediment dams;
- Utilisation of sediment dams to capture runoff from infrastructure areas;
- Adding flocculants to dams, where required, to aid the settlement of entrained sediment;
- Placement of geotextile liners and rock check dams in drains as required to reduce water velocities and prevent scouring;
- Construction of graded banks over final reshaped areas to minimise erosion and re-direct runoff to catch drains and water storage areas;
- Regular maintenance of controls and inspection of works immediately after storm events to ensure erosion and sediment controls are performing adequately;
- Revegetation of final stable landforms and disturbed areas; and
- Repair or redesign of erosion and sediment controls that are not performing adequately, as identified in field inspections.

8.3 Final Landform

The final landform and the rehabilitation philosophy to be adopted for Macquarie Coal is to ensure that the site achieves a landform which is appropriate for the selected final land use for the respective domains. Macquarie Coal propose to rehabilitate all areas disturbed by mining to create a final landform that:

- Is free-draining, stable, safe and non-polluting;
 - Is compatible with the surrounding landforms and land uses; and
 - Is an aesthetically pleasing landscape that blends into the surrounding topography.
-

Post mining land uses for each domain, based on the current MOP (SLR, 2018), are detailed in the **Table 8-1**.

Table 8-1 – Post Mining Land Use by Domain

Domain	Domain Name	Final Land Use Outcomes
1	Admin Workshop and Haul Road	Retained infrastructure for Light industrial (access road, buildings), Bushland, Water management
2	North Rehab Area	Bushland, Water management, Retained access tracks
3	South West Pit	Bushland, Water management, Retained access tracks
4	Final void	Pit Lake Bushland, Pasture Water management, Retained access tracks
5	VCAs	Bushland (managed as Voluntary Conservation Areas), Retained access tracks
6	Pit Top Facilities	Retained infrastructure for Light industrial (access road, buildings), Pasture, Water management
7	Tailings Dam	Pasture Water management
8	REA	Pasture Water management
9	Surface Facilities	Retained infrastructure - light industrial (rail loop, access roads, buildings, hardstands), Bushland, Water management
10	Maturation Ponds	Non OCAL Industrial (substation, access road), Pasture Water management
11	Teralba Northgate	Pasture Bushland
12	Infrastructure	Bushland Water management
13	Teralba Southgate	Retained infrastructure Light industrial (hardstands) Bushland

Domain	Domain Name	Final Land Use Outcomes
		Water management
14	Other Mine Owned Lands	Non OCAL Industrial (roadways, powerline corridors), Retained access roads Residential Bushland Water management Wetland
15	Project Approval Area	Existing Bushland – (State Conservation Area) - Recreation
16	Rural Residential Property	Existing Residential (houses, access roads)

8.4 Rehabilitation Performance during the Reporting Period

8.4.1 Rehabilitation Summary

During the reporting period rehabilitation (seeding) was undertaken at WWU where infrastructure had been removed and the maturation ponds at MCPP. No other rehabilitation work was undertaken in 2019.

A summary of rehabilitation at Macquarie Coal at the end 2019 is presented in **Table 8-2** and shown on the Annual Review Plan included in **Appendix D**. Rehabilitation planned for 2020 is limited to the Northern Saddle Dam of the tailings dam.

Table 8-2 – Rehabilitation Status at Macquarie Coal

Mine Area Type	Previous Reporting Period (Actual) 2018(ha)	This Reporting Period (Actual) 2019 (ha)	Next Reporting Period (Forecast) 2020 (ha)
Total Mine footprint	407.8	407.8	407.8
Total Active Disturbance	220.2**	220.2**	220.2**
Land Being Prepared for Rehabilitation	0	273.52	
Land Under Active Rehabilitation	187.6	178.74	
Completed Rehabilitation*	N/A	N/A	38

*Denotes land that has been signed off by RR as completed rehabilitation.

** A reconciliation of rehabilitation and disturbance has been undertaken. Changes in rehabilitation and disturbance are due to this reconciliation.

8.5 Rehabilitation Maintenance

Rehabilitated areas at Macquarie Coal are subject to ongoing monitoring and maintenance program to ensure completion criteria are achieved. During 2019, rehabilitation maintenance (weed control) was undertaken at Westside mine at three management zones; Westside Rehabilitation Zone, Westside VCA & Westside South (refer to **Section 6.7.2**).

8.6 Buildings

During 2019, no buildings were demolished or removed from site (refer to **Section 4.1.4**).

The high voltage switch yard is planned to be removed in 2020.

8.7 RR Sign-off on Rehabilitation

In 2019, no areas of rehabilitation received formal sign-off from RR that the land use objectives and completion criteria were met. Formal sign-off from RR occurred 2020 for the northern rehabilitation at Westside.

8.8 Variations from Proposed MOP Activities

During 2019 an amended MOP (Amendment B) was prepared and approved by the Resource Regulator (refer to **Section 3.2.1**).

There were no variations to proposed MOP activities during the reporting period.

8.9 Rehabilitation Monitoring, Trials and Research

8.9.1 Rehabilitation Monitoring

Rehabilitation monitoring at WWC is undertaken in accordance with the Detailed Mine Closure Plan. Monitoring at MCP, Teralba and Westside Mine is conducted in accordance with Glencore's Closure Criteria Development and Rehabilitation Monitoring as well as the approved Westside Mine Closure MOP. This includes:

- Rehabilitation and revegetation methodology records;
- Annual walkover inspection; and
- Long term rehabilitation and revegetation monitoring program.

Annual inspections are undertaken by suitably qualified and experienced ecologists. Details recorded during annual inspections include:

- Germination rates of revegetation;
- Presence of second generation seedlings;
- Plant/tree health;
- Any treeless areas;
- Feral animal presence and management requirements;
- Weed infestation and management requirements;
- Requirements for additional planting;
- Need for fertiliser application;
- Requirement for lime or gypsum to control pH and improve soil structure;
- Presence of any excessive compaction or 'crusting' affecting plant growth;
- Erosion and the need for repair;
- Fuel loads and need for fire management;
- Quality and effectiveness of fencing;
- Signs of human or animal disturbance; and
- Success of any management programs implemented following previous monitoring inspections.

Any reasonable and feasible management actions that are required will be implemented as soon as reasonably practical.

The outcomes from the annual rehabilitation inspections are summarised below:

Westside Mine Rehabilitation Walkover

The Annual Westside Mine Rehabilitation Walkover was undertaken on 13th and 14th January 2020. The Walkover determined that generally, the rehabilitation at Westside Mine is on a trajectory to achieving closure criteria (Kleinfelder, 2020b). The Walkover determined that:

- The vegetation directly adjacent to the haul road within Domain 1, the former ROM within Domain 2, southern parts of Domain 3, and Domain 4 were all assessed against the closure criteria for all domains. In conclusion, these areas are still relatively young and further development of the rehabilitation is required to assess if they are on a trajectory to meet the required species assemblages, soil profile development and vegetation cover requirements.
- Domain 4 would benefit from additional seeding and possible soil testing and amelioration to assist in stabilisation. Erosion control is required in Domains 3 and 4, along with a solution for diverting runoff to prevent further erosion, on the western batter. These areas require ongoing monitoring to determine if any management actions are required.
- The southern section of Domain 3 and the former clay stockpile area were assessed as too young for rehabilitation completion and require further time to develop and mature. The remaining areas of Domain 3 require some erosion control works, follow up weed control works of the woody weeds that are regenerating at isolated locations.
- Additionally, while not all areas of Domain 3 were assessed as compliant, there is a large portion, approximately 23 ha which was assessed as compliant with all closure criteria, leaving approximately 28.8ha assessed as non-compliant.

Appendix E provides an assessment of each domain against closure criteria.

8.9.2 Rehabilitation Trials and Research

During rehabilitation monitoring at Westside Mine it was observed that trees in some areas of the north pit rehabilitation had fallen over. Following consultation with RR, Macquarie Coal engaged Kleinfelder to undertake an investigation to determine if the tree root architecture for a sample of trees within this rehabilitation was similar to that of a sample tree in an adjoining unmined site.

The trial was undertaken on 18 October 2019. The results of the hydraulic excavation were very similar for all three trees. Root architecture displayed large lateral roots exploring the topsoil, but not penetrating the spoil (in the case of the emplacement trees) or the bedrock in the case of the control tree.

Based on this sample, the toppling of canopy trees on the rehabilitated spoil emplacement can, at least in part be attributed to shallow rooting of the trees as a result of the compacted subsoil. However, the control tree showed a similar result. This tree also had shallow root systems and nearby trees have toppled, perhaps as a result of a lack of deep root penetration.

Observations made by other Kleinfelder ecologists when conducting surveys at other sites ranging from Warners Bay to Karuah have noted toppled trees, usually on obviously shallow or rocky soils. Shallow rooting of canopy species is not an uncommon occurrence and appears to be a natural response of the trees.

8.10 Key Issues that may Affect Rehabilitation

Ongoing works will be undertaken throughout the life of the site to ensure rehabilitation areas meet the requirements of the completion criteria. These works will include capping the Tailings Storage Facility, contaminated lands assessments, weed management and ongoing rehabilitation maintenance. Ongoing rehabilitation maintenance is discussed in **Section 6.7.2** and details regarding weed management are provided in **Section 6.7**.

A formal risk assessment was undertaken by SLR for the Macquarie Coal Closure MOP in 2016. It identified 4 aspects that were considered a high risk to rehabilitation; tailings dam and rejects emplacement area capping, soil type and suitability, subsidence related to auger mining and shallow workings and leaking methane. These risks are discussed in the following sections.

8.10.1 Tailings Dam and Rejects Emplacement Area Capping

Macquarie Coal is committed to filling the tailings dam footprint to produce a free draining final landform. It is intended to backfill the dam footprint with coarse rejects and blend the final landform of the tailings area with the REA to produce an integrated landform rehabilitated for suitable post mining land use.

The capping of the tailings dam for Macquarie Coal constitutes a large portion of the closure project. Capping of the Tailings Dam requires a large capital budget and the risks associated with working on the dam will require ongoing identification and management. The availability of capping material for the Tailings Dam and REA was considered a high risk to rehabilitation during the Macquarie Coal MOP Risk Assessment.

Stage 1 capping of the tailings dam commenced in late 2019 as the surface of the dam was not strong enough to commence conventional capping. This led to an investigation into alternate capping methods and a subsequent modification was made to the MOP (Amendment B 2019) and EPL (1360) to import fly ash from Eraring Power Station. This additional layer will provide adequate stability for capping to continue and is planned to be laid early in 2020, the progress of capping will be reported in the next annual review.

8.10.2 Soil Type and Suitability

At present there are insufficient topsoil stockpile resources for the necessary rehabilitation required across Macquarie Coal. This is a high risk to rehabilitation at the site, as ranked in Macquarie Coal MOP Risk Assessment. Where there are insufficient volumes of topsoil for rehabilitation works, Macquarie Coal shall source topsoil for use, where required, from external provider sources. Organic ameliorants (e.g. compost) may also be sourced from an external provider. Any material sourced from offsite sources will be done so in accordance with the requirements of the Protection of the Environment Operations Act 1997 (POEO Act), waste regulations, the relevant EPA waste classification guidelines and in Environment Protection License.

In addition, onsite borrow pit areas adjacent to the Tailings Dam and REA, along with overburden from Westside Mine may be used as onsite sources of growth media.

It is expected under either of these scenarios, that the use of biosolids or compost will be required to further enhance the establishment of a suitable vegetation cover.

8.10.3 Subsidence Related to Auger Mining and Shallow Workings

The Westside Mine extracted coal from the Great Northern and Fassifern Seams between the 1980s to 2012 from West Wallsend No. 2 LWs 11 to 15 (SLR, 2018).

The Westside Mine also has an area of former highwall coal augering in the Fassifern Seam. In 2008, there was a high wall failure at this area, which resulted in the cessation of auger mining. The high wall was battered back after the high wall failure.

In January 2019 a trial was undertaken using liquefied sand to fill some potholes that had formed where the high wall had failed. Regular inspections of this area continue to be undertaken, to check for potholing and subsidence.

8.10.4 Leaking Methane from the Mine Site

The following potential sources for methane emissions have been identified:

- Unsealed, failed or inadequately sealed mine openings;
 - Shafts, drifts, etc. passing through worked seams including shafts sealed >20 years ago;
 - Boreholes sealed >20 years ago or unsealed boreholes;
 - Subsidence and longwall areas that could have interconnecting paths from underground areas (e.g. goaves) to surface via cracking; and
 - Groundwater expression to surface.
-

To manage leaking methane from the site a sealing strategy was developed for Macquarie Coal and historical disturbance areas outside of domains (SLR, 2018). Methane monitoring is also undertaken (SLR, 2018).

8.11 Actions for the Next Reporting Period

8.11.1 Rehabilitation Outcomes

The rehabilitation outcomes have been agreed with stakeholders and documented in the approved MOP (SLR, 2018), which is available on the WWC website: <http://www.westwallsendcolliery.com.au>

8.11.2 Proposed Rehabilitation Trials, Projects and Initiatives

Proposed rehabilitation trials, projects and initiatives to be undertaken during the next reporting period are included in **Section 8.9**.

Rehabilitation outcomes have not been further developed since the MOP has been prepared. The outcomes listed in the MOP are therefore still current.

8.11.3 Rehabilitation Activities Proposed for 2020

Details regarding proposed rehabilitation activities for Macquarie Coal during 2020 are provided in the Macquarie Coal Closure MOP. This document is available for download on the WWC website: <http://www.westwallsendcolliery.com.au>.

Rehabilitation to be undertaken during 2020 is outlined in **Section 4.3.1**.

Rehabilitated sites at Macquarie Coal will be maintained in 2020. The following works are planned at Westside Mine:

- Weed control works;
- Erosion control within Final Void in the high-risk erosion area (Kleinfelder, 2019e); and
- Improving rehabilitated area around the Final Void where rehabilitation has not been successful.

During 2020 the following rehabilitation maintenance activities will be undertaken at MCPP:

- Weed control works, to reduce weed cover and prevent spread to other areas (Kleinfelder, 2019f).

During the next reporting period, closure works will also be undertaken at Macquarie Coal. Further details regarding these works are included in **Section 4.1.4** and **Appendix B**.

9 Community

9.1 Community Engagement

Community consultation is a key component of Macquarie Coal's operation due to the close proximity of Macquarie Coal to residential areas. During 2019, Macquarie Coal undertook community engagement in accordance with the site's Social Involvement Plan (SIP). The SIP outlines how stakeholders are identified, assesses stakeholder information needs and defines the sites Stakeholder Engagement Strategy. The SIP also details complaints management, training and the community support.

