WERRIS CREEK COAL MINE

2019 ANNUAL REVIEW

Table 1 - Annual Review Title Block

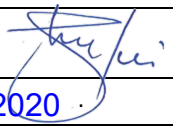
Name of Operation	Werris Creek No. 2 Coal Mine
Name of Operator	Werris Creek Coal Pty Limited
Development consent / Project Approval #	Project Approval 10_0059 Modification 2
Name of holder of development consent/project approval	Werris Creek Coal Pty Limited
Mining lease # (Leaseholder)	ML1563 (Creek Resources Pty Ltd & Betalpha Pty Ltd); ML1671, ML1672 (Werris Creek Coal Pty Limited)
Water Licence # (Licence Holder)	WAL29506 (Betalpha Pty Ltd); WAL32224 (Werris Creek Coal Pty Ltd)
MOP Commencement Date	14 January 2016
MOP Completion Date	30 November 2022
Annual Review Commencement Date	1 January 2019
Annual Review Completion Date	31 December 2019
I, Jaques duToit, certify that this audit report is a true and accurate record of the compliance status of Werris Creek Coal Mine for the period 1st January 2019 to 31st December 2019, and that I am authorised to make this statement on behalf of Werris Creek 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	**Jacques du Toit**
Title of Authorised Reporting Officer	**General Manager – Open Cut Operations**
Signature	
Date	29 / 04 / 2020

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 STATEMENT OF COMPLIANCE

This Annual Review has been prepared to provide a summary of the environmental performance of the Werris Creek Coal Mine (WCC) over the reporting period. The compliance status of the WCC against relevant approvals during the reporting period was assessed as at the end of the reporting period (i.e. 31 December 2019) and is summarised in **Table 1**. References to the Environment Protection Licence (EPL) are limited to those that relate to the Project Approval conditions, specifically: Schedule 3 Condition 20(b), 22, 23(a) and Schedule 5 Condition 8(c).

Table 1 – Statement of Compliance

Were all the conditions of the relevant approvals complied with?	Yes/No
Project Approval 10_0059 Modification 2	Yes
Mining Operations Plan (MOP)	Yes
Mining Lease ML 1563	Yes
Mining Lease ML 1671	Yes
Mining Lease ML 1672	Yes
EPL12290	Yes
WAL29506	Yes
WAL32224	Yes

No non-compliances were recorded during the reporting period.

2 INTRODUCTION

This is the thirteenth Annual Review produced for the Werris Creek No. 2 Coal Mine (WCC) and has been prepared in accordance with the NSW Department of Planning, Industry and Environment's (DPIE) Integrated Mining Policy – Annual Review Guideline, October 2015. This document has been prepared to satisfy the following requirements:

- The Annual Review requirements of the DPIE under the Project Approval PA 10_0059 (Condition 3 Schedule 5);
- Environmental Management Report requirements of the Division of Mining, Exploration and Geoscience (DMEG)under the WCC Mining Leases; and
- The routine reporting expectations of DPI Water.

This report covers the period between 1st January 2019 to 31st December 2019.

2.1 PROJECT BACKGROUND

WCC is located approximately 4 km south of Werris Creek and 11 km north-northwest of Quirindi in northwest slopes and plains region of New South Wales (**Figure 1**) and lies within a 910 ha area covered by Mining Lease (ML) 1563, ML1671 and ML1672. The current Project Approval (PA) 10_0059 Modification 2 limits mining until 31st December 2032. The Mining Operations Plan (MOP) covers a 7-year period from the 14th January 2016 to the 30th November 2022. WCC has approval to mine in full the Werris Creek coal measures.

WCC is owned and operated by Werris Creek Coal Pty Limited (WCC), a wholly owned subsidiary of Whitehaven Coal Limited (WHC). The key operational personnel responsible for environmental management at WCC are listed in **Table 2**.

Table 2 – Key Personnel at WCC

Name	Title	Contact
Mr Matt Hollis	WCC Environmental Superintendant	02 6763 6000
Mr Craig Sullivan	WCC Operations Manager	02 6763 6000
Mr Jacques Du-toit	General Manager – Open Cut Operations	02 6741 9300

Figure 1: WCC Locality Map and Noise Monitoring Sites

3 APPROVALS

Table 3 provides a summary of the key current licences, leases and approvals that have been obtained for the operation of WCC.

Table 3 – Licences, Leases and Approvals

Authority	Approval	Number	Issue	Expiry	Comments
Department of Planning Infrastructure & Environment (DPIE)	Project Approval	PA10_0059	25/10/2011	31/12/2032	Life of Mine Project allows northerly continuation for entire coal deposit mining up to 2.5Mtpa and 24 hours 7 days per week.
		PA10_0059 MOD1	30/08/2012	31/12/2032	Modification of Biodiversity Offset Area to allow for augmentation of VWD1 to 250ML.
		PA10_0059 MOD2	3/11/2015	31/12/2032	Modification of overburden emplacement design, enabling of a dry processing plant, and to allow void water for agricultural use.
Department of Regional NSW – Division of Mining, Exploration and Geoscience (DMEG)	Mining Lease	ML 1563	23/03/2005	23/03/2026	Mining Lease granted for 21 years.
		ML 1671	9/03/2012	9/03/2032	Mining Lease granted for 21 years.
		ML 1672	9/03/2012	9/03/2032	Mining Lease granted for 21 years.
	Mining Operations Plan	None	14/01/2016	30/11/2022	MOP approved on 14th January 2016
Environment Protection Authority	Environment Protection Licence	12290	18/04/2005	Anniversary date: 1 April Review Date: 14/07/2020	Last variation 21st March 2018
Department of Primary Industries – Water	Water Access Licence (Water Management Act 2000)	WAL29506	21/02/2013	Perpetuity	Aquifer – 50ML annual allocation. DPI-Water reference number 90AL822531. Formerly 90BL252588
		WAL32224	19/06/2013	Perpetuity	Aquifer – 211ML annual allocation. DPI-Water reference number 90AL828344. Formerly 90BL255087
	Water Works Approval	90WA822532	21/02/2013	15/01/2025	Linked to WAL29506. Bore. Formerly 90PT982801
		90WA828345	19/06/2013	25/06/2027	Linked to WAL32224. Excavation. Formerly 90PT982872
Australian Department of Agriculture, Water and the Environment	Environment Protection and Biodiversity Conservation Act Approval	2010/5571	21/12/2011	31/12/2032	Authorises impacts on EPBC listed threatened species and communities and listed migratory species
Dam Safety Committee	Prescribed Dams	Werris VWD1 Werris VWD3 Werris VWD4	18/10/2012 13/12/2012 13/12/2012	Perpetuity Perpetuity Perpetuity	Significant Sunny Day and Flood Consequence

4 OPERATIONS SUMMARY

4.1 EXPLORATION ACTIVITIES

The WCC drilling program during the half-year ending December 2019 achieved a total meterage of 227m focussed to the north of the high wall in Strip 24. Three open holes (chip holes) and two cored holes were drilled for a total combined depth of 227m. This depth includes redrills. All boreholes were geologically logged, and geophysically logged.

4.2 MINING OPERATIONS

Table 4 presents the production summary for the previous and current reporting periods and the anticipated production schedule for the next reporting period. ROM coal production is summarised by calendar year to align with PA_0059 conditions. All units are in tonnes unless otherwise stated.

Table 4 – Production Summary

Material	Approved limit	Previous reporting period (actual)	This reporting period (actual)	Next Reporting period (forecast)
Waste Rock / Overburden (bcm)	N/A	14,254,064	14,517,443	13,570,112
ROM Coal (t) (calendar year)	2,500,000 (PA 10_0059)	1,867,752	1,499,822	1,996,518
Coarse reject (t)	N/A	0	0	0
Fine reject (t)	N/A	0	0	0
Saleable Product (t)	5,000,000 (EPL12290)	1,838,375	1,550,144	1,700,000*

*Estimate

4.3 COAL HANDLING AND PROCESSING

During the reporting period, coal processing operated Monday to Friday 6:00am to 2:40am with an occasional weekend shift. Train loading operations occurred 24 hours per day, 7 days per week dependent on train scheduling. Coal is segregated at the ROM coal stockpile based on the expected ash content of the coal. The higher ash coal products are processed through the fixed plant crusher and subsequently processed through the secondary crusher. Low ash coal products are processed by the mobile crushers and then screened.

Product coal is transported by road trucks from the coal processing area to the product coal stockpile area at the train load out facility via the private coal haul road. The despatch of product coal from WCC is either railed to the Port of Newcastle or transported by road to domestic customers. Product movements by month for both rail and domestic road haulage can be found on the Whitehaven Coal website. WCC complied with Schedule 2, Conditions 7 and 8, of PA_0059. The maximum quantity of product coal stockpiled on site during the reporting period was 201,837 tonnes, which occurred during September 2019 and the total quantity of domestic coal transported from site on public roads was 661 tonnes for the period.

4.4 OTHER OPERATIONS

4.4.1 Hours of Operation

Mining operations are permitted to be conducted up to 24 hours per day, seven days per week, except for blasting, which is restricted to 9:00am – 5:00pm Monday to Saturday. During the reporting period, mining operations maintained reduced hours of 20.6 hours per day (6:00am – 2:40am) 5 days per week

(Monday to Friday), and a 10.5 hour day shift on both Saturday and Sunday. Other ancillary tasks and maintenance activities continued upto 24 hours per day, seven days per week.

4.5 NEXT REPORTING PERIOD

4.5.1 Exploration

No exploration drilling has been planned at WCC in the next reporting period, however may be undertaken if required.

4.5.2 Mine Operations

The mine production rates are planned to continue at much the same level as in the current reporting period, although the position in the strip and pit allow for more coal tonnes to be mined offset by lower overburden, as shown in **Table 4**. Vegetation clearing activities in mining areas over the next reporting period will be conducted in accordance with the approved Biodiversity Management Plan and MOP.

4.5.3 Rehabilitation progress

As per MOP commitments, WCC plans to undertake rehabilitation works on 37 hectares of the overburden emplacement in the 2020 reporting period. The continued focus for the period will be on the finalisation of decommissioned areas, landform development and growth medium development. Maintenance works and supplementary planting will continue on existing rehabilitation areas to replace any losses sustained during the recent drought.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

Correspondence received by WCC from the NSW Department of Planning following acceptance of the submitted 2018 Annual Review, indicated the following information is to be included in the 2019 WCC Annual Review;

- Noise – please update **Figure 1** to ensure the continuous noise monitoring locations are legible;
  WCC Comment: **Figure 1** has been updated.

- Water – please include water monitoring location SB18 on **Figure 5**;
  WCC Comment: **Figure 5** has been updated

- Biodiversity – As required by the Biodiversity and Offset Management Plan (BOMP) please provide a comparison of monitoring program results against the completion criteria (soil pH and erosion), and a comparison against results from previous years and predictions from the EA.
  WCC Comment: Commentary on the Biodiversity Offset Management Plan requirements has been provided in Section 6.4.2 Environmental Performance.

6 ENVIRONMENTAL PERFORMANCE

6.1 NOISE

6.1.1 Environmental Management

During the reporting period various controls were implemented to reduce noise generation including:

- Annual testing of maximum sound power levels;
- Stage 1 or 2 noise attenuation fitted on all trucks;
- Use of enclosed conveyors; and
- Use of silent horns by excavator operators during the night periods.

WCC have implemented a number of mitigation strategies to minimise the effects of noise on the community, including:

- Property acquisitions;
- Private agreements;
- Installation and maintenance of an acoustic and visual amenity bund; and
- Installation and maintenance of a mine infrastructure area bund.

