INVINCIBLE COLLIERY ANNUAL REVIEW

1 January – 31 December 2020

FINAL

March 2021

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FINAL

Document Status

Rev No.	Reviewer		Approved for Issue	
	Name	Date	Name	Date
Final	Rod Williams	31/3/2021	Graham Goodwin	31/03/2021

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Annual Review Title Block

Name of operation:	Invincible Colliery
Name of operator:	Shoalhaven Coal Pty Limited
Development consent:	Invincible Coal Mine Extension Project Approval 07_0127 (MOD 5)
Name of holder of development consent:	Shoalhaven Coal Company Pty Limited
Mining leases:	ML1638, ML1635, CCL702, EL7517
Name of holder of mining leases:	Shoalhaven Coal Pty Limited
Water licence:	Water Access Licence (WAL) 36485 (10BL602586)
Name of holder of water licence:	Shoalhaven Coal Pty Limited
MOP start date:	29 September 2015
MOP end date:	29 March 2021
Annual Review start date:	1 January 2020
Annual Review end date:	31 December 2020

I, Graham Goodwin, certify that this audit report is a true and accurate record of the compliance status of Invincible Colliery for the period 1 January 2020 to 31 December 2020, and that I am authorised to make this statement on behalf of Shoalhaven Coal.

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:	Graham Goodwin
Title of authorised reporting officer:	Mining Engineering Manager
Signature of authorised reporting officer:	
Date:	31/03/2021

1.0 Statement of Compliance

This Annual Review provides a summary of the Invincible Colliery operations performance over the period 1 January to 31 December 2020 (referred to hereafter as the report period).

It is noted that during the report period an Independent Environmental Audit (IEA) was not undertaken. An IEA was undertaken in 2016 which identified non-compliances across EPL, Mining Lease (ML) and the Project Approval. An updated action plan is included **Appendix 1** (i.e. actions which have been addressed have been removed from the action plan). During the report period, Invincible Colliery operated in accordance with Project Approval 07_0127 – Mod 5 (Project Approval) Southern Extension Project, as approved by the Planning and Assessment Commission (PAC) on 2 February 2018. Invincible Colliery remained on care and maintenance during the report period whilst planning for the recommencement of operations was undertaken by Shoalhaven Coal Pty Limited (Shoalhaven Coal).

The compliance status for the report period is summarised in **Table 1.1**. Two non-compliances occurred during the reporting period associated with two events. The non-compliances related to the failure of air quality and meteorological monitoring equipment and monitoring in accordance with the prescribed sampling period. The non-compliances identified have been ranked according to the risk matrix included in **Table 1.2**. A brief description of each is provided in **Table 1.3**.

Table 1.1 Statement of Compliance

Relevant Approval	All conditions complied with?
Project Approval (PA) 07_1027 (Mod 5)	No
Environment Protection Licence (EPL) 1095	No
WAL 36485 (10BL602586)	Yes
Mining Lease (ML) 1635, ML 1638 and Consolidated Coal Lease (CCL) 702 and Exploration Lease 7517	Yes

Table 1.2 Compliance Status Key for Table 1.3

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	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

Source: Annual Review Guideline (NSW Government, 2015).

Table 1.3 Non-Compliance Recorded during the Report Period

Relevant Approval	Condition No.	Condition Description	Compliance Status	Comment	Where Addressed in Annual Review
Project Approval **Environment Protection Licence**	PA 07_0127 (Mod 5) Schedule 4 Condition 19 EPL 1095 Condition M2.2	Failure to monitor in accordance with Air Quality Monitoring Program High Volume Air Sampler (HVAS) unit did not collect 24 hour sample	**Non-compliant**	Monitoring of particulate matter was not undertaken on the scheduled HVAS run dates for 19, 25 and 31 July 2020 due to a mechanical fault associated with the HVAS unit. The non-compliance was reported to the Department of Planning, Industry and Environment (DPIE) on 17 September 2020.	**Section 6.3.3.2**
Project Approval	PA 07_0127 (Mod 5) Schedule 3 Condition 21	Failure to operate meteorological station	**Non-compliant**	The Invincible Colliery meteorological station MET1 failed to record data for the period 1 May to 3 July 2020 due to a technical issue associated with the unit's battery and solar panel. The non-compliance was reported to the DPIE on 17 September 2020.	**Section 6.2**

2.0 Introduction

Shoalhaven Coal owns the Invincible Colliery, an open cut coal mine located approximately 25 kilometres (km) north-west of Lithgow in New South Wales (NSW) (refer to **Figure 2.1**). The Cullen Bullen village is located approximately 3 km north-west of the Invincible Mine infrastructure area. Castlereagh Coal is the trading name for Shoalhaven Coal Pty Ltd which is part of the Manildra Group (Manildra), a family owned Australian group of companies providing integrated and diverse agribusiness operations. The Invincible Colliery was placed in care and maintenance in April 2013 when the available known and reported coal reserve within the approved Invincible mining area was exhausted and Coalpac Pty Ltd, were unable to secure a modification of the Project Approval to allow further mining in adjacent areas. As a result, administrators were appointed on 18 October 2013, and Coalpac Pty Ltd was placed into voluntary liquidation on 17 November 2014. Castlereagh Coal purchased Invincible Colliery, and the nearby Cullen Valley Mine, in 2015 to secure its supply of a speciality coal product, known as 'nut' coal, for Manildra's Shoalhaven Starches Plant located at Bomaderry on the NSW South Coast. Shoalhaven Starches Plant previously sourced speciality nut coal from Invincible Colliery prior to cessation of mining in 2013.

Since acquiring the Invincible Colliery, Shoalhaven Coal's focus has been to recommence mining operations to source coal for Manildra's operations in Nowra. Shoalhaven Coal has sought to modify the Invincible Colliery Project Approval in accordance with Section 75W of the *Environmental Planning and Assessment Act 1979*. The modification proposes to extend open cut mining operations to the south of the existing approved mining area into the Southern Extension Area. The proposed modification is known as the Southern Extension Project. The Environmental Assessment was publicly exhibited between 27 September and 8 November 2016, and subsequently approved by the NSW Planning and Assessment Commission (PAC) on 5 February 2018, refer to **Section 3.1**.

Shoalhaven Coal operated the colliery under a care and maintenance arrangement during the report period.

Invincible Colliery is located in an area of historical mining operations associated with western coalfields of NSW, including the former mining operations at Cullen Valley Mine, Baal Bone Colliery, Pine Dale and Ivanhoe Colliery. The Invincible site has had a long history of mining operations commencing in 1901. Open cut mining has been carried out at Invincible Colliery at various times ranging from the 1940s through to the mine being placed onto care and maintenance in 2013. The existing operations are shown in **Figure 2.2**.

2.1 Mine Contacts

The Mining Engineering Manager is responsible to the regulatory authorities for all aspects of environmental compliance at the site. The Mining Engineering Manager's contact details are summarised in **Table 2.1.**

Table 2.1 Key Personnel Responsible for Environmental Management

Name	Role	Company	Contact details
Graham Goodwin	Mining Engineering Manager	Manildra Group	Invincible Colliery Castlereagh Highway Cullen Bullen, NSW 2790 M | 0418 830 598

2.2 Annual Review Requirements

During the report period, Invincible Colliery operated in accordance with Project Approval.

Condition 4 of Schedule 5 of the Project Approval requires an Annual Review (AR) to be prepared and submitted to the DPIE. This report has been prepared in accordance with *NSW Government Annual Review Guidelines* (NSW Government, 2015) and details the operational and environmental management activities of Invincible Colliery during the report period. Project Approval requirements along with an explanation of where each requirement is addressed within this document are provided in **Table 2.2**.

Table 2.2 Project Approval 07_0127 (MOD 5) Conditions for the Annual Review

Conditions		Addressed in
Schedule 3 – Specific Environmental Conditions Monitoring of Coal Transport		
40.	The Proponent must: a) Keep accurate records of the: • Amount of coal transported from the project in each calendar year (on a monthly basis) • Number of coal truck movements generated by the project to the Mt Piper Power Station and the Shoalhaven Starches Plant (on a daily basis) b) include these records in the Annual Review.	**Section 4.0**
Schedule 3 – Specific Environmental Conditions Waste Minimisation		
43.	(e) monitor and report on effectiveness of the waste minimisation and management measures in the Annual Review.	**Section 6.10**
Schedule 5 – Environmental Management, Monitoring, Auditing and Reporting Annual Reporting		
4.	By the end of March each year, or other timing as may be agreed by the Secretary, the Proponent must review the environmental performance of the project to the satisfaction of the Secretary. This review must:	**This document**
	(a) describe the project (including any rehabilitation) that was carried out in the past financial year, and the project that is proposed to be carried out over the next year;	**Sections 4.0, 6.0** and **8.0**
	(b) include a comprehensive review of the monitoring results and complaints records of the project over the past financial year, which includes a comparison of these results against the: • relevant statutory requirements, limits or performance measures/criteria • requirements of any plan or program required under this approval • monitoring results of previous years • relevant predictions in the EA;	**Sections 6.0** and **9.2**
	(c) identify any non-compliance over the past financial year, and describe what actions were (or are being) taken to ensure compliance.	**Sections 1.0** and **11.0**
	(d) identify any trends in the monitoring data over the life of the project;	**Sections 6.0**
	(e) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and	**Section 6.1**
	(f) describe what measures will be implemented over the current financial year to improve the environmental performance of the project.	**Section 6.0**

Note: For the purposes of the Annual Review, Condition 4(a), 4(b), 4(c) and 4(f) have been interpreted to be the calendar year which is consistent with previous Annual Reviews prepared for Invincible Colliery and aligns with a required submission date of March.

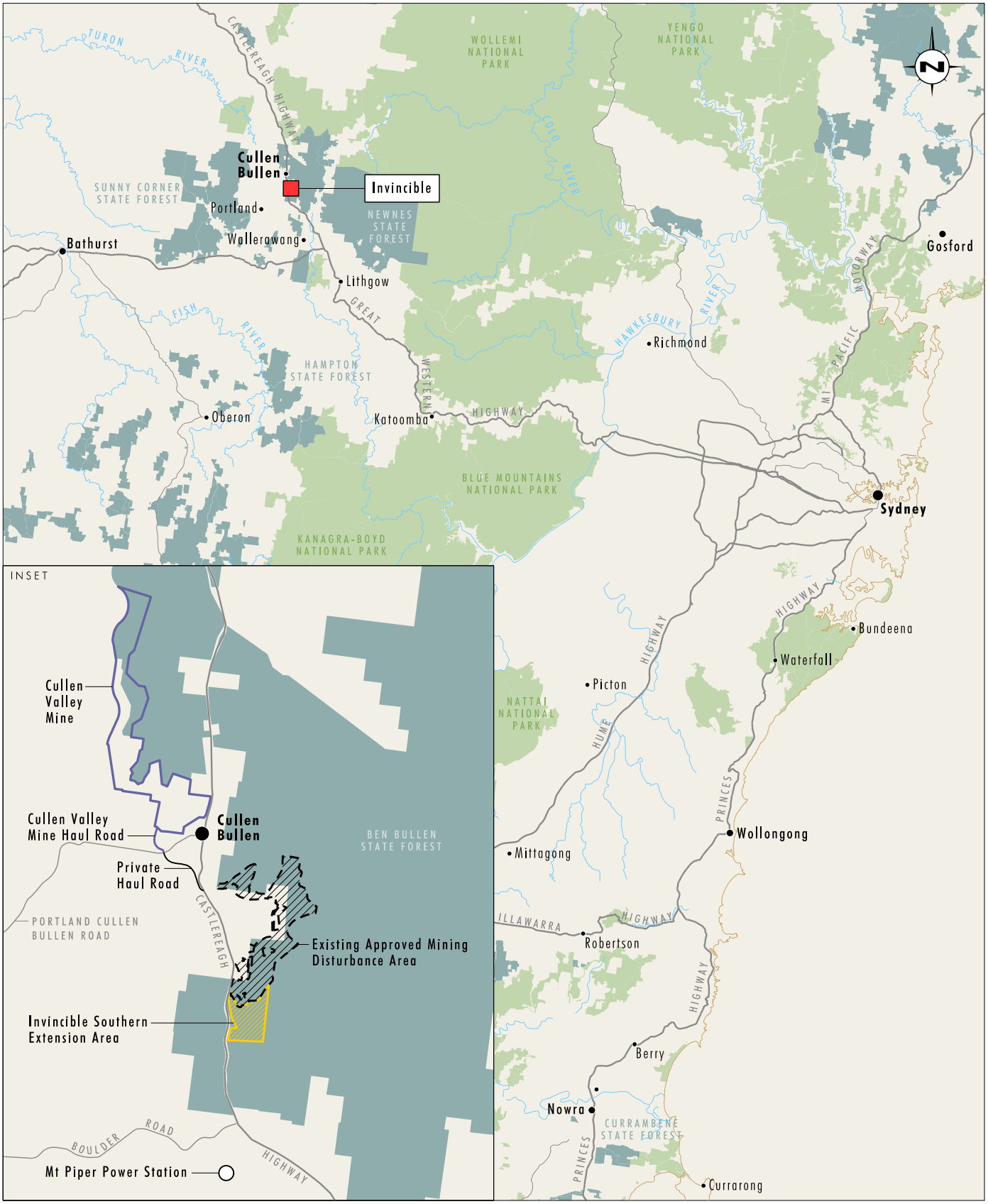


FIGURE 2.1

Locality Plan
Invincible Colliery

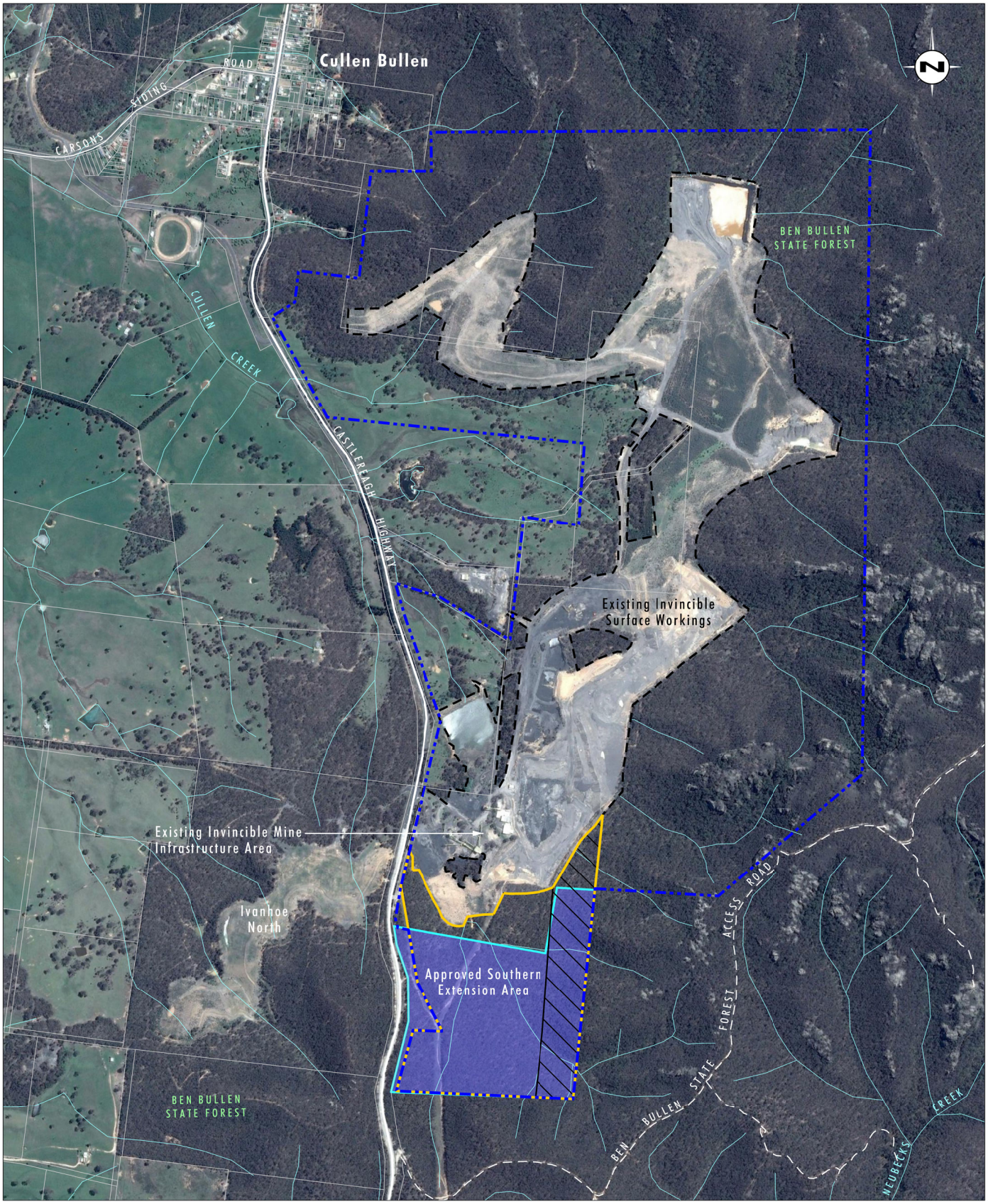


Image Source: Google Earth - CNES/Astrium (Oct 2016)
Data Source: LPI (2016), Forest Corporation of NSW (2015)

0 0.25 0.5 1.0km
1:20 000

Legend

- Existing Approved Mining Disturbance Area
- Approved Southern Extension Area
- Mining Restriction Area
- Invincible Project Approval Boundary
- MLA431

FIGURE 2.2

Invincible Colliery
Southern Extension Project

3.0 Approvals

The operations at Invincible Colliery are subject to a range of standards and performance measures. Environmental approvals, licences and leases currently held by Invincible Colliery are listed in **Table 3.1.**

3.1 Development Consent History

The Invincible Project Approval granted on 4 December 2008 which permits mining for eight years from the date of grant of the approval (i.e. to 4 December 2016). This 2008 Project Approval has subsequent modifications approved in 2009 and 2010.

During 2016, Shoalhaven Coal submitted an application to DPIE to modify the Invincible Project Approval to extend the life of mining operations at Invincible Colliery and obtain approval to extend the open cut mining operations to an area immediately south of the existing operations (i.e. the Southern Extension Project) The Invincible Southern Extension Project area is located within the Ben Bullen State Forest to the east of the Castlereagh Highway (refer to **Figure 2.2**). The Invincible Southern Extension Project was approved by the PAC on 2 February 2018. The approval of the Southern Extension Project is noted as MOD 5 on the Project Approval.

The Invincible Southern Extension Project includes:

- extending the period in which mining can continue for a period of 8 years from approval of the modification application
- extending the open cut mining area to mine down to, and including, the Lithgow Seam to the south of the existing mine in the Southern Extension Area
- maximum mining and production rates of up to 1.2 Mtpa
- product coal transport arrangements (with coal to be transported from the site by road truck to either the Shoalhaven Starches Plant or Mt Piper Power Station)
- use of existing open cut voids and former underground workings for temporary water storage
- continued use of existing Invincible Colliery infrastructure (including maintenance work, and minor upgrades and operation of the existing Invincible Coal Preparation Plant (Invincible CPP), and
- rehabilitation of the Southern Extension Area and existing disturbance areas at Invincible Colliery by reshaping mining areas to remove voids and revegetating the reshaped landform with locally endemic woodland and forest communities.

Table 3.1 Current Approvals, Licences and Leases

Approval	Date Granted	Expiry Date	Details
Project Approval (PA) 07_0127 (MOD 5)	2 Feb 2018	31 December 2025	The MOD 5 Project Approval applied through the reporting period.
Environment Protection Licence (EPL) 1095	28 Feb (anniversary date)	Renewed annually	Held by Shoalhaven Coal over the Invincible premises.
Mining Lease (ML) 1635	10 Sep 2009	10 Sep 2030	Extends to the surface and covers the existing open cut mining areas at Invincible.
Mining Lease (ML) 1638	6 Nov 2009	6 Nov 2030	Extends to the surface and covers the existing open cut mining areas at Invincible. ML 1638 extends into the northern end of the Southern Extension Area.
Consolidated Coal Lease (CCL) 702	26 Nov 1990	24 Nov 2024	Variable depth.
Mining Lease Application 431	(Not yet determined) Application submitted 24 July 2012	Pending determination	Mining Lease Application for determination by the Division of Resources and Geoscience.
Mining Lease Application 545	(Not yet determined) Application submitted 11 October 2017	Pending determination	Mining Lease Application for determination by the Division of Resources and Geoscience.
Exploration Licence 7517	16 Apr 2010	Pending determination	Variable depth.
WAL 35978 (10BL602584) "Washery Bore"	24 Dec 2012	23 Dec 2027	Authorises the extraction of 26 units from the NSW Murray-Darling Porous Rock Groundwater Sources Water Sharing Plan.

3.2 Approved Management Plans

The environmental management plans listed below are the approved management plans for the Invincible Colliery that applied during the report period.

- Environmental Management Strategy (Coalpac, 2009a)
- Environmental Monitoring Program (Coalpac, 2009b)
- Aboriginal Cultural Heritage Management Plan (Coalpac, 2009c)
- Air Quality Monitoring Plan (Coalpac, 2009d)
- Blast Monitoring & Management Plan (Coalpac, 2009e)
- Landscape Management Plan (Coalpac, 2009f)
- Mining Operations Plan (Sedgman, 2015)
- Noise Monitoring Program (Coalpac, 2009g)
- Pollution Incident Response Management Plan (Umwelt, 2020)
- Road Closure Management Plan (Coalpac, 2010)
- Water Management Plan (Coalpac, 2009h).

3.3 Management Plans in Preparation

Prior to the re-commencement of mining, a range of environmental management plans are required to be developed in accordance with the Project Approval. During 2018 several draft management plans were distributed to stakeholders for comment. Following receipt of comments, Shoalhaven Coal will submit the management plans to Department of Planning, Infrastructure and Environment (DPIE) for review and seek the Secretary's satisfaction prior to recommending operations. Shoalhaven Coal continues to update the community of the proposed mining schedule via the Community Consultative Committee. The status of these management plans is detailed in **Table 3.2**.

Table 3.2 Status of Project Approval 07-0127 Management Plans

Management Strategy/Plan	Approval Agency	Stakeholders consulted	Date submitted	Comment
Noise Management Plan	DPIE	EPA	16 November 2018	Draft document issued Awaiting comments
Blast Management Plan	DPIE	EPA, RMS and Lithgow Council	N/A	N/A – Blasting not proposed at this point in time
Air Quality Management Plan	DPIE	EPA	16 November 2018	Draft document issued Awaiting comments
Water Management Plan	DPIE	DPI Water and EPA	20 December 2018	Draft document issued Awaiting comments from DPI Water and EPA
Biodiversity Management Plan	DPIE	DPIE (formerly OEH)	16 November 2018	Comments received
Aboriginal Cultural Heritage Management Plan	DPIE	DPIE (formerly OEH), Registered Aboriginal Parties	21 November 2018 (RAPs only)	Draft document issued Awaiting comments
Transport Management Plan	DPIE	DPIE	16 November 2018 (Lithgow Council) 28 November 2018 (RMS)	Comments received
Rehabilitation Strategy	DPIE	DPIE	31 July 2018	Draft document issued Awaiting comments
Rehabilitation Management Plan (MOP)	NSW RR	DPIE, NSW RR, OEH, DPI Water, Lithgow Council and CCC	16 November 2018	Comments received (except comments from DPI Water)
Pollution Incident Response Management Plan	N/A	EPA	Updated December 2020	Updated PIRMP available on Castlereagh Coal website
Environmental Management Strategy	N/A	DPIE	N/A	Draft document not yet issued

Shoalhaven has issued draft documents to the respective approval agencies and has received comments on all stakeholders except as noted in **Table 3.2**. All management plans will be finalised prior to recommencement of operations at Invincible.

4.0 Operations Summary

A summary of the operations undertaken at Invincible Colliery during the report period are included in the following sections. It is noted that Invincible Colliery was on care and maintenance during the report period and therefore there were no mining operations undertaken.

4.1 Mining Operations

As discussed in **Section 3.1**, on 5 February 2018 the Invincible Colliery Southern Extension Project was approved by the PAC. This approval allows the mining down to, and including, the Lithgow Seam to the south of the existing mine in the Southern Extension Area (refer to **Figure 2.2**). There was no mining undertaken at Invincible Colliery during 2020. The proposed timing for the recommencement of mining at Invincible Colliery Area is being confirmed by Shoalhaven Coal. Production figures for the report period are detailed in **Table 4.1**.

Prior to the re-commencement of mining, a range of environmental management plans are required to be developed in accordance with the Project Approval. The timing for the recommencement of mining operations has not yet been confirmed by Shoalhaven Coal. A number of the draft management plans have been distributed to stakeholders for comment with Shoalhaven Coal to update the community of the proposed mining schedule via the Community Consultative Committee once the timing has been confirmed. DPIE will be advised of the recommencement date as part of the submission of relevant management plans as required by the Project Approval.