A stakeholder consultation strategy was developed by Macquarie Coal for the Rationalisation and Closure activities. The strategy has been implemented as required during the progression of activities, seeking the feedback and approval of the relevant agencies and community stakeholders where necessary.

9.1.1 Community Consultative Committee

In accordance with Condition 6, Schedule 6 of Project Approval (PA 09_0203), WWC has established a Community Consultative Committee (CCC). The CCC is comprised of community members from the residential areas of Teralba, Barnsley and Killingworth as well as a councillor from Lake Macquarie City Council (LMCC) (independent chairperson). During 2019 an invitation was extended to a community member from Wakefield to join the committee. The CCC provides a forum for discussion, interaction and feedback. Two CCC meetings were held in 2019; one on 7 May and the other on 6 November 2019.

During 2018, the operation of the CCC as a joint CCC for the five Macquarie Coal sites (Westside Mine, WWC, MCPP and Teralba Northgate and Southgate) was formalised. The committee was renamed from WWC CCC to Macquarie Coal Complex CCC (MCC CCC). Agreement was also sought to give MCC CCC responsibilities for Teralba Northgate and Southgate, given there are no requirements for these sites to have a CCC.

The CCC agenda includes an update of operations, subsidence management and monitoring update, environment and community performance (including a review of environmental monitoring results, community complaints and environmental incidents), and a summary of mine closure activities. Meeting minutes are available at <http://www.westwallsendmine.com.au>. CCC members are sent copies of relevant reports such as the Macquarie Coal Annual Review.

The format of CCC meetings and members of the committee comply with the DPE *Community Consultative Committee Guideline*, January 2019.

9.1.2 Newsletters and Notices

Macquarie Coal distributed Community Newsletters, dated May 2019 and November 2019 to residents at Barnsley, Killingworth, Teralba and Wakefield. The newsletters provided information on the consolidated premises including updates on civil works at WWC and MCPP, details regarding the TSF capping, installation of spillways at Westside Mine, along with Macquarie Coal's closure and decommissioning plans.

9.2 Community Sponsorship and Donations

Macquarie Coal no longer sponsors any community activities. However, Glencore (the majority owner of Macquarie Coal) sponsors the community through "SmartyGrants".

During 2019, Macquarie Coal donated to local charities and organisations equipment and other infrastructure no longer needed at the site, due to the onsite demolition works and rationalization. One of these local organisations was the Rural Fire Service who accepted equipment lockers for personnel to store their personal effects during service.

9.3 Environmental Complaints

Macquarie Coal recognises the importance of open dialogue with the local community about its operations and the potential impacts of its operation on the environmental amenity of the local community.

Environmental complaints from both the community and workforce are recorded in accordance with Macquarie Coal's procedure for environmental incident and community complaint management. The report form details the nature of the complaint and the mitigation measures to be implemented, if required. The form is forwarded to the Macquarie Coal Environment and Community Manager to facilitate corrective actions and circulated to relevant Macquarie Coal personnel.

During the reporting period one complaint was recorded. No complaints were also received in 2014 and 2015 by Macquarie Coal. **Table 9-1** shows a comparison of the environmental complaints received by Macquarie Coal against the previous seven years.

Table 9-1 – Summary of Complaints by Issue 2012 - 2019

Complaint Type	2012	2013	2014	2015	2016	2017	2018	2019	Total
Dust	0	1	0	0	0	0	0	0	1
Subsidence	0	3	0	0	0	0	0	0	3
Property Management	0	1	0	0	0	0	0	0	1
Noise	8	1	0	0	1	0	0	0	10
Traffic	2	0	0	0	0	0	0	0	2
Water	0	0	0	0	0	1	0	1	2

A register of complaints is maintained and published on the West Wallsend website <http://www.westwallsendmine.com.au/en/Publications/Pages/community-complaints-register.aspx>

9.4 Environmental Monitoring Program Review

Throughout 2019 various components of the Macquarie Coal environmental monitoring program have been reviewed and updated. Changes following the review included;

- the relocation of the meteorological station (EPA Point 19) to the MCPP,
- the installation of a real time dust monitor at the TSF to gather background data prior to commencing capping;
- establishing a new 20m x 20m biodiversity monitoring plot at WWC pit top and in the southern rehabilitation at Westside;
- rationalising monitoring plots at Westside following pending sign off of rehabilitation in the north pit;
- monitoring of areas burnt by November 2018 bushfire, no remediation required;
-

10 Independent Audit

10.1 WWC Independent Audit

In June 2019 an Independent Environmental Audit (IEA) was undertaken for WWC, in accordance with Condition 9, Schedule 6, of the WWC Project Approval (PA 09_0203). The IEA period was 4 July 2016 to 20 June 2019, with the last IEA undertaken in July 2016. The IEA report is available on the WWC website (<http://www.westwallsendmine.com.au>). There were no outstanding actions from the 2016 IEA.

The IEA reviewed 21 approvals and environmental management documents and the recommendations from the previous 2016 Independent Environmental Audit in detail and other documents in a more general manner, where relevant. Two conditions were identified as Not compliant, with a number of historical Not compliant conditions also identified. Some of the historical non-compliances noted in this IEA relate to the same issue which, due to the duplication of commitments between consent documents and management plans, raise the same non-compliance several times.

Two hundred and sixty six (266) conditions were identified as Compliant and ninety nine (99) as Not triggered. The next IEA will be commissioned by the end of June 2022, in accordance with Condition 9, Schedule 6, PA 09_0203.

10.2 Westside Mine Independent Audit

In accordance with Condition 8.1, Schedule 2 of DA 125-5-2002, an IEA is required to be undertaken at Westside Mine every three years. The last IEA undertaken at Westside Mine to meet this DA requirement was in 2012. All actions from this audit have been completed and closed out. Audits under this DA are no longer a DPE requirement.

11 Incidents and Non-Compliances during the Reporting Period

During 2019, there were one non-compliances.

One reportable incident occurred during 2019. A non-compliance with EPL 1360 occurred, a failure to obtain a sample at EPA Point 8 in August and September 2019 as the depositional dust gauge had fallen over. Monitoring is required to be undertaken continuously, in accordance with Condition M2.2 of EPL 1360. This incident was reported to EPA via the 2019 Annual Return. **Table 11-1** provides further details of this reportable incident.

Table 11-1 – Summary of 2019 Environmental Incidents and Non-Compliances at Macquarie Coal

Date of Incident	Description of Incident	Corrective Action Taken/Status
August 2019	Non-compliance with Condition M2.2 Air Monitoring Requirements Failure to obtain a sample at EPA Point 8 in August and September 2019 as the depositional dust gauge had fallen over.	An audit was undertaken of all of the dust gauges and a new dust gauge holder was installed at EPA Point 8 to secure the dust gauge and prevent it from falling over.

12 Activities to be completed in the next Reporting Period

The works listed in **Table 12-1** will be completed in 2020 at Macquarie Coal. These activities are discussed in the Macquarie Coal Closure MOP, accessible on the WWC website (<http://www.westwallsendcolliery.com.au>).

Table 12-1 – Proposed Activities in 2020

Topic	Proposed Activity	Proposed Timing
Mine Closure	Capping of the Tailings Storage Facility	Ongoing
Subsidence	Subsidence inspections on Quarry Trail and in subsidence affected areas of the SSCA.	Ongoing
Subsidence	Continue subsidence remediation using the sand pumping method.	Ongoing
Rehabilitation	Maintenance of rehabilitated areas (weed management and erosion control)	Ongoing
Rehabilitation	Rehabilitation monitoring	Ongoing
Rehabilitation	Shear vane testing of the TSF	Ongoing
Biodiversity	Biodiversity monitoring	Ongoing
Erosion	Erosion works (refer to Section 8.11.3)	Ongoing

13 Document Information

13.1 Reference information

Reference information, listed in **Table 13-1** below, is information that is directly related to the development of this document or referenced from within this document.

Table 13-1 – Reference information

Reference	Title
BOM (2019)	Monthly Rainfall Data http://www.bom.gov.au/jsp/ncc/cdio/weatherData Accessed on 7 January 2019
Coffey (2018)	<i>Bio-Remediation Area Validation Sampling, Westside Site, West Wallsend Colliery, NSW</i>
DPE (2019)	<i>Community Consultative Committee Guideline</i>
Glencore (2015a)	<i>LW 51 and LW 52 Biodiversity Management Plan</i> (WWCUG-1477460896-14131).
Glencore (2015c)	<i>LW 51 and LW 52 Extraction Plan</i> (GCAA-1023863433-3796).
Glencore (2016a)	<i>West Wallsend Underground. Plan for West Wallsend Underground Air Quality and Greenhouse Gas Management Plan</i> (WWCUG-1477460896-9203).
Glencore (2016b)	<i>Westside Mine Environmental Management Plan</i> (WSCOC-240530029-175).
Glencore (2018)	<i>Macquarie Coal Social Involvement Plan</i> (WWCUG-1477460896-7362).
Kleinfelder (2018)	<i>Weed Action Plan (WAP)</i>
Kleinfelder (2019a)	<i>West Wallsend Underground 2018 Biodiversity Monitoring</i> . Document Number: NCA18R87668.
Kleinfelder (2019b)	<i>Westside Mine 2018/19 Biodiversity Monitoring. Westside Mine</i> . Document Number: NCA19R90514
Kleinfelder (2019c)	<i>Macquarie Coal Preparation Plant 2018 Biodiversity Monitoring</i> . Document Number: NCA18R87667.
Kleinfelder (2019d)	<i>2018 Voluntary Conservation Agreement Area Monitoring – Westside Mine</i> . Document Number: NCA18R879768.
Kleinfelder (2019e)	<i>Westside Mine 2019/20 Rehabilitation Walkover Inspection Report</i> . NCA20R106771
Kleinfelder (2019f)	<i>Macquarie Coal Preparation Plant 2018 Rehabilitation Walkover Inspection Report</i> . NCA19R90516
Kleinfelder (2020a)	<i>Macquarie Coal Preparation Plant 2020 Biodiversity Monitoring</i> . Document Number: NCA20R106409.
Kleinfelder (2020b)	<i>Westside Mine 2019/20 Rehabilitation Walkover Inspection Report</i> . Document Number: NCA20R106771
NSW Government (2015)	Annual Review Guideline.

SLR Consulting (2018)	<i>Mining Operations Plan. Closure of the OCAL Complex. 1 February 2017 to 31 December 2030. Report Number OCCP-SLR-DOM00-CM-RPT-001. Amendment A.</i>
Umwelt (2002).	<i>Westside Mine Southern Extension Environmental Impact Statement. Prepared for Oceanic Coal Australia Pty Ltd, May 2002.</i>
Umwelt (2005).	<i>Westside The Conservation Management Plan for the VCA.</i>
Umwelt (2010)	<i>WWC Continued Operations Project Environmental Assessment. Prepared for Oceanic Coal Australia Pty Ltd.</i>
Umwelt (2014)	<i>Oceanic Coal Australia Pty Limited. Environmental Assessment. Proposed Longwalls 51 & 52. West Wallsend Colliery.</i>
Umwelt (2016)	<i>Aboriginal Cultural Heritage Management Plan.</i>