During the reporting period a number of operational strategies were in place to respond to potential noise impacts from mining operations including:

- Continuous noise monitoring;
- Attended noise monitoring;
- Noise control operators engaged;
- Sound filtering and interpretation to isolate the masking effects of extraneous noise sources from birds, insects, and other environmental noise sources during monitoring.
- Modification of operations, including shutting down plant items, to reduce offsite impacts.
- Night time surface operations and dump locations planned to minimise noise where possible; and

Figure 1 - WCC identifies the monitoring locations for both continuous and attended noise monitoring locations**.**

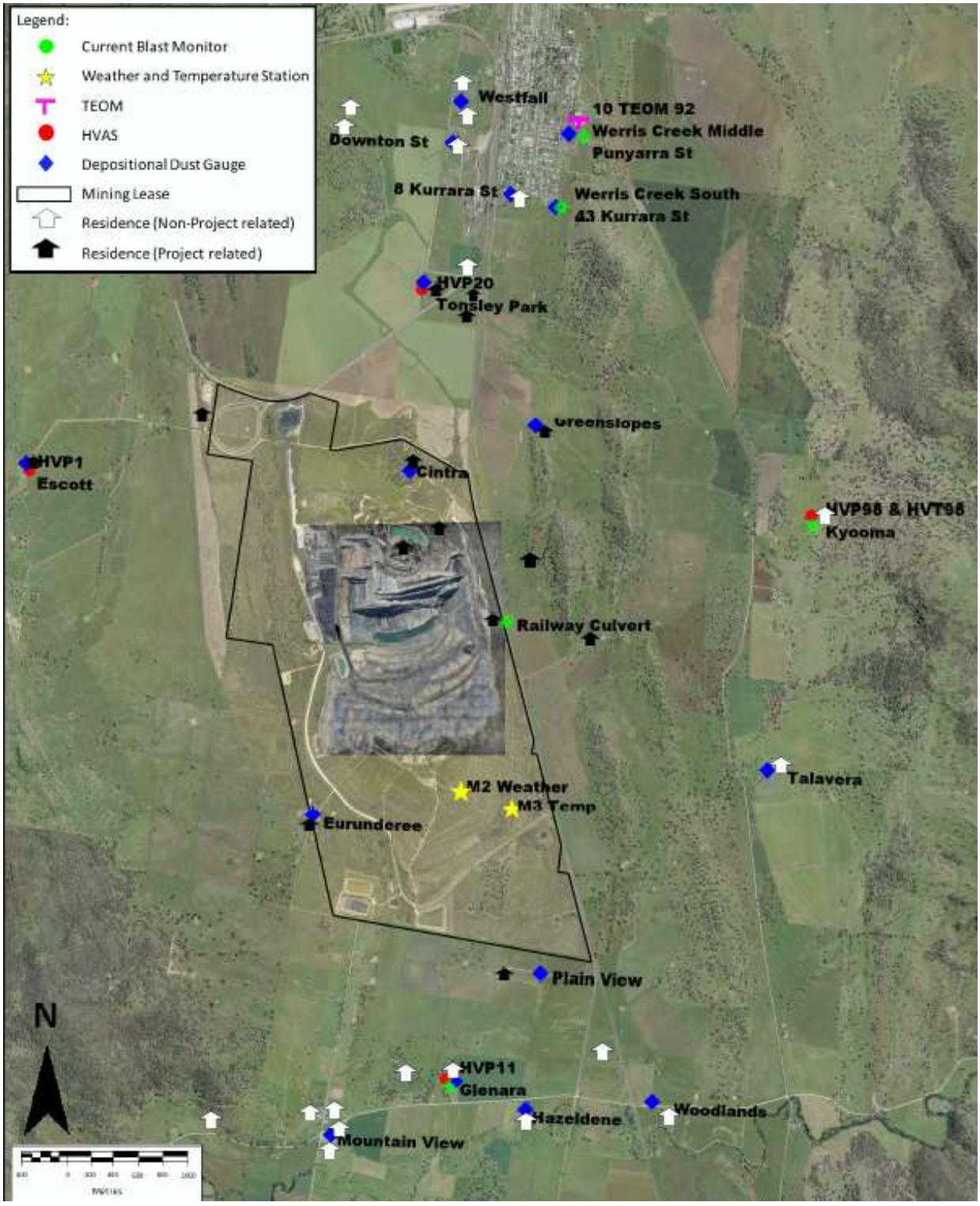


Figure 2: Blast Monitoring Sites and Air Quality Monitoring Network

6.1.2 Environmental Performance

Attended Monitoring

Attended monitoring is undertaken on a monthly basis by an independent consultant and is used to assess compliance with licence and approval limits for mine contributed noise. Attended noise monitoring identified no exceedances of the noise criteria during the reporting period. As a comparison to previous years, no exceedance was reported in 2018 and a single exceedance was reported during the 2017 reporting periods at R98-Kyooma.

Attended noise monitoring continued generally in accordance with EA predictions.

6.1.3 Proposed Improvement Measures

WCC continued construction of the remainder of the visual and acoustic bund during 2019. A minor amount of final shaping and rehabilitation to the northern most extent of the acoustic bund is outstanding and will be completed in early 2020.

6.2 BLASTING

6.2.1 Environmental Management

Best practice blast management measures are implemented at WCC to achieve acceptable outcomes in terms of blast overpressure and vibration, fume generation, and dust impacts.

During the reporting period a number of controls were applied and maintained to reduce the potential for impacts, including:

- buffer management through acquisition of a number of adjacent properties thorough private negotiation;
- blasts designed with consideration of the predicted vibration of the shot, geology, ground conditions, explosives selection, initiation sequence/timing, powder factor, history/experience, and the sleeping time of the shot;
- maintenance of the predicted blast vibration objective for Werris Creek of 0.8 mm/s;
- explosive product selection and loading, to reduce the risk of auto-ignition and/or blast fume generation;
- stemming height and quality monitored by, the shot-firer to minimise the risk of elevated air overpressure from rifling;
- initiation sequence strategies are used to minimise vibration and air overpressure impacts;
- sleeping shots minimised to avoid potential deterioration of product;
- WCC aims to fire all blasts in the middle of the day generally between 12:00pm and 2:00pm, when atmospheric mixing is generally highest;
- blast notification prior to every blast;
- pre-blast weather assessment conducted;
- road closures of the Werris Creek Road when proximity of blasts occurred within 200 meters;
- blast fume rating recorded; and
- structural inspections - In response to claims of property damage due to blasting operations.

Air blast overpressure and ground vibration monitoring are undertaken at four monitoring locations illustrated in **Figure 2**, with vibration and air overpressure also measured adjacent to a railway culvert for blasts within 500 metres of this structure. All blast monitors were operational during the reporting period.

6.2.2 Environmental Performance

There were 128 blasts undertaken during the reporting period. All blast events have been within the applicable airblast overpressure and ground vibration limits set out in PA 10_0059 MOD2.

6.3 AIR QUALITY

6.3.1 Environmental Management

The air quality criterion applicable to WCC is specified in Condition 16, Schedule 3 of PA10_0059 MOD2 and is managed through the implementation of the Air Quality and Greenhouse Gas Management Plan (AQGHGMP). During the reporting period, various controls were implemented to manage dust including:

- Use of water carts across the site with an additional contractor water cart also utilised during rehabilitation activities;
- Overburden, coal and soil loading activities are not undertaken during periods of adverse weather (high winds or dry conditions), with SMS triggers employed to provide a near-real time operational response;
- Blasting activities restricted to suitable weather conditions and include notification to key stakeholders and residents;
- All personnel are instructed that all vehicles must utilise existing tracks on-site and must be driven to the conditions to minimize trafficable dust generation;
- The extent of disturbed areas (pre-strip clearing and rehabilitation) are minimized to that required for mining operations, with these areas stabilized and revegetated as soon as practicable once no longer required for ongoing operations;
- Water sprays are used on the coal feed hopper, crusher and at all conveyor transfer and discharge points;
- A designated pump and sprinkler installed during the reporting period to minimize dust entrainment off the SAIL stockpile in adverse weather conditions;
- Water Sprinklers added to the TLO to aid in dust suppression;
- Modification of operations, including shutting down plant items, to reduce offsite impacts; and
- Installed bird deterrents were maintained on depositional dust gauges to reduce contamination.

The above management measures will continue to be maintained throughout the next reporting period to continually improve air quality performance.

The WCC Air Quality Monitoring network is illustrated in **Figure 2** and includes:

- Continuous monitoring of $PM_{2.5}$ and PM_{10} levels at the Werris Creek TEOM;
- PM_{10} levels are measured at four High Volume Air Samplers (HVAS) distributed across neighbouring properties surrounding WCC. The HVAS run for twenty-four hours every six days. Total Suspended Particulate Matter (TSP) is also measured at a separate HVAS unit located at Kyooma;
- A network of 20 dust deposition gauges surrounding WCC, measuring deposited dust and particulates collected monthly; and
- Six depositional dust gauges located in Quirindi to measure deposited dust adjacent to the railway line. The dust gauges are located in a linear fashion on either side of the railway line, in order to determine the contribution of coal dust to the overall reported quantity.

6.3.2 Environmental Performance

TEOM

Monitoring conducted at the Werris Creek TEOM indicates the PM_{10} annual average remained below the applicable criteria of 30 µg/m^3. The majority of 24 hour measurements of PM_{10} remained below the 24 hour average limit of 50 µg/m^3 with the exception of forty three results which exceeded the limit. The elevated results were identified on the following dates during 2019, January 29th, October 29th, November 1st, 17th – 19th, 21st- 23rd, 26th, 28th and 29th and December 7th- 12th, 17th – 24th.

Notifications regarding the elevated results have been provided to the DP&EIE following receipt of the monitoring results. Subsequent investigations demonstrated WCC was not the cause of the elevated PM_{10} levels on all occasions. High regional dust alerts were received on the majority of the above-mentioned dates, advising of elevated PM_{10} levels were present in the general area. During these occasions, investigations confirmed operations were located either downwind of the TEOM location or were generally outside of the wind direction and identified as not contributing to the elevated results monitored . An increase in dust exceedances was observed in the last quarter of 2019 this is associated with prolonged below average rainfall, drought conditions, bushfire smoke from neighbouring regions and frequent dust storms.

Figure 3 below shows continuous results for PM_{10} (24hr) and $PM_{2.5}$ (24hr) for the reporting period, as well as a running annual average throughout the reporting year.

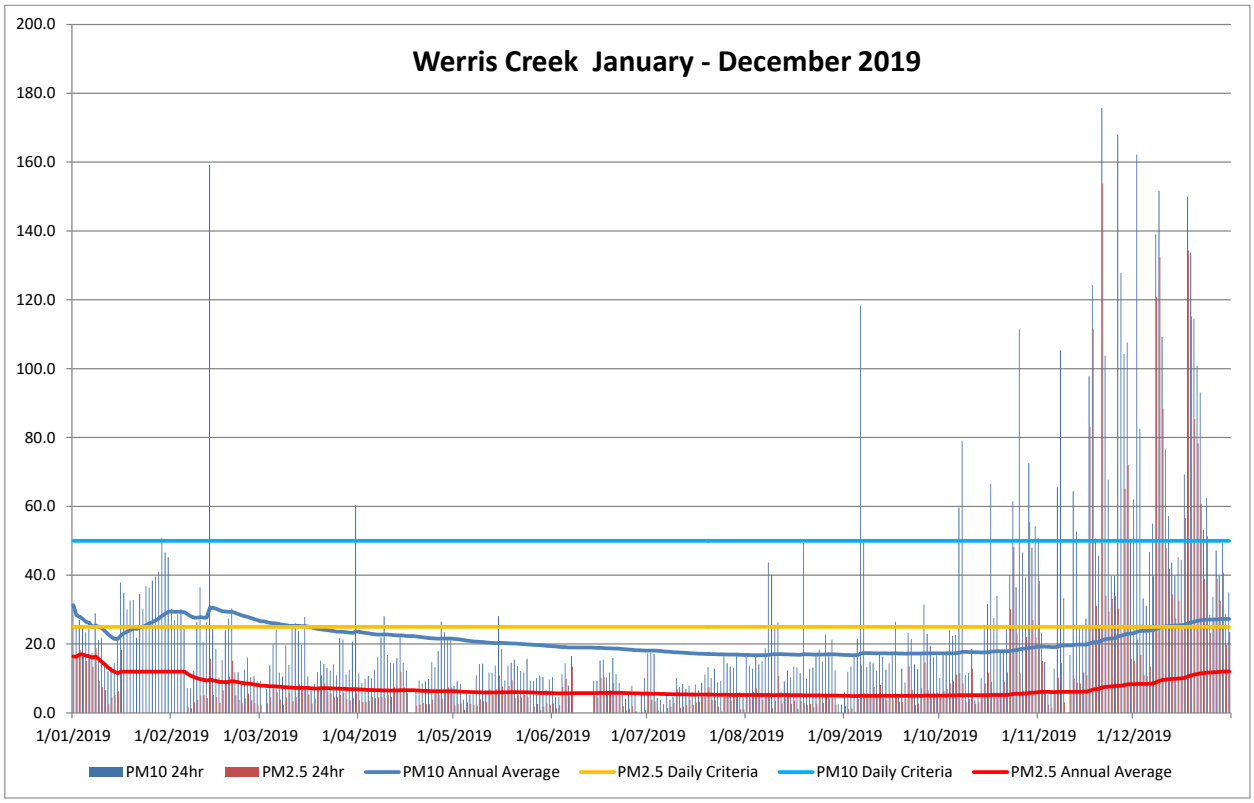


Figure 3: Werris Creek TEOM summary for January – December 2019

HVAS

Monitoring conducted across the HVAS PM_{10} network has shown the rolling annual average PM_{10} concentrations to be below the criteria of 30 µg/m3 at all monitoring stations across the network during the reporting period with the exception of Tonsley Park and Glenara. See **Figure 1** and **Table 5**.