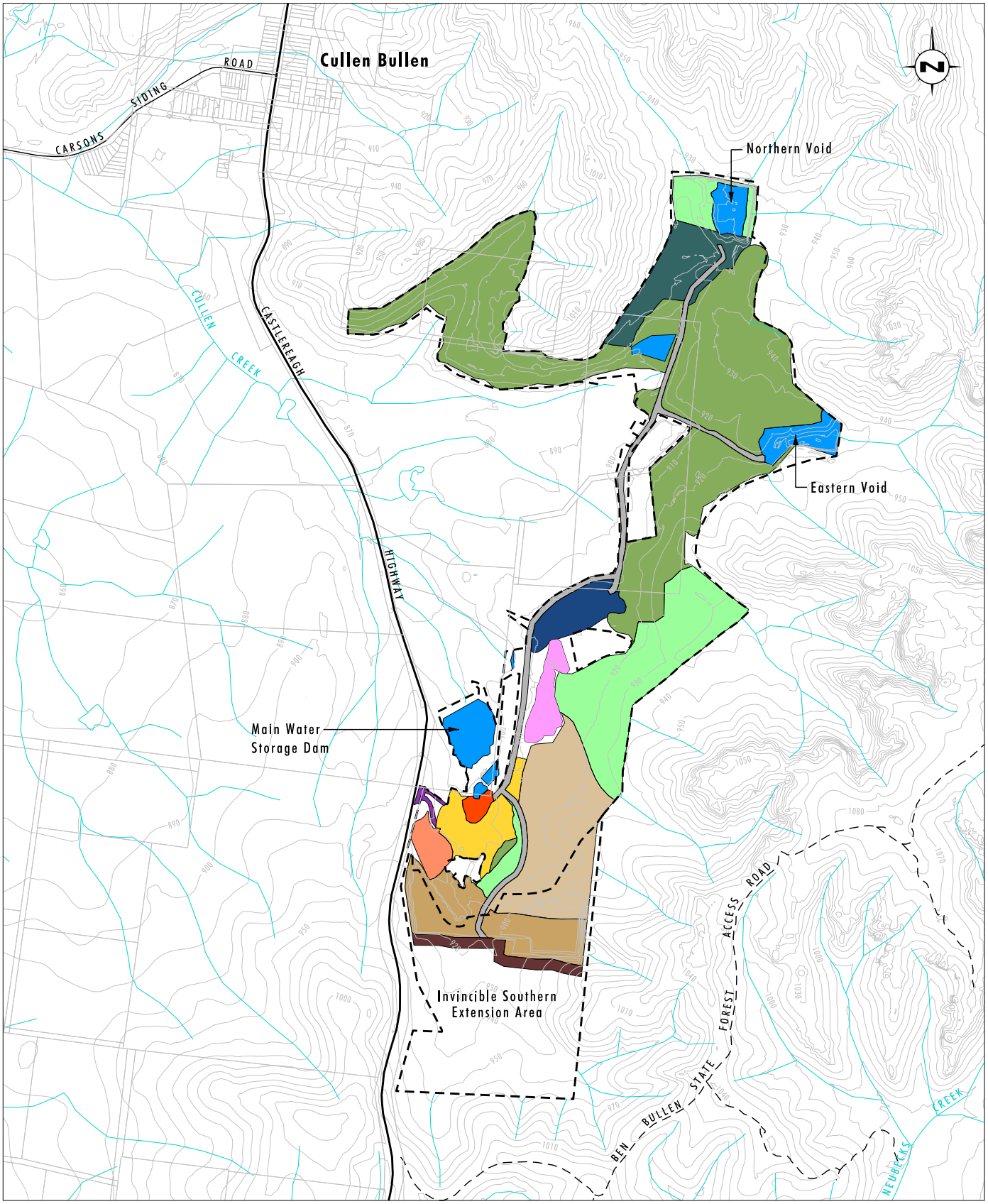
A shaft located in ML 1635 was exposed by the Rural Fire Service whilst constructing a fire break, during the 2019 report period. Shoalhaven Coal has since erected a fence and warning signs around the area.

Table 4.1 2020 Production Summary

Material	Approved limit	Previous reporting period (actual 2019)	This reporting period (actual 2020)	Next reporting period (forecast 201)
Waste rock/ overburden	-	0	0	Not yet confirmed
Coal works Coal mining	0 – 2Mtpa handled (EPL) 0.5 - 2Mtpa produced (EPL) 1.2Mtpa extraction (PA)	0	0	Not yet confirmed
Coarse reject	-	0	0	Not yet confirmed
Fine reject (tailings)	-	0	0	Not yet confirmed

4.2 Vehicle Movements

In accordance with Condition 40 of Schedule 3 of the Project Approval, records regarding the amount of coal transported from the mine site and annual number of coal truck movements for 2020 is required to be included within this report. As the site was in care and maintenance during the report period, there was no coal transported from Invincible Colliery during 2020.



Data Source: LPI (2016)
Note: Contour Interval 10m

Legend

- Existing Approved Mining Disturbance Area
- Temporary Stabilisation Area
- Proposed Active Mining
- Proposed Overburden Emplacement Area
- Pre Strip
- Rehabilitation - Vegetated (to date)
- Shaped Not Seeded (to date)
- Coal Stockpile - Product
- Coal Stockpile - ROM
- Haul Road/Access Road
- Sealed Access Road
- Infrastructure/Laydown Area
- MIA/Administration
- Water Management Area
- Tailings Drying Area

FIGURE 4.1

Mining and Rehabilitation Status 2019
Invincible Colliery

File Name (A4): R130/3968_170.dgn
20190312 11.57

5.0 Actions Required from Previous Annual Review

Following submission of the 2019 Annual Review to DPIE on 30 March 2020, DPIE provided comment on the Annual Review in correspondence to Shoalhaven on 24 April 2020. DPIE advised that the Annual Review was considered to generally satisfy the requirement of the Approval in relation to Annual Reviews and requested that the Annual Review be made publicly available on the company website.

Table 5.1 Actions Required from 2019 Annual Review

DPIE Requirements	Works undertaken	Addressed in this document
It is requested that the 2020 Annual Review provides information, in the format of a table, on the status and/or approval of any management plans during the 2020 reporting period.	An update on progress of management plans is included in this Annual Review.	**Table 3.3**
In accordance with Condition 13 of Schedule 5, MOD 5, it is requested that a copy of the 2019 Annual Review is uploaded to the website within a month from the date of this letter.	In accordance with Condition 13 of Schedule 5, Shoalhaven Coal has made a copy the 2019 Annual Review publicly available on its website:	N/A

6.0 Environmental Performance

The following sections provide a summary of environmental monitoring and management undertaken during the report period. Invincible Colliery undertakes a range of environmental monitoring. Environmental monitoring locations for the site are shown on **Figure 6.1**. Environmental monitoring data and a copy of the current Invincible Colliery management plans are published on the Castlereagh Coal website (http://www.castlereaghcoal.com.au) in accordance with the requirement of the Project Approval. An overview of environmental performance at Invincible Colliery is provided in the following sections. A summary of the environmental performance during the report period is presented in **Table 6.1**.

6.1 Summary of Performance against EA Predictions

The Invincible Colliery has been subject to three Environmental Assessments (EA) and several modifications in the last 14 years of operations. The Invincible Expansion Project involving expanded operations to the north and south of the original mining area was assessed by the EA dated April 2008 (R.W. Corkery & Co. Pty Limited, 2008). An EA was also prepared for the Invincible Colliery Southern Extension Project (Umwelt, 2016) which assessed the expansion of operations immediately to the south of the existing operations.

As there have been no operations undertaken during the report period in accordance with the EA for the Invincible Southern Extension Project (Umwelt, 2016), the results of environmental monitoring obtained during the report period has been compared to the predictions in the EA dated April 2008 (R.W. Corkery & Co. Pty Limited, 2008) and associated modification documents dated February 2009 (R.W. Corkery & Co. Pty Limited, 2009) and June 2010 (Hansen Bailey, 2010) within this Annual Review. During the report period, Invincible Colliery was on care and maintenance and there were no mining activities conducted. When mining operations recommence the Annual Review will report against the EIS predictions in the Invincible Southern Extension Project (Umwelt, 2016). Environmental monitoring undertaken during the report period included noise, air quality, surface and groundwater quality and biodiversity.

6.1.1 Air Quality Predictions against the EA

The EA (R.W. Corkery & Co. Pty Limited, 2008) predicted that adoption of air quality control measures including dust suppression, progressive rehabilitation and minimisation of clearing in advance of operational activities would result in annual average PM_{10} and dust deposition concentrations being below regulatory criteria. The air quality modelling completed for the EA (R.W. Corkery & Co. Pty Limited, 2008) was undertaken assuming that mining operations were being conducted. Invincible Colliery operated in a care and maintenance capacity during the report period and the TSP, PM_{10} and dust deposition concentrations recorded were below regulatory criteria for the reporting period. The details regarding the air quality monitoring results can be found in **Section 6.3**.

6.1.2 Water Quality Predictions against the EA

Clean surface water is diverted away from active disturbance areas and runoff from disturbed areas is collected and stored for operational uses such as dust suppression. The EA (R.W. Corkery & Co. Pty Limited, 2008) predicted that the project was unlikely to have a significant impact on local or regional surface water quantity or quality. The EA (R.W. Corkery & Co. Pty Limited, 2008) did not predict any additional water quality impacts for the modification proposals. Water quality monitoring was undertaken on eight discharge events during the report period. All the results complied with the EPL water quality concentration limits with the exception of the March 2020 total suspended solid result. Further details on the surface water quality monitoring results are provided in **Section 6.4**.

6.1.3 Groundwater Predictions against the EA

As noted in **Section 6.5** , there have been no impacts detected on groundwater levels and water quality at Invincible Colliery.

6.1.4 Noise Predictions against the EA

The EA (R.W. Corkery & Co. Pty Limited, 2008) modelling results indicated that noise mitigation measures would result in compliance with project specific noise criteria except for a 1dB(A) exceedance during calm daytime conditions at the Billabong property. Under worst case scenario conditions, the following exceedances were predicted:

- 2dB(A) at Hillview property
- between 4dB(A) and 7dB(A) at Billabong property
- 1dB(A) at Cullen Bullen west
- between 2dB(A) and 4dB(A) at Cullen Bullen south property.

As detailed in **Section 6.6** , noise monitoring has shown that noise emissions have been inaudible at all locations since the mine was placed on care and maintenance in 2013.

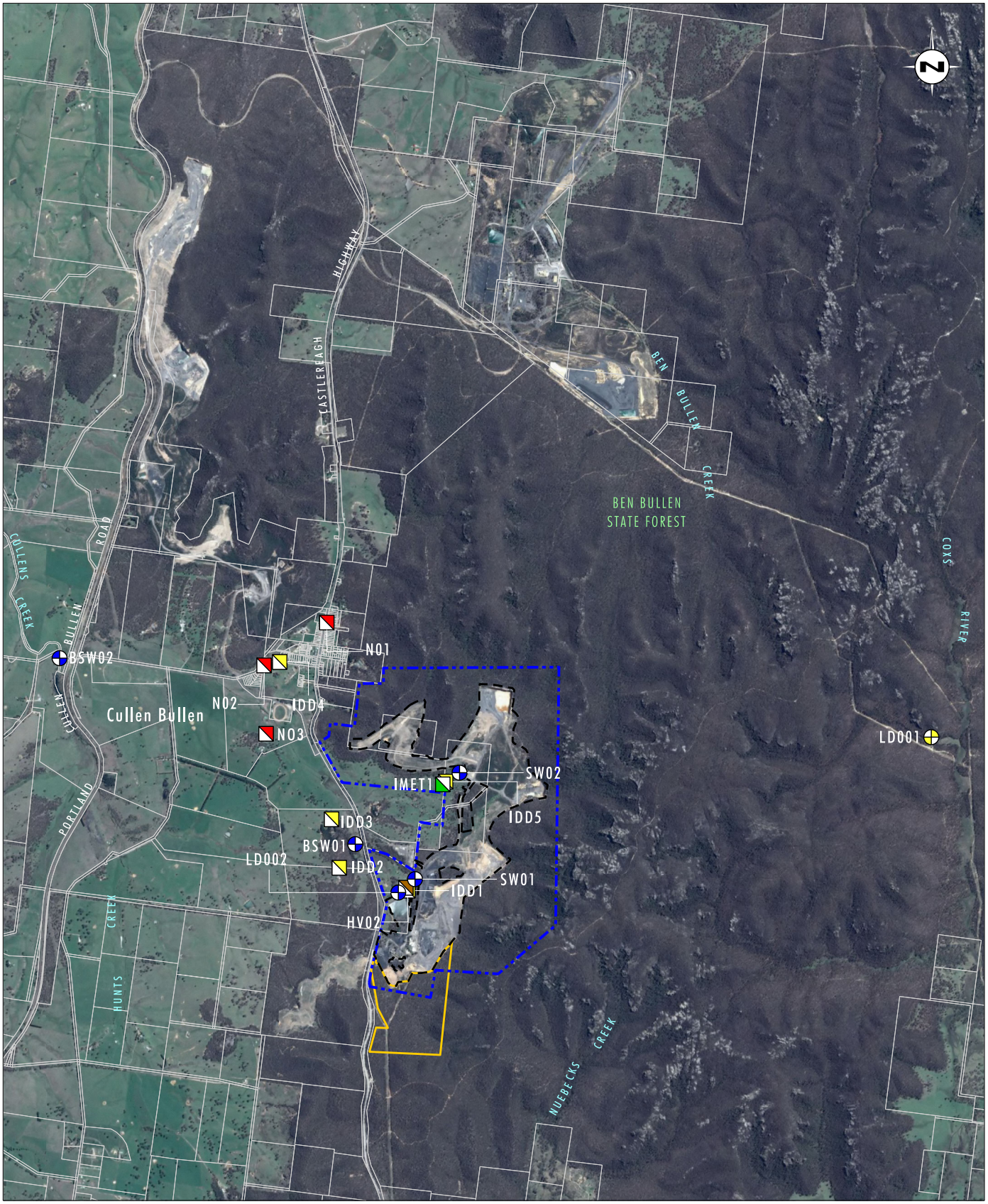


Image Source: Google Earth - CNES/Astrim (2016)

0 0.5 1.0 2.0km
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Legend

- Existing Approved Mining Disturbance Area - Invincible
- Invincible Project Approval Boundary
- Approved Southern Extension Area
- Blast Monitoring Point
- Depositional Dust Monitoring Point
- Meteorological Station
- HVAS Monitor
- Noise Monitoring Point
- Surface Water Monitoring Point
- Groundwater Monitoring Point

FIGURE 6.1

Environmental Monitoring Locations
Invincible Colliery

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20190312 12.00

Table 6.1 Summary of Environmental Performance during the Report Period

Aspect	Approval Criteria/ EIS Prediction	Performance during the reporting period	Trend/key management implications	Implemented/proposed management actions
Air Quality (Refer to Section 6.3)	Refer **Section 6.3.2**/ Refer **Section 6.1.1**	Annual average deposited dust, PM_{10} and TSP levels were below the respective performance criteria. Elevated dust, PM_{10} and TSP levels were recorded in January 2020 in response to widespread fires burning in the vicinity of Invincible Colliery.	Refer to **Section 6.3.4** Recorded air quality levels are generally consistent with previous years when Invincible has been on care and maintenance.	No further action required.
Surface Water Quality (Refer to Section 6.4)	Refer **Section 6.4.2** / Refer **Section 6.1.2**	Water quality across the Invincible Colliery water monitoring network was generally compliant with respective concentration limits.	Refer to **Section 6.4.4** Water quality is generally consistent with previous years when Invincible has been on care and maintenance.	No further action required.
Groundwater (Refer to Section 6.5)	Refer **Section 6.5.2** / Refer **Section 6.1.3**	Groundwater was unable to be monitored during the report period due to bore accessibility issues caused by bushfire damage in the Ben Bullen State Forest.	Groundwater quality monitoring results (excluding the 2020 report period) are further discussed in **Section 6.5.4**	Liaise with NSW Forestry to confirm if access to LD001 will be reinstated (i.e. replace bridge).
Noise (Refer to Section 6.6)	Refer to **Section 6.6.2** / Refer to **Section 6.1.4**	Compliant	Refer to **Section 6.6.4** Noise emissions were inaudible at all private residences during the report period, which is consistent with monitoring undertaken during care and maintenance.	No further action required.
Biodiversity (Refer to Section 6.7)	Refer to **Section 6.7.2**/ Refer to **Section 8.3**	Compliant	Refer to **Section 6.7.3**	Biodiversity monitoring program will continue in accordance with regulatory requirements.

6.2 Meteorological Monitoring

The Invincible Colliery weather station (IMET1) is located within the Lot 113 biodiversity offset area as shown in **Figure 6.1**. A summary of monthly meteorological monitoring is provided in **Table 6.2**.

IMET1 was not operational during the period 1 May to 3 July 2020 due to a mechanical fault associated with the device's battery and solar panel. This fault was diagnosed during the June 2020 scheduled download of the meteorological station. Replacement parts were installed successfully on 3 July 2020, with a calibration check performed at the time of reinstallation.

As a result, meteorological data for Invincible Colliery was not recorded during this time. The DPIE was notified of the issue on 17 September 2020.

6.2.1 Rainfall

Invincible Colliery received 687.0 mm of rainfall over 138 rain days during the report period. The highest rainfall occurred during February (110.0 mm), while the lowest rainfall was recorded during September had the lowest rainfall (48.0 mm). A summary of monthly rainfall data is provided in **Table 6.2**.

6.2.2 Temperature

Air temperature is measured at 2 and 10 metres above ground level at Invincible Colliery. The maximum temperature recorded during the report period was in December (38.2 @ 2 m, 37.9@10 m) and the lowest temperature occurred in August (-3.9 @ 2 m, -3.5 @10 m). Maximum and minimum monthly temperatures are summarised in **Table 6.2**.

6.2.3 Humidity

The highest humidity recorded during the report period at Invincible Colliery occurred from July to December (100%) and the lowest was during January and October (9.6%), as shown in **Table 6.2**.

6.3 Air Quality

6.3.1 Environmental Management Measures

There were no mining activities undertaken during the report period. On-site activities were limited to inspections conducted for care and maintenance of the mine site and environmental monitoring. As such, impacts to air quality were minimal. Air quality monitoring is undertaken in accordance with the Air Quality Monitoring Program (AQMP) (Coalpac, 2009c). The air quality monitoring network consists of five dust deposition gauges and one High Volume Air Sampler (HVAS) which measures particulate matter <10 µm (PM_{10}) (refer to **Figure 6.1**).

Air quality impacts at Invincible Colliery are managed in a manner that minimises generation of airborne and visual dust.

6.3.2 Performance Criteria

Shoalhaven Coal is required to ensure that dust and particulate emissions do not cause exceedances of the criteria specified by the Project Approval. The air quality impact assessment criteria specified in the Project Approval are provided in **Table 6.3**.

Table 6.2 Invincible Colliery Weather Data

Month	Rainfall (mm)	Cumulative Rainfall (mm)	No. of rain days/month	Air temp @ 2m (°C)		Air temp @ 10m (°C)		Humidity (%)	
				Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
January 2020	53.2	53.2	13	10.7	38.2	11.3	37.9	9.6	93.6
February 2020	110.0	163.2	20	6.7	37.8	8.0	37.7	12.5	95.6
March 2020	89.6	252.8	13	5.5	29.7	6.0	29.7	11.6	98.1
April 2020	88.0	340.8	7	1.7	23.6	2.2	23.4	16.8	98.4
May 2020	-	-	-	-	-	-	-	-	-
June 2020	-	-	-	-	-	-	-	-	-
July 2020	50.0	390.8	15	-2.9	14.8	-2.4	15.1	25.1	100.0
August 2020	70.6	461.4	16	-3.9	18.0	-3.5	18.5	11.7	100.0
September 2020	48.0	509.4	12	-1.3	22.4	-0.7	22.4	21.9	100.0
October 2020	56.0	565.4	15	1.7	24.6	2.5	24.8	9.6	100.0
November 2020	50.0	615.4	11	3.8	33.0	4.2	33.1	12.9	100.0
December 2020	71.6	687	16	3.7	35.4	4.2	35.9	11.1	100.0
Total	**687**	-	**138**	-	-	-	-	-	-

- Meteorological data was unable to be recorded for the period 1 May to 3 July.

Table 6.3 Air Quality Performance Criteria

Pollutant	Averaging Period	Criterion
Total suspended matter (TSP) matter	Annual average	90 µg/m^3
Particulate matter <10µm (PM_{10})	Annual average	30 µg/m^3
	24 hour average	50 µg/m^3
Deposited dust	Annual average (maximum total)	4 g/m^2/month

6.3.3 Environmental Outcomes

6.3.3.1 Dust Deposition

Deposited dust is monitored on a 30 ±2 day cycle at five representative locations around the mine site (dust deposition gauges IDD1 to IDD5) (refer to Figure 6.1). The annual average criterion for deposited dust (4 g/m^2/month) was not exceeded at any of the dust deposition gauges during the report period. The 2020 annual average dust levels for all locations was less than 2 g/m^2/month and therefore complied with air quality performance criteria. It is noted that January results for monitoring locations IDD1-IDD5 were considered to be influenced by regional bushfire events. The exclusion of the January 2020 results from the annual average calculation however represents a maximum change of 0.6 g/m^2/month. The monthly deposited dust monitoring results and annual averages for 2020 are shown in **Table 6.4** and is compared with historical results in **Appendix 2.**

Table 6.4 Deposited Dust Monitoring Results

Date	Total Insoluble Solids (g/m^2/month)				
	IDD1	IDD2	IDD3	IDD4	IDD5
January 2020	7.7	3.1	3.7	3.1	1.5
February 2020	1.2	1.1	1.1	0.7	0.4
March 2020	0.4	0.2	0.3	0.2	0.4
April 2020	0.5	0.2	0.5	1.4	0.4
May 2020	0.3	0.3	1.1	0.4	0.8
June 2020	0.2	0.1	0.1	0.1	<0.1
July 2020	0.1	0.1	0.1	<0.1	<0.1
August 2020	3.9	0.4	0.6	1.0	0.5
September 2020	0.5	0.6	0.7	0.2	0.2
October 2020	0.9	0.6	1.0	0.5	1.2
November 2020	0.5	0.4	0.5	0.5	0.7
December 2020	0.5	0.1	0.2	<0.1	1.2
Annual Average 2020	**1.4**	**0.6**	**0.8**	**0.7**	**0.6**
Annual Average 2020 (Excluding January 2020 result)	**0.8**	**0.4**	**0.6**	**0.5**	**0.5**

6.3.3.2 Particulate Matter

Monitoring of particulate matter was conducted during 2020. Total suspended particulates are estimated from the PM_{10} concentrations. The annual average criteria for PM_{10} (30 µg/m^3) and TSP (90 µg/m^3) were not exceeded during the report period. The annual average PM_{10} monitoring results for the reporting period are shown in **Table 6.5**.

Table 6.5 Particulate Matter (PM_{10}) and Total Suspended Particulates (TSP) Annual Average Results

Averaging period	PM_{10} (µg/m^3)	TSP (µg/m^3)*
Annual Average 2020	11.1	27.8
Annual Average 2020 (Excluding results influenced by extraordinary events)	7.1	17.8
Annual Average Criterion	30	90

**Total suspended particulates are estimated from the PM_{10} concentrations.*

On 19, 25 and 31 July 2020, HV02 failed to run due to a mechanical fault associated with the flow sensor of the HVAS unit. Invincible Colliery attempted to re-run the HVAS prior to the next scheduled run date however, the attempts were unsuccessful on each occasion. Therefore, neither the scheduled monitoring event, nor re-run event was able to be conducted. The faulty unit was replaced with a functional, calibrated unit on 3 August 2020. The non-compliance was reported to the DPIE on 17 September 2020.

6.3.4 Trends in Data

6.3.4.1 Dust Deposition

Table 6.6 presents the annual average deposited dust levels over the previous five years. The 2020 annual average deposited dust levels are within the range of results recorded in the previous five years at all sites (with the exception of IDD1). The 2020 annual average dust deposition levels for all sites are well below the performance criteria (4 g/m^2/month).

Graphs of the long-term deposited dust levels are included in **Appendix 2**.

Table 6.6 Annual Averages for Dust Deposition 2015 - 2020

Reporting period	Total Insoluble Solids (g/m^2/month)				
	IDD1	IDD2	IDD3	IDD4	IDD5
Criteria	**4**	**4**	**4**	**4**	**4**
2015	0.6	0.6	0.9	0.5	1.0
2016	1.1	0.3	0.7	0.5	1.5
2017	1.3	0.9	0.6	0.7	0.6
2018	1.0	0.9	1.2	1.4	1.5
2019	1.1	1.0	1.8	1.1	1.5
2020	1.4	0.6	0.8	0.7	0.6
2020 ^ (Excluding January 2020 result)	0.8	0.4	0.6	0.5	0.5

^ Annual average values excluding the monitoring results influenced by bushfire events.

The 2020 annual average deposited dust level recorded at IDD1 is the highest in recent years, however, is still well below the performance criteria. It is noted that bushfire activity burning within the vicinity of Invincible Colliery during January 2020 influenced the January 2020 monitoring results, particularly at IDD1, which recorded a result of 7.7 g/m^2. Excluding the January 2020 results, the 2020 annual average deposited dust levels at all monitoring locations would be consistent with the historical range of results obtained over the previous five years.

6.3.4.2 Particulate Matter

Table 6.7 presents the PM_{10} annual average over the previous five years. The 2020 annual averages for both PM_{10} and TSP recorded at Invincible Colliery are within the range of results over the previous five years, despite the January 2020 results being influenced by bushfire activity burning within the vicinity of Invincible Colliery. By excluding the January 2020 results from the 2020 annual average calculations, the 2020 average PM_{10} level declines by 4 µg/m^3, while the 2020 average TSP level declines by 10 µg/m^3.

Table 6.7 Annual Averages for Particulate Matter 2015 - 2020

Annual Average	PM_{10} (µg/m^3)	TSP (µg/m^3)*
2015	6.1	15.2
2016	8.0	20.0
2017	7.8	19.5
2018	8.8	22.1
2019	19.2	48.1
2020	11.1	27.8
2020^ (Excluding January 2020 result)	7.1	17.8

**Total suspended particulates are estimated from the PM_{10} concentrations.*
^ Annual average values excluding the monitoring results influenced by bushfire events.