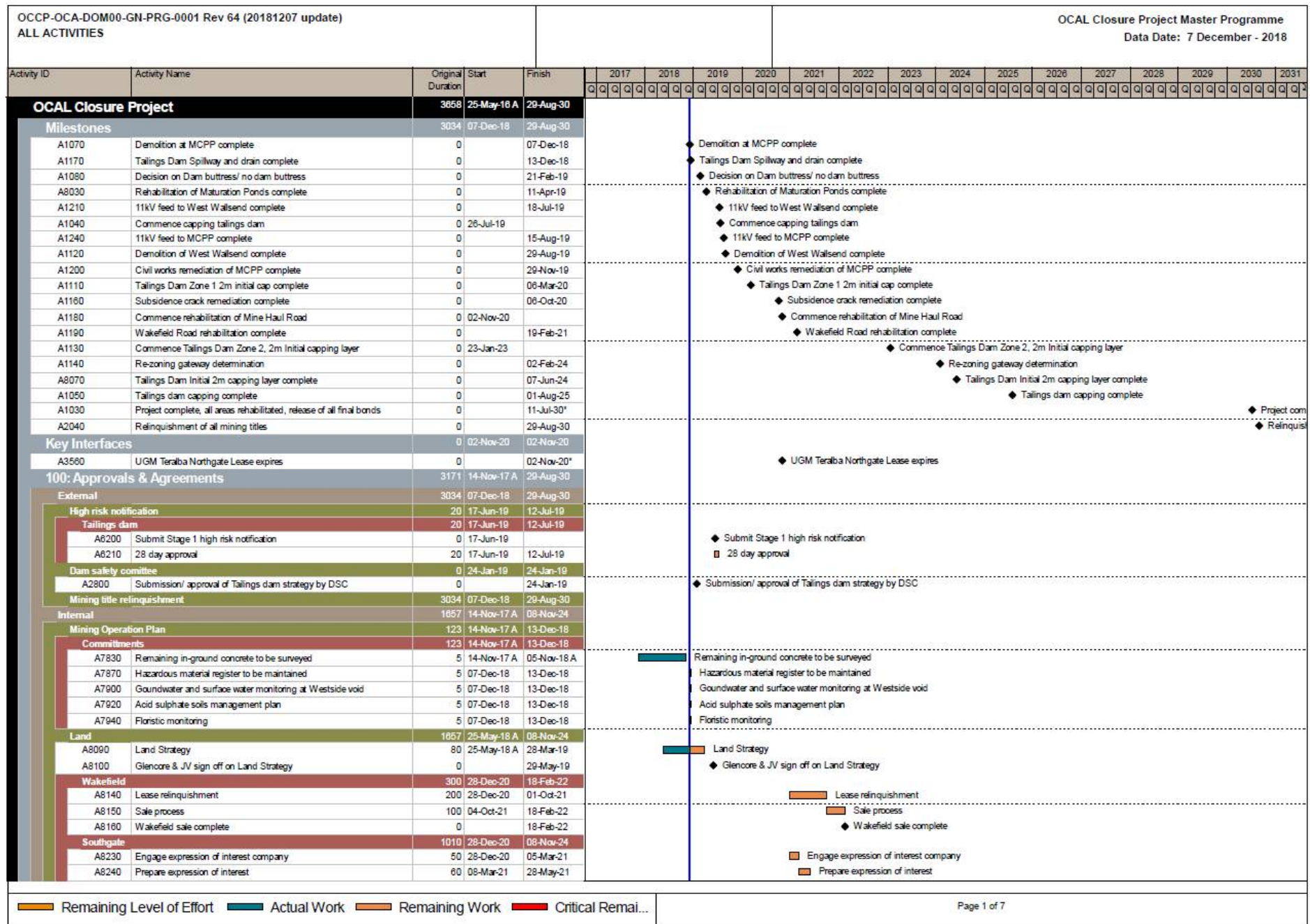
14 Change Information

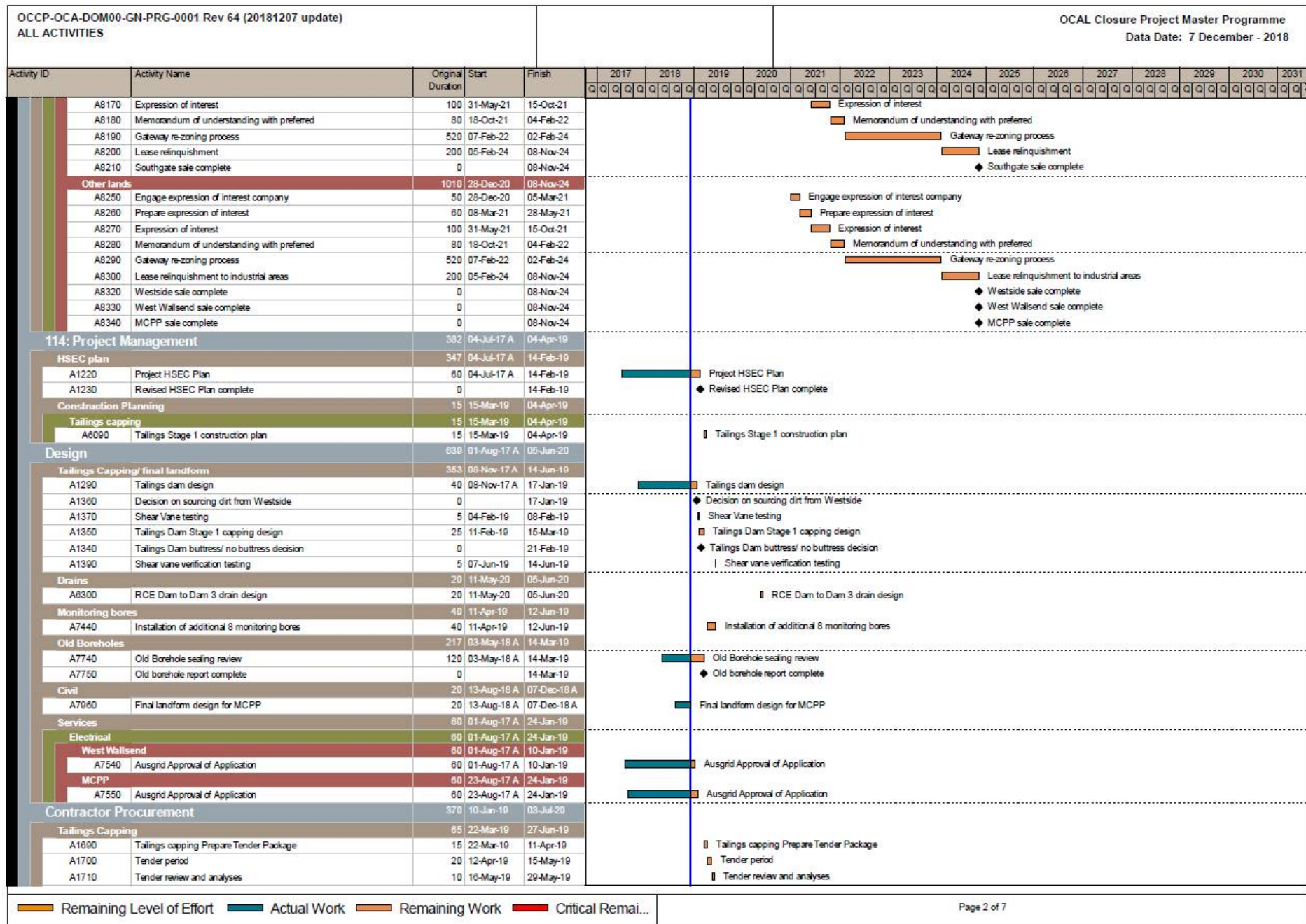
Full details of the document history are recorded in the document control register, by version. A summary of the current change is provided in **Table 14-2** below.

Table 14-1 – Change information

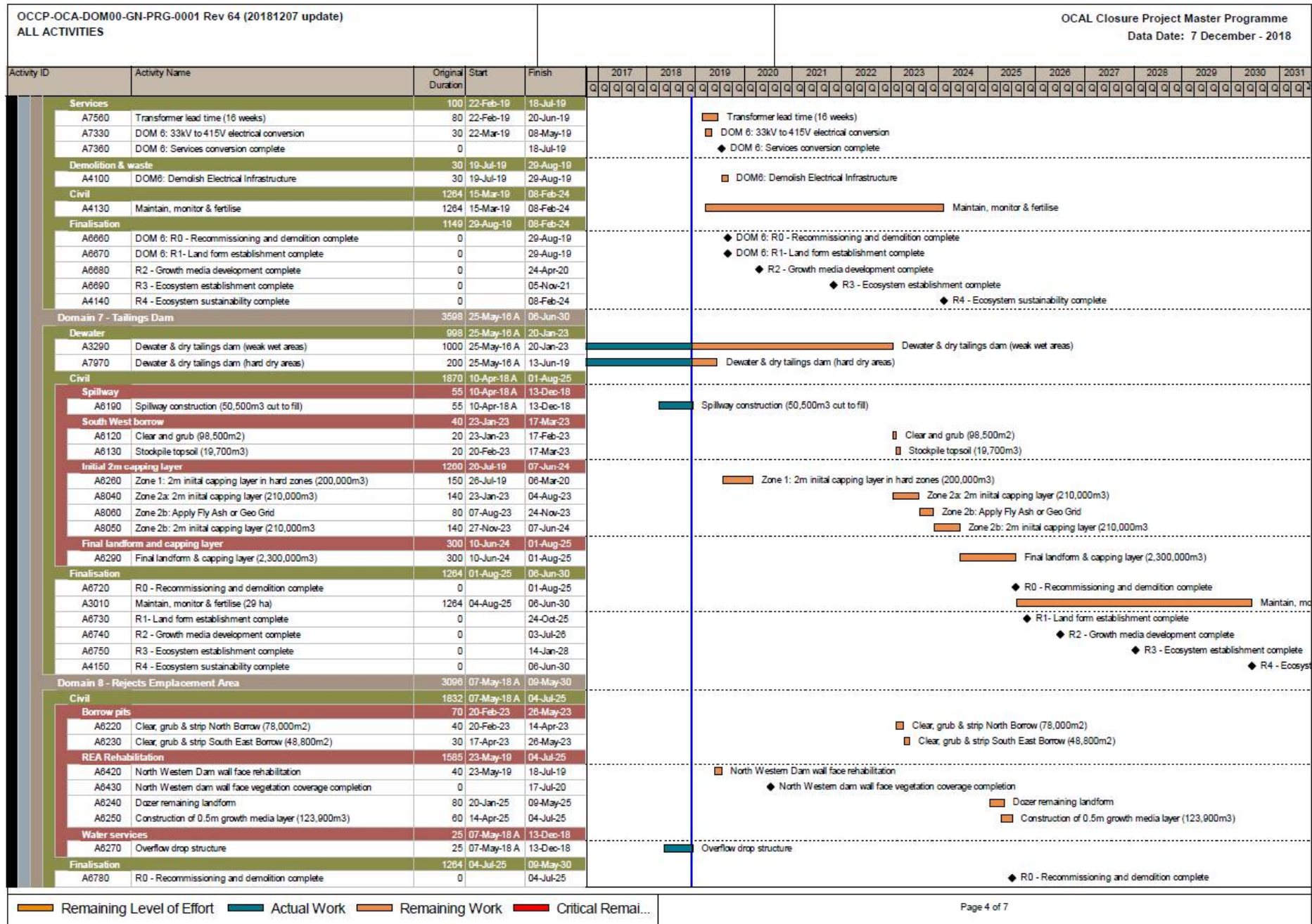
Version	Date	Change Details
1	31 March 2020	Final original document

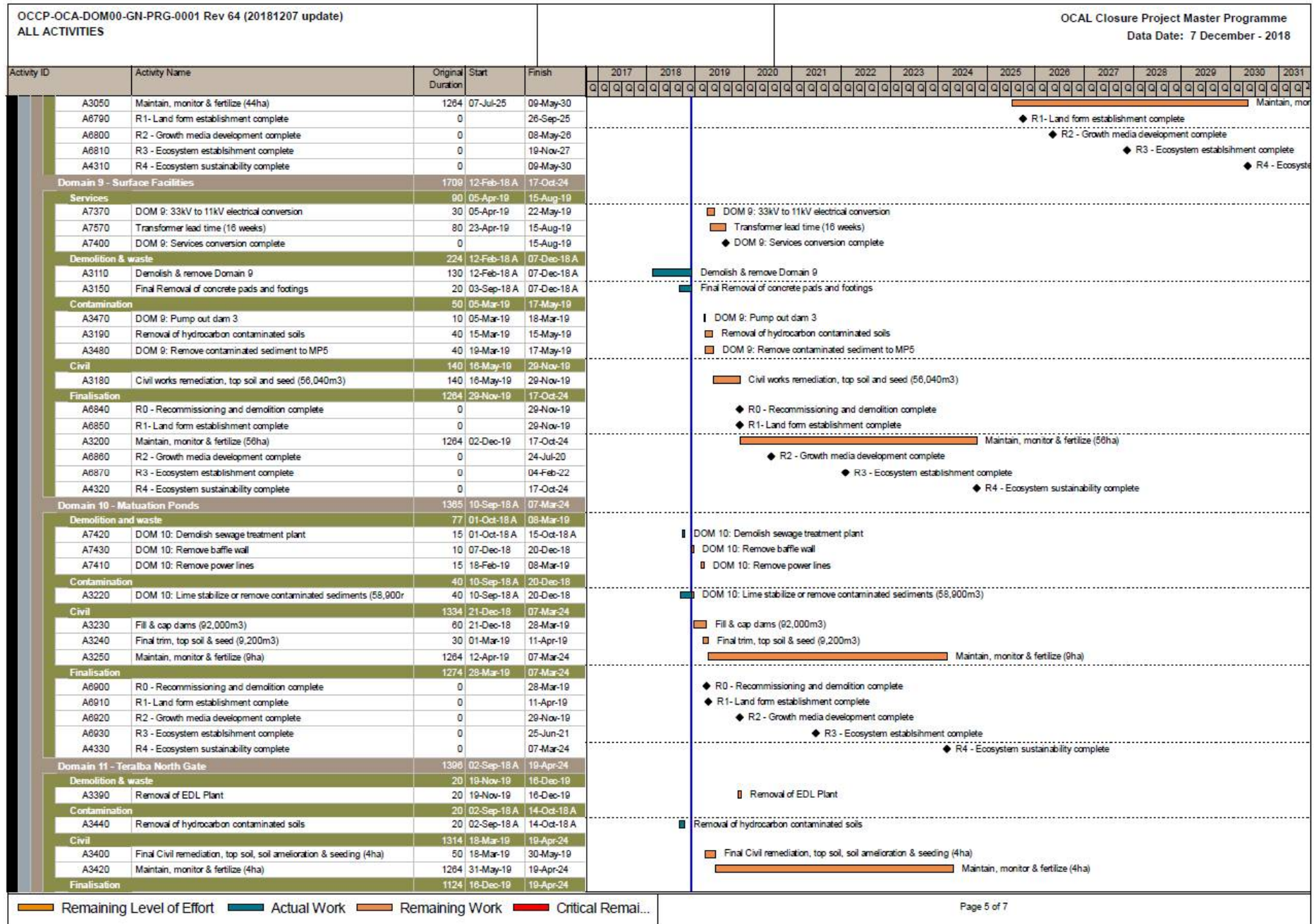
Appendix A – 2019 Closure Activities





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OCCP-OCA-DOM00-GN-PRG-0001 Rev 64 (20181207 update) ALL ACTIVITIES					OCAL Closure Project Master Programme Data Date: 7 December - 2018																										
Activity ID	Activity Name	Original Duration	Start	Finish	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031												
A6960	R0 - Recommissioning and demolition complete	0		16-Dec-19																											
A6970	R1- Land form establishment complete	0		16-Dec-19																											
A6980	R2 - Growth media development complete	0		10-Aug-20																											
A6990	R3 - Ecosystem establishment complete	0		21-Feb-22																											
A4340	R4 - Ecosystem sustainability complete	0		19-Apr-24																											
Domain 12 - Infrastructure		1354	02-Nov-20	08-Jan-26																											
Demolition & waste		40	02-Nov-20	25-Dec-20																											
A3520	Demolition & removal of the Mine Haul road	40	02-Nov-20	25-Dec-20																											
Civil		1314	28-Dec-20	08-Jan-26																											
A3530	Fill in Wakefield overpass tunnel	40	28-Dec-20	19-Feb-21																											
A3550	Final trim, top soil, soil ameloration & seeding to haul road & domain	30	25-Jan-21	05-Mar-21																											
A3580	Maintain, monitor & fertilize (4ha)	1264	08-Mar-21	08-Jan-26																											
Finalisation		1274	19-Feb-21	08-Jan-26																											
A7020	R0 - Decommissioning and demolition complete	0		19-Feb-21																											
A7030	R1- Land form establishment complete	0		05-Mar-21																											
A7040	R2 - Growth media development complete	0		15-Oct-21																											
A7050	R3 - Ecosystem establishment complete	0		28-Apr-23																											
A4350	R4 - Ecosystem sustainability complete	0		08-Jan-26																											
Domain 13 - Teralba South Gate		1728	28-Mar-19	28-Nov-25																											
General		0	02-Nov-20	02-Nov-20																											
A3640	UGM lease expires	0		02-Nov-20*																											
Salvage		30	15-Dec-20	25-Jan-21																											
A3660	Seperation, dismantling and storage/ sale/ transfer of salvagable items	30	15-Dec-20	25-Jan-21																											
Contamination		70	28-Mar-19	08-Jul-19																											
A3790	Drain & remove contaminated sediments from the dam (600m3)	30	28-Mar-19	10-May-19																											
A3780	Remove remaining coal to the area (1,797m3)	20	13-May-19	07-Jun-19																											
A3740	Removal of hydrocarbon contaminated soils	20	11-Jun-19	08-Jul-19																											
Civil		1658	09-Jul-19	28-Nov-25																											
A3760	Final trim, top soil, soil ameloration & seeding (4ha)	15	09-Jul-19	29-Jul-19																											
A3770	Maintain, monitor & fertilize (4ha)	1264	26-Jan-21	28-Nov-25																											
Finalisation		1658	08-Jul-19	28-Nov-25																											
A7080	R0 - Recommissioning and demolition complete	0		08-Jul-19																											
A7090	R1- Land form establishment complete	0		29-Jul-19																											
A7100	R2 - Growth media development complete	0		24-Mar-20																											
A7110	R3 - Ecosystem establishment complete	0		05-Oct-21																											
A4360	R4 - Ecosystem sustainability complete	0		28-Nov-25																											
Domain 14 - Other Mine Owned Lands		0	01-Jul-19	01-Jul-19																											
Finalisation		0	01-Jul-19	01-Jul-19																											
A4370	Domain sign-off with Department finalised	0		01-Jul-19																											
Domain 15 - Project Approval Area		840	08-Jan-19	19-Apr-22																											
Subsidence Remediation		840	08-Jan-19	19-Apr-22																											
A2950	2019 Crack remediation	240	08-Jan-19	17-Dec-19																											
A2960	2020 Crack remediation	200	18-Dec-19	06-Oct-20																											
A2910	Crack remediation complete	0		06-Oct-20																											
A2900	Crack remediation performance monitoring	400	07-Oct-20	19-Apr-22																											
A2890	Final Glenore & OEH sign off	0		19-Apr-22																											
Finalisation		400	06-Oct-20	19-Apr-22																											
A7210	R0 - Recommissioning and demolition complete	0		06-Oct-20																											
A7220	R1- Land form establishment complete	0		01-Dec-20																											
A7230	R2 - Growth media development complete	0		13-Jul-21																											
A7240	R3 - Ecosystem establishment complete	0		08-Feb-22																											