A significant increase in dusts levels was observed in the last quarter of 2019 and the rolling annual average was affected by prolonged below average rainfall, drought conditions, bushfire smoke and elevated regional dust levels.

The majority of 24 hour measurements of PM_{10} remained below the daily criteria of 50 µg/m^3 with the exception of thirty two monitoring results. The exceedances occurred at the following sites;

- Tonsley Park on February 13th and 19th, March 15th, October 17th and 29th, November 22nd and 28th, December 10th and 22nd.
- Kyooma on February 13th, October 17th and 29th, November 22nd and 28th, December 10th, 16th and 22nd.
- Escott on February 13th, October 17th and 29th, November 22nd and 28th, December 10th and 22nd.
- Glenara on February 13th and 19th, October 17th and 29th, November 22nd and 28th, December 10th and 22nd.

Notifications regarding the elevated results were provided to the DPIE following receipt of the monitoring results. Subsequent investigations demonstrated that WCC was not the cause of the elevated PM_{10} levels on all occasions. Widespread high regional dust alerts were in place and WCC operations were downwind of the monitor at the time of monitoring.

All other PM_{10} measurements were within criteria as shown in **Figure 4.**

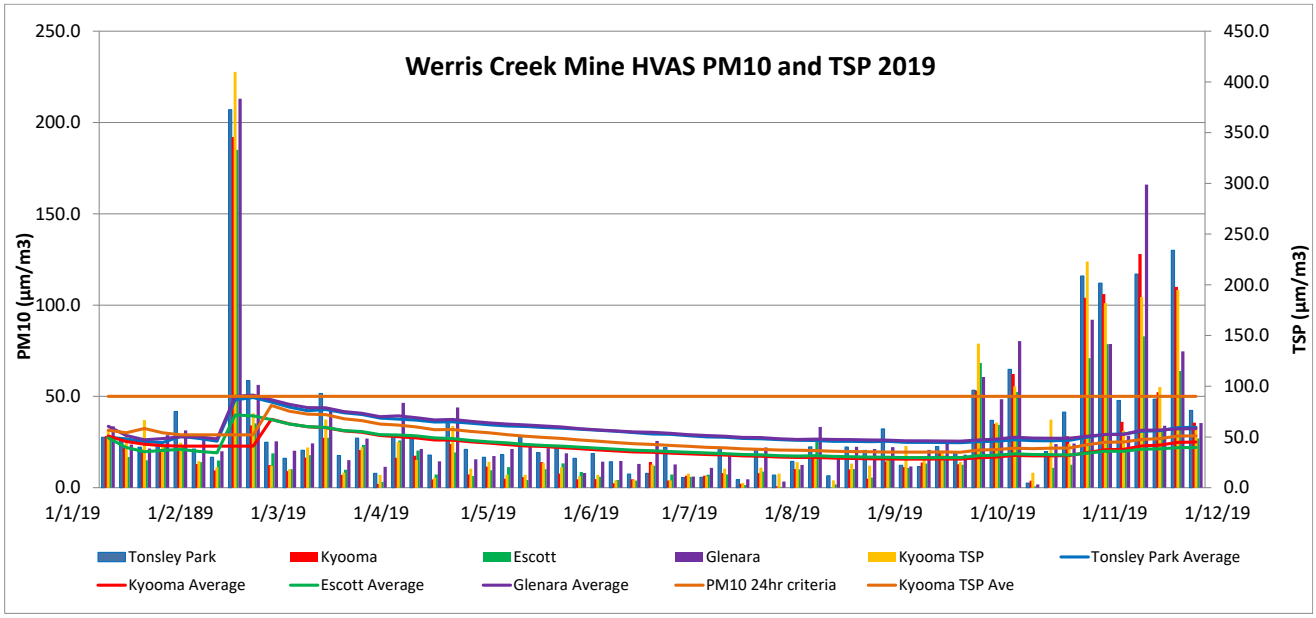


Figure 4: Werris Creek Mine HVAS PM10 and TSP results for January – December 2019

A summary of current and historical HVAS and TEOM data is presented in **Table 5**

Table 5- TEOM and HVAS Averages

Location	2017	2018	2019
	µg/m^3		
10TEOM92 – Werris Creek	10.8	16.1	**27.0**
HVP20 – Tonsley Park	15.0	20.6	**33.0**
HVP98 – Kyooma	8.7	14.9	**25.0**
HVP1 – Escott	9.2	13.7	**22.0**
HVP11 – Glenara	19.1	23.4	**32.3**

Deposited Dust

Analysis of January – December 2019 monitoring results from depositional dust gauges shows the majority of monitoring sites met compliance criteria, with the exception of DG2 (Cintra) which was above the annual average criteria for the 2019 reporting period. Located directly north of WCC operations, DG2 is located on a project related property.

Table 6 outlines results which have been excluded either due to direct contamination of the sample or upon investigation of elevated results, the investigation found that the result was attributed to localised dust sources and not WCC operations. External conditions such as, dry conditions, agricultural activities, organic matter (insects, bird droppings), and fire have influenced results at various localised monitors.

Of the seven sites with elevated monthly dust measurements, sites (Escott, Eurunderee, Railway View, Marengo, Mountain View, Werris Creek South and Westfall) all recorded annual depositional dust averages below the criteria.

An investigation of the results at dust gauge site DG34 (8 Kurrara street) and DG24 (Hazeldene) with elevated measurements during the reporting period showed elevated results and low deposited dust levels at nearby gauges, indicating a localised source of dust generation or contamination at both sites, unrelated to activities at WCC. A summary of deposited dust monitoring results is presented in **Table 6** below.

Table 6 – Deposited Dust Summary for 2019

EPL# 12290	ID	Property	Annual Average	Average - Excluded	Minimum	Maximum	AQGHGMP Criteria	# Results Excluded
-	DG1	Escott^	1.3	-	0.1	5.2	4.0	0
-	DG2	Cintra^	**5.0**	-	2.9	8.9	4.0	0
-	DG3	Eurunderee^	2.5	-	0.8	4.8	4.0	0
-	DG5	Railway View^	2.8	2.7	0.7	5.6	4.0	1
-	DG9	Marengo^	1.6	-	0.5	4.2	4.0	0
#29	DG11	Glenara	1.7	-	0.5	3.7	4.0	0
-	DG14	Greenslopes^	2.0	1.6	0.3	6.3*	4.0	1
-	DG15	Plain View^	1.3	-	0.4	3.0	4.0	0
-	DG17	Woodlands	1.7	1.2	0.4	6.9@	4.0	1
-	DG20	Tonsley Park^	2.0	-	0.6	3.5	4.0	0
-	DG22	Mountain View	1.6	1.5	0.6	4.1	4.0	2
-	DG24	Hazeldene	2.4	1.5	0.6	10.2@	4.0	2
-	DG34	8 Kurrara Street	**11.5**	1.4	0.6	33.9@	4.0	5
-	DG62	Werris Creek South	1.3	-	0.2	4.5	4.0	0
#30	DG92	Werris Creek Centre	1.4	-	0.2	3.7	4.0	0
-	DG96	Talavera+	-	-	-	-	4.0	-
#28	DG98	Kyooma	1.7	1.0	0.2	8.5*	4.0	1
-	DG101	Westfall	2.6	2.3	0.5	6.4*	4.0	1
-	DG103	West Street	1.5	-	0.5	4.0	4.0	0

^ Properties owned by Werris Creek Coal;

*Sample contaminated with organic matter from non-mining source (i.e. bird droppings and insects)

@ Sample contaminated from local dust source non-mining related (i.e. fire, farming activities)

Bold = elevated result

NS = Not Sampled

+ = Dust gauge removed temporarily by landowner

6.4 BIODIVERSITY

6.4.1 Environmental Management

Biodiversity was managed in accordance with:

- Schedule 3 Conditions 28 of the PA 10_0059;
- EPBC 2010 / 5571 Condition 1; and
- The WCC Biodiversity Offset Management Plan (BOMP).

6.4.2 Environmental Performance

WCCM Biodiversity Offset Management Plan (BOMP) was approved by DPIE on 30th August 2013. The WCCM Biodiversity Offset Strategy is required to offset 1317ha of native woodland to achieve a 'like for like or better' biodiversity outcome across five properties (Biodiversity Offset Areas – BOAs) adjacent to the WCCM for the purpose of restoring vegetated corridors across WCC land holdings and Quipolly Creek Catchment linking with sub-regional habitat corridors.

Offset Security Management

During the previous reporting period (2018), WHC and DP&E signed the *NSW Conveyancing Act 1919* Section 88E Instruments to secure the WCCM BOAs. These instruments were then registered with NSW Land Registry Services on 20th July 2018 and 2nd August 2018, which completed securement of WCC BOAs and finalises compliance with PA 10_0059 Schedule 3 Condition 27 and EPBC Act Approval 2010/5571 Condition 1**.**

Infrastructure Management

During the reporting period, 3.4km of redundant internal fences were deconstructed from the WCCM BOAs with the waste disposed offsite and recycled at the Quirindi Waste Management Facility. A total of 9.1km of BOA demarcation fencing was constructed along the perimeter of the Narrawolga and Eurunderee BOAs during the 2019 reporting period. The condition of the BOA fences, gates and signage were maintained to continue restricting unauthorised access and prevent inadvertent livestock grazing with no new boundary fencing constructed.

Seed Management

Routine seed assessments completed for the WCCM BOAs were impacted by the severe drought conditions that were experienced during 2019. The routine seed assessments aim to identify on a seasonal basis the life cycle stage and development of native plants to identify what, where, when and how to target appropriate resources to collect seed for future revegetation programs. Because of the drought conditions, additional seed collection opportunities within the WCCM BOAs were limited. As part of the WHC group wide revegetation planning; the onsite collected seed was supplemented with commercially sourced local and regional provident seed by reputable seed collectors. A local revegetation provider was engaged to propagate the seed to produce Box Gum and non-EEC/CEEC Woodland overstorey species seedlings required for the 2019 revegetation program that was completed for the WCCM BOA.

Revegetation Management

The BOMP revegetation strategy focuses on restoration and revegetation of previously cleared derived native grasslands and assisting natural regeneration in better quality woodland areas. During the reporting period, revegetation ground preparation tractor/excavator augered holes (to a depth >0.3m every 15m) to relieve compaction, improve permeability and infiltration to increase sub-surface soil

moisture was completed over 150ha collectively for Eurunderee, Narrawolga and Marengo BOAs between January and April 2019 in preparation for the FY19 revegetation program. WHC coordinated two revegetation programs during the reporting period consisting of an understorey revegetation (direct seeding) program and an overstorey planting program. The understorey revegetation was undertaken on the Eurunderee BOA in May 2019 sown over 52ha including 200kg of native grass seed (19 species), 25kg of native forb seed (9 species) and 400kg of bulking agent (lime). The overstorey revegetation program between May and August 2019 across the Eurunderee and Narrawolga BOAs with 112ha planted with 5,653 hiko seedlings of Eucalyptus albens, Eucalyptus blakelyi, Eucalyptus melliodora and Angophora floribunda. Despite the prevailing drought conditions throughout 2019; routine tree watering and maintenance activities post planting have been successful to ensure that over an 70% survival had been achieved by the end of the reporting period which is commensurate with the target Box Gum Woodland vegetation structure of the WCCM BOAs.

Heritage Management

During the reporting period, heritage site and fencing inspections were completed of the two known Aboriginal cultural heritage sites within the MCCM BOA with each site maintained with identification/demarcating fencing around the heritage site perimeter and signage to mitigate access and disturbance.

Weed Management

WHC coordinated routine formal weed monitoring/inspections undertaken across WCCM BOA in February, May, August and November 2019. The priority weeds for control were noted as general broadleaf weeds (noxious and environmental species) in areas proposed for revegetation as well as legacy noxious weeds inherited from previous owners management regimes such as African Box Thorn, St Johns Wort, Briar Rose, Green Cestrum and Cactus species (Common, Tiger and Rope Pear). The weed monitoring/inspections ensure that timely and prioritised weed control is undertaken on a seasonal basis with the spatial information directly given to spraying contractors to identify what, where, when and how to target appropriate resources across the MCCM BOA for weed control.