6.3.5 Proposed Improvements

Monitoring of air quality will continue to be conducted during 2021 in accordance with the Air Quality Management Plan (AQMP).

6.4 Surface Water

6.4.1 Environmental Management Measures

The surface water management system at Invincible Colliery utilises a series of settlement ponds and storage dams within the site. These ponds and dams are managed in accordance with the Water Management Plan (WMP) (Coalpac, 2009h) and are further described in **Section 7.0**. Water is discharged as required from the main colliery dam via LD002 as shown in **Figure 6.1**.

6.4.2 Performance Criteria

Shoalhaven Coal is required to manage water discharged from the site so that it does not exceed the pollutant concentration limits specified by the Project Approval and EPL. The concentration limits specified in the EPL are provided in **Table 6.8** with the surface water monitoring results discussed in **Section 6.4.3**.

Table 6.8 Water Quality Concentration Limits

Pollutant	Concentration limit
Oil and Grease	10 mg/L
pH	6.5 – 8.5
Total suspended solids (TSS)	30 mg/L

6.4.3 Environmental Outcomes

Surface water monitoring for water quality is conducted monthly during discharge events at the licenced discharge point (LD002) in accordance with the requirements of EPL 1095. Monthly due diligence monitoring is also conducted within the Main Dam (LD002), Environmental Dam (SW01) and Silt Dam (SW02). Water quality is also monitored on a monthly basis for due diligence purposes at two locations within Cullen Creek (BSW01) and Dulhunty's Creek (BSW02). BSW01 is located upstream of Invincible Colliery and BSW02 located downstream of Invincible Colliery.

The water quality monitoring results from LD002 are included in **Table 6.9**. Eight discharge events occurred throughout the reporting period. During the report period, samples were collected monthly at Main Dam LD002 for due diligence purposes. Background water quality sampling has also been undertaken at the Environmental Dam (SW01), Silt Dam (SW02), Cullen Creek (BSW01) and Dulhunty's Creek (BSW02). The results of which are included in **Appendix 2**.

A comparison of the background water quality (annual average) results during the report period is included in **Section 6.4.4**.

Table 6.9 LD002 Water Quality Monitoring Results

Sampling date	pH	Oil and grease	TSS
LD002 (licensed discharge point)			
Criteria	**6.5 – 8.5**	**10**	**30**
14/1/2020	8.45	<5	7
11/02/2020	7.65	<5	<5
10/03/2020	7.53	<5	72
7/04/2020*	7.12	<5	6
5/05/2020*	7.58	<5	10
3/06/2020*	6.70	<5	<5
2/07/2020	6.64	<5	<5
3/08/2020*	6.83	<5	11
3/09/2020*	7.00	<5	<5
1/10/2020*	8.02	<5	15
2/11/2020*	7.08	<5	<5
3/12/2020*	7.06	<5	<5

Note: monthly sampling is undertaken at LD002 for due diligence purposes

* Water discharge event

6.4.4 Trends in Data

During the report period, discharges occurred on eight occasions as shown in **Table 6.9**. All water quality monitoring results obtained during discharge events at LD002 complied with the EPL water quality concentration limits, with the exception of the March total suspended solids result. Subsequent monthly monitoring results following March 2020 returned to levels expected at LD002.

6.4.4.1 Background Water Quality Monitoring Results – Dams

Annual average of the background water quality in the on-site dams during 2020 together with monitoring results from previous years is presented in **Table 6.10**. LD002 discharge and the due diligence water quality results between 2011 and 2019 for pH, oil and grease and TSS is displayed graphically in **Appendix 2**.

The 2020 annual average pH recorded at the Main Dam (7.39) was slightly less than the annual averages of 2019 (7.50), 2018 (7.50) and 2017 (7.47). The 2020 annual average pH recorded at the Environmental Dam (3.18) was slightly less than the 2019 annual average (3.57), however is consistent with the range of annual averages since 2015. The 2020 annual average pH recorded at the Silt Dam (7.32) was also slightly lower than the 2019 (7.47) and 2018 (7.43) annual averages, however was within the historical range of annual averages (6.75 to 7.47) for the Silt Dam.

The oil and grease results at the Main, Environmental and Silt Dams for 2020 were below detection limits, which is consistent with the results for 2015 to 2019.

TSS annual average results at the Main, Environmental and Silt Dams for 2020 ranged between 7 and 62 mg/L. The 2020 results for the Main Dam and Environmental Dam were within the historical range of results, while results for the Silt Dam are above the 2015 to 2019 results.

Table 6.10 Comparison of Water Quality in On-Site Dams 2014-2020

Annual Average Period	Location	pH	Oil & Grease	TSS
Criteria		**6.5 – 8.5**	**10**	**30**
2015	Main Dam	6.74	<2 mg/L	<5 mg/L
	Environmental Dam	2.93	<2 mg/L	7 mg/L
	Silt Dam	7.36	<2 mg/L	32 mg/L
2016	Main Dam	7.39	<2 mg/L	10 mg/L
	Environmental Dam	3.07	<2 mg/L	26 mg/L
	Silt Dam	6.75	<2 mg/L	27 mg/L
2017	Main Dam	7.47	<5 mg/L	10 mg/L
	Environmental Dam	3.49	<5 mg/L	25 mg/L
	Silt Dam	7.02	<5 mg/L	16 mg/L
2018	Main Dam	7.50	<5 mg/L	6 mg/L
	Environmental Dam	5.55	<5 mg/L	16 mg/L
	Silt Dam	7.43	<5 mg/L	23 mg/L
2019	Main Dam	7.50	<5 mg/L	11 mg/L
	Environmental Dam	3.57	<5 mg/L	17 mg/L
	Silt Dam	7.47	<5 mg/L	38 mg/L
2020	Main Dam	7.39	<5 mg/L	7 mg/L
	Environmental Dam	3.18	<5 mg/L	16 mg/L
	Silt Dam	7.32	<5 mg/L	62 mg/L

6.4.4.2 Background Water Quality Monitoring Results – Creeks

The 2020 annual average water quality at Cullen Creek (BSW01) which is upstream of Invincible Colliery and Dulhunty's Creek (BSW02) which is downstream of Invincible Colliery, together with the annual average results for the previous 5 years is present in **Table 6.11**.

The 2020 annual average pH recorded at the upstream location of BSW01 (6.79) was similar to the 2019 annual average (6.76) and was within the historical range of annual averages (6.46 to 6.99). The 2020 annual average pH recorded downstream at BSW02 (7.28) was the lowest annual average recorded for the site since 2015.

The annual average oil and grease concentrations at BSW01 and BSW02 have been below laboratory detection limits during every year sampled, with the exception being BSW01 for 2018, and BSW02 for 2017.

The annual average TSS concentration is typically lower at the downstream location when compared to the upstream location. The 2020 annual average TSS concentration recorded at BSW01 (21 mg/L) was the lowest annual average since 2016, while the 2020 annual average TSS concentration recorded at BSW02 (29.8 mg/L) was the highest in the 2015 to 2020 period.

Table 6.11 Upstream and Downstream Creek Water Quality 2015 - 2020

Annual Average	Location	pH	Oil & grease	TSS
2015	BSW01	6.99	<2 mg/L	19 mg/L
	BSW02	7.90	<2 mg/L	12 mg/L
2016	BSW01	6.55	<2 mg/L	27 mg/L
	BSW02	7.47	<2 mg/L	8 mg/L
2017	BSW01	6.46	<5 mg/L	23 mg/L
	BSW02	7.78	6 mg/L	7 mg/L
2018	BSW01	6.57	5 mg/L	33 mg/L
	BSW02	7.92	<5 mg/L	8 mg/L
2019	BSW01	6.76	<5 mg/L	90 mg/L
	BSW02	7.94	<5 mg/L	8 mg/L
2020	BSW01	6.79	<5 mg/L	21 mg/L
	BSW02	7.28	<5 mg/L	29.8 mg/L

6.4.5 Proposed Improvements

Monitoring of water quality at Invincible Colliery will continue to be conducted during care and maintenance.

6.5 Groundwater

Shoalhaven Coal operates a network of groundwater monitoring bores which extends across the Cullen Valley Mine and the Invincible Colliery. In accordance with the approved WMP for Invincible, only the groundwater monitoring bore of LD001 relates to the Invincible Colliery. Historically the groundwater monitoring results have been reported within the Invincible Colliery Annual Review for groundwater monitoring undertaken across the Invincible Colliery and Cullen Valley Mine. Within the 2019 and this 2020 Annual Review, the groundwater monitoring data provided is for LD001 only. The Cullen Valley Mine Annual Review includes the results of the groundwater monitoring which is conducted across both mining complexes as this data is relevant to Cullen Valley Mine.

During the annual groundwater monitoring event in November 2020, it was discovered that the bridge which is used to access LD001 had been damaged by bushfire and therefore LD001 was unable to be sampled. Therefore, the trends in data described in **Section 6.5.3** reflect the monitoring data obtained between 2012 and 2019. During 2021, Shoalhaven will liaise with NSW Forestry regarding access to groundwater monitoring location. Decisions relating to LD001 will be discussed with the relevant authorities once the outcomes of the above are known.

6.5.1 Environmental Management Measures

The Invincible mining operation is located on the western escarpment of the Sydney Basin and groundwater intercepted in the monitoring bores is typically greater than 70 m below the surface. Water management will continue to be undertaken in accordance with the approved Water Management Plan (refer to **Section 6.1**)

6.5.2 Performance Criteria

There are no pollutant concentration limits for groundwater specified in EPL. There are also no trigger levels detailed in the currently approved Invincible Colliery Water Management Plan (Coalpac, 2009h).

6.5.3 Trends in Data

The long term trends for LD001 in standing water level, electrical conductivity, hardness, sulphate, nitrate and metals are discussed below. Long term graphs and tables for these groundwater parameters can be found in **Appendix 2**.

Groundwater monitoring bore LD001 was unable to be accessed during the reporting period due to damage caused by bushfires in the vicinity of Invincible Colliery. Therefore, no monitoring was undertaken at groundwater bore LD001 during the reporting period. The trends identified below exclude the 2020 reporting period.

6.5.3.1 Standing Water Level

Since 2012 the standing water level in LD001 has steadily increased from 884.81 to 890.88 in 2017. The 2019 measurement of 889.14 is below the 2017 maximum and above the 2012 low as shown graphically in **Appendix 2**.

6.5.3.2 pH

Between 2011 and 2018 the pH level ranges between 5.90 and 7.55. The 2019 pH measurement of 7.67 is 0.12 units greater than the previous maximum pH level recorded in 2018 (refer to **Appendix 2**).

6.5.3.3 EC

The conductivity level between 2011 and 2018 ranges between 120 µS/cm and 166 µS/cm, with five of the results between 120 µS/cm and 130 µS/cm. The 2019 EC result was 9 µS/cm greater than the previous maximum (refer to **Appendix 2**).

6.5.3.4 Hardness

Between 2011 and 2018 hardness has ranged between 35 mg $CaCO_3$/L and 53 mg $CaCO_3$/L. Between 2013 and 2017 the hardness results show a linear increase (refer to **Appendix 2**), decreasing in 2018 to 49 mg $CaCO_3$/L. The 2019 hardness result increased from the 2018 result with a hardness of 56 mg $CaCO_3$/L, which is 7 mg $CaCO_3$/L above the 2018 result and is 3 mg $CaCO_3$/L above the historical range of results. This increasing trend is consistent with the bores associated with the Cullen Valley Mine.

6.5.3.5 Sulphate

Since 2011 the sulphate level declined from a maximum of 25 mg/L to 13 mg/L in 2016, with a minimum of 11 mg/L occurring in 2013. Since 2013, the sulphate results show little variation, ranging between 11 and 14 mg/L (refer to **Appendix 2**). The 2019 sulphate level of 13 mg/L is within the historical range.

6.5.3.6 Nitrate

Between 2011 and 2018 nitrate levels have ranged from non-detectable (i.e. <0.01) to a maximum of 0.26mg/L (refer to **Appendix 2**). The 2019 nitrate level of 0.34 mg/L is slightly outside the historical range

6.5.3.7 Metals

Dissolved metals have been monitored at LD001 since 2013 (refer to **Appendix 2**). For 2019 all parameters (Aluminium, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Molybdenum, Selenium) returned results which were below the limit of detection with the exception of Manganese, Nickel and Zinc. The levels for Manganese and Zinc were within the range of previous results.

The level of Nickel recorded was below the previous minimum levels, however the 2019 results are within the levels recorded within the adjacent bores CP114 and CP115 and is generally consistent with nickel levels recorded in CP116. Monitoring at this bore will continue in 2019 to monitor this trend.

Mercury has not been recorded during 2019 after being removed in 2018 from the suite of parameters sampled in 2018 due to all historical results being below the limit of detection.

6.5.4 Proposed Improvements

Shoalhaven will liaise with NSW Forestry regarding access to groundwater monitoring locations during 2021.

6.6 Noise

6.6.1 Environmental Management Measures

A Noise Monitoring Program (NMP) (Coalpac, 2009f) has been prepared in accordance with the Project Approval outlining the required frequency of monitoring during mining operations. There were no mining operations during the report period, however, quarterly attended monitoring was conducted at three locations (N01, N02 and N03) (refer to **Figure 6.1**).

6.6.2 Performance Criteria

Noise impact assessment criteria for monitoring are specified in the EPL and Project Approval as outlined in **Table 6.12** and **Table 6.13**. As a result of the approval of PA07_0127 (MOD 5) in February 2018, there are currently inconsistencies in noise criteria specified in the EPL and Project Approval. This will be addressed through the EPL licence Variation process to be undertaken prior to the recommencement of mining operations.

Table 6.12 EPL Noise Impact Assessment Criteria

Location	Day time limit dB(A) LAeq (15 minute)	Evening Limit	Night time limit
At any residence on privately owned land (except Billabong and Hillview properties)	40	35 dB(A) L_{Aeq} (15 minute)	35 dB(A) L_{Aeq} (15 minute)

Note: The Billabong and Hillview properties were purchased by Coalpac in 2010.

Table 6.13 Noise Impact Assessment Criteria PA 07_0127 (MOD 5)

Location	Day time limit L_{Aeq}(15 minute)	Evening limit L_{Aeq}(15 minute)	Night time limit L_{Aeq}(15 minute)	Location L_{A1}(1 minute)
393 (Billabong)	40	40	35	45
394 (Hillview)	43	43	35	45
All other privately owned land	35	35	35	45

Note: The Billabong and Hillview properties were purchased by Coalpac in 2010.

6.6.3 Environmental Outcomes

There were no exceedances of the noise performance the report period as shown in **Table 6.14**. On all monitoring occasions, the noise from Invincible Colliery was inaudible.

Table 6.14 2020 Quarterly Attended Noise Monitoring Results

Location	Criterion (dB)	Quarter 1 ($L_{Aeq\ 15min}$)	Quarter 2 ($L_{Aeq\ 15min}$)	Quarter 3 ($L_{Aeq\ 15min}$)	Quarter 4 ($L_{Aeq\ 15min}$)
Cullen Bullen Central (N01)	40	IA	IA	IA	IA
Cullen Bullen West (N02)	40	IA	IA	IA	IA
Cullen Bullen South (N03)	40	IA	IA	IA	IA

IA – noise from the mine was inaudible

6.6.4 Trends in Data

The results of noise performance monitoring for the period 2011 – 2020 are summarised in **Appendix 2**. Results for quarterly noise monitoring during 2013 to 2020 has shown the site contribution to be generally inaudible at all monitoring locations.

6.6.5 Proposed Improvements

There were no noise complaints or non-compliances with noise criteria during the report period. Current management measures will continue to be undertaken for care and maintenance activities. Noise monitoring will continue to be undertaken quarterly during the care and maintenance phase.

6.7 Biodiversity

6.7.1 Environmental Management Measures

The 2020 Biodiversity Monitoring of the Rehabilitation and Biodiversity Offset Areas was undertaken in accordance with the approved Landscape Management Plan (LMP) (Coalpac, 2009e). Biodiversity monitoring commenced at Invincible in 2011 (Kleinfelder, 2011-2015) and has been undertaken by Umwelt since 2016 (refer to **Figure 6.2**).

6.7.2 Performance Criteria

In 2020, biodiversity monitoring was undertaken for the Invincible Colliery Biodiversity Offset Area (BOA) and Rehabilitation Areas (refer to **Figure 6.2** for monitoring locations). The Biodiversity Monitoring Program is based on the monitoring requirements documented in the LMP (Coalpac, 2009e).

Monitoring of BOA and rehabilitation areas in 2020 included the following:

- Floristic monitoring within fixed plots (20m x 10m) every 10 ha to record floristic diversity and vegetation condition.
- Fauna surveys to record the fauna species diversity and habitat quality.
- Targeted searches for Clandulla geebung and Capertee stringybark (only in BOA).
- An assessment against the performance/completion criteria and checklists of the management plans and current MOP (Sedgman, 2015) for the site.

An assessment of the monitoring results against the relevant biodiversity and rehabilitation performance and completion criteria for Invincible Colliery is detailed in **Table 8.2**.

6.7.3 Environmental Outcomes and Trends in Data

6.7.3.1 Environmental Conditions

During the 2020 surveys, the Cullen Bullen region was listed as being in “Non-Drought” according to the Combined Drought Indicator (CDI) (DPI 2021) (**Plate 6.1**). The CDI uses a combination of factors in making this determination including the rainfall index, soil water index, pasture growth index and drought direction index. This comes off the back of conditions in 2017, 2018 and 2019 (DPI 2021) where:

- The region was listed as “Drought Affected (intensifying) in August 2017
- The region was listed as in “Drought” and in “Intense Drought” from November 2017 to December 2018 before recovering until late 2019
- The region was listed as in “Drought” and in “Intense Drought” from December 2019 to January 2020
- The region was listed as “Non-Drought” since August 2020.

These trends are shown in Plate 6.1 (DPI 2021) for the Cullen Bullen Parish (Roxburgh County). This plate provides the rainfall index, plant growth index and soil water index for this parish, which combines to provide the CDI. This is then categorised into either Intense Drought, Drought, Drought Affected, Drought Recovery or Non-Drought. Of particular relevance in this plate is the rainfall index and plant growth index, which are key measures of community condition and can substantially influence the local vegetation and local water sources leading to varying resource availability for fauna species.

The total annual rainfall recorded at Portland (approximately 7 km south east) in 2020 was 916.5 mm which is above the average annual rainfall recorded over the last 116 years (703.5 mm) (BOM 2021).

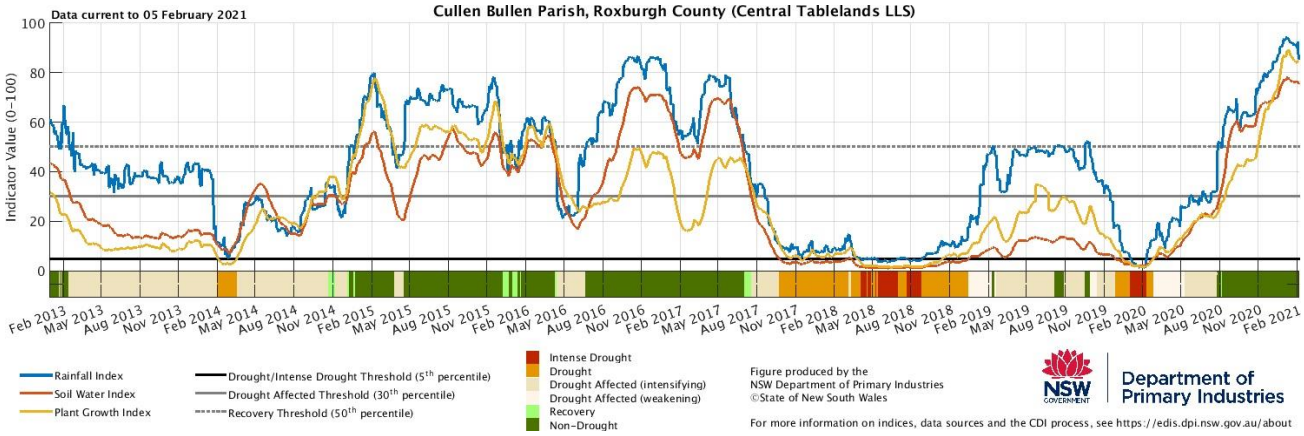

Plate 6.1 Seasonal environmental conditions recorded at Cullen Bullen

6.7.3.2 Biodiversity Offset Areas

All BOA monitoring sites have undergone substantial recovery following drought conditions experienced in the region since 2017. Native vegetation of the BOA is considered to be in moderate condition across both grassland and woodland habitats and is expected to continue to recover with the easing of drought conditions. The floristic composition and vegetation condition has increased for the majority of monitoring locations in 2020 compared to previous monitoring events which highlights the expected affect that rainfall and drought have on floristic diversity, and the ability for flora species to respond rapidly to favourable environmental conditions following a period of drought. All areas of remnant woodland demonstrated a substantial increase in the vegetative cover throughout the ground strata, and slight increase in the canopy and midstory stratums (refer to **Plate 6.2**). Some of the monitoring sites have experienced impacts from bushfire in early 2020, which has resulted in the reduction of midstory and canopy cover and abundance, with some instances of sites with the complete canopy strata removed. However, coppicing and regeneration of tree species was evident at most sites indicating that those sites are recovering post-fire. Weeds experienced similar increases where exotic species were recorded in moderate to high abundances throughout most areas of woodland habitat. Eucalyptus recruitment was observed at most monitoring sites, where persisting saplings and juvenile eucalypts growing within the ecotone of woodland and grassland habitats were improving in health post-drought.

While the 2020 monitoring observed increased cover and abundance of native species it should be noted that the cover and abundance of these species is expected to decrease slightly in subsequent monitoring events as is typical of native flora species following a period of increased growth after a drought.

Plate 6.2 Condition of BOA monitoring location B06 (Left – 2019; Right -2020)

The relationship between native and exotic grassland species is known to fluctuate seasonally in response to prevailing environmental conditions. In 2020, grassland habitat areas contained substantial species diversity which has increased markedly compared with the 2019 survey results. Grassland areas within the BOA continued to be dominated by annual grasses and cosmopolitan weed species, which is to be expected given the historical agricultural use of the BOA. The overall vegetative cover of the grassland areas increased across all monitoring locations, which highlights the effect of suitable environmental conditions following a period of drought, despite grazing by native and exotic fauna. Vegetation condition and floristic composition have returned to similar values previously recorded prior to recent drought conditions. The 2020 survey results show that grassland areas in the BOA support reasonable native species diversity, albeit in low to moderate abundances.

Given the native flora species diversity recorded in both grassland and woodland habitats during the 2020 surveys no management activities are recommended at the present time.

Habitat condition in the BOAs has declined since the 2018 monitoring surveys as a result of the previous drought conditions in the region and recent bushfires that affected some monitoring sites. The condition of habitats within the BOAs is expected to improve as the communities recover from the effects of drought and fire. The main habitat feature recorded in the BOA was fallen timber, which provides refuge for reptiles and small mammal species. Tree hollows were scarce due to the limited area of woodland habitats and the age of the tree stands as a result of historic clearing. Recent bushfires in early 2020 that impacted some monitoring sites has resulted in the removal of some habitat features with the burn-out of existing logs, however these features are being replaced by new treefall. Woodland communities that were not affected by bushfire continue to provide a stable range of habitat features including woody debris, hollow bearing trees, fallen timber, permanent water sources and exposed rock. The diversity of habitats, as well as the abundance of habitat edges and the proximity to rural and remnant forest areas is the likely reason for the BOA to retain fauna species diversity.

Monitoring in 2020 recorded an increase in overall fauna species diversity throughout the BOAs with a total of 68 fauna species recorded compared to 53 species recorded during 2019 and 77 species recorded in 2018. A large proportion of this is represented by birds with 53 species recorded across all BOA sites. The remaining 15 fauna species recorded during 2020 monitoring included five mammal species, six reptile species and four frog species. Micro-bat monitoring in 2020 was consistent with that of 2019 which consisted of site stratification to decrease the number of sample sites and increase the detection period of the Anabat ultrasonic recording device from one hour to an entire night of recording. A total of six microbat species were identified in 2020 compared to eight species in 2019 and two species in 2018.

A total of three threatened species were recorded in the BOA at Invincible Colliery during 2020. These were the gang-gang cockatoo (*Callocephalon fimbriatum*), black falcon (*Falco subniger*), powerful owl (*Ninox strenua*). These species are all listed as vulnerable under the BC Act. 2020 represents the first time that the black falcon was recorded at Invincible Colliery. All other species have been previously recorded at Invincible Colliery during previous monitoring events.

6.7.3.3 Rehabilitation Areas

The Invincible Rehabilitation Areas are defined by the year each area was established, being 2008, 2009 and 2011. For the purpose of monitoring in 2020 these have been separated more broadly into two distinct areas based on vegetation establishment and growth, being well established vegetation located to the east (as indicated by monitoring sites R10, R11, R12, and R14) and establishing vegetation located in northern and western areas (as indicated by monitoring sites R15 and R18) (refer to **Figure 6.2**).

Monitoring in 2020 indicated that the overall vegetation condition and total species diversity of the Invincible Colliery rehabilitation areas increased compared to 2019 surveys. Species in the groundcover strata in particular, has shown a substantial increase in vegetative cover throughout all rehabilitation areas. Native grasses were abundant in cover and abundance within these areas with the most commonly recorded species being kangaroo grass (*Rhytidosperma spp*.) and speargrass (*Austrostipa spp*.), some of which demonstrated substantial flowering and seeding. Native forbs were also higher in abundance compared with 2019 survey results, which did not record forbs at some sites. Shrubs and young trees are recovering from die back following drought conditions (refer to **Plate 6.3**).