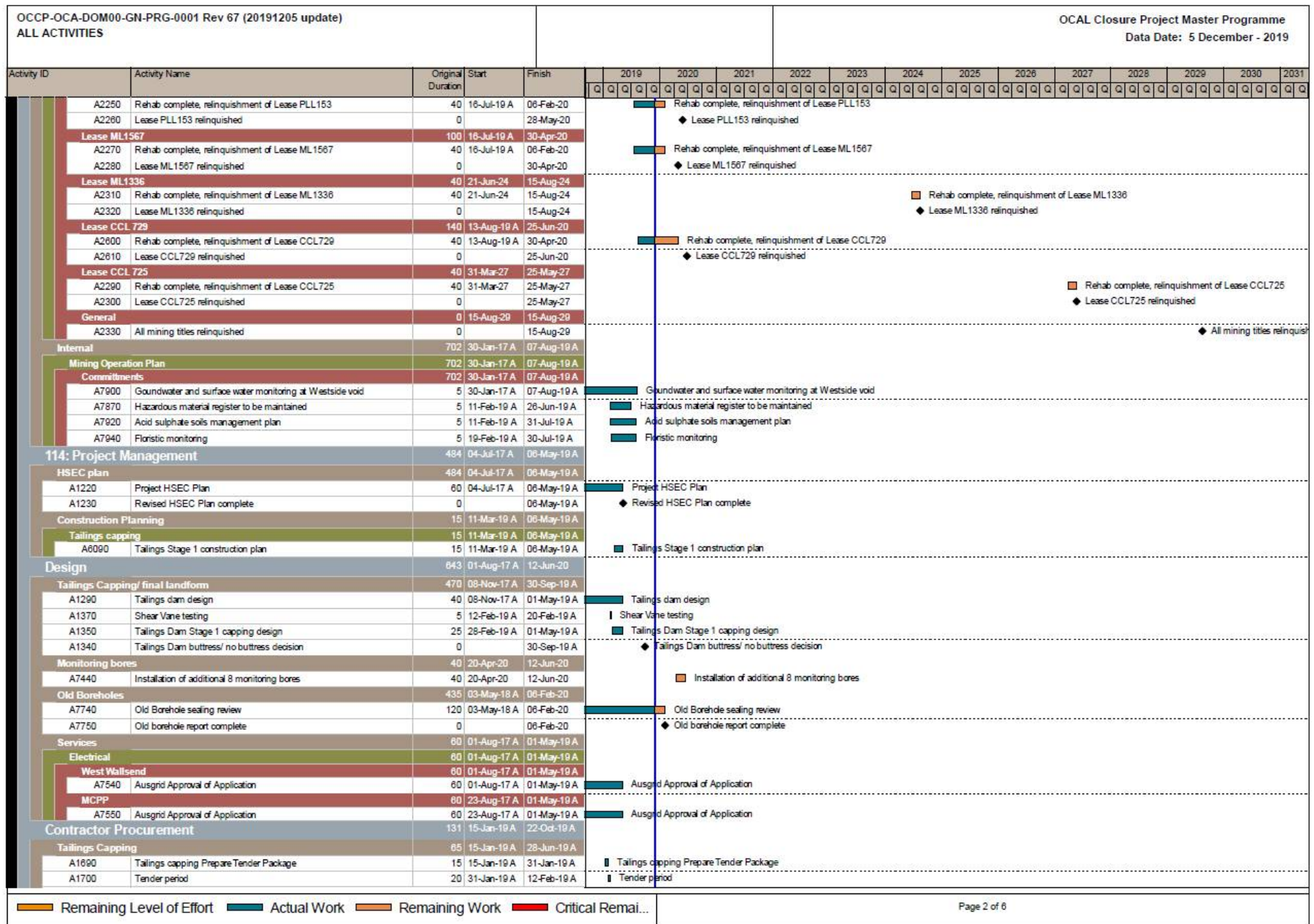
Remaining Level of Effort Actual Work Remaining Work Critical Remai...

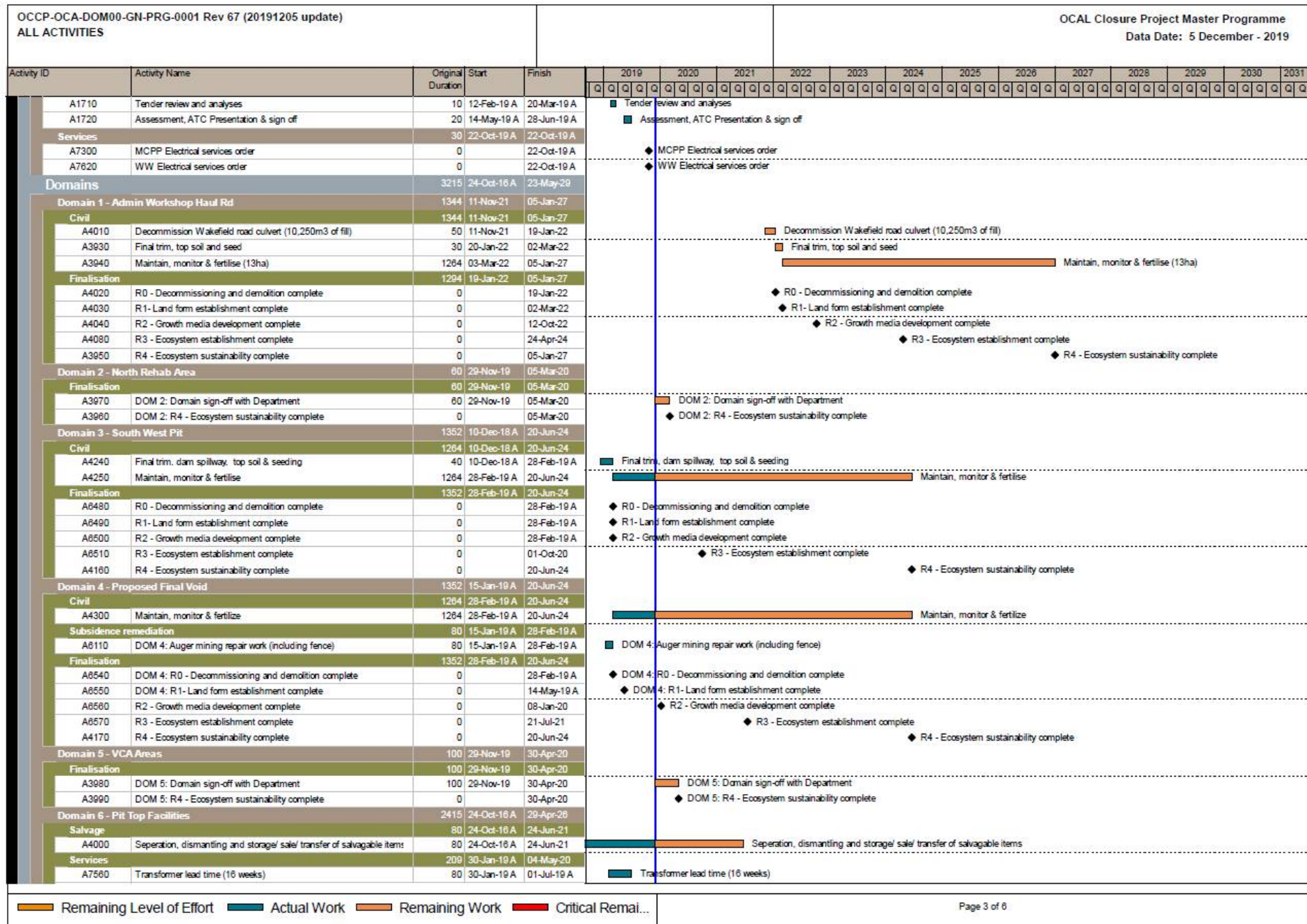
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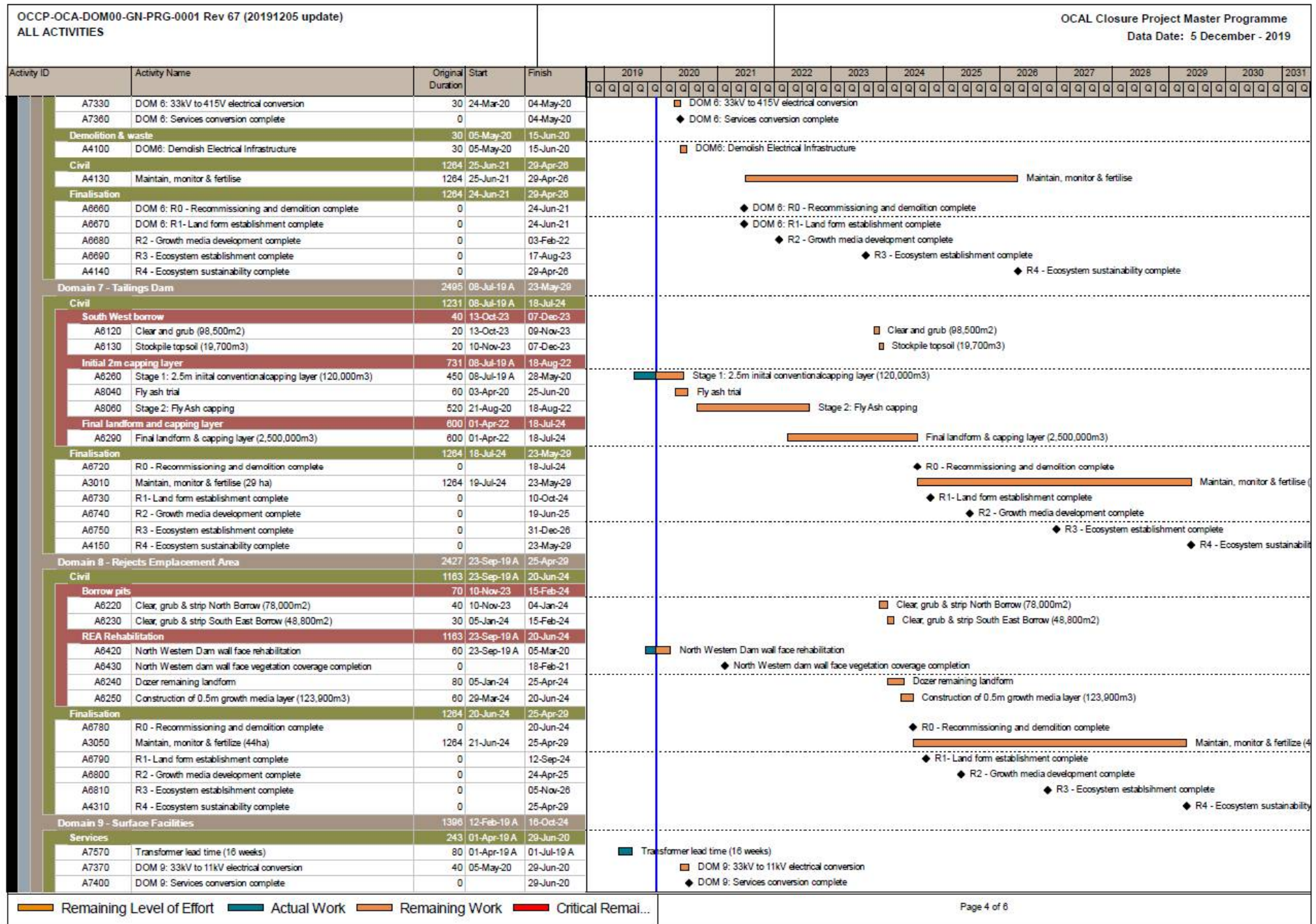
Macquarie Coal Annual Review 2019