Feral Animals Management

WHC coordinated routine formal feral animal monitoring across WCCM BOAs in February, May, August and November 2019. The adoption of a “monitor, measure and manage” approach to feral animal management will allow WHC to implement adaptive management in response to changes being measured through monitoring in feral animal abundance specific to the different geographical regions of the WCCM BOAs. Feral animal monitoring utilises the relevant methodologies for specific feral animals generally in accordance with the NSW DPI Monitoring Techniques for Vertebrate Pests so that a range of methods can be used such as transects/spotlighting and cameras traps where practicable and relevant to specific offset areas/properties. Monitoring demonstrated that certain animals like Eastern Grey Kangaroos can be high, Foxes, Hares, Deer and Feral Pigs can be medium in abundance seasonally with all other feral animal species recorded as scarce to low abundance levels across 2019. The feral animal monitoring ensures that timely and prioritised feral animal control is undertaken on a seasonal basis identifying what, where, when and how to target appropriate resources across the WCCM BOAs for feral animal management.

During the reporting period, WHC implemented a comprehensive feral animal control program across the WCCM BOAs with routine 1080 baiting and pig trapping programs undertaken in March (11 Foxes removed from 138 baits presented and 7 Feral Pigs trapped), June (24 Foxes removed from 138 baits presented and no Feral Pigs trapped), September (10 Foxes removed from 184 baits presented and 17 Feral Pigs trapped) and December 2019 (32 Foxes removed from 180 baits presented and no Feral

Pigs trapped). Night time open range shooting programs were implemented in conjunction with the other routine programs resulting in an additional 9 Foxes, 7 Hares and 4 Rabbits were controlled in 2019. Only appropriately qualified and experienced feral animal contractors (appropriate feral animal management qualifications, NSW fire arm licence and pesticide accreditation where relevant) were engaged to undertake feral animal control works for WHC.

Soil & Erosion Management

Soil Testing

No soil testing was undertaken during the reporting period. Soil testing was however carried out during the 2018 reporting period and results of soil testing indicated that the top soil materials tested do not have any substantial limitations to plant growth. In all samples, the salinity was low; materials were non-dispersive, and non-sodic. The topsoil and subsoil materials were considered to be of reasonable quality apart from having low fertility. The overburden materials had elevated alkalinity, which is common in sedimentary spoil materials associated with coal in the region. The results of the testing support the vegetation type requirements as detailed in the are in line with the MOP for Werris Creek Coal Mine.

Annual soil testing will resume for the 2020 reporting period (and each period thereafter) and further comparison will be made between each reported testing results in future Annual Reviews.

Soil Erosion

Very little rainfall occurred throughout the 2019 reporting period therefore very low levels of erosion were detected onsite. No specific treatment or soil erosion mitigation works were therefore required. WCC has a commitment to maintaining the existing Rehabilitated areas and will rectify and restore any rehabilitation area that suffers from erosion to the original standard as per the requirements of the Biodiversity Offset Management Plan.

Grazing Management

During the reporting period, the WCCM BOA was not stocked and subsequently grazing was excluded.

Bushfire Management

In accordance with the BMP, annual fuel load monitoring was undertaken in December 2019 as part of planning and assessment of bushfire hazard and ecological burn strategy in 2020. During the reporting period, the average grass load measured and fire risk for the WCCM BOA ranged between 1.1t/ha and 2.5t/ha (low) and low fire risk. Other fire management implemented by WHC during the reporting period included the maintenance fire break tracks (66.6km) to a zero fuel barrier standard at WCCM BOA. WHC also completed a 60ha ecological burn of the Eurunderee and Narrawolga BOAs in May 2019. WHC maintains regular communications throughout the reporting period with both the Liverpool Range Zone RFS team around planning of other WHC BOA site ecological burn programs as well as providing WHC emergency contacts. WHC maintains a specialist fire fighting contractor for an oncall engagement during the fire season to respond in the event of a bushfire on WHC BOAs and non-mining lands.

Monitoring Program

The extensive, prevailing dry conditions affecting the Werris Creek Coal Mine (WCCM) Rehabilitation and BOAs throughout 2019 are likely to have contributed to a notable decrease in native plant species richness, which dropped from 12 sites last year to 5 out of the 30 sites meeting or exceeding the performance criteria (native species richness benchmark for relevant biometric vegetation communities). Native overstorey cover decreased from 9 sites last year to 5 out of the 34 sites meeting or exceeding the performance criteria (overstorey cover benchmark for relevant biometric vegetation

communities). Native midstorey cover was consistent with the previous year with 31 out of the 34 sites meeting or exceeding the performance criteria (midstorey cover benchmark for relevant biometric vegetation communities). Native ground cover decreased from 30 sites last year to 15 out of the 34 sites meeting or exceeding the performance criteria (groundcover benchmark for relevant biometric vegetation communities). Diurnal bird survey results for Spring 2019 show total species richness was 91 but ranged between 8 and 33 at the 24 sites monitored in 2019 (Ecoplanning 2020); which was an increase from 2018 total diurnal bird species richness of 75 and sites ranged between 6 and 27. Analysis of Anabat data showed a total microbat species richness of 14 across all sites with species richness ranging between 5 and 10 at the 23 sites successfully monitored in 2019. Total microbat species richness was the same in 2018 with 14 species, however, the range for 2018 was between 0 and 11. Herpetofauna survey results for total species richness was 21 but ranged between 0 and 6 at the 24 sites monitored in 2019; which was an increase from the 2018 total herpetofauna species richness of 12 and sites ranged between 0 and 5. Incidental sightings of mammals during both nocturnal and daytime searches indicate four exotic and six native mammal species across the WCCM Rehabilitation and BOAs. This was a slight increase from 2018 when three exotic and five native mammal species were sighted.

6.4.3 Proposed Improvement Measures

Monitoring programs such as quarterly weed inspections and quarterly seed assessments will continue to be implemented into the next period.

6.5 HERITAGE

6.5.1 Environmental Management

The LOM Environmental Assessment determined that the project would not result in any future adverse impacts on Aboriginal cultural heritage. The impact associated with the removal of the remnant features of the former Werris Creek Colliery is considered to be minor, as the historic sites do not meet the NSW Heritage Office (2001) criteria for high significance sites (even at a local level) (Landskape, 2010). WCC previously undertook quarterly inspections of the only known significant Aboriginal heritage item onsite – the “Narrawolga” Axe Grinding Grooves prior to their relocation in consultation with stakeholders, to the Willow Tree Visitor Information Centre in 2015.

The Heritage Management Plan outlines additional heritage management actions related to items associated with the former underground and these have been completed.

6.5.2 Environmental Performance

No previously unknown sites or artefacts were discovered during the period.

Going forward, heritage management will be focused on items potentially discovered through the mining of the former Werris Creek Colliery, underground workings. Should heritage items be uncovered, processes identified within the Heritage Management Plan will be undertaken.

6.6 WASTE

6.6.1 Environmental Management

WCC continued to engage a total waste management service provider during 2019. This practice has ensured WCC is positioned to maintain regulatory compliance with regard to offsite disposal at licenced facilities and on-site storage requirements.

6.6.2 Environmental Performance

The engaged waste management service provider records waste generation quantities at the point of either disposal or collection. The quantities of each generated waste type have been summarised in **Table 7** for the 2019 period. The current reporting period demonstrates benefits in total levels of resource recovery seen from improvements to waste management practices at WCC implemented in late 2014. The reduction has been driven by waste minimisation measures such as the introduction of separate recyclable waste and general waste bins as well as educational posters identifying waste streams with appropriate bins. These improvements have led to some reduction in general waste volumes, while seeing a general increase in recycling / resource recovery overall.

Table 7 – Approximate Quantities of Waste Generated for 2019

Waste Stream	2017	2018	2019
*Waste Oil (kL)	103.8	194.4	162.3
*Scrap Metal (kg)	76, 200	33,500	33,000
General Waste (m3)	1,051	1,456	1302
*Co-Mingled Recycling (m3)	159.1	160.94	170
Septic (L)	0	4000	4000
*Empty IBCs (kg)	2020	1980	N/A
Hydraulic Hoses (kg)	34,100	21,110	20500
*Batteries (kg)	2944	4483	N/A

6.7 ENVIRONMENTAL PERFORMANCE SUMMARY

An environmental performance summary is presented in **Table 8** below.

Table 8 – Environmental Performance

Aspect	Approval Criteria / EIS Prediction	Performance during the reporting period	Trend / Key Management Implications	Implemented / proposed management actions
Noise	Refer s6.1	Approval criteria has been met	NA	NA
Blasting	Refer s6.2	Approval criteria has been met	NA	NA
Air Quality	Refer s6.3	Thirty two exceedances of dust criteria at HVAS occurred at the following sites; • Tonsley Park PM10 on February 13th and 19th, March 15th, October 17th and 29th, November 22nd and 28th, December 10th and 22nd. • Kyooma PM10 on February 13th, October 17th and 29th, November 22nd and 28th, December 10th, 16th and 22nd. • Escott PM10 on February 13th, October 17th and 29th, November 22nd and 28th, December 10th and 22nd. • Glenara PM10 on February 13th and 19th, October 17th and 29th, November 22nd and 28th, December 10th and 22nd. Forty three (43) exceedances of dust criteria at TEOM on the January 29th , October 29th , November 1st , 17th – 19th , 21st - 23rd , 26th , 28th and 29th and December 7th - 12th , 17th – 24th 2019	Monthly HVAS sampling identified the daily maximum criteria of 50 µg/m3 was exceeded on two occasions Monthly TEOM sampling identified the daily maximum criteria of 50 µg/m^3 was exceeded on seven occasions	Notifications regarding the elevated results were provided to the Department of Planning, Industry and Environment following receipt of the monitoring results. Subsequent investigations demonstrated that WCC was not the cause of the elevated PM10 levels on all occasions.
Biodiversity	Refer s6.4	Approval criteria has been met	NA	NA
Heritage	Refer s6.5	Approval criteria has been met	NA	NA

7 WATER MANAGEMENT

7.1 WATER TAKE

WCC currently holds two Water Access Licences, with the water taken under these licences for the 2019 reporting year summarised in **Table 9.**

Table 9 - Water Take 2019 January - December (ML)

Water Licence #	Water Sharing Plan	Water Source and Management Zone	Entitlement	Passive Take / Inflows	Active Pumping by WCC	Total
WAL 32224	NSW Murray Darling Basin Porous Rock Groundwater Sources	Gunnedah – Oxley Basin Mdb Groundwater Source	211	53	0	53
WAL 29506	NSW Murray Darling Basin Porous Rock Groundwater Sources	Gunnedah – Oxley Basin Mdb Groundwater Source	50	0	0	0

7.2 SURFACE WATER MANAGEMENT

7.2.1 Environmental Management

The management of surface water aims to prevent surface water pollution both within onsite dams and offsite watercourses. The overall water management strategy is to segregate different water streams onsite based on the potential pollutant in each stream.

- Void Water – the void water catchment area is comprised of the active mining area and overburden emplacement which collects both rainfall runoff and groundwater in the base of the open cut void and needs to be dewatered by pumping to the surface to allow mining of the basal coal seam;
- Dirty Water – the dirty water catchment area is comprised of areas previously disturbed by mining such as rehabilitation and soil stockpile areas, with the focus on the reduction of suspended solids and subsequent discharge of treated water;
- Clean Water – the clean water catchment area is undisturbed by mining activities and allowed to flow offsite without active management; and
- Contaminated Water – includes potentially hydrocarbon contaminated water runoff from the workshop and fuel farm areas which is treated through an oil-water separator, as well as water from ablutions which is treated through a septic system onsite.

Void Water Management

Void Water is stored in one of six designated void water dams (VWD's) comprising the void water management system at WCC. VWD's 1,2, 3, 4 and 7 are long term water storage structures, while VWD 8 is a temporary structure, designed for the transfer of void water for use around the project or short term out of pit storage of out of surplus void water. The operational functions of the current VWD2 will be replaced by VWD7 which was constructed in 2018 and is scheduled to be commissioned for full time operational use in 2020. VWD2 will be decommissioned shortly thereafter. This will allow for the northern advancement of the dump formation over the current location of VWD2 in line with the MOP. Routine checks and photo-inspections of VWD's were undertaken throughout the reporting period. An annual inspection of the prescribed dams (VWD's 1, 3 and 4) was undertaken by an external structural engineer. The annual inspection identified that all prescribed dams were being managed appropriately

Void water is predominantly used for dust suppression purposes on site. Water carts engaged in watering haul roads and other areas of the mining excavation are the predominant user of water for dust suppression purposes, with water also used to control dust at conveyor loading points and on coal stockpiles. Void water use is monitored and calculated monthly using water meters on key pipelines and water fill points, supplemented by surveyed volumes of water stored in dams and the void on site. This data is used to update the Water Balance Model for site.