Plate 6.3 Condition of Invincible Rehabilitation monitoring location R10 (Left – 2019; Right – 2020)

In 2020 the eastern rehabilitation areas generally demonstrated higher native species diversity and vegetation condition, as well as a greater density of established plants compared to the north-western rehabilitation areas which were established more recently. This is attributed with the age difference of these areas where the older areas of rehabilitation demonstrate a higher level of plasticity and resistance to drought. North-western rehabilitation areas exhibited reduced vegetation growth and ecosystem function where the severe die back of trees, shrubs and ground layer species contributed to the low quality of vegetation.

Senescence, a natural process of deterioration with age, was evident in a small proportion of mature Acacia species within the eastern rehabilitation areas. Eastern rehabilitation areas demonstrated increased ecological function including the production of leaf litter from well-established trees and shrubs, production of woody debris through Acacia senescence, deterioration of existing woody debris and the presence of detritivores such as wood roaches and wood boring caterpillars. A number of tall trees and

shrub species (*Eucalyptus spp*. and *Acacia spp*.) were observed with reproductive material (flowers and/or fruit) while few saplings were observed through eastern rehabilitation areas. A number of ant species were observed opportunistically.

Monitoring in 2020 recorded a total of 58 fauna species, comprising 39 bird species, 12 mammal species, six amphibian species and one reptile species. This represents an increase in total fauna species diversity compared to monitoring in 2019 (34 species) and 2018 (54 species). These faunal groups, in particular amphibians, have likely had a positive response to suitable weather conditions following the recent period of drought. Fluctuations in fauna presence is expected when monitoring dynamic biological systems, particularly when monitoring takes place following extreme natural variables, such as drought.

Fauna species diversity of rehabilitation areas was considered to be influenced by age and structure of rehabilitation areas, and the decline in condition of surrounding remnant habitats including the BOA and Ben Bullen State Forest as a result of recent bushfires. This is particularly the case for highly mobile fauna such as birds, microbats and arboreal mammals that move between habitat patches depending on their condition. It is likely that the Invincible rehabilitation areas are acting as refuge habitat as they were not affected by bushfires which had a substantial impact on surrounding remnant woodland habitat. In a landscape context flowering acacia within these rehabilitation areas provide important food resources for nectarivorous fauna (birds and arboreal mammals in particular) while adjacent remnant vegetation recovers from the effects of fire. Tall acacias were observed flowering sporadically throughout eastern rehabilitation areas and in proximity to nest boxes containing threatened squirrel gliders (*Petuarus norfolcens*is) (located at R12).

Nest boxes provide an artificial substitute for species including a variety of gliders, birds and microbats, which have been shown to consistently use the boxes based on the monitoring results. Monitoring results in 2020 highlighted the effectiveness of compensatory habitat features when integrated into rehabilitation, such that two sugar gliders (*Petaurus breviceps*) and three squirrel gliders (*Petaurus norfolcensis*) were found in two nest boxes near monitoring site R12 (refer to **Plate 6.4**). Three other nest boxes contained nesting material consistent with that of a bird's nest. Two of the poles with nest boxes are installed on them were burnt off at ground level. The cause of this is unknown, however may have been the result of spot fires from the bushfires earlier in 2020. The nest boxes on these two poles were still in good condition and consideration will be made for the reinstallation of these poles as compensatory habitat. Compensatory habitat features may play a critical role for fauna refugia during periods of extended drought where the distance to important food sources decrease greatly.

Plate 6.4 Squirrel gliders (*Petaurus norfolcensis*) recorded in a nest box during monitoring

Three threatened species were recorded adjacent to the rehabilitation area during 2020, being a pair of gang-gang cockatoos (*Callocephalon fimbriatum*) observed foraging within the adjoining BOA grassland area near monitoring site R12, three squirrel gliders (*Petaurus norfolcensis*) recorded using a nest box, and the remains of a greater glider (*Petauroides volans*) located near monitoring site R15. The greater glider is listed as vulnerable under the EPBC Act, while the other two threatened species are listed as vulnerable under the BC Act. 2020 represents the first time that the greater glider has been recorded within the Rehabilitation Areas of Invincible Colliery, however it is likely that this individual moved into the area from adjacent remnant vegetation that was impacted during the bushfires earlier in 2020.

6.7.3.4 Clandulla Geebung Monitoring

Targeted searches for Clandulla geebung (*Persoonia marginata*) and Capertee stringybark (*Eucalyptus cannonii*) was undertaken within the BOA. No new locations of either species were identified.

6.7.4 Proposed Improvements

Biodiversity Monitoring and management of the Rehabilitation and Biodiversity Offset Areas will continue to be conducted during 2021 in accordance with the approved Landscape Management Plan (LMP) (Coalpac, 2009e).

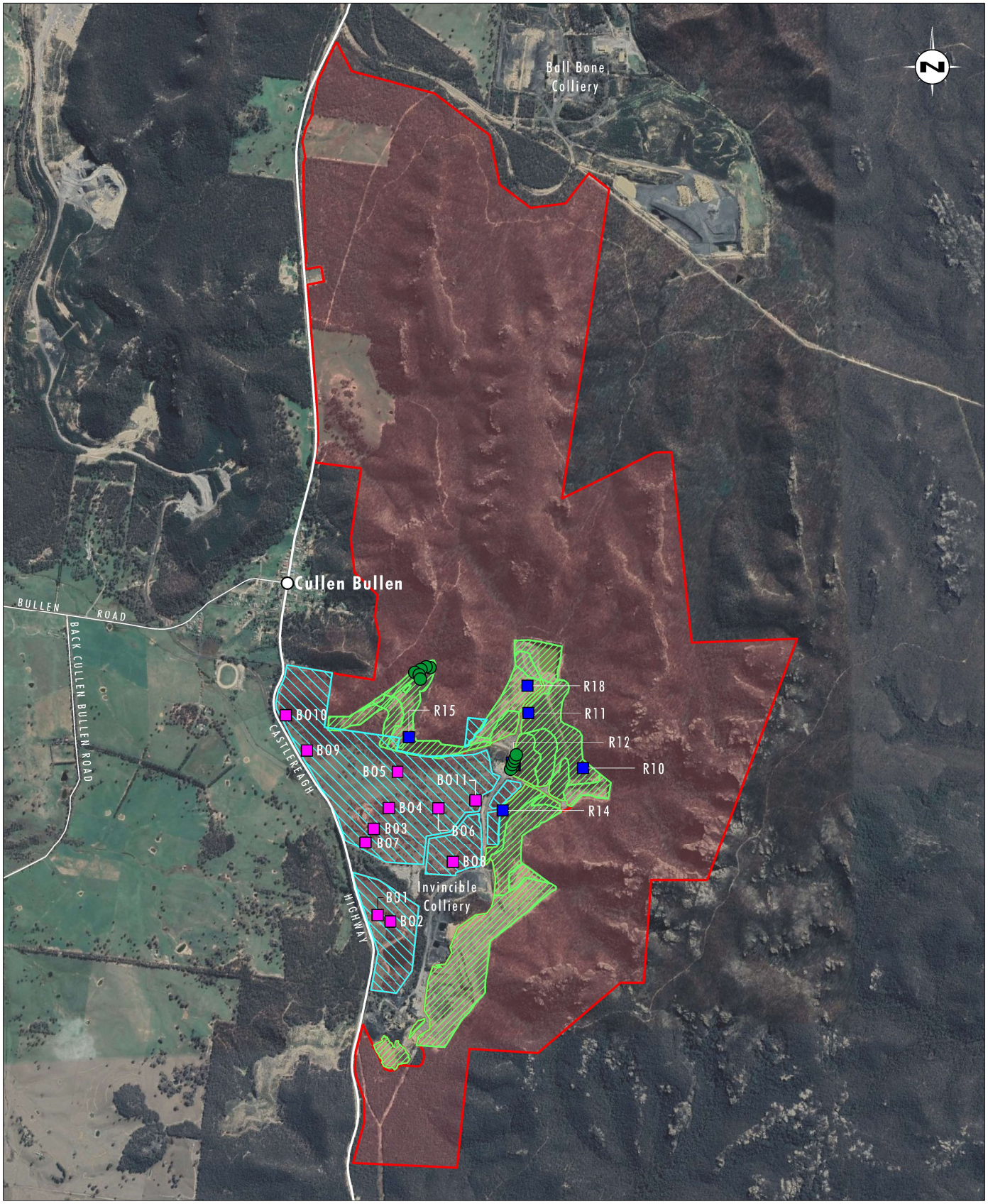

Image Source: Google Earth (Apr 2020)
Data Source: Kleinfelder (2017)

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Legend

- Study Area
- Biodiversity Offset Area
- Rehabilitation Zones
- Rehabilitation Monitoring Point
- Biodiversity Offset Area Monitoring Site
- Nest Box Location

FIGURE 6.2

Biodiversity Offset Area and Rehabilitation Monitoring Sites

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6.8 Weeds and Feral Animals

6.8.1 Weeds

6.8.1.1 Rehabilitation Areas

Invincible Rehabilitation Areas demonstrated a minor continued presence of weeds during monitoring in 2020. Weeds were limited to cosmopolitan species such as catsear (*Hypochaeris radicata*), St John's wort (*Hypericum perforatum*), blackberry (*Rubus fruticosus spp. aggregate*) or Paterson's curse (*Echium plantagineum*) which were found in relatively low abundances throughout most rehabilitation vegetation. Treatment of St John's wort (*Hypericum perforatum*) was observed in some areas, however follow up treatment and assessment of different areas is recommended for this weed. Given the current low density of blackberry (*Rubus fruticosus aggregate*) within the rehabilitation areas, it is recommended that hand removal and spraying be conducted as this will prevent further infestations and be more cost effective in the long term.

Small fluctuations are common when monitoring the presence of weeds in management areas and generally vary in response to a range of variables such as rainfall and drought. The cover and abundance of weeds have not noticeably increased such that they significantly impact the vegetation condition since the easing of drought conditions. While studies have shown that bare ground favours the establishment of some weed species via colonisation from surrounding areas, this does not appear to be the case considering the Rehabilitation Areas have been established for up to 10 years with low cover of exotic species consistently recorded. The likelihood of exotic species further colonising rehabilitation areas is low, given the soil structure and the density of tree and shrub species currently in established in rehabilitation areas. The continued production of leaf litter and wood debris as rehabilitation progresses will likely aid the suppression of exotic species.

6.8.1.2 Biodiversity Offset Area

Monitoring in 2020 demonstrated an increase in the presence of weeds across all areas of the BOA, however these also corresponded with increased abundance and cover of native species, which this is likely a product of the suitable environmental conditions following recent drought conditions. Colonising exotic species were also recorded at monitoring sites that were recovering from the impacts of bushfires earlier in the year. The majority of weeds recorded in these areas were annual species such as grasses that are not expected to have an adverse effect on the integrity and function of the natural ecosystem. However, weed species that were recorded consistently throughout the BOAs included Yorkshire fog (*Holcus lanatus*), catsear (*Hypochaeris radicata*), St John's wort (*Hypericum perforatum*) and Paterson's curse (*Echium plantagineum*) in the grassland habitats and blackberry (*Rubus fruticosus aggregate*), hawthorn (*Crataegus monogyna*), catsear, St John's wort and Paterson's curse in the woodland areas. Treatment of St John's wort (*Hypericum perforatum*) was observed in some areas, however follow up treatment and assessment of different areas is recommended for this weed. Future weed management of other species, if it is required, will be conducted in accordance with the LMP (Coalpac, 2009f).

6.8.2 Feral Animals

6.8.2.1 Biodiversity Offset Area

Two introduced species were observed within the BOA during 2020, being rabbits (*Oryctolagus cuniculus*) near monitoring sites B01 and B07, and dogs (*Canus lupus familiaris*) near monitoring site B05. No management activities are recommended at the present time given the low impact potential that these species may have on the quality of vegetation throughout the BOA.

6.8.2.2 Rehabilitation Area

One introduced species was observed within Rehabilitation Areas of Invincible Colliery during 2020 being dog (*Canus lupus familiaris*) identified at monitoring site R18.

The management of feral animals is conducted in accordance with the LMP (Coalpac, 2009f). No management activities are recommended at the present time for rabbits or dogs given their low numbers observed and low potential to impact rehabilitation progress.

6.9 Blasting

Blasting is managed and monitored in accordance with the Blast Management Plan (BMP) (Coalpac,2009d) and the EPL. However, as no mining operations were undertaken, no blasting was conducted during the report period.

6.10 Waste Management

As no mining activities were undertaken during the report period, minimal quantities of waste materials were required to be stored on site. Sewage from the workshops/administration areas is directed to septic systems which are pumped out by a licensed waste collection and disposal contractor on an as-needs basis.

Waste oils and grease stored at the maintenance workshop are collected by a licensed waste recycling contractor on an as needs basis. All paper and general wastes from administration and workshop areas is disposed of in garbage bins located adjacent to the administration buildings. The bins are collected as required and the contents placed in large waste skip bins positioned adjacent to the heavy vehicle maintenance building to await removal by a licensed industrial waste collector. Industrial waste collection is undertaken as required.

6.11 Hazardous Material Management

The volume of hazardous materials delivered to and stored within the site are low as there were no mining operations conducted during the report period. Hazardous material storage tanks containing oils, grease and degreasers have been emptied, isolated and secured. Any additional storage tanks have been removed from the site. Storage tanks remaining on site that contain these materials are kept emptied during the care and maintenance period. One of the above ground self-bunded diesel tanks (75,000L Transtank) is operational (i.e. in use). A second Transtank (95,000L) is kept on site but is currently not in use.

Diesel is delivered to site as required. In addition, waste oil and grease are stored adjacent to the workshop in a bunded area which is removed as required by a licensed contractor.

6.12 Heritage

6.12.1 Indigenous Heritage

Several artefact scatters, open camp sites and an isolated find were located during an archaeological field survey conducted in 2010. Only one of these sites (Invincible OS1 artefact scatter) was determined to have high archaeological significance.

An Aboriginal Heritage Management Plan (AHMP) (Coalpac, 2009g) has been prepared and implemented in accordance with the Project Approval (Mod 3) and in consultation with the then Department of Environment and Climate Change and the Aboriginal community. The artefact scatter site OS1 is located outside the mine disturbance area and has been fenced and signposted in accordance with the AHMP. No disturbance of OS1 occurred during the report period.

6.12.2 Non-Indigenous Heritage

No items of European heritage are present within the Invincible Colliery site and therefore there are no specific management measures required to be implemented.

6.13 Spontaneous Combustion

There are no known occurrences of spontaneous combustion at Invincible Colliery. Experience to date in mining at the Invincible Colliery has demonstrated that the waste material, stockpiled coal and other relevant materials have a low propensity to spontaneously combust. Any future extraction, processing and stockpiling of coal will continue to be managed to ensure any potential for spontaneous combustion is minimised.

6.14 Bushfire

Bushfire hazards are managed in accordance with the LMP (Coalpac, 2009e). A number of measures and safeguards have been implemented to minimise bushfire risk at Invincible Colliery, these include:

- fitting fire extinguishers to all earthmoving and mining equipment
- fitting and maintaining efficient exhaust systems and spark arresters to mobile equipment
- advising NSW Rural Fire Service, regulatory authorities and neighbours of any burning-off operations
- ensuring that vehicles with low level exhaust systems do not leave defined tracks in locations and conditions likely to lead to ignition of combustible plant material and, and
- maintaining, at the request of NSW Forestry Corporation, existing fire trails or access roads at the extremities of the lease area, which serve as access for fire-fighting services as well as establishing a fire break to the limits of operations at the open cut.

6.15 Mine Subsidence

Mining operations at Invincible Colliery ceased in 2013. There was no mining undertaken during the report period. As such, no subsidence management measures were required to be implemented.

6.16 Public Safety

Access to working areas of the open cut are controlled by locked gates. Access to the site by members of the public is via contact at the mine office where visitors or contractors can only be escorted around the site by site personnel. Warning signs have been placed on extremities of operations to make members of the public aware of the presence of the open cut. There were no public safety incidents during the report period.

7.0 Water Management

7.1 Water Management System

The strategy behind the surface water management plan is to keep the clean and dirty water systems separate by interception and diversion of stormwater runoff from operational and non-operational areas. The water management system at Invincible Colliery has been designed (as far as possible) as a closed loop system. Water that enters the site via rainfall or through the water table is diverted to a series of settlement dams within the site.

There are 5 active sediment dams (SD2, SD3, SD4, SD5 and SD6), one Environmental Dam (SD1), one storage dam (Main Water Dam – LD002), 2 sediment ponds, one clean water storage dam located within the Aboriginal Heritage site (OS-1) and 7 inactive fine reject dams currently on site. The Main Water Dam has a total capacity of 117 ML. The remaining dams have the following capacities:

- SD1 – 0.5 ML
- SD2 – 4.8 ML
- SD3 – <0.5 ML
- SD4 -47.8 ML
- SD5 – 2.3 ML
- SD6 – 1.5 ML

The Environmental Dam which contains acid water is monitored on a regular basis by site personnel. The Environmental Dam is fitted with an automatic pump out unit to ensure the water level remains low. Due to the permeable nature of the waste rock that is back-filled into the completed open cut excavation, and the proximity of the open cut to the abandoned underground workings, the majority of surface water runoff collected in pit sumps, fine reject dams, coal stockpile areas, active mining areas and waste dumps seeps down into the abandoned underground workings. Water from the abandoned underground workings is used for dust suppression and accessed from Pit 205. Any excess water, that meets the required water quality criteria, will be released from the Main Dam, LD002 which is a licenced discharge point under the EPL.

7.2 Water Take

There has been no water drawn from external sources under licences (detailed in **Table 7.1**). Water is currently sourced from the existing connection to the Fish River Water Supply pipeline.

Table 7.1 Water Take

Water Licence #	Water sharing plan, source and management zone (as applicable)	Entitlement	Passive take/inflows	Active pumping	Total
WAL 35978 (10BL602584)	NSW Murray-Darling Porous Rock Groundwater Sources Water Sharing Plan	26 units	0	0	0

7.3 Erosion and Sedimentation

7.3.1 Environmental Management Measures

Permanent erosion and sediment control (ESC) measures within the Invincible Colliery include containment and diversion of “clean” water around disturbed areas and containment of runoff from these disturbed areas within on-site sediment dams. Temporary measures include contour banks, drainage lines, and rock lined drop structures. Where inspections identify failure of ESC measures, repairs and rectification works are undertaken as required.

8.0 Rehabilitation

8.1 Status of Mining and Rehabilitation

Unshaped emplacement areas as well as access tracks and water management structures are inspected by site personnel with maintenance and repairs undertaken as required. The current status of mining and rehabilitation areas within the mine domains established in the approved Invincible Colliery Care and Maintenance Mining Operations Plan (MOP) (Sedgman, 2015) is provided in **Table 8.1.** During the report period, there was no rehabilitation or mining works undertaken at Invincible Colliery.

Table 8.1 Rehabilitation Status

Mine Area Type	Previous Reporting Period (actual) 2019 (ha)	This Reporting Period (actual) 2020 (ha)	Next Reporting Period (forecast) 2021 (ha)
A. Total mine footprint (all areas including active disturbance areas and rehabilitation areas)	134.17	134.17	Not yet confirmed
B. Total active disturbance (areas within the footprint still requiring rehabilitation)	63.23	63.23	Not yet confirmed
C. Land being prepared for rehabilitation	9.1	9.1	Not yet confirmed
D. Land under active rehabilitation	61.84	61.84	Not yet confirmed
E. Completed rehabilitation (areas that have achieved completion criteria and been signed-off by DRG)	0	0	0

* Projected disturbance and rehabilitation figures for the 2021 report period will be included within the Invincible Rehabilitation Management Plan to be submitted to DPE / DRG prior to the commencement of mining and will be reported in the 2021 Annual Review.

8.2 Post Rehabilitation Land Uses

The proposed final land use aims to emulate the pre-mining environment and will enhance local and regional ecological linkages across the site and with adjacent areas. The primary objective of site revegetation and regeneration is to create a stable final landform with acceptable post-mining land use and suitability. In the long term, rehabilitation areas will become integrated with adjacent native vegetation communities.

A Rehabilitation Strategy (Umwelt, 2018) has been prepared for Invincible Colliery and incorporates the Southern Extension Project area. The Rehabilitation Strategy includes an investigation into the various options for backfilling of the remaining voids onsite, options to avoid the disturbance of vegetation in proximity to the Eastern Void and includes a detailed description of the measures to be implemented and a plan for the implementation of these measures.

Rehabilitation areas will continue to be monitored on an annual basis and will be managed until self-sustaining. Final rehabilitation areas will achieve the rehabilitation completion criteria prior to relinquishment.

8.3 Completion Criteria Assessment

Table 8.2 provides a summary and assessment of compliance of the monitoring results against the relevant biodiversity and rehabilitation performance and completion criteria for Invincible Colliery.

8.4 Rehabilitation Activities

Although the mine is in care and maintenance, management and monitoring of rehabilitation areas is undertaken in accordance with the approved Invincible Colliery LMP (Coalpac, 2009e).

Areas of rehabilitation to the north of the site were shaped in 2015. There has been no removal of buildings or other infrastructure and no new rehabilitation areas were established during the report period. Rehabilitation activities undertaken during the report period included:

- assessment of rehabilitation areas to determine if further works are required / how have they performed following improved rainfall conditions (i.e. monitoring); and
- repair of erosion washouts on site.

In the long term, rehabilitation areas are to become integrated with adjacent native vegetation communities with this process detailed in the revised RMP and BMP which have been submitted to regulatory authorities for comment.

An assessment of rehabilitation performance against the completion criteria in the LMP is included in **Table 8.2** below. It is noted that these criteria will be refined as part of revised Rehabilitation Management Plan. It is noted that there are areas which have been disturbed by mining which are yet to be rehabilitated. These disturbed areas do not form part of the general assessment presented in **Table 8.2**.

Table 8.2 Assessment of Monitoring Results against Invincible Colliery Completion Criteria

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
1. Planning Stage			
Consideration of the completion criteria for the planning stage of the project are not relevant to this monitoring report and have not been considered further			
2. Establishment Stage			
Consideration of the completion criteria for the establishment phase of the project are not relevant to this monitoring report and have not been considered further.			
3. Development and Sign-Off Stages			
3.1 Vegetation Establishment and Sustainability			
Tree species composition is compatible with that of other vegetation types in the lease, i.e. it includes:			
• local eucalypt species	A range of local eucalypt species are present	Plant or seed more species if required	A range of local eucalypt species are present within the Rehabilitation Areas
• local tall *Acacia* species	A range of local *Acacia* species are present	Plant or seed more species if required	A range of local *Acacia* species are present within the Rehabilitation Areas
Tree health	More than 75% of trees are healthy and growing as indicated by monitoring	Investigate causes of the problem and correct if required	Satisfied. Tree health within the rehabilitation areas appeared to be >75% healthy during the 2020 monitoring. Tree health demonstrated an increase in 2020 compared with previous year during which extended drought conditions caused a reduction in tree health (die back). Future monitoring will determine how the tree health within rehabilitation areas will respond following favourable environmental conditions.
Leaf nutrient analysis	Nutrient analyses conducted on trees in representative areas indicate no deficiencies of key macro- or micro-nutrients	Investigate causes of any problems and address as required	Generally satisfied. No nutrient analyses were undertaken as part of the 2020 monitoring. No nutrient deficiencies were observed (e.g. leaf discoloration, unusual growth forms, etc)

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
Tree density	Monitoring or visual estimation show the density of eucalypt trees >2m tall to be >200 stems/ha, averaged over the rehabilitated area monitored	Plant or seed more trees if required	Satisfied. Tree densities within the rehabilitation areas appeared to be greater than 200 stems per hectare.
Presence of treeless areas	No treeless areas greater than 0.5 ha are present	Correct using planting or seeding if required	Satisfied. No treeless area greater than 0.5 ha was observed during the 2020 monitoring
Evidence of tree regeneration	Second generation tree seedlings are present or likely to be, based on monitoring or research in comparable older sites	Conduct follow-up assessment later, or add seed if required	Satisfied. Continued establishment of second generation *Acacia* seedlings was recorded at monitoring locations R10, R11, R12, R14 and R18. Second generation *Acacia* seedlings were found to occur in proximity to patches of senescence (plant death due to age). Eucalypt seedlings were recorded at monitoring sites R11, R12 and R14. Further monitoring is to be undertaken in subsequent years to confirm the success of natural regeneration over time.

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
Sufficient grass or shrub cover, rocks, logs, etc. are present on steeper slopes to control erosion in the long-term	Monitoring and visual estimation show grass or shrub cover to be >50% on these areas, or sites have sufficient rock cover to maintain erosion below target standards (see Criteria 3.3)	Where necessary, delay closure until grass and shrub cover increases, or increase cover by seeding	Satisfied. Monitoring and visual estimation during 2020 recorded grass or shrub cover to be >50% in the Invincible rehabilitation areas monitored. Compared with previous years, grass and shrub cover has increased following the easing of prolonged drought conditions experienced in the region since 2017. No major areas of erosion were evident during monitoring.
Presence of bare areas on outer slopes	No bare areas that have obviously failed and are greater than 0.1ha in total area, or greater than 5m in width extending >10m down the slope, are present	Increase soil quality to assist grass and herb cover on bare areas, this may include increasing organic matter content to promote soil structures	Satisfied. An increase in the cover of vegetation in the ground layer was recorded in 2020 and is attributed to the easing of drought conditions. Subsequently, areas of bare ground were uncommon across the Invincible rehabilitation area. Areas of bare ground that were recorded were present in areas with dense shrub layers. Overall, the Rehabilitation Areas inspected were considered to meet this criteria.