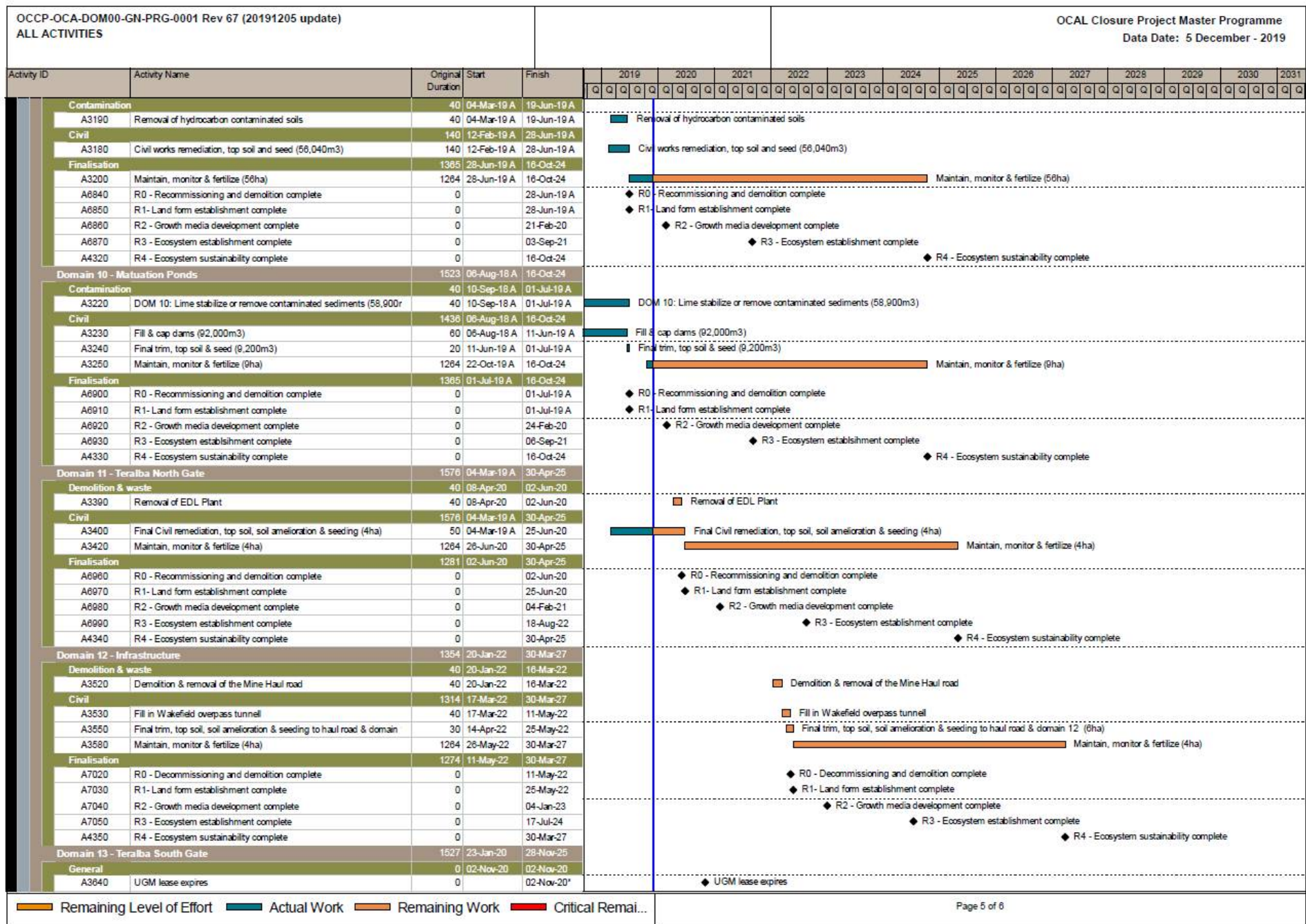
Appendix B – 2020 Closure Activities

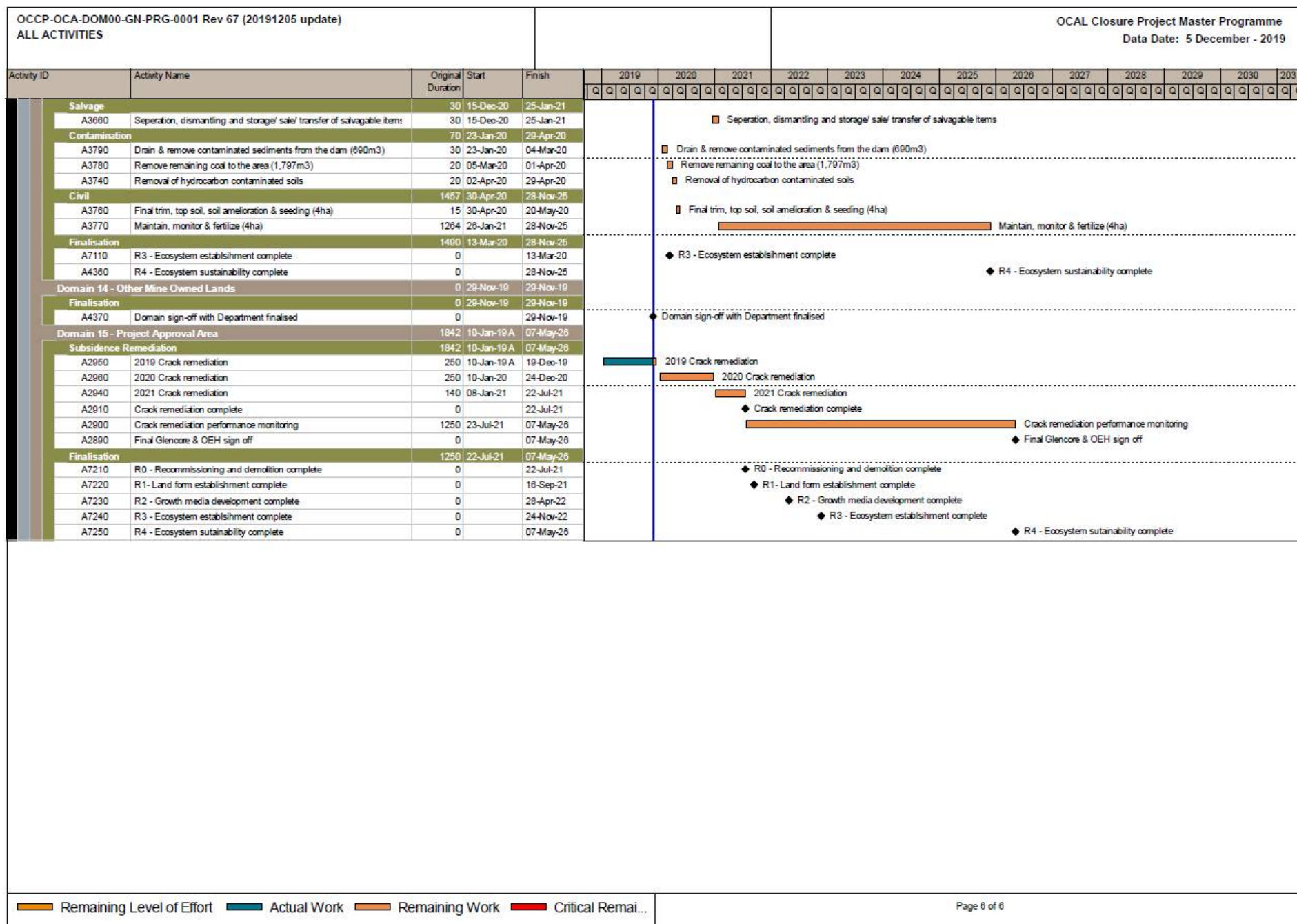
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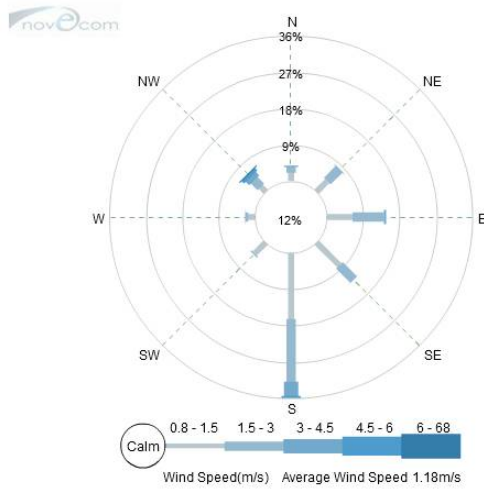




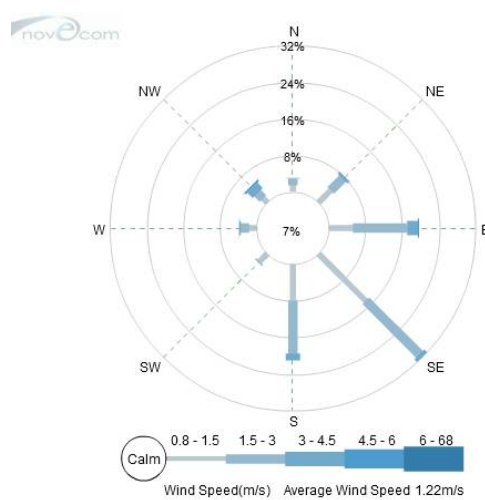


Appendix C – 2019 Wind Roses

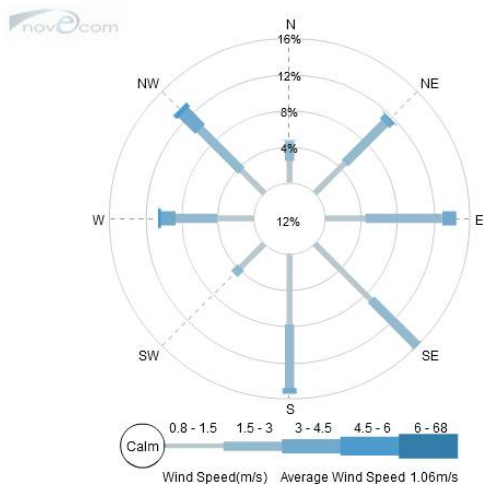
January 2019



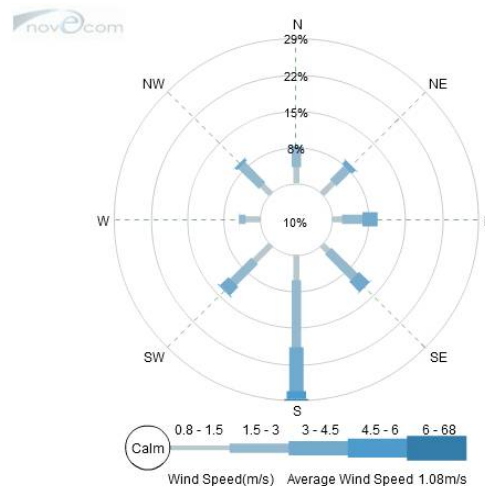
February 2019



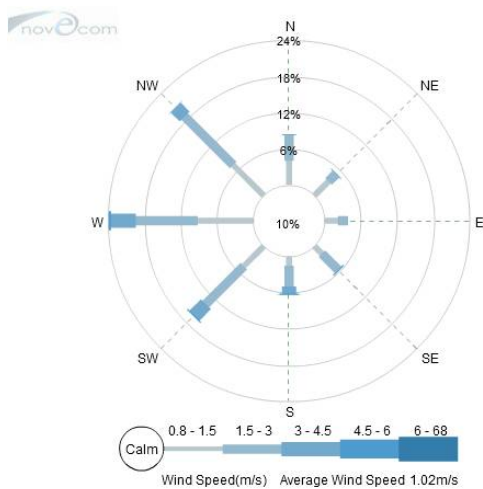
March 2019



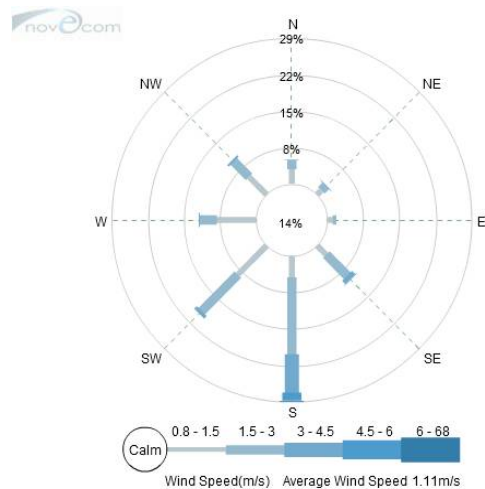
April 2019



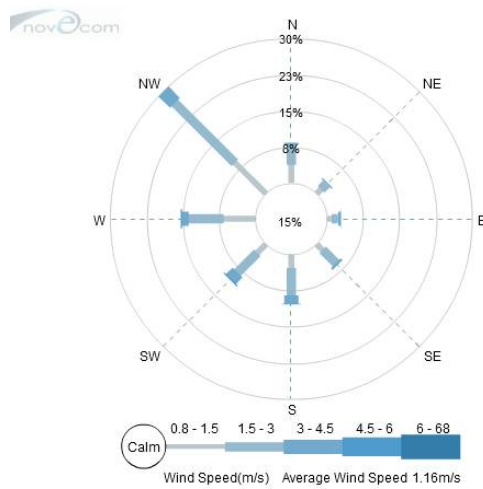
May 2019



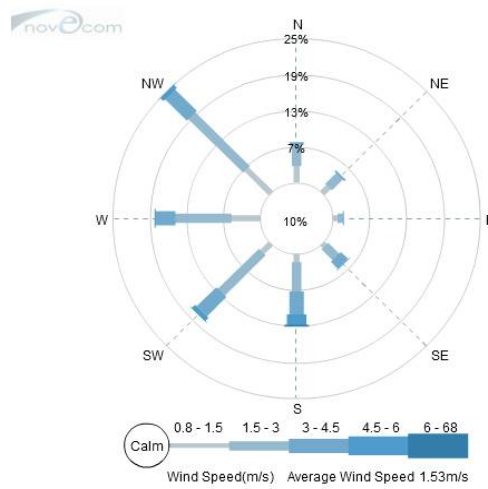
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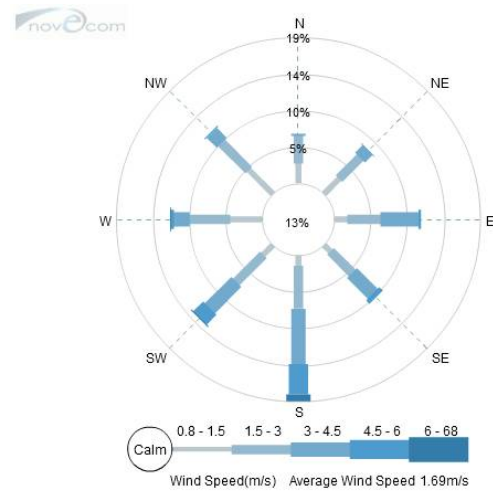
July 2019