Dirty Water Management and Erosion and Sediment Control Measures

During the period, dirty water dams remained in place to capture surface runoff from disturbed areas of the mine site. There were no discharge events during the reporting period from these dams.

Some stormwater drainage systems were maintained or improved during the reporting period to minimise erosion and sediment transport at WCC. Minor maintenance of existing sediment dams SB18 and SB17 occurred during the period, requiring de-silting, maintenance of flow paths and minor erosion control. Regular checks of the dirty water management system were undertaken as required dependent on rainfall volume.

Contaminated Water Management

WCC undertook regular maintenance of the key contaminated water infrastructure during the reporting period, with the servicing of both the workshop sump and the oil water separator occurring as required throughout the reporting period. Waste from these facilities is transported either offsite (liquid waste to licensed waste facility) or to the onsite bioremediation area (solids) for treatment / disposal of residual hydrocarbons within the material.

7.2.2 Environmental Performance

Surface Water Quality

Quarterly sampling of water stored within the clean, dirty and void water dams and within Quipolly and Werris Creeks' (**Figure 5**) was undertaken by WCC.

Table 10 presents the average results recorded at each location for the 2019 reporting period.

Table 10 – Quarterly Surface Water Quality for Dams and Offsite Creeks'

Dam/ Creek	Monitoring Site (EPA No)	Number of Samples	Value	pH	Electrical Conductivity (µS/cm)	Total Suspended Solids (mg/L)	Oil & Grease (mg/L)
VWD1	16	4	Ave	7.8	1198	9	<5
			Max	8.0	1330	17	<5
VWD2	27	4	Ave	8.0	1165	8	4
			Max	8.1	1280	11	<5
VWD3	-	4	Ave	8.4	1663	139	4
			Max	9.0	2700	494	<5
VWD4	-	4	Ave	8.2	1528	31	<5
			Max	8.3	1640	97	<5
SB2	10	0*	Ave	Dry	Dry	Dry	Dry
			Max				
SB9	12	0*	Ave	Dry	Dry	Dry	Dry
			Max				
SB10	14	0*	Ave	Dry	Dry	Dry	Dry
			Max				
SB18	32	1*	Ave	8.65	270	54	<5
			Max	8.65	270	54	<5
QCU	25	0*	Ave	Dry	Dry	Dry	Dry
			Max				
QCD	26	1*	Ave	7.9	1420	830	90
			Max	7.9	1420	830	90
WCU	23	0*	Ave	Dry	Dry	Dry	Dry
			Ave				
WCD	24	4	Ave	8.1	1294	709	32
			Max	8.3	1620	902	38

* Sample location was dry during some or all of the quarterly monitoring periods.

The quarterly water quality shown in **Table 10** was generally consistent with the previous reporting period, with the exception of a maximum EC at VWD3 increase of approximately 500 µS/cm being recorded. This was attributed to low levels of stored water remaining in the dams for the majority of the period without in-pumping. Evaporation had therefore increased stored EC levels. Water quality monitoring was generally consistent with EA predictions for each analyte, with the exception of EC's at VWD3 as detailed above.

During the 2019 period, 158.5 ML of void water was utilised for beneficial reuse through irrigation for agriculture purposes. **Table 11** outlines the water quality results taken prior to discharge. All results were within water quality criteria.

Table 11 – Surface Water Quality for Irrigation discharges in 2019

Dam/ Creek	Monitoring Site (EPA No)		pH	Electrical Conductivity (µS/cm)
EPL 100% Limit			**9**	**2000**
VWD1	33	Min Value	7.7	1170
		Max Value	8.7	1340

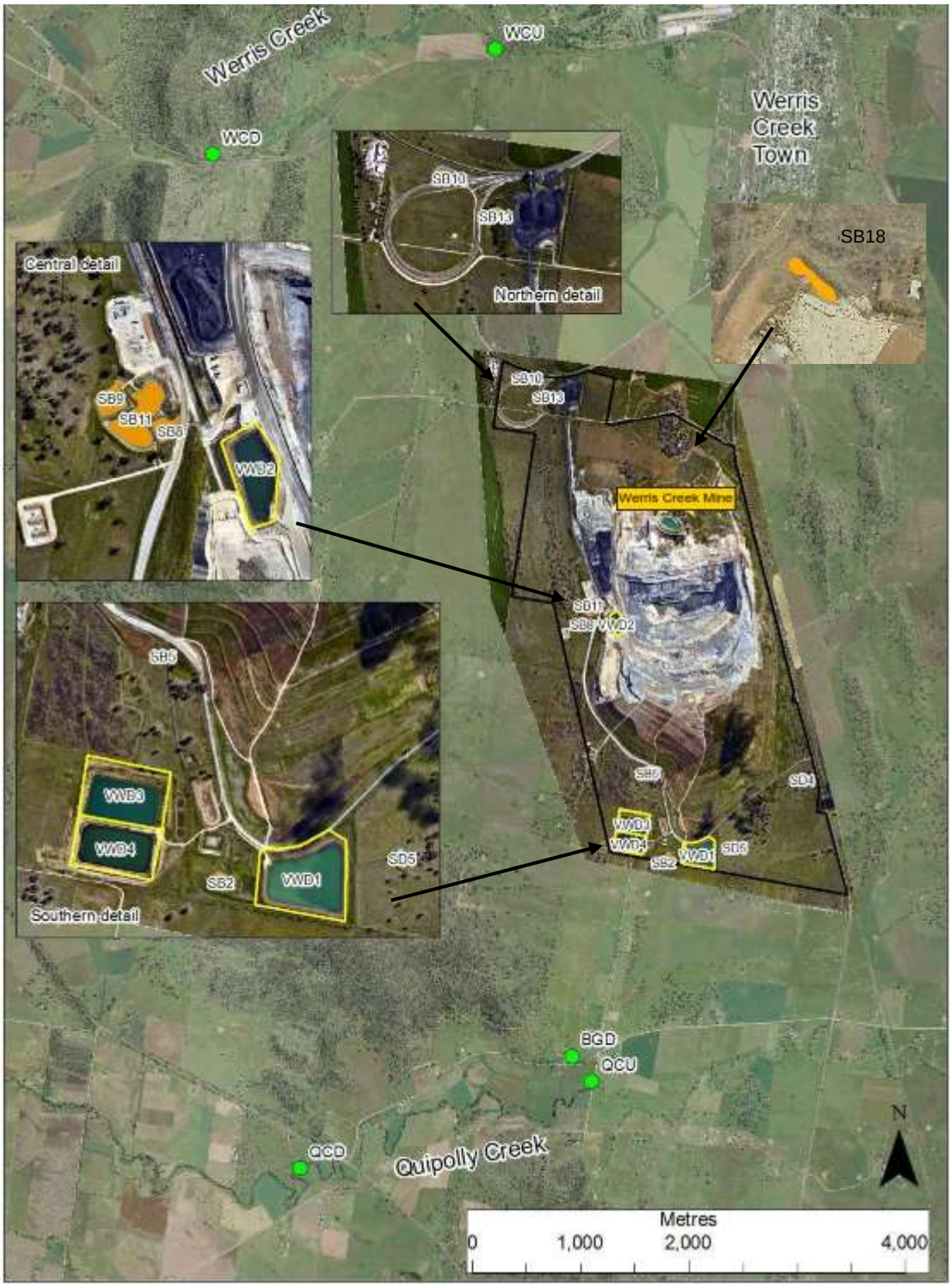


Figure 5: Surface Water Monitoring Network

7.3 GROUNDWATER MANAGEMENT

7.3.1 Environmental Management

The management of groundwater at WCC is undertaken to achieve two goals, namely:

- Monitoring and measuring potential impacts from mining operations on adjacent aquifers and privately owned bores: and
- Dewatering and use of void water (rainfall runoff and groundwater) that is intercepted by mining operations.

WCC currently monitors 43 groundwater bores, located on the mine site and neighbouring properties, to measure potential impacts on groundwater quality and groundwater availability.

WCC monitors groundwater quality and levels across a range of bores as shown in **Table 12** and **Figure 6.** Monitoring bores in the Werrie Basalt are separated into those close to WCC and those further away, with select bores in both the Werrie Basalt and Quipolly Alluvium nominated as background monitoring bores, due to their location far upstream from WCC when considering the dominant groundwater flow contours. In addition, ten bores also contain logging piezometers, providing a higher resolution water level dataset to enhance the understanding gained from the bimonthly groundwater level sampling of the monitoring network. These piezometers have been placed to target certain zones, including the Werrie Basalt northwest, south and east of WCC, and the upper, middle and lower reaches of the Quipolly Alluvium aquifer in the vicinity of WCC.

Table 12 – WCC Groundwater Monitoring Program

Precinct	**Bores**
Werrie Basalt near WCC	MW1*, MW2, MW3, MW4B, MW5, MW6*, MW27, MW36A*, MW36B
Werrie Basalt	MW8#, MW10, MW14, MW17B, MW19A, MW20, MW38A, MW38B, MW38C, MW38E, MW41* and MW43*
Quipolly Alluvium	MW7*, MW12, MW13*, MW13B, MW13D, MW15, MW16, MW17A, MW18A, MW21A, MW22A, MW22B, MW23A, MW23B, MW26B, MW28A#*, MW32, MW40* and MW42*
Others	MW24A, MW29 (both Werrie Basalt in the Black Soil Gully valley) MW34 (minor alluvium associated with Werris Creek)
Monitoring Frequency	**Parameters**
Bimonthly	Standing Water Level
Quarterly^	MW7 - Standing Water Level, Total Nitrogen, Nitrate, Total Phosphorus, Reactive Phosphorus, Electrical Conductivity, pH, Chloride, Sulfate, Alkalinity, Calcium, Magnesium, Sodium, Potassium, Arsenic, Barium, Beryllium, Cadmium, Cobalt, Chromium, Copper, Manganese, Nickel, Lead, Vanadium, Zinc, Mercury, Ammonium, Nitrite, Nitrite+Nitrate, TKN, Anions, Cations, Ion Balance, TPH
6 Monthly≥	Total Nitrogen, Nitrate, Total Phosphorus, Reactive Phosphorus, Electrical Conductivity, pH
Annually	Chloride, Sulfate, Alkalinity, Calcium, Magnesium, Sodium, Potassium, Arsenic, Barium, Beryllium, Cadmium, Cobalt, Chromium, Copper, Manganese, Nickel, Lead, Vanadium, Zinc, Mercury, Ammonium, Nitrite, Nitrite+Nitrate, TKN, Anions, Cations, Ion Balance, TPH
# Background monitoring bore * Groundwater logger installed in bore for all or part of reporting period (land owner will not grant access) ^Applies to MW7 bore only ≥Applies to MW1, MW2, MW3, MW4B, MW5, MW6 in conjunction with bimontly depth monitoring	

The Water Balance Model for WCC was updated as part of this Annual Review, with this model used to verify model assumptions in relation to groundwater interception in the mining void. A CUSUM statistical analysis was undertaken on all monitoring bores at the end of the reporting period to assess whether any bores show changes in water level outside of natural variability. To provide further clarity on the interaction between the Quipolly Alluvium Aquifer and the Werris Basalt Aquifer, four additional monitoring wells were installed during the reporting period (two in each aquifer), and fitted with standing water level loggers.

Figure 6: Groundwater Monitoring Network

7.3.2 Environmental Performance

Performance with respect to groundwater management, the prevention of pollution and the assessment of impacts on groundwater availability to other surrounding users, is assessed through groundwater level and chemistry monitoring. Monitoring focuses on the Werrie Basalt and Quipolly Alluvium aquifers.

Table 13 presents the groundwater level monitoring data for January to December in the Werrie Basalt and Quipolly Alluvium aquifers. For Quipolly Creek Alluvium, MW28A and MW23A are representative of upstream and downstream aquifer conditions respectively. For Werrie Basalt, MW5 and MW14 are representative of aquifer conditions either side of the watershed between Quipolly Creek in the south and Werris Creek in the north. All groundwater sampling and analyses were undertaken by a NATA accredited laboratory.