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
Shrubs, grasses and other understorey plants	A range of native shrubs, grasses and other understorey species have established through topsoil, seeding or recolonisation	Investigate the feasibility of establishing more shrub or grass species and do so if practicable	Satisfied. During 2020, substantial increases in cover and abundance were recorded for a range of native shrubs, grasses and other understorey species following the easing of drought conditions. It is expected, however, that a reduction in the cover of grasses and other native groundcover is expected following the very favourable conditions experienced in 2020, as this is a natural response for native flora during favourable environmental conditions following severe drought. Future monitoring will determine how the native species diversity of rehabilitation areas will respond following favourable environmental conditions.
Noxious weeds	A management program for the control of declared plants and other weeds such as Pampas Grass and Crofton Weed has been implemented on the site	Control declared plants and other problem weeds as per the management program	Satisfied. A management program is in place to control noxious weeds and weed control is undertaken as required.
Fire tolerance	Tree, understorey and grass species are capable of either surviving or regenerating following a fire	Rehabilitation may be too young to determine this; investigate using research and/or literature review of relevant research on other mines	Satisfied. Impacts to rehabilitation areas from bushfires were less severe than in remnant vegetation, indicating that the rehabilitation has some degree of fire tolerance. Future biodiversity monitoring will inform the level of fire tolerance for this area.

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
Drought tolerance	Tree, understorey and grass species are capable of surviving drought	If large-scale deaths have occurred, consider the need for replanting or reseeding, and whether more drought tolerant species should be included in the seed mix	Satisfied. Drought conditions have eased in the region following extended drought conditions since 2017 (DPI 2020). Monitoring results since 2017 indicate the rehabilitation areas, appear to be relatively tolerant given the lack of rainfall. This was evident in the 2020 monitoring results as shrub and tree health did not appear to decline as a result of the drought. This degree of drought tolerance is also evidenced by the presence of Acacia and Eucalypt saplings and reproductive material at most sites. Groundcover has improved following the easing of drought, particularly native grasses which were recorded in high abundances and were seeding. It is expected, however, that a reduction in the cover of grasses and other native groundcover is expected following the very favourable conditions experienced in 2020, as this is a natural response for native flora. Ongoing monitoring is required to determine the condition of biodiversity values as they continue to respond to suitable conditions following the extended drought period.

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
Sustainability	Monitoring and research results indicate that the rehabilitation is likely to be sustainable over the long-term, if managed according to the procedures defined in Criteria 4 below	Continue monitoring in accordance with approved Flora and Fauna Management Plan / Biodiversity Management Plan	Generally satisfied. Consistency seen in qualitative descriptions suggest that the rehabilitation may be sustainable over time, however ongoing monitoring is required to assess these criteria.
3.2 Fauna habitat and faunal recolonisation			
Habitat	Fauna habitat in rehabilitated areas matches that in some surrounding un-mined open forest/woodland areas, or will do so in time	Investigate whether further planting or seeding might be required as per Criterion 3.1	Generally satisfied. Rehabilitated Areas are not old enough to support the range of habitats provided by the surrounding un-mined forests and woodlands. The rehabilitated areas are progressing towards the pre-existing or surrounding landforms. 2020 monitoring demonstrated that rehabilitation areas provided an important supplementary food source and refuge compared to remnant habitats that were affected by bushfires.

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
Diversity of vegetation	Includes a range of vegetation structural habitats, e.g. eucalypts, shrubs, ground cover and a developing litter layer	Investigate whether further planting or seeding might be required as per Criterion 3.1	Satisfied. All Rehabilitation Areas include a range of structural habitats. In 2020 species diversity had increased across both the rehabilitation area and the BOA for all stratums as the region experienced favourable environmental conditions following an extended period of drought. The overall diversity of native flora species at this stage of rehabilitation is still limited by the initial seeding mix used during works and age of the rehabilitation areas. It is expected the areas will trend over time to satisfy the completion criteria.
Fauna recolonisation - invertebrates	Studies demonstrate that key invertebrate functional groups such as ants and soil faunal communities are re-establishing	Investigate the causes where key groups have not recolonised	Invertebrate studies have not been undertaken previously and were not conducted in 2020.

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
Fauna recolonisation - vertebrates	Vertebrate surveys demonstrate that bird, mammal, reptile and frog communities are becoming established in rehabilitated sites	Investigate the causes where key vertebrate groups have not recolonised	Satisfied. An increase in fauna species diversity was recorded in 2020 compared to previous monitoring. This likely has occurred as a result of increasing habitat condition following the easing of extended drought conditions. Additionally, it is likely that the Invincible rehabilitation areas are acting as refuge habitat as they were not affected by bushfires which had a substantial impact on surrounding remnant woodland habitat within the BOA. Fauna species diversity increased in 2020 compared with previous monitoring, however the total number of fauna species recorded in the Rehabilitation Areas was less than those recorded in the BOAs indicating that the rehabilitation habitats are not yet able to permanently support animal populations (nesting and refuge habitat). It is expected that faunal communities will continue to establish towards a similar number to those recorded in the surrounding un-mined vegetation as the diversity of habitats progressively improve. Further evidence will be drawn from future monitoring events as habitat corridors continue to establish and permanent habitat features become more frequent.

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
Management of fauna habitat in un-mined areas	Fauna habitat of adjacent un-mined areas has been protected as stipulated in this Plan	Protect areas of adjacent native fauna habitat	Satisfied Fauna habitat of adjacent un-mined areas has been protected as stipulated in the LMP.
Management of rare species habitat	Habitat of rare or vulnerable fauna species, such as the Common Bent-winged Bat, Little Bent-winged Bat and the Squirrel Glider, has been managed to promote the species conservation	Take necessary steps to conserve habitat considered likely to provide habitat for these species	Satisfied Habitat of rare or vulnerable fauna species, such as the Common Bent-Winged Bat, Little Bent-winged Bat and the Squirrel Glider, has been managed to promote the species conservation as stipulated in the LMP.
3.3 Landform stability			
Absence of significant erosion - gullies	No erosion gullies >1m deep and 1m wide are present on any outer slopes	Gullies which fail to meet the standard should be reshaped and replanted if required	Generally satisfied No erosion gullies of this size were identified within the areas visited during the monitoring surveys. While smaller erosion gullies were noted as a precaution to enable future monitoring.
Integrity of waterways	If still required, any constructed waterways are still in good working condition	Repair waterways if required	Not assessed as part of report period.
Graded banks have been removed	To avoid overtopping, after establishment of adequate vegetation cover, graded banks will be removed	Remove when appropriate	Not assessed as part of report period.
Final void	Standards or milestones relating to a final void will be developed if applicable	Refer to Mine Closure Plan	Not assessed as part of report period.
3.4 Soil Suitability			
Not assessed as part of annual biodiversity monitoring.			

Rehabilitation Criteria	Standard or Milestone Required	Suggested Corrective Action	Results and Outcomes of 2020 Monitoring
3.5 Land Use Suitability			
Suitability for nature conservation	Areas of rehabilitation and adjacent un-mined areas together possess defined conservation values and could be managed for the purposes of conserving a range of local flora and fauna species and vegetation types, including any rare fauna species recorded	Determine whether further revegetation or other management procedures may be required	Satisfied. Areas of rehabilitation and adjacent un-mined areas together possess conservation values and could be managed for the purposes of conserving a range of local flora and fauna species and vegetation types
Protection of water quality	Water quality, landform design, geotechnical stability and vegetation monitoring data all suggest that sites are not likely to pose a threat to downstream water quality	Implement corrective procedures if required	Satisfied. Water quality monitoring and vegetation monitoring suggests that dirty water runoff is unlikely to pose a threat to downstream water quality. Water quality to continue to be monitored as part of the approved WMP
Long-term management	Management requirements have been defined (see Criteria 4 below). Long-term management operations (e.g. maintenance of access tracks, fire) will not be greater than those of areas prior to mining, or where extra management actions may be required, a mechanism has been put in place for addressing these	Develop long-term management plan as in Criteria 4 below	Not assessed as part of report period
3.6 Safety			
Not assessed as part of biodiversity monitoring report.			
4. Monitoring and Maintenance Stage			
Monitoring and maintenance requirements to addresses post-closure and post-relinquishment is not relevant to this monitoring report and is not addressed further.			

9.0 Community

9.1 CCC Meetings

One community consultation meeting was held in the reporting period on 2 December 2020.

During the December 2020 meeting, information was presented on environmental monitoring and performance, complaints received, statutory reporting, rehabilitation and land management works undertaken on site.

It was agreed during this meeting that the CCC would meet during 2021 in December only, due to the care and maintenance status of the operations. A CCC meeting could be called, should the status of the operations change.

The outcomes of the CCC meeting are detailed in the meeting minutes available on the Castlereagh Coal website.

9.2 Complaints

In accordance with Condition M5 of the EPL, a community complaints line is operated by Invincible Colliery during the hours of operation. The complaints line is (02) 6359 0600 which is also displayed on the Castlereagh Coal website. This contact point provides the community with a mechanism by which to raise any concerns that they have with operations at Invincible Colliery.

Shoalhaven Coal maintains a complaint register to record and respond to complaints received from the community. There were no complaints received from the local community in relation to care and maintenance activities at Invincible Colliery during the report period. A comparison of complaints received between 2011 and 2020 is outlined in **Table 9.1**.

There have been no complaints received relating to operations at Invincible Colliery since the mine was placed in care and maintenance in May 2013. Prior to 2013 and during previous mining operations, the majority of complaints received were in relation to traffic and other amenity aspects.

Table 9.1 Comparison of Complaints for Invincible Colliery 2011 - 2020

Complaint Type	2011	2012	2013*	2014	2015	2016	2017	2018	2019	2020
Noise	2	0	0	0	0	0	0	0	0	0
Air quality (dust)	1	0	0	0	0	0	0	0	0	0
Blasting	2	1	0	0	0	0	0	0	0	0
Traffic	3	5	0	0	0	0	0	0	0	0
Water	0	0	0	0	0	0	0	0	0	0
Other	0	1	3	0	0	0	0	0	0	0
Total	**8**	**7**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

** Invincible Colliery was placed in care and maintenance in May 2013.*

10.0 Independent Audit

An Independent Environmental Audit (IEA) was conducted during 2016 in accordance with Schedule 5, Condition 5 of the Project Approval. The audit period included the care and maintenance period from May 2013 to January 2016. The mine was operated by the previous mine owner Coalpac from May 2013 to May 2015. The current owner, Shoalhaven Coal, was only responsible for operations between May 2015 and January 2016; therefore many of the non-compliances detected by the audit were outside the control of Shoalhaven Coal. In addition, a large number of the non-compliances that have occurred during Shoalhaven Coal's ownership are as a direct result of historical practices conducted by Coalpac.

An action plan was developed as an outcome of the audit findings and follow up actions have been implemented as required in consultation with DPE. The status of each audit action plan item can be found in **Appendix 1**. As seen, Shoalhaven Coal has completed many of the audit action items or a number of the items will be resolved through the development of revised management plans for the recommencement of mining operations.

In accordance with Condition 11 of Schedule 5 of the Project Approval, an IEA is required within a year of the recommencement of mining operations. The results of the IEA when completed, will be reported in the subsequent Annual Review.

11.0 Incidents and Non-Compliances during the Report Period

There were no environmental incidents causing or threatening material environmental harm at Invincible Colliery during the report period. The Invincible Pollution Incident Response Management Plan (Umwelt, 2018) was not activated during the report period with review of the PIRMP being undertaken in December 2020 (refer to the Castlereagh Coal website). Non-compliances which occurred during the report are discussed in in **Section 1.0**.

12.0 Activities to be Completed in the Next Reporting Period

Activities to be completed in the next report period (i.e. during 2021) will include:

- undertake works required by the Project Approval and EPL, should the recommencing of mining activities be confirmed by Shoalhaven Coal. There are a range of environmental management plans which are at various stages of preparation (refer to **Table 6.1**). These plans were submitted to DPE for approval during 2019.
- Prepare relinquishment application for rehabilitation areas that has met relevant criteria.
- completion of annual CCC meetings, as agreed with CCC members.
- Investigate the logistics and practicality of reinstalling nest boxes damaged by the 2019/2020 fire.
- Liaise with NSW Forestry to confirm if access to LD001 will be reinstated (i.e. replace bridge).
- continuation of environmental monitoring.

13.0 References

Coalpac Pty Ltd (2009a). Environmental Management Strategy for the Invincible Open Cut Coal Mine Extension.

Coalpac Pty Ltd (2009b). Environmental Monitoring Program for the Invincible Colliery.

Coalpac Pty Ltd (2009c). Aboriginal Cultural Heritage Management Plan for the Invincible Open Cut Coal Mine Extension.

Coalpac Pty Ltd (2009d). Air Quality Monitoring Program for the Invincible Open Cut Coal Mine Extension.

Coalpac Pty Ltd (2009e). Invincible Open Cut Coal Mine Extension Blast Monitoring & Management Plan.

Coalpac Pty Ltd (2009f). Landscape Management Plan for the Invincible Open Cut Coal Mine Extension.

Coalpac Pty Ltd (2009g). Noise Monitoring Program for the Invincible Open Cut Coal Mine Extension.

Coalpac Pty Ltd (2009h). Water Management Plan for the Invincible Open Cut Coal Mine Extension.

Coalpac Pty Ltd (2010). Road Closure Management Plan for the Invincible Colliery Operation.

Global Acoustics Pty Ltd (2020a). Invincible Colliery Environmental Noise Monitoring Quarter 1, 2020. Prepared for Shoalhaven Coal.

Global Acoustics Pty Ltd (2020b). Invincible Colliery Environmental Noise Monitoring Quarter 2, 2020. Prepared for Shoalhaven Coal.

Global Acoustics Pty Ltd (2020c). Invincible Colliery Environmental Noise Monitoring Quarter 3, 2020. Prepared for Shoalhaven Coal.

Global Acoustics Pty Ltd (2020d). Invincible Colliery Environmental Noise Monitoring Quarter 4, 2020. Prepared for Shoalhaven Coal.

Hansen Bailey (2010). Invincible Colliery: Modification to Project Approval Environmental Assessment. Prepared for Coalpac Pty Limited.

Hansen Bailey (2012). Coalpac Consolidated Project: Environmental Assessment Statement. Prepared for Coalpac Pty Limited

Hansen Bailey (2014). Invincible Colliery and Cullen Valley Mine Environmental Assessment: Modifications to PA 07_127 and DA 200-5-2003.

NSW Government (2015). Annual Review Guideline.

RCA Australia (2020). Groundwater Monitoring – Invincible Colliery, Cullen Bullen. Prepared for Invincible Colliery.

R.W. Corkery & Co. Pty Limited (2008). Environmental Assessment of the Proposed Extension to the Invincible Colliery Open Cut Mine and Production Increase.

R.W. Corkery & Co. Pty Limited (2009). Proposed Modification to Project Approval 07_0127 for the Invincible Colliery Open Cut Mine. Prepared for Coalpac Pty Limited.

Sedgman Limited (2015). Invincible Colliery Care and Maintenance Mining Operations Plan.

Sedgman Limited (2016). Cullen Valley Mine & Invincible Colliery Pollution Incident Response Management Plan. Prepared for Shoalhaven Coal.

Umwelt (Australia) Pty Limited (2016). Invincible Southern Extension Project – Environmental Assessment. Prepared for Shoalhaven Coal Pty Limited. Umwelt (Australia) Pty Limited (2017). 2016 Biodiversity Offset Monitoring of Cullen Valley Mine and Invincible Colliery. Prepared for Shoalhaven Coal Pty Limited.

Umwelt (Australia) Pty Limited (2019). Pollution Incident Response Management Plan Cullen Valley Mine and Invincible Colliery.

APPENDIX 1

Independent Environmental Audit Action Plan Update

Invincible Colliery IEA Action Plan

ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC1 **Low**	PA-07-0127, S2, C1	The Proponent shall implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the project.	The AEMRs stated that there were no reportable incidents of material harm to the environment during the audit period. A site inspection and review of documentation found no significant issues, however non compliances have been identified. In the Auditors' opinion, the intent of this condition to minimise harm to the environment has been established via various environmental management plans and the engagement of Sedgman in 2015 to manage implementation of these plans during the care and maintenance period.	Implement recommendations described below.	Castlereagh Coal	All non-compliances are addressed in this Action Plan and follow up actions have been implemented as required. **2017 – Annual Review Update** Continued implementation of the audit action plan to be undertaken during 2018, as they relate to project Approval (07_0127) as modified on 2 February 2018. **2018 – Annual Review Update** Continued implementation of the audit action plan to be undertaken during 2019, as they relate to project Approval (07_0127) as modified on 2 February 2018. **2019 – Annual Review Update** Continued implementation of the audit action plan to be undertaken during 2020, as they relate to project Approval (07_0127) as modified on 2 February 2018. **2020 – Annual Review Update** Continued implementation of the audit action plan to be undertaken during 2020, as they relate to project Approval (07_0127) as modified on 2 February 2018.	Active
NC2 **Low**	PA-07-0127, S2, C2	The Proponent shall carry out the project generally in accordance with the: a) EA; b) statement of commitments; c) the modification application 07_0127 MOD 2 and accompanying documents entitled: • 'Proposed Modification to Project Approval 07_0127 for the Invincible • Colliery Open Cut Mine, May 2009'; and • 'Addendum to the Proposed Modification to Project Approval 07_0127 for the Invincible Colliery Open Cut Mine, July 2009' d) modification application 07_0127 – MOD 3 and the accompanying Environmental Assessment prepared by Hansen Bailey and dated June2010; and e) the conditions of this approval.	This scope of the audit incorporated a review of compliance against the Project Approval, Statement of Commitments, EPL and Mine leases only. Non-compliances with the conditions of the Project Approval (S2.2e) and Statement of Commitments (S2.2b) were identified during the audit as outlined in this compliance table.	Implementation of the recommendations in this audit will assist in ensuring the project is carried out in accordance with the Project Approval and Statement of Commitments.	Castlereagh Coal	All non-compliances are addressed in this Action Plan and follow up actions being implemented as required. **2017 – Annual Review Update** Continued implementation of the audit action plan to be undertaken during 2018, as they relate to project Approval (07_0127) as modified on 2 February 2018. **2018 – Annual Review Update** Continued implementation of the audit action plan to be undertaken during 2019, as they relate to project Approval (07_0127) as modified on 2 February 2018. **2019 – Annual Review Update** Continued implementation of the audit action plan to be undertaken during 2020, as they relate to project Approval (07_0127) as modified on 2 February 2018. **2020 – Annual Review Update** Continued implementation of the audit action plan to be undertaken during 2020, as they relate to project Approval (07_0127) as modified on 2 February 2018.	Active

Invincible Colliery IEA Action Plan

ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC5 **Med**	PA 07_0127, S2, C14(a)	The Proponent shall ensure that all the plant and equipment used on site is: (a) maintained in a proper and efficient condition; and	The 2015 AEMR reports that most mobile plant and equipment has been removed from the site. Remaining equipment (such as excavators and dozers used for erosion control and rehabilitation maintenance and a mobile water pump) is periodically run, where possible, with pre-start inspections conducted at each instance. Sedgman advise that light vehicles are serviced off-site as required and no records are kept on site. Maintenance/pre-start inspection records for mobile equipment were not verified. It is noted that the mobile water pump is new and has not required servicing. Stationary plant and equipment that is currently used on site during the care and maintenance period, as observed during the site inspection, includes (but is not limited to): a 75,000L diesel AST and a wastewater collection system. This system comprises a bulk waste oil tank and liquid waste storage facility that is bunded and contained by a catch drain network that leads to an oil/water separator and a 6,000L waste oil collection tank. During the site inspection, the following observations were made by the Auditor: 1. The catch drain system contained (in sections) oily sediment and debris. 2. A break in the PVC pipes that leads from the catch drains to the oil/water separator and waste oil collection tank. Should any spills within the bunded area occur, this would leak onto the soil and vegetation on the embankment. 3. The 6000L waste oil collection tank is not bunded. The wastewater collection system is designed to capture any spills from the current diesel AST refuelling area, the bunded waste oil tank and the liquid waste storage area. As such it is required to be maintained in proper and efficient working condition during the care and maintenance period.	Undertake maintenance and cleaning of the wastewater catch drain system. Conduct a maintenance inspection and integrity test of the wastewater collection system including bunding, tanks and piping. Repair the breakage in the piping that leads from the wastewater catch drain to the oil/water separator and waste oil collection tank. Investigate whether any soil contamination has resulted from the breakage. Install bunding around the waste oil collection tank (if it is to remain operational). Retain maintenance and servicing records for all plant and equipment used at the site.	Castlereagh Coal	The following items are included in the current inspection/ maintenance program. However, there is currently no formal recording of actions for repair/maintenance: • Inspection and maintenance of the catch drain system. • Inspection and maintenance of the wastewater collection system. • Plant and equipment maintenance and servicing. A new Inspection Checklist has been prepared to allow recording of repairs/maintenance and corrective actions required and this checklist is currently being used during routine inspections conducted by the Mining Engineering Manager. The waste oil collection system is currently not in use. However, repairs to the catch drain pipework will be undertaken as required. The wastewater collection system is now assessed during routine inspections. There is no evidence of leakage/spillage or contamination in this area and the system will continue to be monitored on a regular basis. The waste oil collection system is currently not in use. If this system is proposed to be used in future, bunding will be installed prior to use. The UST tank is empty and is not currently used. However, it may be used again once operations recommence so will not be decommissioned. The tank and associated pipework will be tested prior to recommissioning. **2016 – Annual Review Update** No further action required as waste oil system is not utilised. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. **2017 – Annual Review Update.** The waste oil system was not utilised during the 2017 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2018 – Annual Review Update.** The waste oil system was not utilised during the 2018 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2019 – Annual Review Update.** The waste oil system was not utilised during the 2019 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2020 – Annual Review Update.** The waste oil system was not utilised during the 2020 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining.	Active

Invincible Colliery IEA Action Plan

ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC6 **Med**	PA 07_0127, S3, C12	Except as may be expressly provided for by an EPL, or in accordance with section 120 of the *Protection of the Environment Operations Act 1997*, (POEO Act) the Proponent shall not discharge any mine water from the site.	The EPL permits wet weather discharge from the overflow point located at the water storage dam below the washery and labelled as Discharge Point #2 on plan titled 'Invincible Open Cut Environmental Monitoring Sites' dated 29 June 2001. A copy of the plan was not available at the time of the audit and is required to verify the location as per this figure; however the description appears to match the discharge location used. It was reported during site interviews, that dirty water storage dams are utilised during heavy rainfall events, these are the Sump Dam (SDC3-7) and Crib Hut Dam (SD-C3-6, now SD4). All water captured in these two dams is either pumped or drains into the underground workings or is reused on site when required. This is approved in the Care and Maintenance Mining Operations Plan (2013) but is not expressly provided for within the EPL. Consultation with the Department of Primary Industries - Water also indicated that the site needs to consider the Aquifer Interference Policy for all surface water movement activities.	Review the current operations against the Aquifer Interference Policy. Apply to the EPA for a modification of the Environment Protection Licence to permit discharge via the underground workings.	Coalpac	Mine water is not discharged from the site except from the licenced discharge location at the Main Dam (LD002) and only when water quality is in accordance with EPL criteria. EPA has advised that discharge of groundwater from old underground workings (LD001) was previously approved under the EPL at a rate of 2ML/day but was removed in 2012 due to concerns with groundwater quality and volumes and the potential impacts on Cox's River and Long Swamp. At that time, the pump was removed from LD001 and no discharge currently occurs from this location. While water is pumped from Sediment Dam 2 to Sediment Dam 4, which drains to the old underground workings, there is no discharge from the underground workings. **2016 – Annual Review Update** No further action required. **2017 – Annual Review Update** No further action required. **2018 – Annual Review Update** A revised water management plan for the site was submitted to the EPA and DPI Water during the 2018 report period and will be completed during the 2019 report period. **2019 – Annual Review Update** A revised water management plan for the site was submitted to the EPA and DPI Water during the 2018 report period and will be completed prior to the recommencement of operations. The EPA and DPI Water are yet to provide comments on the draft management plans. **2020 – Annual Review Update** A revised water management plan for the site was submitted to the EPA and DPI Water during the 2018 report period and will be completed prior to the recommencement of operations. The EPA and DPI Water are yet to provide comments on the draft management plans.	Active
NC7 **Med**	PA 07_0127, S3, C13(c)(ii)	Water Management Plan (WMP) This Plan must include an erosion and sediment control plan for all surface works in the mining area that is consistent with the requirements of Managing Urban Stormwater: Soils and Construction Manual (Landcom 2004, or its latest version);	Section 8 of the WMP (2009) provides an Erosion and Sediment Control Plan. Erosion was observed on site during the site inspection and has been noted by others during recent inspections of the rehabilitation areas (Kleinfelder, 2015), indicating that review and maintenance of controls is required.	Update the Erosion and Sediment Control Plan with reference to the latest guidelines for Managing Urban Stormwater: Soils and Construction, Volume 2E Mines and Quarries (Blue Book).	Coalpac	Erosion and sediment control rectification works are currently being conducted by Sedgman Civil Engineers. Proposed timeframe for update of the ESCP: 31 January 2017. The Stage 1 erosion control design has been completed and a new ESCP will be provided by the end of June 2017. **2016 – Annual Review Update** A review of the proposed design, including determination of whether any interim works can be undertaken will be completed by June 2017. **2017 – Annual Review Update** Management Plans will be updated during 2018 to incorporate the Southern Extension Project Area and Project Approval conditions. **2018 – Annual Review Update** A revised water management plan for the site was submitted to the EPA and DPI Water during the 2018 report period and will be completed during the 2019 report period. **2019 – Annual Review Update** A revised water management plan for the site was submitted to the EPA and DPI Water during the 2018 report period and will be completed prior to the recommencement of operations. The EPA and DPI Water are yet to provide comments on the draft management plans. **2020 – Annual Review Update**	Active

Invincible Colliery IEA Action Plan

ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
						A revised water management plan for the site was submitted to the EPA and DPI Water during the 2018 report period and will be completed prior to the recommencement of operations. The EPA and DPI Water are yet to provide comments on the draft management plans.	