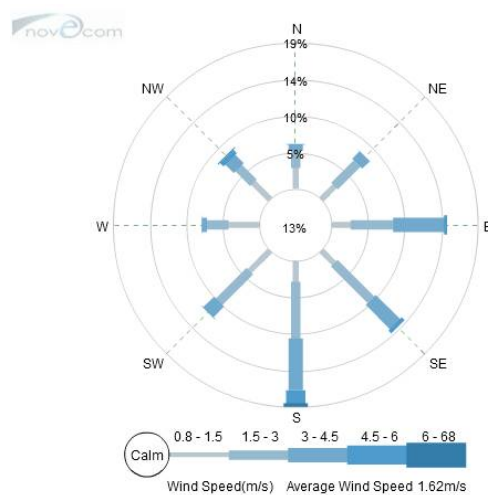
August 2019



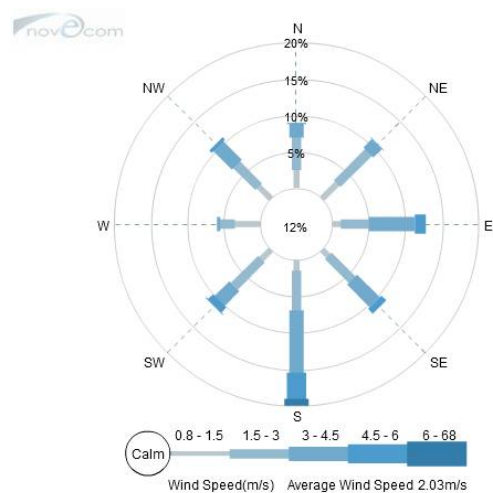
September 2019



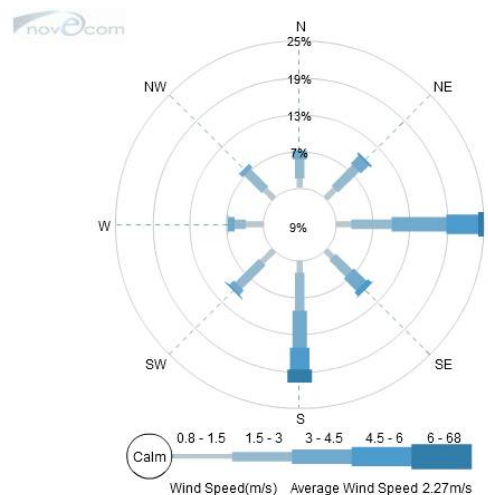
October 2019



November 2019



December 2019



Appendix D – Macquarie Coal Annual Review 2019 Domain Plan

Annual Review 2019

Domain Plan

MACQUARIE COAL

GLENCORE

Legend

Mining Lease Boundaries

Watercourses

NonPerennial
Perennial

Major Roads

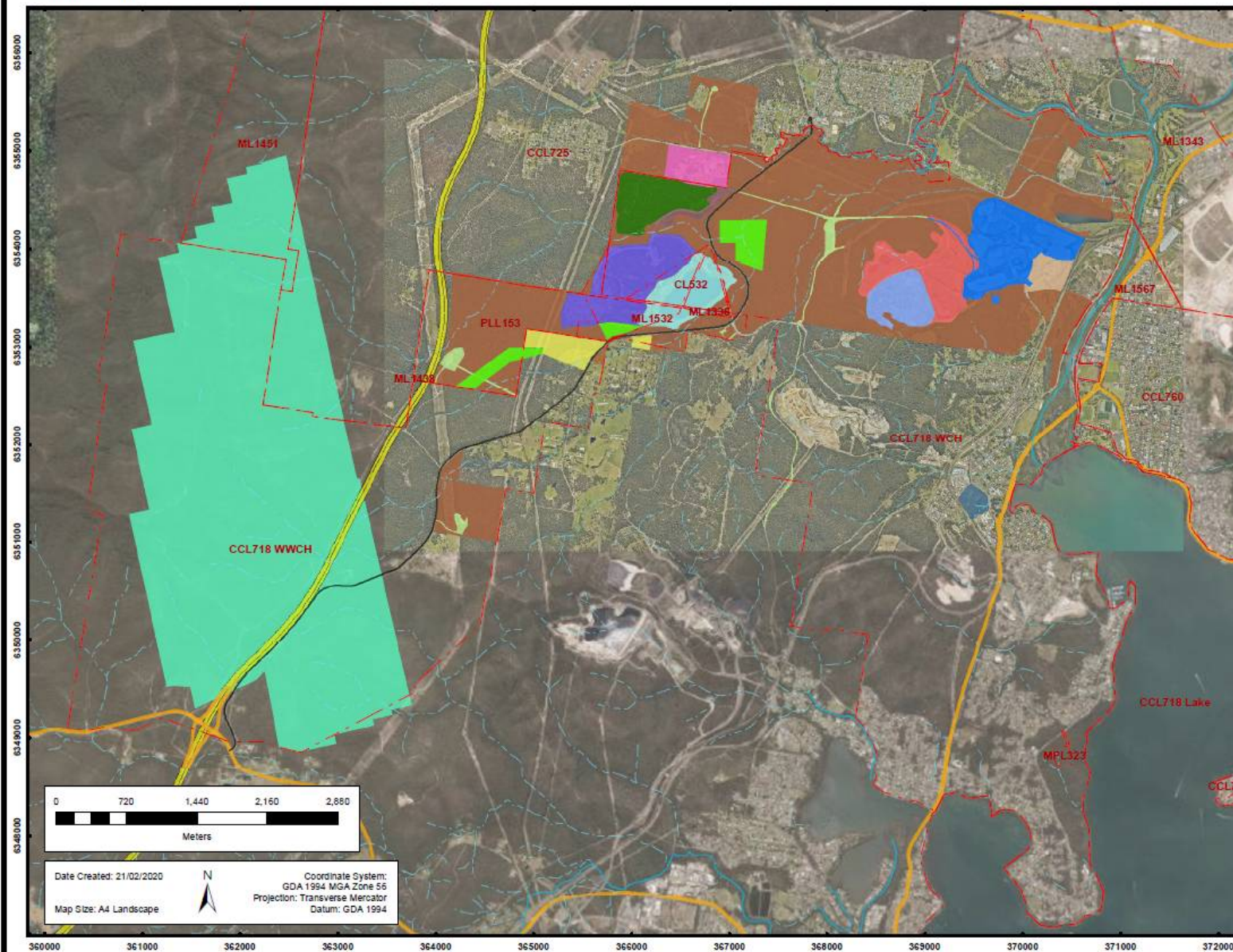
Motorway
Arterial Road
Primary Road
SubArterial Road

Layer

Domain 01 Admin Workshop Haul Rd
Domain 02 North Rehabilitation Area
Domain 03 South West Pit
Domain 04 Proposed Final Void
Domain 05 VCA Areas
Domain 06 Pit Top Facilities
Domain 07 Tailings Dam
Domain 08 Rejects Emplacement Area
Domain 09 Surface Facilities
Domain 10 Maturation Ponds
Domain 11 Teralba North Gate
Domain 12 Infrastructure
Domain 13 Teralba South Gate
Domain 14 Other Mine Owned Lands
Domain 15 Project Approval
Domain 16 Rural Residential property

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Appendix E – Assessment against Closure Criteria



APPENDIX 1. ASSESSMENT AGAINST CLOSURE CRITERIA

Note: not all closure criteria were addressed as part of this walkover assessment. Those criteria not within this scope of works and have not been included in the following tables.

Domain 1 – All Domain Closure Criteria

Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Phase 2 – Landform Establishment								
Free draining to the surface water system via hydraulically and geomorphically suitable features and discharging from approved locations as per EPLs	Landform suitable for final land use and compatible with surrounding landscape	Visual and/or Remote Sensing GIS assessment of slope and stability at Walkover/Flyover	Visual inspections confirm rehabilitated landforms exhibit an absence of significant slumping.	MOP	5	Commenced	Compliant	No Slumping was observed during walkover
Within acceptable erosion and sediment mobilisation rates	Minimal active accelerated erosion	Visual and/or Remote Sensing GIS assessment of gully erosion at Walkover/Flyover	No areas of active gully erosion (i.e. >1 m deep and 1 m wide).	MOP	2	Commenced	Compliant	No gully erosion was observed during walkover.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
			No evidence of tunnel erosion.	MOP	2	Commenced	Compliant	No tunnel erosion was observed during walkover
			Rill erosion is limited to isolated areas of minor rilling up to 200 mm deep	MOP	2	Commenced	Compliant	No rill erosion greater than 200 mm deep was observed during walkover
			There is no active scouring where the runoff from rehabilitation areas discharges into natural channels.	MOP	4	Commenced	Compliant	No active scouring was observed during walkover
Phase 3 – Growth Medium Development								
Capable of supporting and maintaining the designated post mining land use	Areas of rehabilitation top- dressed with a suitable growing media	Visual assessment of depth and rehabilitation establishment records	Topsoil or a suitable alternative are spread uniformly at the specified depth appropriate for the final land use.	MOP	10	Commenced	Compliant	Generally, across the domain there is a good distribution of soil/subsoil.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Biologically and physically enduring and self-sustaining e.g. biodiversity, habitat, landform, drainage, etc.	Habitat features are salvaged and re-used in native vegetation rehabilitation to provide fauna habitat resources	Visual assessment of habitat features and rehabilitation establishment records	Habitat features, including structures suitable for target species are incorporated into rehabilitation areas at required densities, where appropriate.	MOP	No	Not commenced	Compliant	Leaf litter, fallen timber, complete vegetation strata and depressions were observed.
Phase 4 – Ecosystem Establishment								
Within acceptable soil and leachate quality	Monitoring demonstrates appropriate soil quality in rehabilitated areas	Soil testing/ monitoring records	Bare areas of soil >400 m ² are tested for pH, EC, ESP, macronutrients and trace elements.	Rehabilitation monitoring reports	9	Not commenced	Compliant	No bare areas of soil >400 m ² was observed during walkover
Suitable complements to adjacent land features, infrastructure and uses	Rehabilitation areas species diversity and abundance is comparable to analogue bushland vegetation community	Quantitative density assessments for woody species along transects	BUSHLAND: Indicative minimum total tree/shrub densities for seeded areas to be: Year 1 – 1,000 stems/ha Year 5 – 500 stems/ha Year 10 – 400 stems/ha. Note: These are initial targets and will be refined based on site monitoring and other relevant available data.	Project Approval, MOP	11	Commenced	Compliant	Within the narrowing of haul roads rehabilitated area stems exceed 500 stem/ha based on general observation during walkover.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
		Quantitative richness assessments for all species along transects	BUSHLAND: Revegetation areas contain flora species assemblages characteristic of each strata for the desired native vegetation communities.	MOP	No	Commenced	Compliant	Flora species characteristic of each seeded strata were observed during walkover.
Within acceptable erosion and sediment mobilisation rates (similar to natural analogue)	Erosion will be controlled	Assessment of erosion and sediment control structures at Walkover/Flyover and at transects using erosion rating system	Monitoring indicates there is no significant and active erosion (gully depth >500 mm) that compromises land capability or the intended final land use.	MOP	2	Not commenced	Compliant	No gully erosion was observed during walkover.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Consistent with the final post mining land use	Weeds are controlled on OCAL lands	Quantitative assessment of weed presence at Walkover/Flyover as well as Long-term monitoring transects	Weed presence does not pose a risk to the establishment of rehabilitation areas and land	WWC Biodiversity and Land Management Plan	12	Not commenced	Compliant	Lantana, Wild Tobacco, Inkweed, Croftonweed and Pampas Grass were observed throughout the rehabilitation area, but they do not pose a threat to the establishment of native revegetation Work Required: Weed control works will still be required, these works should be undertaken following best practice and in a manner that promotes germination of desirable species. Ongoing monitoring should be undertaken following weed control works to determine if active revegetation via tube stock or seeding is required.
	Pests animal are controlled on OCAL lands	Land management records, opportunistic sightings during ecological monitoring	Pest animal presence does not pose a risk to the establishment of rehabilitation areas.	WWC Biodiversity and Land Management Plan	14	Ongoing	Compliant	No evidence of significant pest animal disturbance was observed during walkover. (Although individuals of European Rabbit and European Hare were observed during walkover and biodiversity monitoring. Ongoing monitoring and possible baiting program is required to ensure pest species population size do not increase).



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Phase 5 – Ecosystem and Land Use Sustainability								
Suitable complements to adjacent land features, infrastructure and uses	Native vegetation rehabilitation areas ecosystem is comparable to surrounding native vegetation community	Quantitative richness assessments for transects	<u>BUSHLAND:</u> Rehabilitation areas contain flora species assemblages characteristic of the desired native vegetation communities	MOP	No	Ongoing	Compliant	Flora species characteristic of seeded community (as per seed mix listed in Closure of the OCAL Complex MOP) were observed during walkover.
		Estimation canopy, midstorey and ground cover	<u>BUSHLAND:</u> Native rehabilitation areas provide a range of structural features (e.g. trees, shrubs, ground cover, developing litter layer etc.).	MOP	No	Not commenced	Compliant	Flora species provide a range of structural features including trees, shrubs, ground cover, litter accumulation and some fallen timber.
		Regeneration metric	<u>BUSHLAND:</u> Rehabilitation monitoring verifies second-generation tree seedlings are present or likely to be, based on comparable older rehabilitation sites.	MOP	No	Not commenced	Compliant	Second-generation tree seedlings observed



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
		Regular flyovers and/or GIS polygons demonstrate progression towards connectivity of vegetation communities	<u>BUSHLAND:</u> Habitat corridors are established and consistent with desired vegetation community compositions where required.	MOP	NO	Not commenced	Compliant	Habitat corridors have been established through the development of rehabilitated vegetation communities comparable with that of local vegetation providing shelter and food resources for local fauna. Habitat corridor running east to west connecting Teralba to Sugarloaf State Conservation Area and habitat corridor running south-west to north-east connecting existing bushland have been established.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Consistent with the final post mining land use	Weeds are controlled on OCAL lands	Quantitative assessment of weed presence at Walkover/Flyover as well as Long-term monitoring transects	Weed presence does not present a risk to rehabilitation.	WWC Biodiversity and Land Management Plan	12	Not commenced	Compliant	Inkweed, Croftonweed and Pampas Grass were observed throughout the rehabilitation area, but they do not pose a threat to the establishment of native revegetation Work Required: Weed control works will still be required, these works should be undertaken following best practice and in a manner that promotes germination of desirable species. Ongoing monitoring should be undertaken following weed control works to determine if active revegetation via tube stock or seeding is required.
Within acceptable erosion and sediment mobilisation rates	Erosion does not present a safety hazard or compromise the post mining land capability	Assessment of erosion and sediment control structures at Walkover/Flyover and at transects using rating system	No significant erosion is present that constitutes a safety hazard or compromises the capability of the supporting the end land use.	CCL 718 Condition 26 and 32	2	Commenced	Compliant	No active and or safety compromising erosion was observed during walkover.