Table 13 – Groundwater Monitoring Bore Level Summary – January to December 2019

Site		January-19		March-19		May-19	
		mbgl	%	**mbgl**	%	**mbgl**	%
Werrie Basalt near WCC	**MW1**	Dry		Dry		Dry	
	MW2	52.18	-2%	53.28	-2%	Dry	
	MW3	20.29	-1%	20.42	-1%	20.57	-1%
	MW4B	18.35	-2%	18.54	-1%	18.78	-1%
	MW5	13.32	-1%	13.54	-2%	13.56	0%
	MW6	16.24	0%	16.26	0%	16.25	0%
	MW36A*	17.52	0%	53.45	0%	54.60	0%
	MW36A	17.52	30%	19.17	-2%	21.08	-3%
	MW36B	17.48	30%	19.98	-6%	21.09	-3%
Werrie Basalt	**MW8***	20.33	-1%	20.53	-1%	20.69	-1%
	MW10	14.72	1%	14.35	1%	14.22	0%
	MW14	13.26	0%	14.78	-1%	16.42	-3%
	MW17B*	14.26	-1%	14.47	-1%	14.54	0%
	MW19A*	No sample		No access		No access	
	MW20*	22.62	2%	22.73	2%	22.71	0%
	MW38A	12.68	8%	12.05	0%	12.20	-1%
	MW38B*	10.20	1%	10.07	1%	10.40	-3%
	MW38C*	24.12	0%	24.38	0%	24.11	1%
	MW38E*	11.70	-3%	11.57	1%	11.76	-2%
	MW41	10.05	-2%	10.20	-1%	10.34	-1%
	MW43	8.80	-2%	8.96	-2%	9.12	-2%
#[1]	**MW24A***	16.89	-4%	17.67	-4%	17.65	0%
	MW29*	15.97	92%	14.54	10%	14.63	-1%
Quipolly Alluvium	**MW12***	Dry		Dry		Dry	
	MW13*	Dry		Dry		Dry	
	MW13B*	6.38	-2%	6.53	-2%	6.55	0%
	MW13D*	6.52	0%	6.6	-1%	6.62	0%
	MW15*	No access		No access		No access	
	MW16*	Dry		Dry		Dry	
	MW17A*	8.95	-2%	8.15	10%	8.25	-1%
	MW18A*	Dry		Dry		Dry	
	MW21A*	Dry		Dry		Dry	
	MW22A*	Dry		Dry		Dry	
	MW22B*	Dry		Dry		Dry	
	MW23A*	4.72	-4%	4.84	-2%	4.79	1%
	MW23B*	4.63	-8%	4.70	-1%	4.75	-1%
	MW26B*	10.52	-2%	10.52	0%	10.65	-1%
	MW28A*	17.28	-2%	17.55	-2%	Dry	
	MW32*	4.51	-4%	Pump over bore		Pump over bore	
	MW40	10.13	-2%	10.22	-1%	10.38	-2%
	MW42	8.69	-2%	8.84	-2%	9.01	-2%
#[2]	**MW34***	11.62	-2%	12.13	-4%	No access	

Site		July-19		September-19		November-19	
		mbgl	%	**mbgl**	%	**mbgl**	%
Werrie Basalt near WCC	**MW1**	Dry		Dry		Dry	
	MW2	Dry		58.32	-9%	57.95	1%
	MW3	20.73	-1%	20.78	0%	20.92	-1%
	MW4B	19.10	-2%	19.35	-1%	19.53	-1%
	MW5	13.70	-1%	13.76	0%	13.89	-1%
	MW6	16.23	0%	16.32	-1%	16.29	0%
	MW27*	Dry		Dry		Dry	
	MW36A	22.63	-4%	23.35	-3%	23.99	-3%
	MW36B	22.62	-4%	23.34	-3%	23.98	-3%
Werrie Basalt	**MW8***	20.89	-1%	21.06	-1%	21.28	-1%
	MW10	14.27	-1%	14.32	0%	14.52	-1%
	MW14	18.26	-6%	19.32	-5%	20.52	-6%
	MW17B*	15.96	-9%	15.94	0%	16.69	-4%
	MW19A*	No access		No access		No access	
	MW20*	22.88	0%	23.03	-1%	23.15	-1%
	MW38A	13.10	-7%	13.73	-5%	14.32	-4%
	MW38B*	10.40	0%	10.42	0%	10.53	-1%
	MW38C*	24.25	0%	24.24	0%	24.92	-3%
	MW38E*	11.81	0%	11.92	-1%	12.09	-1%
	MW41	10.51	-2%	10.60	-1%	10.72	-1%
	MW43	9.26	-2%	9.36	-1%	9.50	-1%
#[1]	**MW24A***	17.7	0%	16.05	10%	18.24	-12%
	MW29*	14.69	0%	14.84	-1%	14.93	-1%
Quipolly Alluvium	**MW12***	Dry		Dry		Dry	
	MW13*	Dry		Dry		Dry	
	MW13B*	6.8	-4%	6.82	0%	7.10	-4%
	MW13D*	6.62	0%	6.63	0%	6.6	0%
	MW15*	Dry		No access		No access	
	MW16*	Dry		Dry		Dry	
	MW17A*	8.37	-1%	8.59	-3%	8.66	-1%
	MW18A*	Dry		Dry		Dry	
	MW21A*	Dry		Dry		Dry	
	MW22A*	Dry		Dry		Dry	
	MW22B*	Dry		Dry		Dry	
	MW23A*	4.83	-1%	4.9	-1%	5.01	-2%
	MW23B*	5.62	-15%	5.67	-1%	4.84	17%
	MW26B*	10.8	-1%	10.93	-1%	11.04	-1%
	MW28A*	Dry		Dry		Dry	
	MW32*	Pump over bore		Pump over bore		Pump over bore	
	MW40	10.53	-1%	10.63	-1%	10.77	-1%
	MW42	9.15	-2%	9.25	-1%	9.39	-1%
#[2]	**MW34***	No access		12.33	-2%	12.56	-2%

mbgl – meters below ground level, the distance from top of bore to groundwater surface.

Bold –lowest recorded groundwater level measured during the reporting period.

Orange – Change decrease

Green – Change increase or no change

* - Bore is used for water extraction unrelated to WCC (i.e. stock and domestic or irrigation).

#[1] – Werrie Basalt in the Black Soil Gully valley to east of Werris Creek Mine.

#[2] - Werris Creek Alluvium.

The groundwater level monitoring results have shown generally low water levels throughout 2019, which is representative of the prolonged dry seasons and is representative of general below average rainfall. Cumulative residual rainfall is graphically presented in **Figure 8** and **Figure 9**.

A specialist groundwater consultant undertook the annual groundwater review for 2019, identifying the following findings. All monitoring wells (MW) were reviewed using a CUSUM statistical analysis. All wells that are located in the Basalt Aquifer were identified above CUMSUM trigger levels for the 2019 period. MW26 monitoring the Quipolly aquifer also exceeded the CUSUM trigger level during 2019, requiring further investigation. These wells were MW2, MW4B, MW5, MW6, MW17B & MW27 and are located within the Werrie Basalt aquifer and MW26 part of the Quipolly Alluvium Aquifer. Ramboll (2020) found declining water level trends in the triggered MW's were similar to water level trends in the background monitoring well (MW8) and were consistent with residual rainfall patterns, which indicate

lower than average rainfall since March 2017. **Figure 7** identifies these findings inclusive of the background monitoring well MW8.

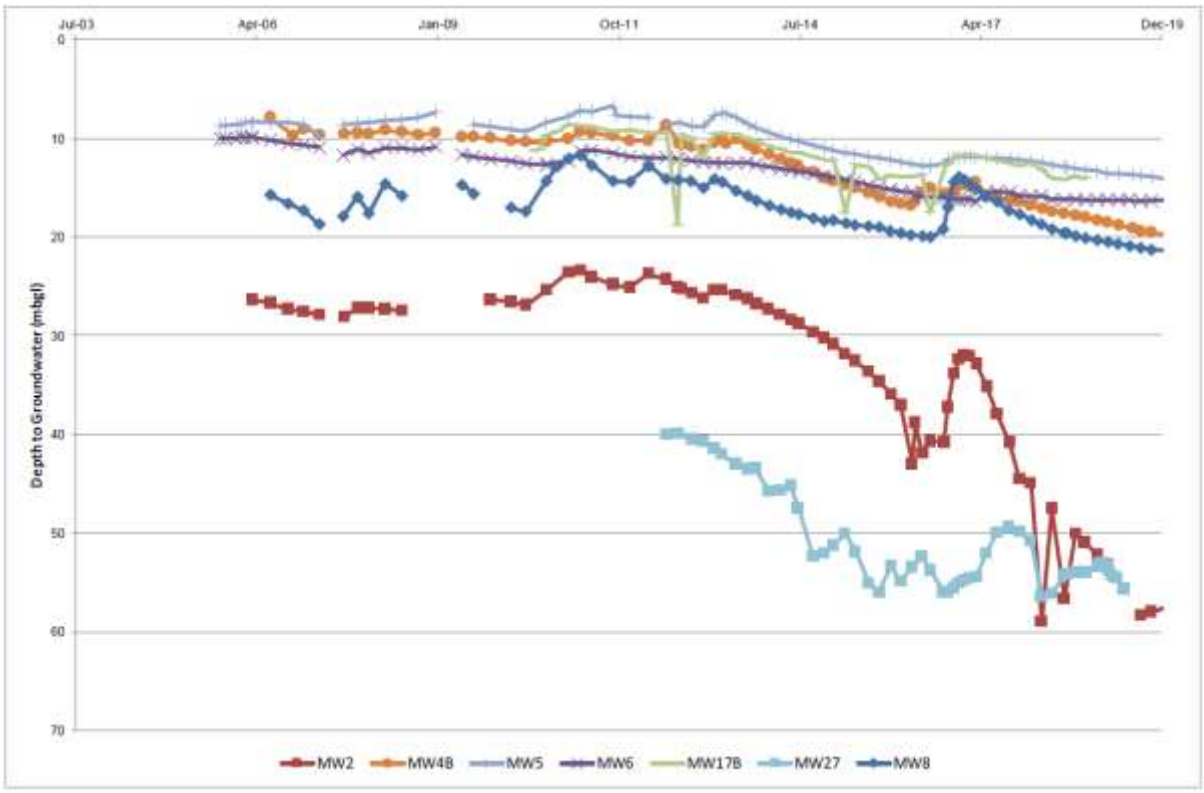


Figure 7: Comparison of groundwater trends in trigged monitoring wells.

Quipolly Alluvium Aquifer

In aquifer systems that are recharged by rainfall, groundwater levels closely follow the cumulative residual rainfall patterns. The Quipolly alluvial aquifer is a system reliant on rainfall recharge and flooding and it is expected that this correlation would be apparent in wells monitoring the Quipolly alluvium. Groundwater level data from wells within the Quipolly alluvium aquifer system are compared to cumulative residual rainfall and presented in **Figure 8**. Ramboll (2020) have identified a decline in groundwater levels, consistent with the lower than average rainfall shown by the cumulative residual rainfall plot.

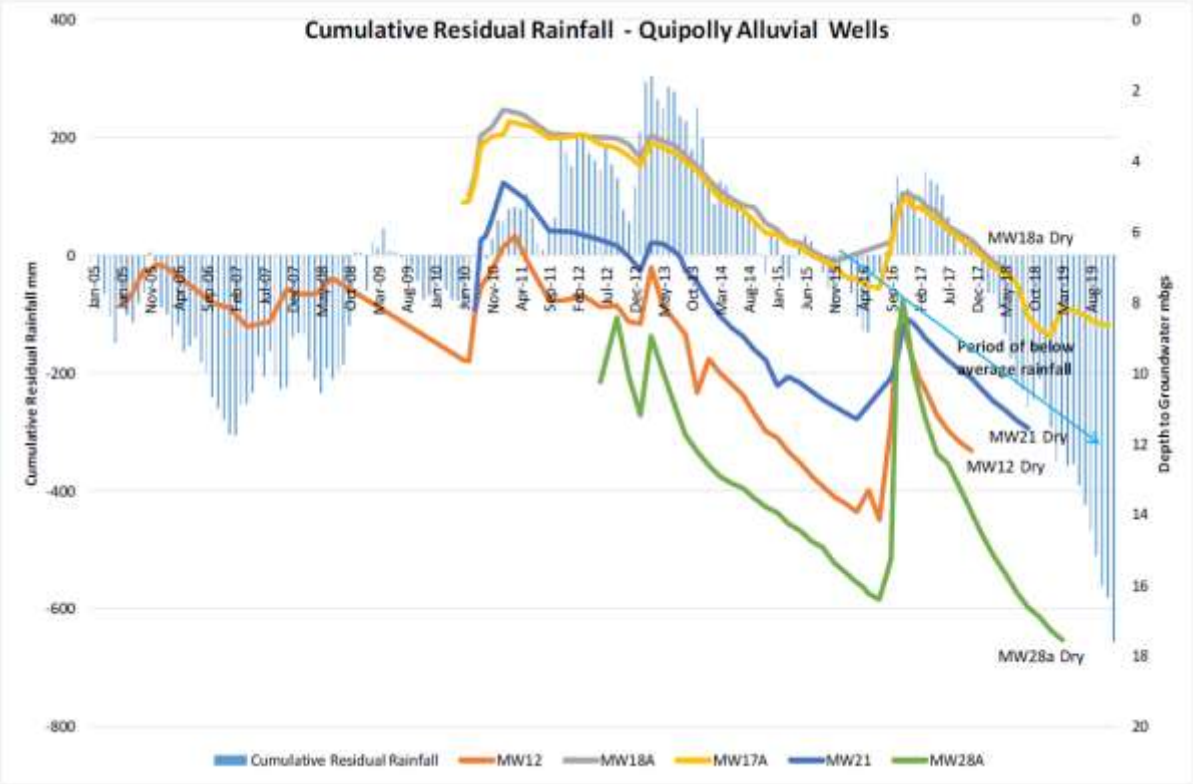


Figure 8: Cumulative residual rainfall and monitoring wells within the Quipolly Alluvium

Groundwater well MW28A, located to the south east of the project site is considered to be up-gradient of any mine influence and representative of fluctuation in the aquifer in response to factors other than mining. The fluctuations observed in MW28A were found to be generally consistent with other Quipolly aquifer wells.