Invincible Colliery IEA Action Plan

ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC8 Low	PA 07_0127, S3, C13(c)(iv)	This Plan must include a groundwater monitoring program with: - baseline data of groundwater levels and quality in the region, including details of any privately-owned groundwater bores which could be affected by the development; - groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts of the development; and - a program to monitor: - groundwater inflows to the open cut mining operations; & - impacts of the development on the region's aquifers, groundwater bores and surrounding watercourses	Section 10 of the WMP (2009) references a Groundwater Monitoring Program. The plan includes baseline data, groundwater impact assessment criteria and trigger levels; however it lacks a detailed monitoring program to assess groundwater inflows to the open cut mining operations or impacts of the development on the regions water resources. The 2014 and 2015 AEMRs indicate that groundwater monitoring is undertaken from up and downgradient wells, however this monitoring is not detailed in the WMP.	Update the WMP to include a groundwater monitoring program that satisfies the requirements of the Project Approval.	Coalpac	6 rounds of groundwater monitoring have previously been conducted since 2011 and a 7th round was conducted in November 2015 by RCA Environmental. The groundwater monitoring has been undertaken to provide a baseline dataset to assess the impact of mining operations on groundwater resources. The groundwater water monitoring program and results are described in RCAs *Invincible Colliery Groundwater Monitoring Report November 2015*. The WMP will be updated to include the groundwater monitoring program as part of the project approval process for future mining operations as agreed with DPE. Update of the WMP will be undertaken as part of the proposed expansion project. **2016 – Annual Review Update** No further action proposed. **2017 – Annual Review Update** Management Plans will be updated during 2018 to incorporate the Southern Extension Project Area and Project Approval conditions. **2018 – Annual Review Update** A revised water management plan for the site was submitted to the EPA and DPI Water during the 2018 report period and will be completed during the 2019 report period. **2019 – Annual Review Update** A revised water management plan for the site was submitted to the EPA and DPI Water during the 2018 report period and will be completed prior to the recommencement of operations. The EPA and DPI Water are yet to provide comments on the draft management plans.	Active
NC11 Low	PA 07_0127, S3, C32	Biodiversity Offsets Within 2 years of the date of this approval, the Proponent shall provide appropriate long term security for the biodiversity offset strategy (BOS), to the satisfaction of the Director-General. Note: The long-term security of the offset can be achieved through one, or a combination, of the following: Deed of Agreement with the Minister, rezoning the land under the Lithgow Local Environment Plan, caveats on the title under the *Conveyancing Act 1919*, etc.	Evidence of the provision of appropriate long-term security for the BOS was not provided by Sedgman or CC.	It is recommended that the leaseholder provide appropriate security for the BOS such as rezoning of Lot 112 DP877190, Lot 113 DP 877190 and Lot 1 DP180294 or the application of a protective covenant (such as a Section 88B Covenant) on title. Consult with the DPE.	Coalpac	Preparation of the BOS and establishment of a security pre-dates CC's involvement in the project and we are unable to confirm whether a security has been provided. Provision of a long-term security for the BOS will be addressed as part of the proposed expansion project. **2016 – Annual Review Update** No further works proposed as provision of a long-term security for the BOS will be addressed as part of the proposed expansion project. **2017 – Annual Review Update** The timing requirements of this condition have been revised in the current project approval (i.e. Z" Within 2 years of the recommencement of mining operations, unless the Secretary agrees otherwise, "These works will be progressed during 2018 – 2019. **2018 – Annual Review Update** The timing requirements of this condition have been revised in the current project approval (i.e. " Within 2 years of the recommencement of mining operations, unless the Secretary agrees otherwise…") These works will be progressed during the 2019 report period. **2019 – Annual Review Update** The timing requirements of this condition have been revised in the current project approval (i.e. " Within 2 years of the recommencement of mining operations, unless the Secretary agrees otherwise…") These works will be completed prior to the recommencement of operations. **2020 – Annual Review Update**	Active

Invincible Colliery IEA Action Plan

ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
						The timing requirements of this condition have been revised in the current project approval (i.e. " Within 2 years of the recommencement of mining operations, unless the Secretary agrees otherwise…") These works will be completed prior to the recommencement of operations.	
NC12 Low		The Proponent shall progressively rehabilitate the site in a manner that is generally consistent with the final landform set out in the EA (shown conceptually in Figure 5 of Appendix 1) to the satisfaction of the Director-General and I&I NSW.	Progressive rehabilitation of the site has generally been consistent with the final landform set out in the EA. Although the maximum slope has been exceeded in some areas of rehab, particularly the 2012 seeded areas. This has resulted in top soil loss and erosion, in parts, and the failed establishment of native vegetation, seeded as part of rehabilitation measures (aerial seeding in particular) in the north-western portion of the site. Although there has been no new rehabilitation areas established by CC and rehabilitation performance is assessed annually, re-evaluation of the establishment of failed rehabilitation areas, particularly on steep slopes is required.	Whilst no new rehabilitation has been established during CC operations and rehabilitation performance is assessed annually, it is recommended that CC review Rehabilitation progress and performance, including the establishment of failed rehabilitation areas on steep slopes. Any recommendations from the annual review process should be reflected in future rehabilitation plans.	Castlereagh Coal	Annual biodiversity monitoring was conducted within rehabilitation areas in December 2015 and December 2016 and recommendations are being implemented by CC. Areas of failed rehabilitation and erosion in rehabilitation areas are currently being monitored and will be reseeded as required as part of the ongoing care and maintenance activities. **2016 – Annual Review Update** Annual biodiversity monitoring undertaken during 2016. Erosion and sediment control on site to be reviewed in accordance with item NC7. **2017 – Annual Review Update** Annual biodiversity monitoring undertaken during 2017 and reported in the Annual Review. Erosion and sediment control on site to be reviewed in accordance with item NC7. CC notes that a Rehabilitation Management Plan required under Schedule 3 Condition 52 requires a detailed rehabilitation schedule and performance assessment aspects. The Rehabilitation Management Plan will be submitted during 2018. **2018 – Annual Review Update** A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE during 2019. Annual biodiversity and rehabilitation monitoring was also undertaken during 2018. **2019 – Annual Review Update** A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2019 and is discussed in the Annual Review. **2020 – Annual Review Update** A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020 and is discussed in the Annual Review.	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC13 Med	PA 07_0127, S3, C34(a)	The Proponent shall prepare and implement a detailed Landscape Management Plan for the site to the satisfaction of the Director-General and I&I NSW. This plan must: (a) be prepared in consultation with Lithgow City Council (LCC) and NOW by suitably qualified expert/s whose appointment/s have been approved by the Director-General;	A Landscape Management Plan (LMP), dated June 2009 was reviewed. Section 1.2 of the plan indicates that it was prepared in consultation with LCC and NOW as required by this condition. Records were not available to verify this condition has been met. The plan states that it was developed in consultation variously between relevant mine personnel, Global Soil Systems (GSS) and LCC and DWE. Records showing the approved appointment of GSS by the DPE were not available to verify this condition. Site inspection confirmed that the LMP was not implemented according with all criteria set out in the plan. In particular with regard to planting in the BOS, successful establishment of progressive rehabilitation areas, and the annual monitoring of each new area of rehabilitation.	Ensure the LCC and the DPI-Water is consulted during any future revisions to the WMP, and evidence of consultation is retained. Implement the LMP in terms of achieving performance criteria for rehabilitation, and following recommendations from Annual Flora, Fauna and Rehabilitation Monitoring.	Castlereagh Coal	The LMP was prepared and approved by the Director-General during Coalpac ownership of the mine and pre-dates CC's involvement in the project. Any future revisions of the management plans will be undertaken in consultation with relevant regulatory agencies (as required). Update of management plans will be undertaken as part of the proposed expansion project. The annual biodiversity monitoring conducted by Kleinfelder includes assessment against the performance criteria contained in the development stage section of the LMP Assessment Checklist (Appendix 2) including vegetation establishment and sustainability, fauna habitat and recolonization, landform stability and soil suitability. However, they do not provide a completed Assessment Checklist as contained in the LMP Appendix 2. Further annual biodiversity monitoring was conducted by Umwelt in December 2016 and included assessment against the relevant sections of the LMP Checklist. **2016 – Annual Review Update** Annual biodiversity monitoring conducted during 2016 with results included within the 2016 Annual Review (refer to **Section 8.3**). Any updates made to management plans in the future will be undertaken in accordance with relevant stakeholders as defined by statutory approvals. **2017 – Annual Review Update** This condition (i.e. S3, C34(a)) has been removed from the Project Approval. CC notes that a Rehabilitation Management Plan required under Schedule 3 Condition 52 must be prepared in consultation with DPI Water, OEH, Council and CCC. The Rehabilitation Management Plan will be submitted during 2018. **2018 – Annual Review Update** A revised Rehabilitation Management Plan was submitted to agencies for comment during 2018 and will be finalised during the 2019 Report Period. **2019 – Annual Review Update** A revised Rehabilitation Management Plan was submitted to agencies for comment during 2018 and will be finalised prior to the recommencement of operations. The status of all management plans is detailed in the Annual Review. **2020 – Annual Review Update** A revised Rehabilitation Management Plan was submitted to agencies for comment during 2018 and will be finalised prior to the recommencement of operations. The status of all management plans is detailed in the Annual Review.	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC16 Low	PA 07_0127, S3, C37	Biodiversity Offset Strategy (BOS) Implementation Bond Within 3 months of the approval of the LMP, the Proponent shall lodge a BOS implementation bond with either the I&I NSW or the DPE to ensure that the BOS is implemented in accordance with the performance and completion criteria of the LMP. The sum of the bond shall reflect the full cost of implementing the BOS and be determined by employing a suitably qualified rehabilitation expert or quantity surveyor. Notes: • If the BOS is implemented to the satisfaction of the Director-General and I&I NSW, then the bond holder will release the implementation bond. • If the BOS is not implemented to the satisfaction of the Director-General and I&I NSW, then all or part of the bond may be used to ensure the satisfactory completion of the relevant works. • The bond may be incorporated into rehabilitation bonding arrangements under the *Mining Act 1992*.	Evidence of the BOS Implementation Bond was not provided by Sedgman or CC	Evidence of the BOS Implementation Bond was not available. Consult with DPE and DRE and provide evidence of BOS Implementation Bond, or evidence of DG sign-off on the implementation of the BOS.	Coalpac	This security was required to be paid in 2009 during Coalpac ownership; however we are unable to find records of this payment. We have been advised that neither DPE nor DRE have any records of this implementation bond being paid by Coalpac. It is expected that this issue will be resolved as part of the assessment being undertaken for the Invincible Southern Expansion Project. **2016 – Annual Review Update** No further action proposed until a determination is made in regards to the IEP. **2017 – Annual Review Update** This condition (i.e. S3, C37) has been removed from the Project Approval. CC notes that a Conservation Bond must be lodged with the Department within 6 months of the approval of the Biodiversity Management Plan required under Schedule 3 Condition 35 of the Project Approval (as modified). The Biodiversity Management Plan will be submitted during 2018 – 2019 in accordance with this condition. **2018 – Annual Review Update** A revised Biodiversity Management Plan was submitted to agencies for comment during 2018 and will be finalised during the 2019 report period. Following the approval of the management plan, a Conservation Bond will be established in accordance with the requirements of the Project Approval. **2019 – Annual Review Update** A revised Biodiversity Management Plan was submitted to agencies for comment during 2018 and will be finalised prior to the recommencement of operations. Following the approval of the management plan, a Conservation Bond will be established in accordance with the requirements of the Project Approval. **2020 – Annual Review Update** A revised Biodiversity Management Plan was submitted to agencies for comment during 2018 and will be finalised prior to the recommencement of operations. Following the approval of the management plan, a Conservation Bond will be established in accordance with the requirements of the Project Approval.	Active
NC17 Low	PA07_012 7,S3, C40 (a)	Aboriginal Heritage Management Plan (AHMP) The Proponent shall prepare and implement an AHMP for the project to the satisfaction of the Director-General. The Plan must: (a) be prepared in consultation with DECCW and the Aboriginal community;	Verifiable evidence of consultation with DECCW (now NSW OEH) or the Aboriginal Community was not reviewed as the current mine operators' access to these records is limited. The AHMP states that consultation with the Bathurst Local Aboriginal Land Council was made by phone and that they agreed with the conditions of the Project Approval and those detailed within the plan, in terms of its provisions for site material should any such material be found during the course of the project. The AHMP (June 2009) requires 'Invincible OS1' to be fenced and sign posted (Warning and Notice signs). During the site inspection, the Auditor observed: - a fence around the heritage site "Invincible OS1"; however no signage was visible. - maps showing the location of the heritage site on the noticeboard at the main office. It was reported that signage had been installed, but was not visible to the auditor during the audit.	Ensure the EPA and the Aboriginal Community is consulted during any future revisions to the AHMP, and evidence of consultation is retained. Re-erect the signs at the 'Invincible OS1' Aboriginal heritage site as outlined in the AHMP (i.e. Warning and Notice signs). Update plans in all management documents to include the location of the cultural heritage site "Invincible OS1".	Castlereagh Coal	The AHMP prepared by Coalpac states that consultation was made with the DECC and the BLALC. Contact details for BLALC are provided in Appendix 1 and correspondence from BLALC is provided in Appendix 2. Any future review of the AHMP by CC would be conducted in consultation with relevant regulatory authorities and Aboriginal parties. There are eight signs in total at the OS1 site (many of which the audit team would not have seen as they are not visible from a distance and the audit team did not go right down to the site). However many of the signs had fallen off the fence and were therefore not visible from a distance. These signs have now been reattached and all signs are visible. No further action required. **2018– Annual Review Update** An Aboriginal Cultural Heritage Management Plan (ACHMP) was submitted to Aboriginal Stakeholders during 2018 and will be updated to address stakeholder comment and be submitted to OEH for comment in 2019. **2019 – Annual Review Update** An Aboriginal Cultural Heritage Management Plan (ACHMP) was submitted to Aboriginal Stakeholders during 2018 and will be updated to address stakeholder comment and be submitted to OEH for comment and finalised prior to the recommencement of operations. **2020 – Annual Review Update**	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
						An Aboriginal Cultural Heritage Management Plan (ACHMP) was submitted to Aboriginal Stakeholders during 2018 and will be updated to address stakeholder comment and be submitted to OEH for comment and finalised prior to the recommencement of operations.	
NC21 Admin	PA 07_0127, S5, C1(e)	Environmental Management Strategy (EMS) This strategy must (e) include environmental monitoring program for the project that includes all the monitoring requirements of this approval;	Section 12 of the EMS states that Environmental Monitoring Programs have been prepared pursuant to Schedule 3, Condition 6, 10, 13 and 30 of PA 07_0127. This relates to noise, air, water and blast monitoring only and does not include the requirement to monitor waste generation (Schedule 3, Condition 43), rehabilitation (Schedule 3, Condition 35), greenhouse and energy efficiency (Schedule 3, Condition 42), coal transport etc. Section 12 states that the included monitoring plans have been consolidated into a single document as described within Appendix 2 - However, the plans included in Appendix 2 of the EMS could not be verified as Appendix 2 is not attached to the EMS (on the CC website). An Environmental Monitoring Program (Coalpac, 2009) is provided on the CC website. This plan states that it has been developed as required by Schedule 5, Condition 1 (e), however, the date of this report (December 2009) does not indicate that it is the Appendix 2 of the EMS (November 2009).	Inclusion of the current Environmental Monitoring Program within the EMS is required to meet the conditions of the Project Approval. A full copy of the EMS should be uploaded to the website and the EMS should be updated to reference the EMP (ensuring also that the EMP is reviewed for relevancy).	Castlereagh Coal	A link to the Coalpac website is provided on the CC website for access to 'historic documents'. Appendix 2 (Environmental Monitoring Program) was not attached to the pdf of the EMS on the Coalpac website but the Environmental Monitoring Program was included separately on the website. This Environmental Monitoring Program includes programs for waste monitoring (Section 9), rehabilitation (Section 8), greenhouse gases (Section 10), and coal transport (Section 11). Appendix 2 was added to the pdf of the EMS and the complete EMS document has now been uploaded to the CC website **2016 – Annual Review Update** No further action required. **2018 – Annual Review Update** A revised Environmental Management Strategy for Invincible Colliery will be submitted to DPE during 2019. **2019 – Annual Review Update** A revised Environmental Management Strategy for Invincible Colliery will be submitted to DPI prior to the recommencement of operations. **2020 – Annual Review Update** A revised Environmental Management Strategy for Invincible Colliery will be submitted to DPI prior to the recommencement of operations.	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC27 Med	SOC, C3.4	Store waste oils and grease at the maintenance workshop for collection by a licensed waste recycling contractor (Bi-monthly)	Waste oils and grease are stored within drums in the maintenance workshop. The 2015 AEMR states that waste oils and grease from workshop areas is collected in the waste oil storage tank. The above ground waste oil tank is located in bunding near the mechanical servicing area. A number of other chemical storage containers are located within this bunded area. A catch drain is adjacent to the waste oil tank to capture any material in the unlikely event that waste oil or other chemicals are spilled. This drain leads to an oil/water separator and a 6,000L waste oil collection tank. The 2015 AEMR reports that minor servicing may be undertaken on site using this infrastructure however maintenance records or liquid waste disposal records were not sighted. During the site inspection, a number of observations were recorded as follows: 1. The catch drain system was (in sections) filled with oily sediment and debris and as the area is still in use for chemical storage, it requires cleaning and maintenance. 2. A break in the PVC pipes that leads from the catch drains to the oil/water separator and waste oil tank was observed. Should any spills within the bunded area occur, this would leak onto the soil and vegetation on the embankment. The piping needs repair and the integrity of the system requires testing. 3. The waste oil collection tank is not bunded. 4. Liquid waste/product containers stored within the workshop are not bunded.	Ensure all liquid waste containers are stored within secondary containment / in bunding. • Undertake maintenance and cleaning of the wastewater catch drain system. • Retain all records of maintenance of equipment for a period of 7 years. • Retain all records of waste disposal for a period of 7 years. • Install bunding around the waste oil collection tank (if it is to remain operational). • Repair the PVC pipe in the waste oil collection system and investigate any residual contamination. • Conduct a maintenance inspection and integrity test of the waste oil collection system tanks and piping.	Castlereagh Coal	The following items are included in the current inspection/ maintenance program. However, there is currently no formal recording of actions for repair/maintenance: • Inspection and maintenance of the catch drain system. • Inspection and maintenance of the wastewater collection system. • Plant and equipment maintenance and servicing. A new Inspection Checklist has been prepared to allow recording of repairs/maintenance and corrective actions required and this checklist is currently being used during routine inspections conducted by the Mining Engineering Manager. The waste oil collection system is currently not in use. However, repairs to the catch drain pipework will be undertaken as required. The wastewater collection system is now assessed during routine inspections. There is no evidence of leakage/spillage or contamination in this area and the system will continue to be monitored on a regular basis. The waste oil collection system is currently not in use. If this system is proposed to be used in future, bunding will be installed prior to use. The UST tank is empty and is not currently used. However, it may be used again once operations recommence so will not be decommissioned. The tank and associated pipework will be tested prior to recommissioning. **2016 – Annual Review Update** No further action required as waste oil system is not utilised. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. **2017 – Annual Review Update** The waste oil system was not utilised during the 2017 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2018 – Annual Review Update** The waste oil system was not utilised during the 2018 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2019 – Annual Review Update** The waste oil system was not utilised during the 2019 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2020 – Annual Review Update** The waste oil system was not utilised during the 2020 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining.	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC28 Med	SOC, C3.6	Store hydrocarbon contaminated water in the oil/water separator for regular removal from site by a licensed contractor (as required).	See Item 3.3 and 3.4 above. Disposal receipts for the regular removal of liquid wastes is not recorded and the infrastructure to store the liquid waste is in need of repair.	See recommendations for 3.3 and 3.4 above.	Castlereagh Coal	The following items are included in the current inspection/ maintenance program. However, there is currently no formal recording of actions for repair/maintenance: • Inspection and maintenance of the catch drain system. • Inspection and maintenance of the wastewater collection system. • Plant and equipment maintenance and servicing. A new Inspection Checklist has been prepared to allow recording of repairs/maintenance and corrective actions required and this checklist is currently being used during routine inspections conducted by the Mining Engineering Manager. The waste oil collection system is currently not in use. However, repairs to the catch drain pipework will be undertaken as required. The wastewater collection system is now assessed during routine inspections. There is no evidence of leakage/spillage or contamination in this area and the system will continue to be monitored on a regular basis. The waste oil collection system is currently not in use. If this system is proposed to be used in future, bunding will be installed prior to use. The UST tank is empty and is not currently used. However, it may be used again once operations recommence so will not be decommissioned. The tank and associated pipework will be tested prior to recommissioning. **2016 – Annual Review Update** No further action required as waste oil system is not utilised. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. **2017 – Annual Review Update** The waste oil system was not utilised during the 2017 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2018 – Annual Review Update** The waste oil system was not utilised during the 2018 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2019 – Annual Review Update** The waste oil system was not utilised during the 2019 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2020 – Annual Review Update** The waste oil system was not utilised during the 2020 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining.	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC33 Med	SOC, C8.1	Construct a fence around the site “Invincible OS1” and identify this as a culturally sensitive area at the site and on all mine plans (prior to commencement of the project).	The AHMP (June 2009) requires 'Invincible OS1' to be fenced and sign posted (Warning and Notice signs). During the site inspection, the Auditor observed: - a fence around the heritage site "Invincible OS1"; however no signage was visible. - maps showing the location of the heritage site on the noticeboard at the main office. It was reported that signage had been installed, but was not visible to the auditor during the audit. A review of monitoring and management plans indicated that the location of the heritage site is not identified on all mine plans. For example, the 2013 MOP does not include the site on plans 1, 2A, 3, 4A. The AHMP does not include the site's location on the overall mine site layout on Figure 2.	Update plans in all management documents to include the location of the cultural heritage site "Invincible OS1". Re-erect signs on the fencing at the 'Invincible OS1' Aboriginal heritage site as outlined in the Aboriginal Heritage Management Plan (i.e. Warning and Notice signs).	Castlereagh Coal	There are eight signs in total around the fencing of OS1 (most of which the audit team would not have seen as they are not visible from a distance and the audit team did not go right down to the site). However many of these signs had fallen off the fence and were not visible. These signs have now been reattached. No further action required **2018 – Annual Review Update** No further action required. Noted that a revised ACHMP will be prepared during the 2019 report period. **2019 – Annual Review Update** No further action required. Noted that a revised ACHMP will be prepared prior to the recommencement of operations. **2020 – Annual Review Update** No further action required. Noted that a revised ACHMP will be prepared prior to the recommencement of operations.	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC43 Med	SOC, C9.17	Direct all water from wash-down areas and workshops to oil/water separators and containment systems (ongoing).	Wash down areas and workshops drain to a catch drain system that leads to an oil/water separator and a 6000L waste oil collection tank. During the site inspection, maintenance and integrity issues were identified as outlined in condition 9.18 below. These issues affect the ability of the system to contain wastewater and are required to be addressed.	Refer to actions in NC 44 below.	Castlereagh Coal	The following items are included in the current inspection/ maintenance program. However, there is currently no formal recording of actions for repair/maintenance: • Inspection and maintenance of the catch drain system. • Inspection and maintenance of the wastewater collection system. • Plant and equipment maintenance and servicing. A new Inspection Checklist has been prepared to allow recording of repairs/maintenance and corrective actions required and this checklist is currently being used during routine inspections conducted by the Mining Engineering Manager. The waste oil collection system is currently not in use. However, repairs to the catch drain pipework will be undertaken as required. The wastewater collection system is now assessed during routine inspections. There is no evidence of leakage/spillage or contamination in this area and the system will continue to be monitored on a regular basis. The waste oil collection system is currently not in use. If this system is proposed to be used in future, bunding will be installed prior to use. The UST tank is empty and is not currently used. However, it may be used again once operations recommence so will not be decommissioned. The tank and associated pipework will be tested prior to recommissioning. **2016 – Annual Review Update** No further action required as waste oil system is not utilised. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. **2017 – Annual Review Update** The waste oil system was not utilised during the 2017 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2018 – Annual Review Update** The waste oil system was not utilised during the 2018 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2019 – Annual Review Update** No further action required. The waste oil system was not utilised during the 2019 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2020 – Annual Review Update** No further action required. The waste oil system was not utilised during the 2020 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining.	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC44 Med	SOC, C9.18	Ensure all storage tanks are either self-bunded tanks or bunded with an impermeable surface and have a capacity to contain a minimum 110% of the largest storage tank capacity (ongoing).	The 2015 AEMR reports two above ground fuel storage tanks on site. One self-bunded 75,000L diesel tank is currently used to store a maximum of 35,000L fuel for pumps and light vehicles. A second tank (95,000L) was drained down and secured and is currently not in use. Waste oil is collected in the workshop area in portable drums for offsite disposal. Waste oil is also transferred to a bulk waste oil tank located in a bunded area near the vehicle servicing area. A catch drain adjacent to the waste oil tank is designed to capture any spills in this area. This drain leads to an oil/water separator and a 6,000L waste oil collection tank. During the site inspection, a number of observations were recorded as follows: 1. The catch drain system was (in sections) filled with oily sediment and debris and as the area is still in use for chemical storage, it requires cleaning and maintenance. 2. A break in the PVC pipes that leads from the catch drains to the oil/water separator and waste oil tank was observed. Should any spills within the bunded area occur, this would leak onto the soil and vegetation on the embankment. The piping needs repair and the integrity of the system requires testing. 3. The 6000L waste oil collection tank is not bunded. 4. Liquid waste containers stored within the workshop are not bunded.	*Ensure all liquid waste containers are stored within secondary containment / in bunding. *Undertake maintenance and cleaning of the wastewater catch drain system. *Retain all records of maintenance of equipment for a period of 7 years. *Retain all records of waste disposal for a period of 7 years. *Install bunding around the waste oil collection tank (if it is to remain operational). *Repair the breakage in the pipe that leads from the wastewater catch drain to the oil/water separator and waste oil collection tank. Investigate whether any soil contamination has resulted from the breakage. * Conduct a maintenance inspection and integrity test of the waste oil collection system tanks and piping.	Castlereagh Coal	The following items are included in the current inspection/ maintenance program. However, there is currently no formal recording of actions for repair/maintenance: • Inspection and maintenance of the catch drain system. • Inspection and maintenance of the wastewater collection system. • Plant and equipment maintenance and servicing. A new Inspection Checklist has been prepared to allow recording of repairs/maintenance and corrective actions required and this checklist is currently being used during routine inspections conducted by the Mining Engineering Manager. The waste oil collection system is currently not in use. However, repairs to the catch drain pipework will be undertaken as required. The wastewater collection system is now assessed during routine inspections. There is no evidence of leakage/spillage or contamination in this area and the system will continue to be monitored on a regular basis. The waste oil collection system is currently not in use. If this system is proposed to be used in future, bunding will be installed prior to use. The UST tank is empty and is not currently used. However, it may be used again once operations recommence so will not be decommissioned. The tank and associated pipework will be tested prior to recommissioning. **2016 – Annual Review Update** No further action required as waste oil system is not utilised. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. **2017 – Annual Review Update** The waste oil system was not utilised during the 2017 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2018 – Annual Review Update** The waste oil system was not utilised during the 2018 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2019 – Annual Review Update** No further action required. The waste oil system was not utilised during the 2019 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2020 – Annual Review Update** No further action required. The waste oil system was not utilised during the 2020 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining.	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
NC50 High	EPL, A2.1	Premises or plant to which the licence applies. The licence applies to the following premises: THE INVINCIBLE COLLIERY, CASTLEREAGH HIGHWAY, CULLEN BULLEN, NSW 2790 LOT 1 DP 180294, LOT 113 DP 877190 PART BEN BULLEN STATE FOREST. INVINCIBLE COLIERY HOLDING	Project Approval 07_0127 is for: Part Ben Bullen State Forest, Lot 1/DP 180294, Lot 113/DP 877190 and Lot 112/DP 877190. The EPL does not cover Lot 112/DP 877190, an area of land partially within Ben Bullen State Forest and partially outside the Forest. Scheduled works have been undertaken across Lot 112/DP 877190 and the area is also established as a Biodiversity Offset Area. As the areas covered by the Project Approval do not align with the areas covered by the EPL, this is assessed as a non-compliance. A map showing the extent of the land covered by the EPL, in particular, the 'Part Ben Bullen State Forest, Invincible Colliery Holding' was not sighted and is not held by the EPA. Therefore it was difficult to determine if this area of the Project approval area called 'Part Ben Bullen State Forest ', on which coal works have been undertaken, aligns with the EPL.	Review premises details specified in condition A2.1 of the EPL to ensure that it is consistent with the area covered by the Project Approval. Vary the EPL if required.	Castlereagh Coal – the Auditor notes this was carried over from the EPL transferred from Coalpac to CC	EPA has advised that omission of Lot 112 DP877190 from the EPL is likely an oversight at the time of granting the licence. Castlereagh Coal will liaise with EPA to include this lot on the premises description on the licence. It is expected that this issue will be resolved on issue of the new approval and licence for the Invincible Southern Expansion Project. **2016 – Annual Review Update** No further action proposed. **2017 – Annual Review Update** No further action required. **2018 – Annual Review Update** No further action undertaken during 2018. A review of the Invincible EPL is to be undertaken during the 2019 report period. **2019 – Annual Review Update** A review of the Invincible EPL is to be undertaken prior to the recommencement of operations with a revised boundary to be submitted to the EPA at that time. **2020 – Annual Review Update** A review of the Invincible EPL is to be undertaken prior to the recommencement of operations with a revised boundary to be submitted to the EPA at that time.	Active
NC55 Med	EPL, O2.1(a)	Maintenance of plant and equipment All plant and equipment installed at the premises or used in connection with the licensed activity: a) must be maintained in a proper and efficient condition; and	The 2015 AEMR reports that most mobile plant and equipment has been removed from the site. Remaining equipment (such as excavators and dozers used for erosion control and rehabilitation maintenance and a mobile water pump) is periodically run, where possible, with pre-start inspections conducted at each instance. Sedgman advise that light vehicles are serviced off-site as required and no records are kept on site. Maintenance/pre-start inspection records for mobile equipment were not verified. it is noted that the mobile water pump is new and has not required servicing. Stationary plant and equipment that is currently used on site during the care and maintenance period, as observed during the site inspection, includes (but is not limited to): a 75,000L diesel AST and a wastewater collection system. This system comprises a bulk waste oil tank and liquid waste storage facility that is bunded and contained by a catch drain network that leads to an oil/water separator and a 6,000L waste oil collection tank. An underground fuel storage tank is also reported to be located on the site. The fuel tank has not been used during the audit period and has not been decommissioned. Maintenance/servicing/integrity inspection records for this infrastructure were not sighted. During the site inspection, a number of observations were recorded as follows: 1. The catch drain system contained (in sections) oily sediment and debris.	Undertake maintenance and cleaning of the wastewater catch drain system. Conduct a maintenance inspection and integrity test of the wastewater collection system including bunding, tanks and piping. Repair the breakage in the piping that leads from the wastewater catch drain to the oil/water separator and waste oil collection tank. Investigate whether any soil contamination has resulted from the breakage. Install bunding around the waste oil collection tank (if it is to remain operational). Ensure all plant and equipment required during care and maintenance is maintained in a proper and efficient manner as per a maintenance schedule or manufacturer's instructions. Retain maintenance and servicing records for all plant and equipment used at the site. Investigate the status of UST (which has not been used for 3 years). Undertake integrity testing and report results in the AEMRs. If no longer required, decommission the UST in accordance with WorkSafe NSW and NSW EPA requirements. If	Castlereagh Coal	The following items are included in the current inspection/ maintenance program. However, there is currently no formal recording of actions for repair/maintenance: • Inspection and maintenance of the catch drain system. • Inspection and maintenance of the wastewater collection system. • Plant and equipment maintenance and servicing. A new Inspection Checklist has been prepared to allow recording of repairs/maintenance and corrective actions required and this checklist is currently being used during routine inspections conducted by the Mining Engineering Manager. The waste oil collection system is currently not in use. However, repairs to the catch drain pipework will be undertaken as required. The wastewater collection system is now assessed during routine inspections. There is no evidence of leakage/spillage or contamination in this area and the system will continue to be monitored on a regular basis. The waste oil collection system is currently not in use. If this system is proposed to be used in future, bunding will be installed prior to use. The UST tank is empty and is not currently used. However, it may be used again once operations recommence so will not be decommissioned. The tank and associated pipework will be tested prior to recommissioning. **2016 – Annual Review Update** No further action required as waste oil system is not utilised. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. **2017 – Annual Review Update** The waste oil system was not utilised during the 2017 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2018 – Annual Review Update** The waste oil system was not utilised during the 2018 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the	Active