Domain 2 – North Rehabilitation Area (Criteria carried over from Westside Mine Closure MOP)

Please Note that this section only refers to the former ROM

Domain Objectives	Performance Indicator	Completion Criteria	Justification Source	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Phase 2 – Landform Establishment							
Landform suitable for final Landform land use and compatible design with surrounding landscape as sustainable native ecosystem		Contour banks are stable and there is no evidence of overtopping or significant scouring as a result of runoff	Westside Mine MOP for Closure	No	Not commenced	Compliant	Contour banks appeared stable with no overtopping observed during walkover.
Minimal active accelerated Erosion erosion		No areas of active gully erosion (i.e. >1 m deep and 1 m wide)	Westside Mine MOP for Closure	No	Not commenced	Compliant	No active gully erosion was observed during walkover.
		No evidence of tunnel erosion	Westside Mine MOP for Closure	No	Not commenced	Compliant	No evidence of tunnel erosion observed
		Rill erosion is limited to isolated areas of minor rilling up to 200 mm deep	Westside Mine MOP for Closure	2	Not commenced	Compliant	No active rill erosion was observed during walkover.
		There is no active scouring where the runoff from rehabilitation areas discharges into natural channels	Westside Mine MOP for Closure	4	Not commenced	Compliant	No active scouring was observed during the walkover.
Phase 4 – Ecosystem Establishment (Bushland Rehabilitation)							
Revegetation is term and only required maintenance that is consistent with the intended final land use sustainable for the long	Return of affected areas to open bushland	Monitoring demonstrates soil profile development in rehabilitated areas (e.g. development of organic layers, litter layer).	Westside Mine MOP for Closure	No	Ongoing	Compliant	Observations show litter accumulation
		Revegetation areas contain flora species assemblage's characteristic of species found within the region and will provide habitat value in the future.	Westside Mine MOP for Closure	No	Ongoing	Compliant	Species composition was generally of local species found within the region, with some exotic <i>Acacias</i> present



Domain Objectives	Performance Indicator	Completion Criteria	Justification Source	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
		Second generation tree seedlings are present, or likely to be, based on monitoring in comparable older rehabilitation sites.	Westside Mine MOP for Closure	No	Ongoing	Compliant	Second generation seedlings of shrub and canopy strata was observed throughout walkover.
		More than 75% of trees are healthy and growing as indicated by monitoring	Westside Mine MOP for Closure	13	Ongoing	Compliant	Over 75% of trees were observed to be in healthy condition with no significant die back recorded.
		No treeless areas greater than 0.5 ha are present (with the exception of dedicated access or bushfire control tracks).	Westside Mine MOP for Closure	11	Ongoing	Compliant	During the inspection it was noted that all areas contain tree species..
		No bare areas that have obviously failed and are greater than 0.1 ha in total area, or greater than 5 m in width extending >10 m down the slope, are present.	Westside Mine MOP for Closure	2	Ongoing	Compliant	No bare areas 0.1 ha in size or greater than 5 m in width and extending greater than 10 m downslope were observed during walkover.
		There is no significant weed infestation such that weeds do not compromise a significant proportion of the species in the stratum.	Westside Mine MOP for Closure	12	Ongoing	Compliant	No significant weed infestations were observed. However isolated Pampas Grass and Queensland Silver Wattle were observed during walkover. Follow up weed control is recommended to ensure that minor regeneration of weeds is controlled.
		Visual inspections indicate that no crusting or excessive compaction exists that may affect plant growth or recruitment.	Westside Mine MOP for Closure	No	Ongoing	Compliant	No crusting, excessive compaction or bare areas of poor plant germination was observed during walk over.



Domain 2 – All Domain Closure Criteria

Please Note that this section only refers to the former ROM

Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant / Non-Compliant	Status/Works Required
Phase 2 – Landform Establishment								
Free draining to the surface water system via hydraulically and geomorphically suitable features and discharging from approved locations as per EPLs	Landform suitable for final land use and compatible with surrounding landscape	Visual and/or Remote Sensing GIS assessment of slope and stability at Walkover/Flyover	Visual inspections confirm rehabilitated landforms exhibit an absence of significant slumping.	MOP	5	Commenced	Compliant	No Slumping was observed during walkover
Within acceptable erosion and sediment mobilisation rates	Minimal active accelerated erosion	Visual and/or Remote Sensing GIS assessment of gully erosion at Walkover/Flyover	No areas of active gully erosion (i.e. >1 m deep and 1 m wide).	MOP	2	Commenced	Compliant	No gully erosion was observed during walkover.
			No evidence of tunnel erosion.	MOP	2	Commenced	Compliant	No evidence of tunnel erosion observed



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant / Non-Compliant	Status/Works Required
			Rill erosion is limited to isolated areas of minor rilling up to 200 mm deep	MOP	2	Commenced	Compliant	No rill erosion greater than 200 mm deep was observed during walkover
			There is no active scouring where the runoff from rehabilitation areas discharges into natural channels.	MOP	4	Commenced	Compliant	No active scouring was observed during walkover
Phase 3 – Growth Medium Development								
Capable of supporting and maintaining the designated post mining land use	Areas of rehabilitation top-dressed with a suitable growing media	Visual assessment of depth and rehabilitation establishment records	Topsoil or a suitable alternative are spread uniformly at the specified depth appropriate for the final land use.	MOP	10	Commenced	Compliant	Generally there is a good distribution of soil/subsoil.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant / Non-Compliant	Status/Works Required
Biologically and physically enduring and self-sustaining e.g. biodiversity, habitat, landform, drainage, etc.	Habitat features are salvaged and re-used in native vegetation rehabilitation to provide fauna habitat resources	Visual assessment of habitat features and rehabilitation establishment records	Habitat features, including structures suitable for target species are incorporated into rehabilitation areas at required densities, where appropriate.	MOP	No	Not commenced	Compliant	Habitat features within the former ROM include leaf litter and complete vegetation strata.
Phase 4 – Ecosystem Establishment								
Within acceptable soil and leachate quality	Monitoring demonstrates appropriate soil quality in rehabilitated areas	Soil testing/ monitoring records	Bare areas of soil >400m ² are tested for pH, EC, ESP, macronutrients and trace elements.	Rehabilitation monitoring reports	9	Not commenced	Compliant	No bare areas of soil >400 m ² was observed during walkover



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant / Non-Compliant	Status/Works Required
Suitable complements to adjacent land features, infrastructure and uses	Rehabilitation areas species diversity and abundance is comparable to analogue bushland vegetation community	Quantitative density assessments for woody species along transects	<u>BUSHLAND:</u> Indicative minimum total tree/shrub densities for seeded areas to be: Year 1 – 1,000 stems/ha Year 5 – 500 stems/ha Year 10 – 400 stems/ha. Note: These are initial targets and will be refined based on site monitoring and other relevant available data.	Project Approval, MOP	11	Commenced	Compliant	Based on walkover observations, stem densities are compliant with targets
		Quantitative richness assessments for all species along transects	<u>BUSHLAND:</u> Revegetation areas contain flora species assemblages characteristic of each strata for the desired native vegetation communities.	MOP	No	Commenced	Compliant	Flora species composition was generally of local species found within the region with all vegetation strata represented.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant / Non-Compliant	Status/Works Required
Within acceptable erosion and sediment mobilisation rates (similar to natural analogue)	Erosion will be controlled	Assessment of erosion and sediment control structures at Walkover/Flyover and at transects using erosion rating system	Monitoring indicates there is no significant and active erosion (gully depth >500 mm) that compromises land capability or the intended final land use.	MOP	2	Not commenced	Compliant	No gully erosion was observed during walkover.
Consistent with the final post mining land use	Weeds are controlled on OCAL lands	Quantitative assessment of weed presence at Walkover/Flyover as well as Long-term monitoring transects	Weed presence does not pose a risk to the establishment of rehabilitation areas and land	WWC Biodiversity and Land Management Plan	12	Not commenced	Compliant	No significant weed infestations were observed. However isolated Pampas Grass and Queensland Silver Wattle were observed during walkover. Follow up weed control is recommended to ensure that minor regeneration of weeds is controlled.
	Pests animal are controlled on OCAL lands	Land management records, opportunistic sightings during ecological monitoring	Pest animal presence does not pose a risk to the establishment of rehabilitation areas.	WWC Biodiversity and Lan Management Plan	14	Ongoing	Compliant	No evidence of significant pest animal disturbance was observed during walkover. (Although individuals of European Rabbit and European Hare were observed during walkover and biodiversity monitoring. Ongoing monitoring and possible baiting program is required to ensure pest species population size do not increase).
Phase 5 – Ecosystem and Land Use Sustainability								



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant / Non-Compliant	Status/Works Required
Suitable complements to adjacent land features, infrastructure and uses	Native vegetation rehabilitation areas ecosystem is comparable to surrounding native vegetation community	Quantitative richness assessments for transects	<u>BUSHLAND:</u> Rehabilitation areas contain flora species assemblages characteristic of the desired native vegetation communities	MOP	No	Ongoing	Compliant	Observation during walkover was that species composition was generally of local species found within the region, with the exception of some exotic <i>Acacias</i> .
		Estimation canopy, midlayer and ground cover	<u>BUSHLAND:</u> Native rehabilitation areas provide a range of structural features (e.g. trees, shrubs, ground cover, developing litter layer etc.).	MOP	No	Not commenced	Compliant	Flora species provide a range of structural features including trees, shrubs, ground cover, litter accumulation and some fallen timber.
		Regeneration metric	<u>BUSHLAND:</u> Rehabilitation monitoring verifies second-generation tree seedlings are present or likely to be, based on comparable older rehabilitation sites.	MOP	No	Not commenced	Compliant	Second-generation tree seedlings were observed throughout the walkover.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant / Non-Compliant	Status/Works Required
		Regular flyovers and/or GIS polygons demonstrate progression towards connectivity of vegetation communities	<u>BUSHLAND:</u> Habitat corridors are established and consistent with desired vegetation community compositions where required.	MOP	NO	Not commenced	Compliant	Habitat corridors have been established through the development of rehabilitated vegetation communities comparable with that of local vegetation providing shelter and food resources for local fauna. Habitat corridor running east to west connecting Teralba to Sugarloaf State Conservation Area and habitat corridor running south-west to north-east connecting existing bushland have been established.
Consistent with the final post mining land use	Weeds are controlled on OCAL lands	Quantitative assessment of weed presence at Walkover/Flyover as well as Long-term monitoring transects	Weed presence does not present a risk to rehabilitation.	WWC Biodiversity and Land Management Plan	12	Not commenced	Compliant	No significant weed infestations were observed. Isolated Pampas Grass was recorded. Weed treatment works are required to prevent further establishment of weeds
Within acceptable erosion and sediment mobilisation rates	Erosion does not present a safety hazard or compromise the post mining land capability	Assessment of erosion and sediment control structures at Walkover/Flyover and at transects using rating system	No significant erosion is present that constitutes a safety hazard or compromises the capability of the supporting the end land use.	CCL 718 Condition 26 and 32	2	Commenced	Compliant	No active and or safety compromising erosion was observed during walkover.



Domain 3 – All Domain Closure Criteria

Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Phase 2 – Landform Establishment								
Free draining to the surface water system via hydraulically and geomorphically suitable features and discharging from approved locations as per EPLs	Landform suitable for final land use and compatible with surrounding landscape	Visual and/or Remote Sensing GIS assessment of slope and stability at Walkover/Flyover	Visual inspections confirm rehabilitated landforms exhibit an absence of significant slumping.	MOP	5	Commenced	Compliant	No Slumping was observed during walkover
Within acceptable erosion and sediment mobilisation rates	Minimal active accelerated erosion	Visual and/or Remote Sensing GIS assessment of gully erosion at Walkover/Flyover	No areas of active gully erosion (i.e. >1 m deep and 1 m wide).	MOP	2	Commenced	Non-compliant (NC1)	Gully erosion was observed within both the southern and northern portions of Domain 3. Works required: ongoing monitoring of erosion within clay stockpile to assess stability following germination of groundcover is recommended. On-ground works stabilising erosion at identified gully erosion sites is recommended.
			No evidence of tunnel erosion.	MOP	2	Commenced	Non-compliant (NC1)	Tunnel erosion was observed in the southern portion of the domain, and in the northern portion uphill of biodiversity monitoring site 8. Erosion will require ongoing monitoring and possible remediation works. Works required: on-ground works stabilising erosion is recommended.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
			Rill erosion is limited to isolated areas of minor rilling up to 200 mm deep	MOP	2	Commenced	Non-compliant (NC1)	Rill erosion up to 600 mm deep was observed during the walkover. Works required: on-ground works stabilising erosion is recommended.
			There is no active scouring where the runoff from rehabilitation areas discharges into natural channels.	MOP	4	Commenced	Compliant	No active scouring was observed during walkover
Phase 3 – Growth Medium Development								
Biologically and physically enduring and self-sustaining e.g. biodiversity, habitat, landform, drainage, etc.	Habitat features are salvaged and re-used in native vegetation rehabilitation to provide fauna habitat resources	Visual assessment of habitat features and rehabilitation establishment records	Habitat features, including structures suitable for target species are incorporated into rehabilitation areas at required densities, where appropriate.	MOP	No	Not commenced	Compliant	Habitat features within Domain 3 include leaf litter, fallen trees, water bodies and complete vegetation strata. Nest Boxes have been installed throughout the Northern portion of Domain 3