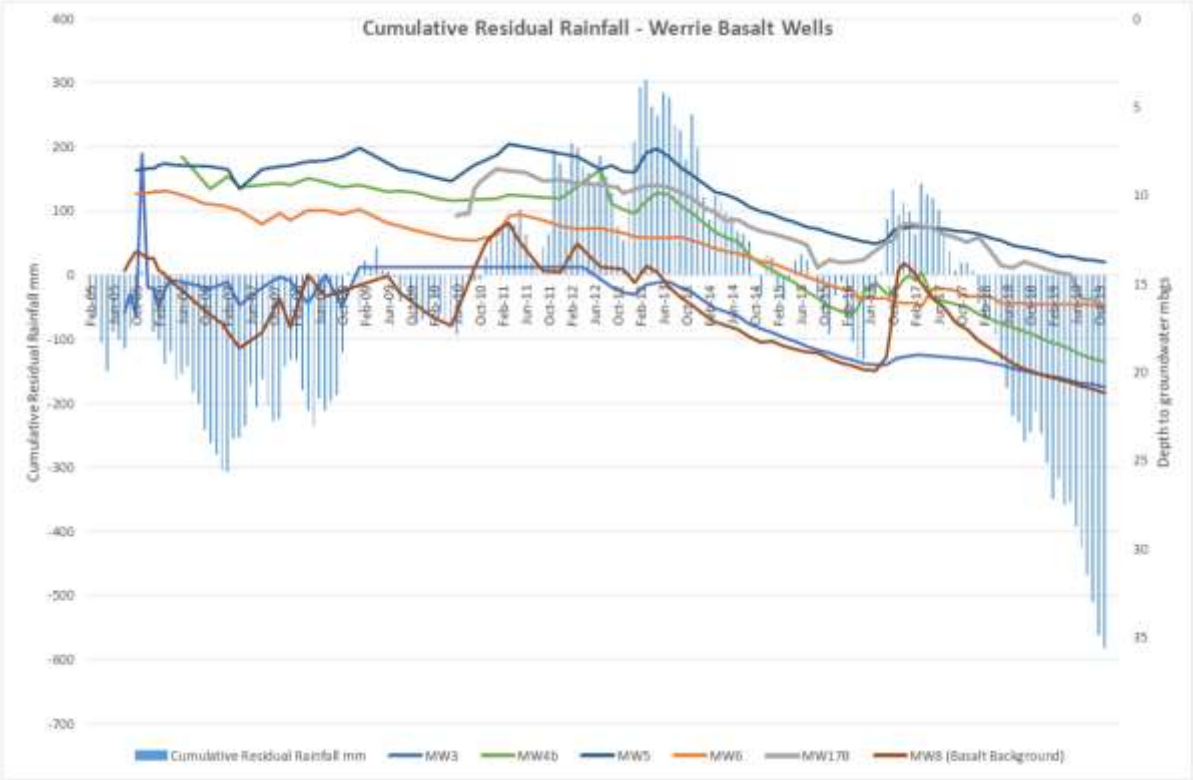
The steep increase in groundwater level within the Quipolly alluvium aquifer in September 2016 was likely attributed to the overflow of Quipolly Dam, upstream of the wells. Quipolly Dam was upgraded by State and Local Government in early 2013 as part of a program to improve dam safety and increase the storage capacity. The dam overflowed in September 2016 for the first time since augmentation works had been completed.

Werrie Basalt Aquifer

Wells monitored within the Werrie Basalt are known to be in an area of low permeability overlying clays, resulting in less noticeable recharge due to cumulative rainfall.

The Werrie Basalt aquifer is regularly monitored on all sides of the mine workings. Monitoring location MW8, located remotely to the south of the site and to the south of Quipolly Creek, is considered a representative background well for comparison of groundwater levels around the south of the site. **Figure 9** presents a comparison of observed groundwater levels in MW8 and Werrie Basalt aquifer monitoring wells, with cumulative residual rainfall. Some correlation to cumulative residual rainfall is observed, however locations directly south of the mine do not demonstrate a response of the same magnitude as the background well MW8. A notable increase in water levels in MW8 in early 2017 was more muted in wells MW4b and MW6 following a lag time.

Figure 9 – Cumulative residual rainfall and groundwater levels in the basalt aquifer.



Ramboll, 2020, conducted an assessment of groundwater flow directions and rates, which indicated regional direction of flow within the groundwater systems has generally remained constant, predominantly towards the south-west. It should be noted that in November 2019 several wells were either dry or the waters levels were noted as being pumped when measured.

Ramboll, 2020, undertook a review of water quality data within both the Quipolly and Werrie Aquifers, in line with requirements outlined in **Table 10**

Groundwater Quality

Monitoring of groundwater quality during the period identified the majority of MW performed within the historical ranges captured during 2004-2010. Outlying results were identified in MW19A, 29, and 21B. These stock and domestic bores have shown slight increases in pH and electrical conductivity, with MW11 showing an increase in nitrates and total nitrogen results. A number of bores associated with agricultural land have continued to display generally high total phosphorus and total nitrogen levels. These levels have been consistent with historic monitoring and are a reflection of the agricultural land use and fertiliser inputs rather than impacts from mining operations.

7.3.3 Proposed Improvement Measures

The groundwater monitoring program described above will continue to be implemented during the next reporting period.

7.4 SITE WATER BALANCE MODEL VALIDATION

The WCC Water Balance Model is focused on accounting for all water entering and leaving the open cut pit to allow a verification of groundwater interception during the reporting year (**Table 14**)**.** The key inputs to the water balance model are:

- Direct rainfall and runoff – Generally the largest input due to the large pit catchment, this item relates to rainfall that falls directly in the void water catchment. During any rainfall event, runoff is significant due to the large catchment and hard, compacted surfaces.
- Recharge from underground workings – Considerable volumes of water are used to manage spontaneous combustion within the former underground workings at WCC. Sprinklers and other drenching sprays are used to reduce the heating of coal that can lead to underground fires, with the majority of this water returning to and collecting in the void.
- Evaporators recharge – Evaporator sprays have been installed at WCC to reduce the volume of void water stored on site. A large portion of this water will not evaporate, but instead percolate through the accumulated spoil until it collects in the void.
- Dust Suppression – To minimise the generation of dust from vehicle movements, water is applied directly to haul roads and dumps. Furthermore, water may be applied to excavator loading faces and production drills to minimise the generation of dust at these points.
- Groundwater – Located within the Coal Measures sequence, the enclosed basin contains various small-scale water bearing zones generally associated with the coal seam. In addition, water is also stored in the former workings of the previous underground colliery and is also present in the overburden spoil. A small proportion of groundwater may also be derived from the Werrie Basalt aquifer.

The key outputs to the model include:

- Pit dewatering – Includes all water pumped from the pit during the year, which is the principle pathway for water leaving the void.
- Irrigation – Includes void water tested and approved for offsite irrigation from VWD 1 onto cropping land.
- Direct evaporation – Includes the volume of water directly evaporated from the pit and other locations within the void water cycle.

Table 14– Water Balance Inputs and Outputs.

Source	Estimated Mean Average Volume (ML)	Notes
INPUTS TO PIT		
Rainfall and Runoff	257	Calculated from WBM based on rainfall, area and characteristics of catchments areas which report back to the pit.
Evaporators and Dust Suppression	88	Volume of water estimated to flow back into the pit from use of evaporators and dust suppression. The final volume returning to the pit is derived from runoff/infiltration/storage calculations in WBM.
Water Pumped to Old Workings	426	Volume of water pumped into the old workings for spontaneous combustion control, (assumed to return directly to the pit).
TOTAL INPUT	**771**	
OUTPUTS FROM PIT		
Out of Pit Pumping	1,080	Estimated from Void Monitoring
Direct Evaporation	40	Estimated volume directly evaporated from the surface of the pit, based on climatic data (from daily evaporation measured at Gunnedah Resource Station).
Groundwater and Underground Workings	19	Pro-rata amount derived from the hydrogeological model.
TOTAL OUTPUT	**1,139**	
Change in Storage	-227	The difference between the estimated volume of water in the pit void between January 2019 and December 2019, based on surveyed levels and the established relationship between height and pit volume.
NET WATER (input-output)	**-368**	Difference in input/output.

As presented in **Table 14**, once inputs, outputs and the observed change in water in the void are accounted for, the model reflects a net decrease in water from within the void of 368 ML, compared to an estimate of the decrease in volume (based on site recordings) of 227 ML.

The results of the pit WBM for January 2019 to December 2019, using water management data from the site confirm reported site conditions, were found to correlate with the hydrogeological model predictions for groundwater inflow to the pit.

As was observed in 2018 an increased storage within the void has seen an out flow from the void into the underground workings. Total inputs of 771ML during the 2019 period in comparison to 681ML during 2018 is representative of the sustained below average rainfall experienced at the Werris Creek Coal Mine. These water stocks have continued to be carried over from previous surplus years.

8 REHABILITATION

The rehabilitation objectives for WCC are described in Section 4 of the WCC MOP. The post mining land use goal for WCC is to reinstate certain areas of the mine to White-box Grassy Woodland communities and to ensure rehabilitation and revegetation is self-sustaining.

8.1 REHABILITATION PERFORMANCE DURING THE REPORTING PERIOD

During the reporting period, mining operations progressed generally in line with the Mining Operations Plan. Works were undertaken in growth medium development (14.2 Ha) during the period via subsoil and topsoil applications on the eastern facing rehabilitation slopes. This is generally in alignment with MOP requirements. WCC will continue to rehabilitate the final landform in line with these requirements. All infrastructure continued to be in use during the period, and as such, no areas of infrastructure were rehabilitated during the period.

Rehabilitation processes for the 2019 reporting year focused on ecosystem establishment of 15.8 ha and the maintenance and advancement of current vegetated areas. This included the planting of approximately 1100 native tube stock coupled with ongoing maintenance, such as mulching existing trees to combat ongoing severe drought conditions and watering newly planted stock (see Section 6.4.2 Environmental Performance, Revegetation). New tree planting numbers of native tube stock were reduced during 2019. The reduction in forecast planting was in response to the ongoing severe drought conditions experienced across the Werris Creek locality and wider region. The reduction ensured that available maintenance resources were able to meet the needs of the existing trees and planted tube stock via an enhanced tree-watering program.

Weed control was completed across all areas of rehabilitation during the reporting period to control a number of broadleaf weeds persistent in regeneration areas. Inspections of rehabilitation structures identified that all areas are structurally sound, with only minimal maintenance required. A description of rehabilitation monitoring and other initiatives to boost rehabilitation success have been reported in Section 6.4 Biodiversity of this review.

8.2 REHABILITATION TRIALS

WHC is supporting research into arboreal habitat augmentation of woodland rehabilitation by installing previously cleared timber back on the post mining landform to replicate habitat provided by stag trees that occur naturally in woodland communities. Motion sensor cameras have predominantly captured images of birds at 8 control sites (no stag trees) and 16 treatment sites (augmented stag trees) on the mine rehabilitation area and 16 reference sites (natural stag trees) within the adjacent biodiversity offset area at WCC. This research will continue into the next reporting period.