Invincible Colliery IEA Action Plan

ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
			2. A break in the PVC pipes that leads from catch drains to oil/water separator and waste oil collection tank. Should any spills within bunded area occur, this would leak onto the soil and vegetation on the embankment. 3. The 6000L waste oil collection tank is not bunded. The wastewater collection system is designed to capture any spills from current diesel AST refuelling area, bunded waste oil tank and liquid waste storage area. The 2015 AEMR reports that minor servicing may be undertaken on site using this infrastructure. As such it is required to be maintained in proper and efficient working condition during the care and maintenance period. The UST should be decommissioned in accordance with WorkSafe NSW and NSW EPA requirements.	the tank is proposed to be used in the future, it is recommended that CC arrange for the tank and associated piping be tested prior to recommissioning.		system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2019 – Annual Review Update** The waste oil system was not utilised during the 2019 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining. **2020 – Annual Review Update** The waste oil system was not utilised during the 2020 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining.	
NC59 Low	EPL, M2.2	Requirement to monitor concentration of pollutants discharged – Air Monitoring Requirements	Dust and HVAS monitoring data was reviewed from May 2013 to December 2015. PM10 - PM10 was monitored weekly and is reported as ug/m3. The ALS 2014 monthly dust monitoring reports specified that the HVAS monitoring was carried out in conformance with AS/NZS 3850.9.6:2003. The Castlereagh Coal monthly monitoring reports provide a summary of results only and do not specify sampling methodology (not verified). Deposited Matter - Dust gauges are monitored monthly and reported as g/m2/month. Weekly estimations of particulate matter are made as outlined below. The ALS 2014 monthly dust monitoring reports specified that the dust monitoring was carried out in conformance with AS/NZS 3580.10.1:2003. The CC monthly monitoring reports provide a summary of results only and do not specify sampling methodology (not verified). Particulate Matter (TSP) - The EPL requires monitoring of particulate matter at IDD1 (EPA point 3) weekly in accordance with AS/NZS 3580:2003 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - TSP matter - High volume sampler gravimetric method. The Project Approval specifies the impact assessment criteria for (TSP) monitoring. Review of the AQMP (2009) indicates that 'a determination was made to estimate TSP from PM10 data' that is collected using the high volume air sampler (HVAS) at this location. Correspondence from the EPA accepting this change in methodology has not been sighted and given that it remains a condition of the EPL, this	The EPL specifies that particulate matter (TSP) is sampled using a high volume air sampler. In practice, at IDD1 (EPA point 3), TSP is estimated from PM10 data that is collected using a high volume air sampler. This revised sampling methodology is outlined in the Air Quality Management Plan, however is in contravention to the current EPL conditions. Consult with the EPA and DPE regarding the appropriateness of the sampling method used for measurement of TSP at IDD1 (EPA point 3). Retain copies of correspondence. If the change in sampling method for TSP is accepted by the relevant agencies, document the methodology for estimation of TSP from PM10 data and ensure this is recorded within the monthly air quality monitoring reports. Monthly monitoring reports to specify sampling methods to demonstrate compliance with EPL sampling method requirements.	Castlereagh Coal – the Auditor notes that the method of TSP sampling was also undertaken by Coalpac	The methodology for calculating TSP based on historic methodology is provided in the monthly monitoring reports provided by RCA to CC. This method was likely agreed between regulatory agencies and Coalpac prior to Castlereagh Coals involvement with the project. CC has sought clarification from the EPA and DPE whether this methodology is still acceptable. DPE has advised that monitoring is currently in accordance with the project approval, as Castlereagh Coal is monitoring air quality using a high volume air sampler and dust deposition gauges. We sent a request to EPA for approval of the calculation of TSP from PM_{10} data on 1st December 2016 but have not received a reply to date. A follow up email was sent to EPA on 13th January 2017. **2016 – Annual Review Update** Consultation will be undertaken with DP&E and EPA during 2017 to resolve the calculation methodology. **2017 – Annual Review Update** The Project Approval (as modified) requires the preparation of an Air Quality Management Plan (AQMP) in consultation with the EPA (Schedule 3 Condition 19). The AQMP will address this issue. The AQMP will be submitted during 2018. **2018 – Annual Review Update** The Project Approval (as modified) requires the preparation of an Air Quality Management Plan (AQMP) in consultation with the EPA (Schedule 3 Condition 19). The AQMP has been developed and submitted to the EPA for comment. The revised plan will be submitted to DPE during the 2019 report period. **2019 – Annual Review Update** The Project Approval (as modified) requires the preparation of an Air Quality Management Plan (AQMP) in consultation with the EPA (Schedule 3 Condition 19). The AQMP has been developed and submitted to the EPA for comment. The revised plan will be submitted to DPE prior to the recommencement of operations. **2020 – Annual Review Update** The Project Approval (as modified) requires the preparation of an Air Quality Management Plan (AQMP) in consultation with the EPA (Schedule 3 Condition 19). The AQMP has been developed and submitted to the EPA for comment. The revised plan will be submitted to DPE prior to the recommencement of operations.	Active

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ID	Criteria	Requirement	Audit Finding	Audit Recommendation	Responsibility (assigned by auditor)	Follow up Actions and Current Status	Status
			variation in sampling methodology is considered a non-compliance. Monitoring reports for August 2013 and September 2013 were not available and therefore, the Auditor could not verify compliance for these dates with respect to this condition.				
NC60 Low	EPL, M3.1	Testing methods - concentration limits Monitoring for the concentration of a pollutant emitted to the air required to be conducted by this licence must be done in accordance with: a) any methodology which is required by or under the Act to be used for the testing of the concentration of the pollutant; or b) if no such requirement is imposed by or under the Act, any methodology which a condition of this licence requires to be used for that testing; or c) if no such requirement is imposed by or under the Act or by a condition of this licence, any methodology approved in writing by the EPA for the purposes of that testing prior to the testing taking place. Note: The *Protection of the Environment Operations (Clean Air) Regulation 2010* requires testing for certain purposes to be conducted in accordance with test methods contained in the publication "Approved Methods for the Sampling and Analysis of Air Pollutants in NSW".	Refer to M2.2. A full assessment of the requirements under the *Protection of the Environment Operations (Clean Air) Regulation 2010* has not been undertaken.	Refer to recommendations in NC59.	Castlereagh Coal	The methodology for calculating TSP based on historic methodology is provided in the monthly monitoring reports provided by RCA to CC. This method was likely agreed between regulatory agencies and Coalpac prior to Castlereagh Coals involvement with the project. CC has sought clarification from the EPA and DPE whether this methodology is still acceptable. DPE has advised that monitoring is currently in accordance with the project approval, as CC is monitoring air quality using a high volume air sampler and dust deposition gauges. We sent a request to EPA for approval of the calculation of TSP from PM10 data on 1st December 2016 but have not received a reply to date. A follow up email was sent to EPA on 13th January 2017. **2016 – Annual Review Update** Consultation will be undertaken with DP&E and EPA during 2017 to resolve the calculation methodology. **2017 – Annual Review Update** The Project Approval (as modified) requires the preparation of an AQMP in consultation with the EPA (Schedule 3 Condition 19). The AQMP will address this issue. The AQMP will be submitted during 2018. **2018 – Annual Review Update** The Project Approval (as modified) requires the preparation of an Air Quality Management Plan (AQMP) in consultation with the EPA (Schedule 3 Condition 19). The AQMP has been developed and submitted to the EPA for comment. The revised plan will be submitted to DPE during the 2019 report period. **2019 – Annual Review Update** The Project Approval (as modified) requires the preparation of an Air Quality Management Plan (AQMP) in consultation with the EPA (Schedule 3 Condition 19). The AQMP has been developed and submitted to the EPA for comment. The revised plan will be submitted to DPE prior to the recommencement of operations. **2020 – Annual Review Update** The Project Approval (as modified) requires the preparation of an Air Quality Management Plan (AQMP) in consultation with the EPA (Schedule 3 Condition 19). The AQMP has been developed and submitted to the EPA for comment. The revised plan will be submitted to DPE prior to the recommencement of operations.	Active

Invincible Colliery IEA Action Plan

Invincible Colliery IEA Action Plan: Improvement Opportunities

ID	Criteria	Audit Recommendation	Proposed Action	Status as at 31 December 2020
IO4	PA 07_0127, S3, C11	Engage a qualified technician to undertake an operation, maintenance and calibration check of the meteorological station and gain written confirmation that it complies with the requirements of the Approved Methods for Sampling of Air Pollutants in New South Wales guideline (in line with PA 07_0127, Schedule 3, Condition 11).	Weather stations are calibrated regularly during download of meteorological data by RCA. Weather stations services are conducted regularly by Ecotech qualified technicians. Full calibration of the stations in accordance with the Australian Standard will be undertaken prior to recommencement of mining operations.	Weather station calibration undertaken during 2018 report period. Completed.
IO7	PA 07_0127, S5, C1(a)	Consult with the DPE to verify whether the Environmental Management Strategy (Coalpac, November 2009) has been approved by the DPE as required by PA 07_0127 Schedule 5, Condition 1.	This document was prepared by Coalpac in 2009 and has been implemented on site. We have no evidence of approval by DPE as this pre-date Castlereagh Coal's involvement in the project. However, we will request confirmation of this from DPE.	The Project Approval (as modified) requires the preparation of an EMS (Schedule 5 Condition 1). A draft EMS has been prepared and will be submitted to DPIE prior to the recommencement of operations.
IO10	SOC, C5.3	Ensure all equipment used on site is regularly serviced and all service records are kept on file. Conduct periodic checks of the sound power levels of equipment used on site during noise generating maintenance works to compare against the levels used in the modelling and confirm compliance with noise criteria (as required by SOC Condition 5.3).	Servicing is conducted as described in **NC55.** There is plant and equipment used as needed on site during care and maintenance, however, this plant and equipment is serviced as required. There have been no complaints of noise disturbance from Invincible Colliery during the audit period and quarterly monitoring of noise from the mine is undertaken by Global Acoustics. Once mining operations recommence, sound power levels of equipment will be checked.	The waste oil system was not utilised during the 2020 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining.
IO12	SOC, C7.5	Review target noxious weed species in subsequent control programs to capture the species identified during the site inspection on 28 January 2016, including Scotch Thistle (*Onopordum acanthium*) that were not known to be targeted during recent control spraying.	Targeted and general weed spraying was undertaken in consultation with ecologists undertaking annual biodiversity monitoring. Weed species were prioritised and spraying conducted between November 2015 and May 2016. It is likely that this weed was sprayed following the site inspection. Biodiversity monitoring will be undertaken again in November/December 2016 and will identify any further species required for weed control.	No further action required. This SOC has been removed from the Project Approval, weed management activities are reported in the Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPIE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO13	SOC, C7.11	Requires planting of *Eucalyptus cannonii*. The 2013 AEMR (Coalpac, 2013b) describes the planting of *E. cannonii* (Section 3.8.1) although this species does not appear on the Rehabilitation Seed Species List in Table 17 of the AEMR. It is recommended that future AEMRs provide consistency between relevant sections of the report, or supplementary information on the planting of *Eucalyptus cannonii* is documented.	Please refer to the response to **IO9**	A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPIE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO14	SOC, C8.2	Conduct inspections of the Aboriginal Heritage site 'Invincible OS1' prior to any planned pumping activity in the vicinity of the site, to ensure that planned water movements do not cause flood impacts to this area in accordance with the requirements of SOC Condition 8.2. Monitor the 'Invincible OS1' site during heavy rainfall periods and implement non-intrusive measures to divert water away from this area as required to minimise flooding impacts.	There is no active pumping into this area. This area only receives runoff from rehabilitation areas located upstream. Site operational staff are not aware of any flooding impacts that have occurred in this area in the last 3 years.	A revised ACHMP will be submitted to DPIE prior to the recommencement of operations.
IO19	SOC, C11.16	Ensure all plant and equipment required during care and maintenance is maintained in a proper and efficient manner as per a maintenance schedule or manufacturer's instructions. Retain service records for all plant and equipment installed at the premises or currently used in connection with Project.	Please refer to the response to **NC55**	No further action required. This SOC has been removed from the Project Approval. The waste oil system was not utilised during the 2020 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining.
IO21	EPL, A3.1	Obtain a copy of the EPL application and review current works and activities to determine compliance with EPL condition A3.1. Establish and maintain a compliance register and include the requirements of the EPL application to enable compliance tracking.	CC does not have access to the original licence application as this was submitted by Coalpac. However, we will request this information from the EPA.	The scheduled activities listed on the licence are "Coal Works" and "Mining for Coal" and are consistent with that previously undertaken at the mine.

Invincible Colliery IEA Action Plan

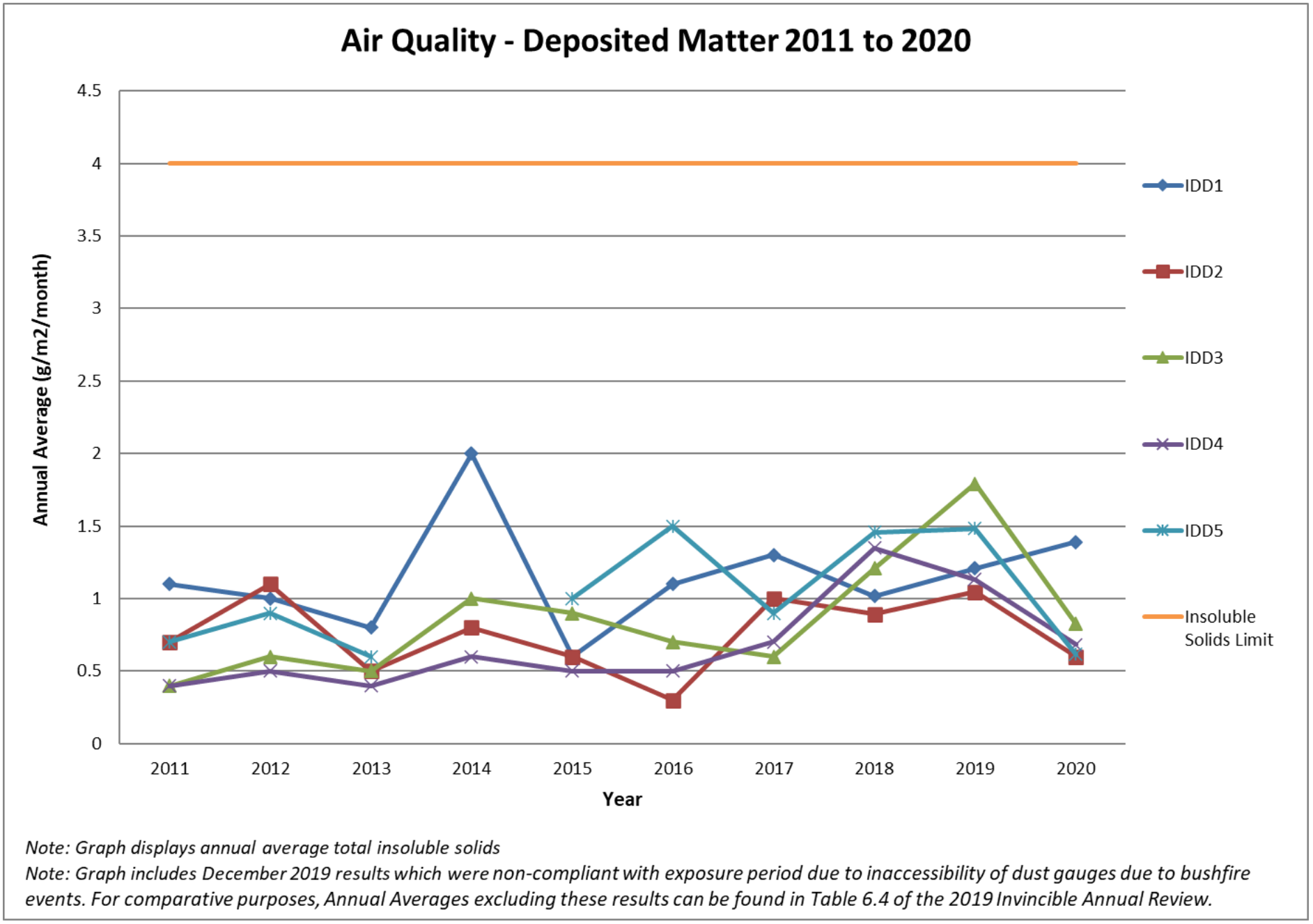
ID	Criteria	Audit Recommendation	Proposed Action	Status as at 31 December 2020
IO22	EPL, P1.3	Update the maps within relevant Environmental Management plans (including the Water Management Plan to clearly identify the location of the wet weather discharge monitoring point (EPA identification 2).	Please refer to the response to **NC45**	A revised water management plan for the site was submitted to the EPA and DPI Water during the 2018 report period and will be completed prior to the recommencement of operations.
IO34	LMP S7.1.1	Annual flora and fauna and rehabilitation monitoring has not recorded the following parameters during the audit period: Species Diversity (the presence of at least four overstorey and four understorey species in 20m x 10m plot per 10ha); Stem densities. Minimum total tree/shrub densities for sown areas are: (i) Year 2 - 3,000 stems/ha (ii) Year 5 - 2,000 stems/ha (iii) Year 7 - 600 stems/ha. This is not reported in the AEMRS. There are no fixed monitoring plots within rehabilitation post 2011. It is recommended that a review of rehabilitation performance against the stated criteria in the LMP is undertaken.	Please refer to the response to **NC49**	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO35	LMP S7.2(e)	The LMP (Section 7.2) requires areas not vegetated with established/remnant native trees and shrubs to be deep ripped in preparation for planting or seeding. No evidence that deep ripping has occurred within the BOA grassland areas during the site inspection. It is recommended that the need for this requirement be reviewed in the next monitoring session, and reported within the AEMR. Undertake deep ripping, if deemed appropriate.	The need for this requirement will be reviewed in consultation with consultants engaged to undertake future biodiversity monitoring. All works undertaken in rehabilitation and biodiversity offsets areas will be reported in the AEMR.	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO36	LMP S7.2(f)	The LMP (Section 7.2) requires seeds to be sown in areas not designated for tubestock planting. No seeding was reported in the AEMRs. It is recommended that the need for this requirement be reviewed following the next monitoring session, and reported within the AEMR. Undertake seeding in appropriate areas, as recommended.	Please refer to the response to **IO35**	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO37	LMP S7.2(g)	The LMP (Section 7.2) requires tubestock planting in areas which contain already established native grasses. No tubestock planting was reported in the AEMR. It is recommended that the need for this requirement be reviewed following the next monitoring session, and reported within the AEMR. Undertake planting in appropriate areas, as recommended.	Please refer to the response to **IO35**	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO38	LMP S7.2(h)	The LMP (Section 7.2) requires the addition of fertiliser during the sowing and tubestock planting process. No fertiliser application in BOA was reported in the AEMR. It is recommended that the need for this requirement be reviewed following the next monitoring session, and reported within the AEMR. Undertake in appropriate areas, as recommended.	Please refer to the response to **IO35**	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO39	LMP S8.1(b)	The LMP (Section 8.1) requires regular walk-through site assessment (minimum once a year). Walk-through site assessments have been conducted as part of the annual monitoring; however it is unclear if all areas of rehabilitation have been inspected annually. This should be clarified/updated as part of future monitoring.	Please refer to the response to **NC49**	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO40	LMP S8.1(c)	The LMP (Section 8.1) requires formal long-term monitoring using fixed monitoring plots. These have been established in older rehabilitation areas (centred within and around the 2008 block). However, monitoring plots are absent from 2012 and part of 2011 rehabilitation areas. It is recommended that fixed monitoring plots are established within all blocks of rehabilitation, including the 2012 rehabilitation areas. Monitoring should occur from the next season.	Please refer to the response to **NC49**	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.