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Phase 4 – Ecosystem Establishment								
Within acceptable soil and leachate quality	Monitoring demonstrates appropriate soil quality in rehabilitated areas	Soil testing/ monitoring records	Bare areas of soil >400m ² are tested for pH, EC, ESP, macronutrients and trace elements.	Rehabilitation monitoring reports	9	Not commenced	Compliant	No bare areas of soil >400 m ² was observed during walkover
Suitable complements to adjacent land features, infrastructure and uses	Rehabilitation areas species diversity and abundance is comparable to analogue bushland vegetation community	Quantitative density assessments for woody species along transects	<u>BUSHLAND:</u> Indicative minimum total tree/shrub densities for seeded areas to be: Year 1 – 1,000 stems/ha Year 5 – 500 stems/ha Year 10 – 400 stems/ha. Note: These are initial targets and will be refined based on site monitoring and other relevant available data.	Project Approval, MOP	11	Commenced	Non-compliant (NC1)	Based on extrapolation of stem densities at biodiversity monitoring site 8, 11, 12 and 13 Domain 3 is compliant with 2,100 stems/ ha, 2,475 stems/ ha, 2,300 stems/ ha and 875 stems/ ha respectively at each site. However, during 2018/19 walkover it was noted that one area labelled weeds and open area had no trees or shrubs with an exotic grass cover. This area is beginning to revegetate naturally Works required: Ongoing monitoring to assess the rate of spread of desirable species.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
		Quantitative richness assessments for all species along transects	<u>BUSHLAND:</u> Revegetation areas contain flora species assemblages characteristic of each strata for the desired native vegetation communities.	MOP	No	Commenced	Compliant	Flora species characteristic of each seeded strata were observed during walkover.
Within acceptable erosion and sediment mobilisation rates (similar to natural analogue)	Erosion will be controlled	Assessment of erosion and sediment control structures at Walkover/Flyover and at transects using erosion rating system	Monitoring indicates there is no significant and active erosion (gully depth >500 mm) that compromises land capability or the intended final land use.	MOP	2	Not commenced	Non-compliant (NC1)	Gully erosion was observed within both the southern and northern portions of Domain 3. Works required: ongoing monitoring of erosion within clay stockpile to assess stability following germination of groundcover is recommended. On-ground works stabilising erosion at identified gully erosion sites is recommended.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Consistent with the final post mining land use	Weeds are controlled on OCAL lands	Quantitative assessment of weed presence at Walkover/Flyover as well as Long-term monitoring transects	Weed presence does not pose a risk to the establishment of rehabilitation areas and land	WWC Biodiversity and Land Management Plan	12	Not commenced	Non-compliant (NC1)	Domain 3 has two areas dominated by weed species (exotic grasses) locally impacting on all vegetation stratum, in particular the shrub and ground cover. Pampas Grass and other exotic grasses are spread throughout the rehabilitation area and dominate groundcover in places. Work Required: Weed control works will be required, these works should be undertaken following best practice and in a manner, that promotes germination of desirable species. Ongoing monitoring should be undertaken following weed control works to determine if active revegetation via tube stock or seeding is required.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
	Pests animal are controlled on OCAL lands	Land management records, opportunistic sightings during ecological monitoring	Pest animal presence does not pose a risk to the establishment of rehabilitation areas.	WWC Biodiversity and Land Management Plan	14	Ongoing	Compliant	No evidence of significant pest animal disturbance was observed during walkover. (Although individuals of European Rabbit and European Hare were observed during walkover and biodiversity monitoring. Ongoing monitoring and possible baiting program is required to ensure pest species population size do not increase).
Phase 5 – Ecosystem and Land Use Sustainability								
Suitable complements to adjacent land features, infrastructure and uses	Native vegetation rehabilitation areas ecosystem is comparable to surrounding native vegetation community	Quantitative richness assessments for transects	<u>BUSHLAND:</u> Rehabilitation areas contain flora species assemblages characteristic of the desired native vegetation communities	MOP	No	Ongoing	Compliant	Flora species characteristic of seeded community (as per seed mix listed in Closure of the OCAL Complex MOP) were observed during walkover.
		Estimation canopy, midlayer and ground cover	<u>BUSHLAND:</u> Native rehabilitation areas provide a range of structural features (e.g. trees, shrubs, ground cover, developing litter layer etc.).	MOP	No	Not commenced	Compliant	Flora species provide a range of structural features including trees, shrubs, ground cover, litter accumulation, and some fallen timber.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
		Regeneration metric	<u>BUSHLAND:</u> Rehabilitation monitoring verifies second-generation tree seedlings are present or likely to be, based on comparable older rehabilitation sites.	MOP	No	Not commenced	Compliant	Second-generation tree seedlings were observed in all biodiversity monitoring sites and most areas during the walkover.
		Regular flyovers and/or GIS polygons demonstrate progression towards connectivity of vegetation communities	<u>BUSHLAND:</u> Habitat corridors are established and consistent with desired vegetation community compositions where required.	MOP	NO	Not commenced	Compliant	Habitat corridors have been established through the development of rehabilitated vegetation communities comparable with that of local vegetation providing shelter and food resources for local fauna. Habitat corridor running east to west connecting Teralba to Sugarloaf State Conservation Area and habitat corridor running south-west to north-east connecting existing bushland have been established.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-Compliant	Status/Works Required
Consistent with the final post mining land use	Weeds are controlled on OCAL lands	Quantitative assessment of weed presence at Walkover/Flyover as well as Long-term monitoring transects	Weed presence does not present a risk to rehabilitation.	WWC Biodiversity and Land Management Plan	12	Not commenced	Non-compliant (NC1)	Weed presence presents a risk to the rehabilitation with ground cover and shrub strata dominated by exotic species in some areas impacting on the abundance of all strata species in the area. Works required: Weed control works should be undertaken throughout Domain 3.
Within acceptable erosion and sediment mobilisation rates	Erosion does not present a safety hazard or compromise the post mining land capability	Assessment of erosion and sediment control structures at Walkover/Flyover and at transects using rating system	No significant erosion is present that constitutes a safety hazard or compromises the capability of the supporting the end land use.	CCL 718 Condition 26 and 32	2	Commenced	Non-compliant (NC1)	Gully erosion was observed within both the southern and northern portions of Domain 3. Works required: ongoing monitoring of erosion within clay stockpile to assess stability following germination of groundcover is recommended. On-ground works stabilising erosion at identified gully erosion sites is recommended.



Domain 4 – All Domain Closure Criteria

Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
Phase 2 – Landform Establishment								
Free draining to the surface water system via hydraulically and geomorphically suitable features and discharging from approved locations as per EPLs	Landform suitable for final land use and compatible with surrounding landscape	Visual and/or Remote Sensing GIS assessment of slope and stability at Walkover/Flyover	Visual inspections confirm rehabilitated landforms exhibit an absence of significant slumping.	MOP	5	Commenced	Compliant	No Slumping was observed during walkover.
Within acceptable erosion and sediment mobilisation rates	Minimal active accelerated erosion	Visual and/or Remote Sensing GIS assessment of gully erosion at Walkover/Flyover	No areas of active gully erosion (i.e. >1 m deep and 1 m wide).	MOP	2	Commenced	Non-Compliant (NC1)	Gully erosion at E17 partially repaired, active gullying recorded at several locations Works required: Rock armouring across this area and/or diversion of run-off through installation of rock drains are recommended
			No evidence of tunnel erosion.	MOP	2	Commenced	Non-compliant (NC1)	Tunnel erosion was observed at E32. Erosion will require remediation works. Works required: on-ground works stabilising erosion is recommended.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
			Rill erosion is limited to isolated areas of minor rilling up to 200 mm deep	MOP	2	Commenced	Non-Compliant (NC1)	Rill erosion was observed during walkover of the western batter of the pit lake. Works required: Rock armouring across this area and/or diversion of run-off through installation of rock drains are recommend
			There is no active scouring where the runoff from rehabilitation areas discharges into natural channels.	MOP	4	Commenced	Compliant	No active scouring was observed during walkover.
Phase 3 – Growth Medium Development								
Capable of supporting and maintaining the designated post mining land use	Areas rehabilitation top-dressed with a suitable growing media	Visual assessment of depth and rehabilitation establishment records	Topsoil or a suitable alternative are spread uniformly at the specified depth appropriate for the final land use.	MOP	10	Commenced	Non-compliant (NC1)	Generally, across the domain there is poor distribution of topsoil. Works required: Further seeding should follow soil amelioration. Seed inoculation could also aid germination and domain rehabilitation.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
Biologically and physically enduring and self-sustaining e.g. biodiversity, habitat, landform, drainage, etc.	Habitat features are salvaged and re-used in native vegetation rehabilitation to provide fauna habitat resources	Visual assessment of habitat features and rehabilitation establishment records	Habitat features, including structures suitable for target species are incorporated into rehabilitation areas at required densities, where appropriate.	MOP	No	Not commenced	Non-compliant (NC1)	No habitat features suitable for fauna species was observed during the walkover. Work required: Further development of the vegetation within the rehabilitation is required to provide habitat for target fauna. Nest box installation should be considered once vegetation matures to a suitable height for installation.
Phase 4 – Ecosystem Establishment								
Within acceptable soil and leachate quality	Monitoring demonstrates appropriate soil quality in rehabilitated areas	Soil testing/ monitoring records	Bare areas of soil >400 m ² are tested for pH, EC, ESP, macronutrients and trace elements.	Rehabilitation monitoring reports	9	Not commenced	Compliant	Although cover abundance is low no areas >400 m ² is bare, soil amelioration and further seeding may be required.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
Suitable complements to adjacent land features, infrastructure and uses	Rehabilitation areas species diversity and abundance is comparable to analogue bushland vegetation community	Quantitative density assessments for woody species along transects	BUSHLAND: Indicative minimum total tree/shrub densities for seeded areas to be: Year 1 – 1,000 stems/ha Year 5 – 500 stems/ha Year 10 – 400 stems/ha. Note: These are initial targets and will be refined based on site monitoring and other relevant available data.	Project Approval, MOP	11	Commenced	Non-compliant (NC1)	The bushland community is immature and an accurate stem count is not possible at this stage. Further development is required to positively identify individuals and obtain an accurate stem count of different strata. Works required: ongoing monitoring is required as rehabilitation area develops.
		Quantitative richness assessments for all species along transects	BUSHLAND: Revegetation areas contain flora species assemblages characteristic of each strata for the desired native vegetation communities.	MOP	No	Commenced	Non-compliant (NC1)	Revegetation area is too young to positively identify all species present. Works required: ongoing monitoring is required as rehabilitation area develops.
Suitable complements to adjacent land features, infrastructure and uses	Rehabilitation areas species diversity and cover is comparable to district	Quantitative richness assessments for all species along transects	PASTURE: Pasture composition comprises palatable grasses and legumes appropriate to the district.	MOP	11	Commenced	Compliant	Pasture composition comprises species comparable with local district.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
		Quantitative assessment of all species along transects	<u>PASTURE</u> : Ground cover (vegetation, leaf litter, mulch) is greater than 70%.	MOP	11	Commenced	Non-compliant (NC1)	Ground cover is less than 70% Works required: Continued monitoring and soil amelioration and further seeding may be required.
Within acceptable erosion and sediment mobilisation rates (similar to natural analogue)	Erosion will be controlled	Assessment of erosion and sediment control structures at Walkover/Flyover and at transects using erosion rating system	Monitoring indicates there is no significant and active erosion (gully depth >500 mm) that compromises land capability or the intended final land use.	MOP	2	Not commenced	Non-compliant (NC1)	Gullying, tunneling and rilling walkover Works required: Works will be required to repair gully and rill erosion with following seeding of impacted area. Seed mixture should be suitable to final land use.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
Consistent with the final post mining land use	Weeds are controlled on OCAL lands	Quantitative assessment of weed presence at Walkover/Flyover as well as Long-term monitoring transects	Weed presence does not pose a risk to the establishment of rehabilitation areas and land	WWC Biodiversity and Land Management Plan	12	Not commenced	Non-compliant (NC1)	Slash Pines and Pampas Grass and other exotic grasses are spread throughout the rehabilitation area and dominate groundcover in places. Work Required: Weed control works will be required, these works should be undertaken following best practice and in a manner, that promotes germination of desirable species. Ongoing monitoring should be undertaken following weed control works to determine if active revegetation via tube stock or seeding is required.
	Pests animal are controlled on OCAL lands	Land management records, opportunistic sightings during ecological monitoring	Pest animal presence does not pose a risk to the establishment of rehabilitation areas.	WWC Biodiversity and Land Management Plan	14	Ongoing	Complaint	No evidence of significant pest animal disturbance was observed during walkover. (Although individuals of European Rabbit, European Hare were observed during walkover and biodiversity monitoring. Ongoing monitoring and possible baiting program is required to ensure pest species population size do not increase).



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
Phase 5 – Ecosystem and Land Use Sustainability								
Within acceptable soil and leachate quality	Appropriate soil quality capable of supporting rehabilitation present	Soil testing/ monitoring records	Soils do not limit plant establishment	MOP	9	Not commenced	Non-compliant (NC1)	Plant establishment is below closure criteria requirement in some areas of Domain 4, soil quality could be a contributing factor. Works required: Continued monitoring further seeding required.
Suitable complements to adjacent land features, infrastructure and uses	Native vegetation rehabilitation areas ecosystem is comparable to surrounding native vegetation community	Quantitative richness assessments for transects	<u>BUSHLAND:</u> Rehabilitation areas contain flora species assemblages characteristic of the desired native vegetation communities	MOP	No	Ongoing	Non-compliant (NC1)	Species diversity is characteristic of the flora from the local area but is generally sparse. Works required: Additional seeding is required to increase diversity and density of natives.
		Estimation canopy, midlayer and ground cover	<u>BUSHLAND:</u> Native rehabilitation areas provide a range of structural features (e.g. trees, shrubs, ground cover, developing litter layer etc.).	MOP	No	Not commenced	Non-compliant (NC1)	Revegetation area is too young for development of all structural features. Works required: Ongoing monitoring as revegetation area continues to develop.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
		Regeneration metric	BUSHLAND: Rehabilitation monitoring verifies second-generation tree seedlings are present or likely to be, based on comparable older rehabilitation sites.	MOP	No	Not commenced	Non-compliant (NC1)	Revegetation area is too young for second-generation tree seedlings to be present. Works required: Ongoing monitoring as revegetation area continues to develop.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
		Regular flyovers and/or GIS polygons demonstrate progression towards connectivity of vegetation communities	<u>BUSHLAND</u> : Habitat corridors are established and consistent with desired vegetation community compositions where required.	MOP	NO	Not commenced	Compliant	Habitat corridors have been established through the development of rehabilitated vegetation communities comparable with that of local vegetation providing shelter and food resources for local fauna. Habitat corridor running east to west connecting Teralba to Sugarloaf State Conservation Area and habitat corridor running south-west to north-east connecting existing bushland have been established. Whilst the vegetation within Domain 4 is not well developed surrounding rehabilitation has formed the habitat corridor between these locations. Once the rehabilitation in Domain 4 is mature enough it will contribute to local corridors.
Suitable complements to adjacent land features, infrastructure and uses	Rehabilitation areas species diversity and cover is comparable to district	Quantitative richness assessments for all species along transects	<u>PASTURE</u> : Pasture composition comprises palatable grasses and legumes appropriate to the district.	MOP	11	Commenced	Compliant	Pasture composition comprises species comparable with local district.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
		Quantitative assessment of all species along transects	<u>PASTURE</u> : Ground cover (vegetation, leaf litter, mulch) is greater than 70%.	MOP	11	Commenced	Non-compliant (NC1)	Ground cover is less than 70% Works required: Continued monitoring and soil amelioration and further seeding may be required.
	Weeds are controlled on OCAL lands	Quantitative assessment of weed presence at Walkover/Flyover as well as Long-term monitoring transects	Weed presence does not present a risk to rehabilitation.	WWC Biodiversity and Land Management Plan	12	Not commenced	Non-compliant (NC1)	Pampas Grass and other exotic grasses are spread throughout the rehabilitation area and dominate groundcover in places. Work Required: Weed control works will be required, these works should be undertaken following best practice and in a manner, that promotes germination of desirable species. Ongoing monitoring should be undertaken following weed control works to determine if active revegetation via tube stock or seeding is required.



Domain Objective (DMCP)	General Objective (MOP)	Performance Indicator	Completion Criteria	Relevance	Link to TARP	Progress at start of MOP	Compliant/ Non-compliant	Status/Works Required
Within acceptable erosion and sediment mobilisation rates	Erosion does not present a safety hazard or compromise the post mining land capability	Assessment of erosion and sediment control structures at Walkover/Flyover and at transects using rating system	No significant erosion is present that constitutes a safety hazard or compromises the capability of the supporting the end land use.	CCL 718 Condition 26 and 32	2		Non-compliant (NC1)	2 gully erosion areas 1.5 x 2 x 10 m in the northern corner batter and western batter 1 x1 x 10; and one rill area 0.5 x 0.5 x 10 m on the western batter of pit lake was observed during walkover. Works required: Works will be required to repair gully erosion with following seeding of impacted area. Seed mixture should be suitable to final land use.