Following on from a successful trial in 2018 of cardboard tube stock guards, the use of cardboard tube stock guards has been continued for plantings undertaken in 2019. Mulching around tube stock plantings was also continued throughout 2019. A relatively low mortality rate (<20%) of planted tube stock has been observed during the latter part of 2019 despite the continued drought conditions.

Table 15 presents a summary of the disturbance classes for the end of the previous reporting period, the end of the current reporting period, and a forecast as at the end of the next reporting period and **Figure 10** identifies the rehabilitation categories as at December 2019.

Table 15 – Rehabilitation Status

Mine Area Type[1]	Previous Reporting Period 2018	This Reporting Period 2019 (Actual)	Next Reporting Period 2020 (Forecast)
	2018 (ha)	2019 (ha)	2020 (ha)
A. Total mine footprint	569	575	585
B. Total active disturbance	361	372	386
C. Land being prepared for rehabilitation	50	35*	37
D. Land under active rehabilitation	159	168	188
E. Completed rehabilitation	0	0	0

[1] Refer Annual Review Guideline (p.11) for description of mine area types.

** Comprises areas seeded with a cover crop only, and those waiting on final native grass seeding when rainfall / soil moisture conditions allow.*

No areas of rehabilitation at WCC have received formal signoff for completion; however, areas under active rehabilitation as listed in item D above are trending well towards completion.

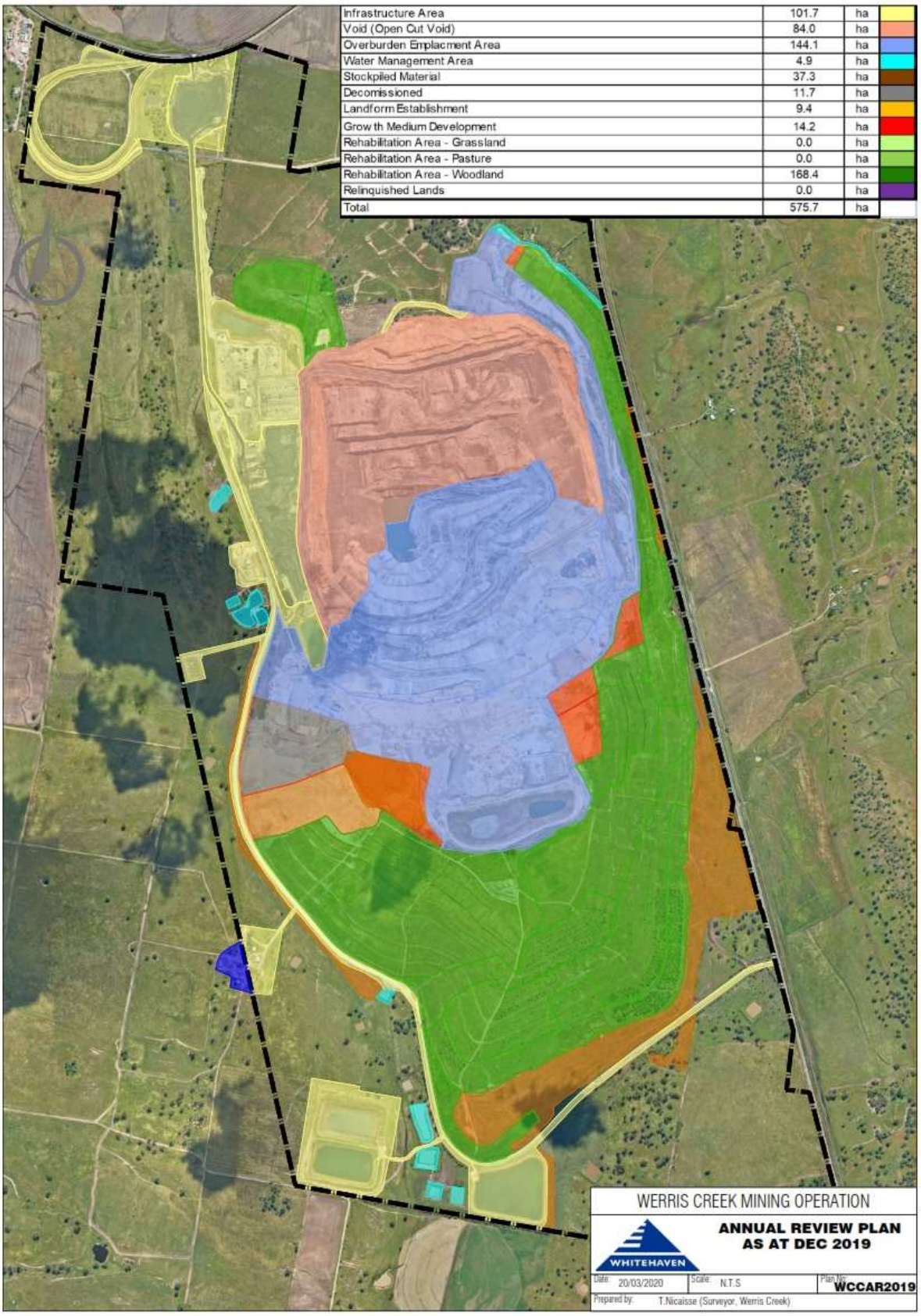


Figure 10: Rehabilitation Status at December 2019

8.3 REHABILITATION WORKS PROPOSED FOR NEXT REPORTING PERIOD

WCC aims to continue rehabilitation efforts during the 2020 reporting period largely in accordance with the projections under year 4/5 of the current MOP. These actions will focus on finalisation of decommissioned areas, landform development and growth medium development of the next section of the outer western batter and upper plateau. Works will also continue to focus on the in-fill planting of tube stock on all rehabilitation areas.

In addition to the progression of the rehabilitated landform, WCC will manage the existing areas of rehabilitation to ensure a continued trend towards the rehabilitation objectives as previously described.

8.4 KEY ISSUES TO ACHIEVING SUCCESSFUL REHABILITATION

There are four key issues in achieving successful rehabilitation, including:

- Poor vegetation establishment and growth due to poor soils/lack or nutrient;
- Weed and feral animal infestation;
- Excessive erosion and sedimentation resulting in land stability and vegetation growth issues;
- Harsh weather conditions limiting growth, i.e. extended periods of drought.

In cases where the performance is sub-optimal, additional management measures will be implemented (e.g. replanting, repairing landform and water management features, application of mulch/fertilisers, feral animal and weed control etc.).

9 COMMUNITY

WCC is located approximately 2 km south-southwest of the residential area of Werris Creek and 1.5km north of the rural community of Quipolly, and as such works closely with these communities to provide beneficial outcomes resulting from coal mining activities at WCC.

9.1 COMMUNITY ENGAGEMENT ACTIVITIES

WCC uses a variety of community engagement and consultation methods including the WCC Community Consultative Committee (CCC), regular updates to the Whitehaven Coal website, designated community telephone complaints lines, local media updates, local school visits, sponsorship of local community events and groups, and meetings as required with neighbours and a range of stakeholders including government and non-government agencies.

In addition there were three CCC meetings held during the 2019 reporting period.

9.2 COMMUNITY CONTRIBUTIONS & INITIATIVES

WHC, which includes WCC, contributes financially to the economy at both state and federal level and to the communities in which we operate. Employees and contractors also add a significant economic contribution to townships in the Liverpool Plains Shire Council (LPSC) through their purchases from local businesses. Whitehaven Coal has contributed in excess of $1 billion to the North West NSW region since 2012.

Community Enhancement Fund (CEF)

As part of the Life of Mine Project, WCC established the Community Enhancement Fund (CEF) to provide support for community projects in the Liverpool Plain Shire and in particular the Werris Creek township.

Whitehaven has pledged more than $1m in payments to the Liverpool Plains Shire Council for community projects. Projects funded to date by Whitehaven in the Liverpool Plains LGA include:

- $100k for projects at Australian Railway Museum, Werris Creek;
- $70k for playground improvements in Werris Creek;
- $65k for skate park, Werris Creek;
- $50k for projects in villages in Liverpool Plains Shire; and
- $20k for Royal Theatre, Quirindi.

9.3 COMMUNITY COMPLAINTS

WCC maintains a dedicated community telephone complaints line (02 6768 7001) which is published at the mine entrance, on the Whitehaven Coal website, and in community newsletters. In the event of a complaint or enquiry, details pertaining to the complainant, the complaint and action taken are recorded on the complaints register. The register is available on the Whitehaven website.

Blasting was the dominant cause for complaints within 2019, with 13 blast-related complaints of the 17 received. When compared to the 2018 reporting period, there was a reduction in blast-related complaints during 2019 with 19 complaints (relating to blasting) received during 2018 of a total of 35 complaints received in the previous 2018 reporting period. The total number of complaints and respective category of each complaint for the current 2019 reporting period is provided in **Table 16**. The previous 2017 and 2018 reporting periods data has also been provided for comparison.

For specific complaint details and actions taken, refer to the Complaint Database for 2019 located on the Whitehaven Coal website.

Table 16 – WCC Complaints 2019

Issue	2017	2018	2019
Blast - Vibration/Overpressure	9	19	12
Blast - Dust/Fume	1	2	1
Blast/Other	0	0	0
Noise – Mine	3	0	0
Dust – Mine	4	5	3
Surface Water	0	0	0
Odour	7	8	1
Water- evaporation	0	1	0
Number of Complaints Raised*	**24**	**35**	**17**

* Number of complaints does not equal the number of issues raised as one complaint can raise multiple issues

10 INDEPENDENT AUDITS

An Independent Environmental Audit (IEA) was undertaken at WCC on the 14th and 15th of June-2017. The full IEA report and Action Plans can be found on the Whitehaven Coal website.

- The remaining issues outstanding at the completion of the reporting period are summarised in **Table 17** and
- **Table 18**. All other actions not listed below have been completed previously.

Table 17 – Status of the Implementation of the 2014 IEA Action Plan

Condition	Recommendations	Actions taken
PA 10_0059 MOD2 Schedule 3 Condition 37	Finalise the construction of the visual bund and revegetate the visual bund.	The eastern visual bund has progressed to a point where by current WCC operations are not in view of the public, reducing potential visual and noise impacts. A minor amount of final shaping and rehabilitation to the northern most extent of the acoustic bund is outstanding and will be completed in early 2020

Table 18– Status of the Implementation of the 2017 IEA Action Plan

Condition	Recommendations	Actions taken
PA 10_0059 MOD2 Schedule 3 Condition 43	For the next MOP update, send the key sections of the MOP document to these agencies for review/comment.	WCC will ensure appropriate consultation will be undertaken during the next MOP revision.
EPL 12290 M9.1	It is unclear to the auditor as to why the EPL requires 60 minute noise monitoring surveys to assess compliance with the criteria which is LAeq15minute.	WCC will consider applying for a variation to EPL 12290.

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

11.1 REPORTABLE INCIDENTS

WCC reported seventy-five incidents during the reporting period, associated with elevated dust levels:

- TEOM exceedances on on the January 29th , October 29th , November 1st , 17th – 19th , 21st - 23rd , 26th , 28th and 29th and December 7th - 12th , 17th – 24th 2019, refer to section 6.3.2. Investigations demonstrated that WCC was not the cause of the elevated results.
- HVAS exceedances at Tonsley Park PM10 on February 13th and 19th, March 15th, October 17th and 29th, November 22nd and 28th, December 10th and 22nd, Kyooma PM10 on February 13th, October 17th and 29th, November 22nd and 28th, December 10th, 16th and 22nd, Escott PM10 on February 13th, October 17th and 29th, November 22nd and 28th, December 10th and 22nd and Glenara PM10 on February 13th and 19th, October 17th and 29th, November 22nd and 28th, December 10th and 22nd, refer to section 6.3.2. Investigations demonstrated that WCC was not the cause of the elevated results.

11.2 NON-COMPLIANCES

The compliance status of WCC against relevant approvals during the reporting period was assessed in Section 1 as at the end of the reporting period (2019). No non-compliances were recorded during th reporting period.

11.3 REGULATORY ACTIONS

WCC did not receive any regulatory actions during the reporting period.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

Activities to be completed in the next reporting period to improve the environmental or community performance of WCC have been included in **Table 19**.

Table 19 – Activities proposed to be completed in the next reporting period

Activity	Timeframe
Completion of review and, if necessary, revision of Environmental Management Plans	In accordance with PA 10_0059
Progression of remaining actions from the IEA	Ongoing
Continued community liaison and engagement with local stakeholders	Ongoing