Invincible Colliery IEA Action Plan

ID	Criteria	Audit Recommendation	Proposed Action	Status as at 31 December 2020
IO41	Ecology	Specific ecological adaptive management recommendations have been made by Kleinfelder (2015), as part of the Annual Flora, Fauna and Rehabilitation Monitoring report, and these are supported by observations and recommendations resulting from the site inspection by Cumberland Ecology. The rehabilitation program should be updated as per the findings of the Cumberland Ecology assessment and the recommendations of annual monitoring.	Please refer to the response to **NC49** The need for this requirement will be reviewed in consultation with ecological consultants engaged to undertake future biodiversity monitoring.	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO42	Ecology	Additional statistical data analysis could be performed to gain a greater understanding of the changes in species composition over time in the BOA, and this would strengthen the monitoring reports.	Please refer to the response to **NC49** The need for this requirement will be reviewed in consultation with ecological consultants engaged to undertake future biodiversity monitoring.	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO43	Ecology	2012 rehabilitation was in very poor condition. Exotic species were found to dominate the understorey with native eucalypt and acacia species germination found to be limited. No tubestock planting was observed in this area. It is therefore recommended that slope stabilisation, seeding, and subsequent tubestock planting (after the slope is stabilised) be undertaken in this area of rehabilitation.	Please refer to the response to **NC49**	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO44	Ecology	The key area for continuing improvement of flora, fauna and rehabilitation management is the remedial action within failed and poor quality rehabilitation areas, particularly the 2012 blocks.	Please refer to the response to **NC49**	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO45	Ecology	Low condition grasslands were not observed to be regenerating and adaptive management should be reviewed.	Please refer to the response to **NC49.** The need for this requirement will be reviewed in consultation with ecological consultants engaged to undertake future biodiversity monitoring.	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO46	Ecology	Actions such as deep-ripping have not been employed at the edges of the moderate quality woodland and native dominated grasslands, which would be likely to improve natural regeneration. Bush regeneration techniques to promote natural regeneration, and then supplementing with tubestock planting and seeding, as part of an adaptive and ongoing approach would be suitable, and should be reviewed in the final MOP and supporting management plans.	Please refer to the response to **IO35**, **IO36** and **IO37**	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO47	Ecology	A low intensity ecological burn within the BOA has been recommended in each monitoring report. This recommendation has not been followed; and is supported by the findings of the Cumberland Ecology site inspection. Controlled ecological burn are very useful for promoting natural regeneration, and are suitable for all the vegetation types present in the BOA and should be considered.	Please refer to the response to **NC49** The need for this requirement will be reviewed in consultation with ecological consultants engaged to undertake future biodiversity monitoring.	Annual biodiversity monitoring conducted during 2020 with results included within the 2020 Annual Review. A Rehabilitation Strategy, revised Biodiversity Management Plan, and a revised Rehabilitation Management Plan were submitted to regulatory authorities in 2018 for comment. These revised plans will be submitted to DPE prior to the recommencement of operations. Annual biodiversity and rehabilitation monitoring was also undertaken during 2020.
IO50		The UST and its management or maintenance is not recorded in any documents relevant to the audit period. It is recommended that the UST be included within the Care and Maintenance MOP and regular maintenance by carried out and reported in the AEMRs. It the tank is no longer required, it should be decommissioned in accordance with WorkCover and NSW EPA requirements.	Please refer to the response to **NC55** If any works are undertaken on the UST, these will be documented in the MOP and reported in the AEMR.	The waste oil system was not utilised during the 2020 report period. A risk assessment regarding the utilisation of the system will be undertaken prior to the system being recommissioned. The waste oil collection system will be reinstated prior to recommencing mining.

APPENDIX 2

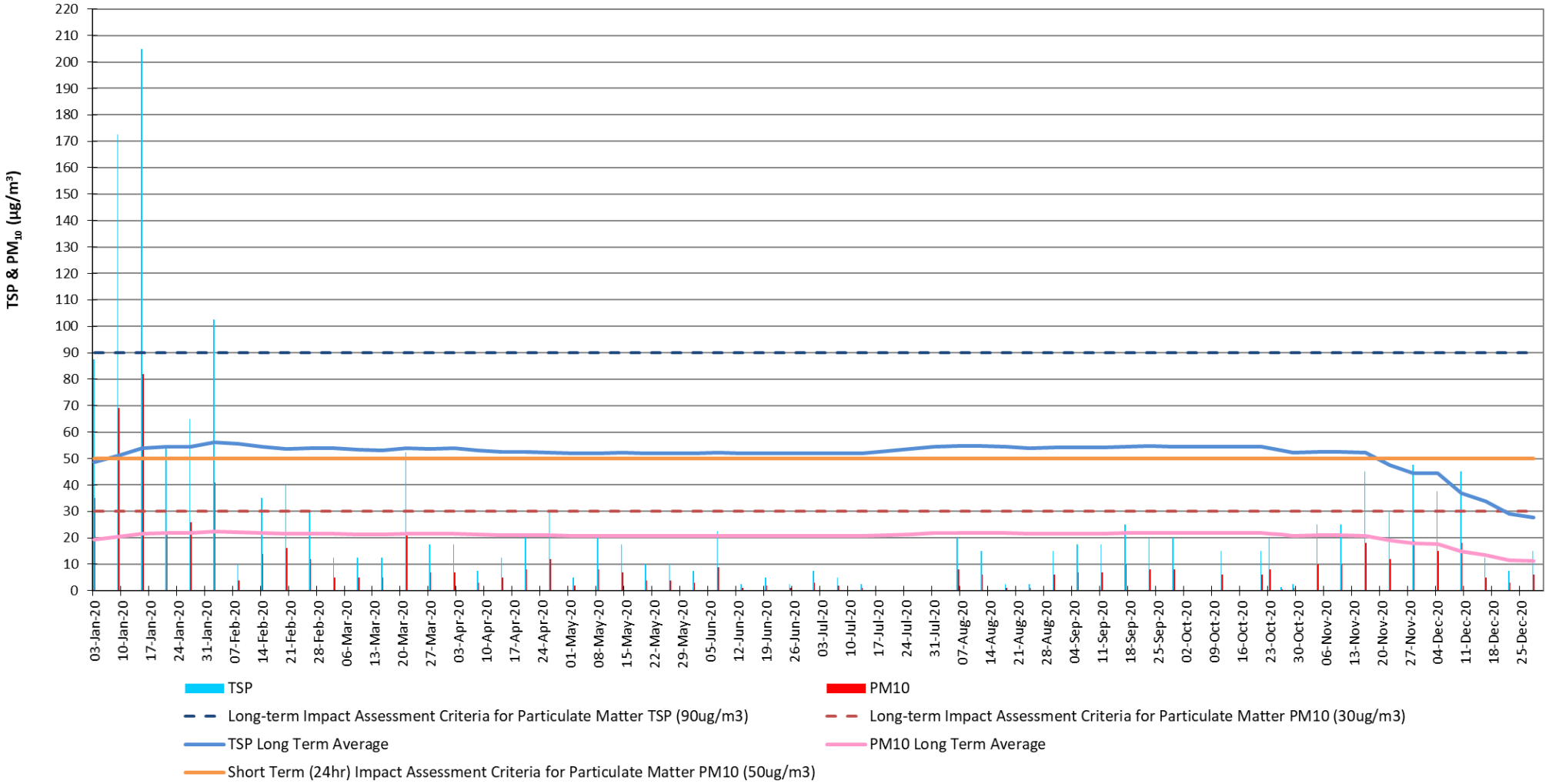
Environmental Monitoring Summary
Tables and Graphs



Note: Graph displays annual average total insoluble solids

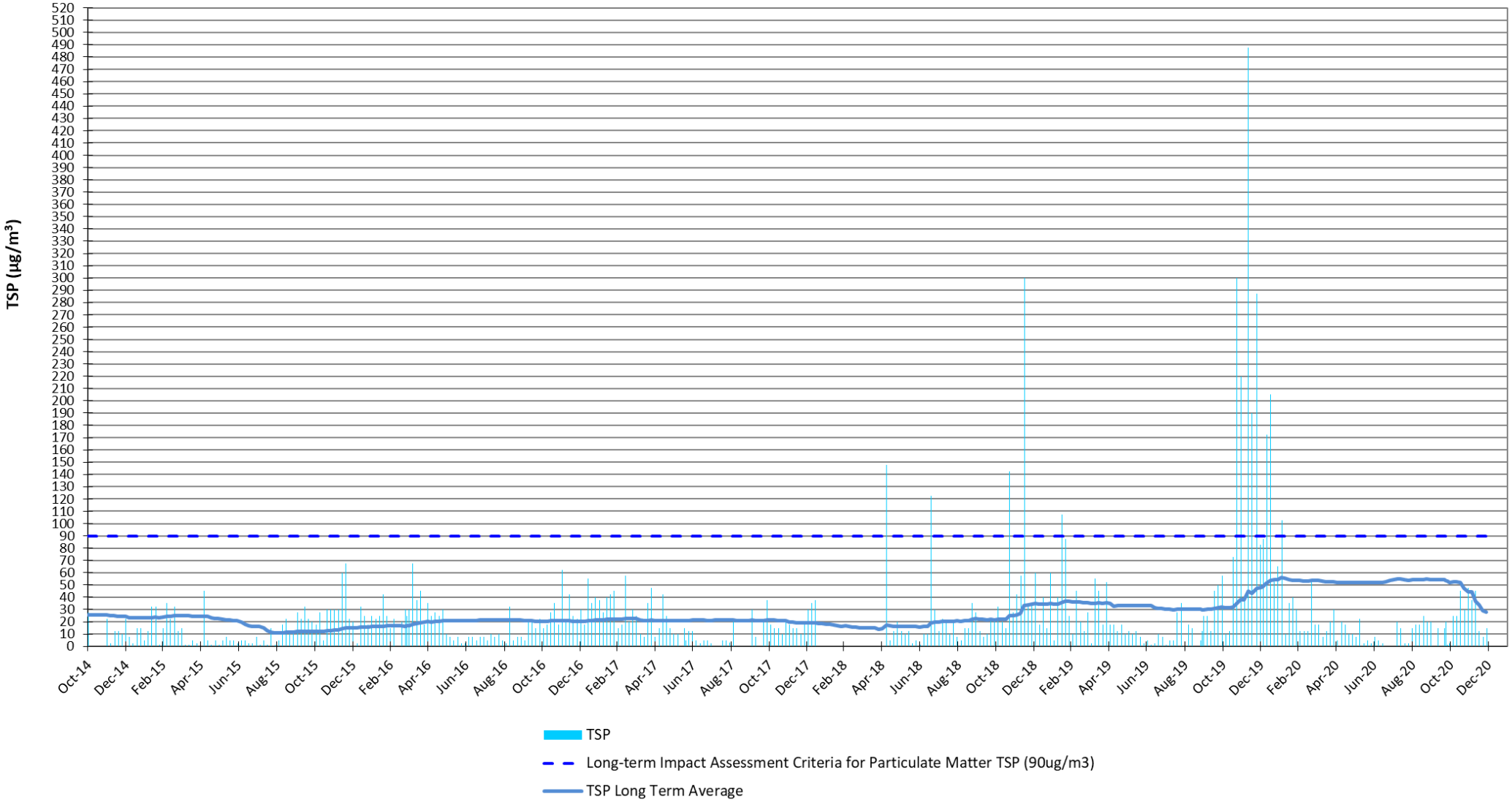
Note: Graph includes December 2019 results which were non-compliant with exposure period due to inaccessibility of dust gauges due to bushfire events. For comparative purposes, Annual Averages excluding these results can be found in Table 6.4 of the 2019 Invincible Annual Review.

Invincible Colliery
TSP & PM10 24hr Results
January 2020 to December 2020



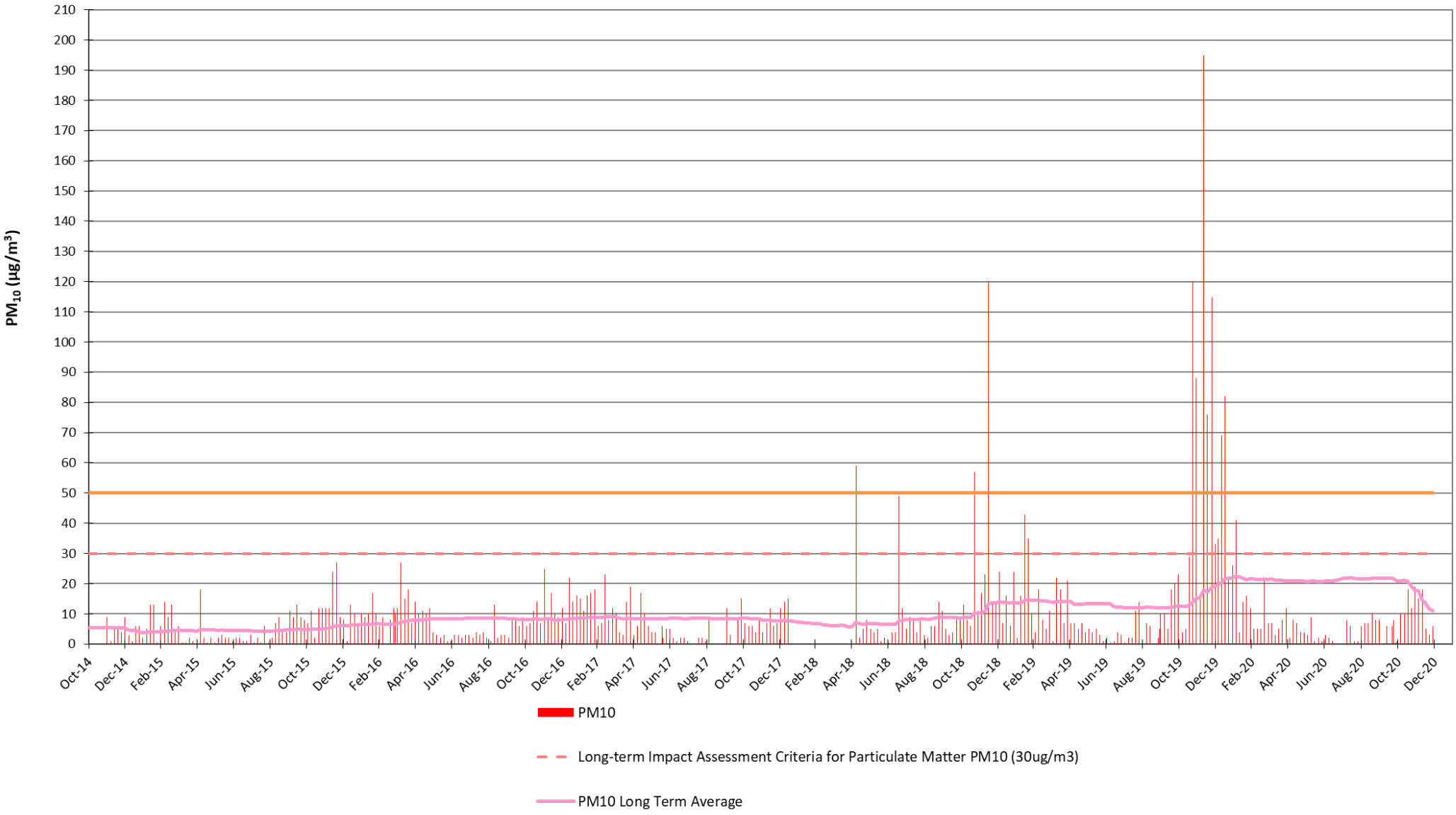
Note: Graph includes January 2020 results which were influenced by extraordinary events. For comparative purposes, Annual Averages excluding these results can be found in Table 6.5 of the 2020 Invincible Annual Review.

Invincible Colliery
TSP Results
October 2014 to December 2020

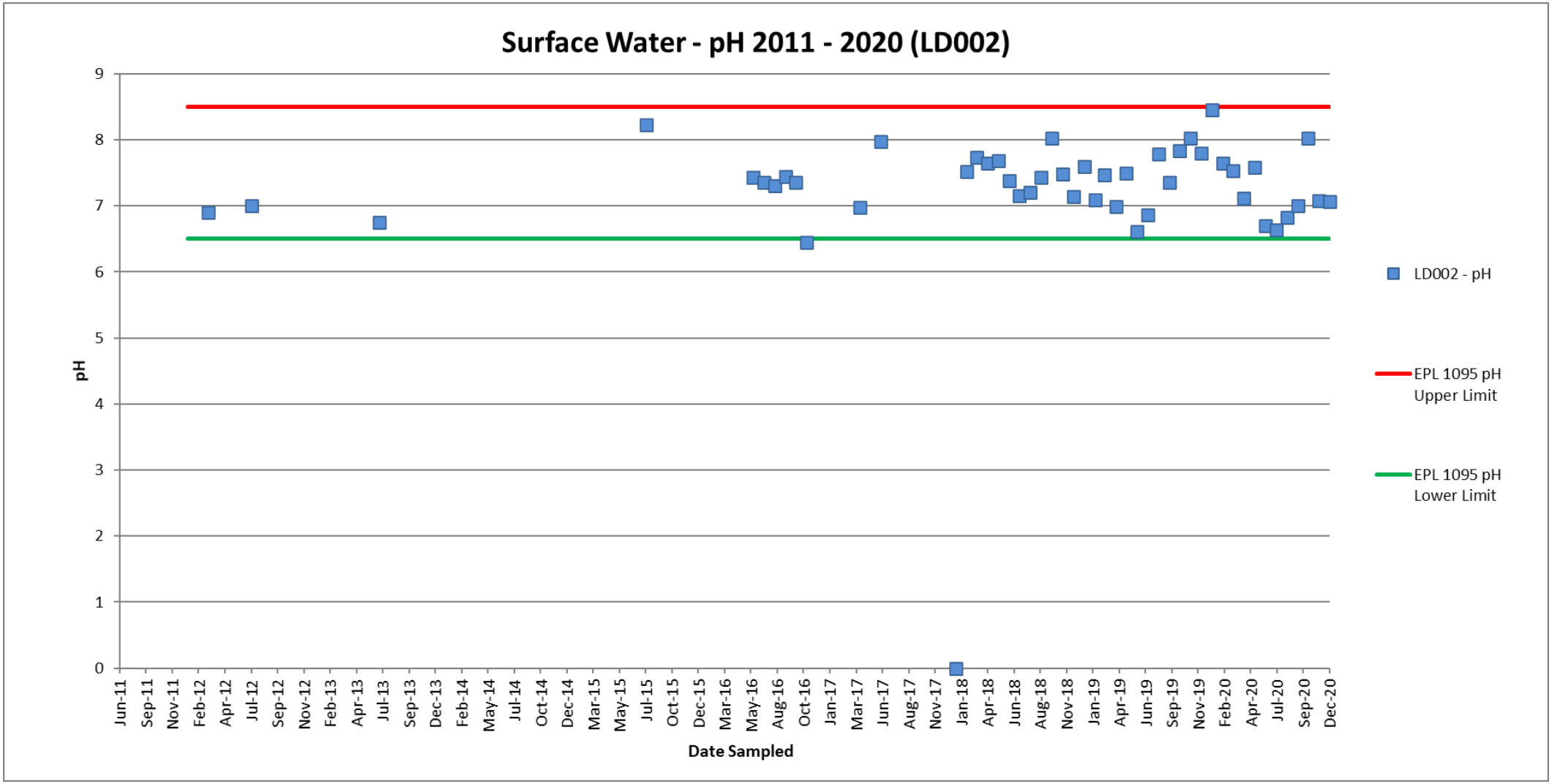


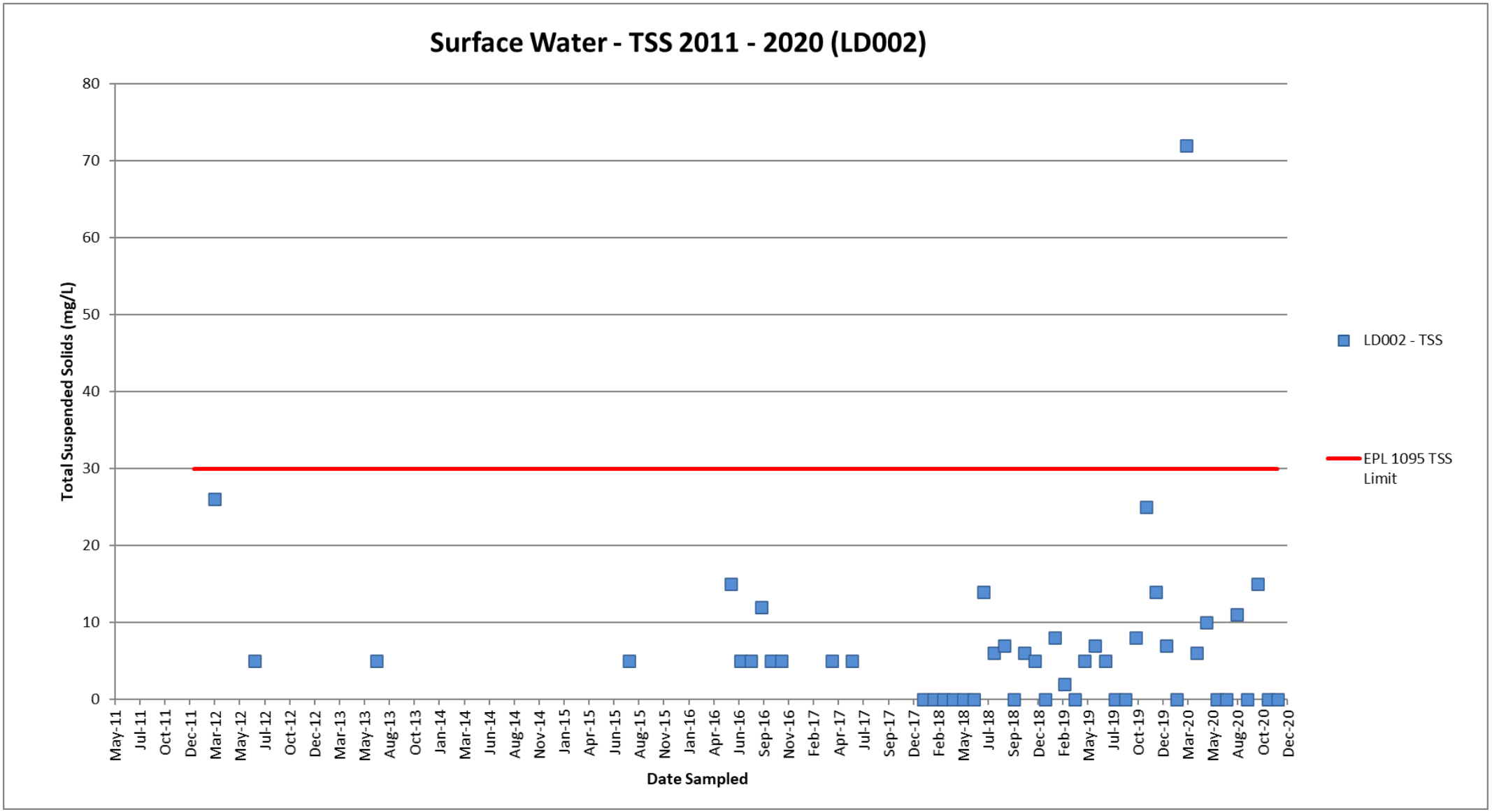
Note: Graph includes December 2019 to January 2020 results which were influenced by extraordinary events. For comparative purposes, Annual Averages excluding these results can be found in Table 6.5 of the 2019 and 2020 Invincible Annual Reviews.

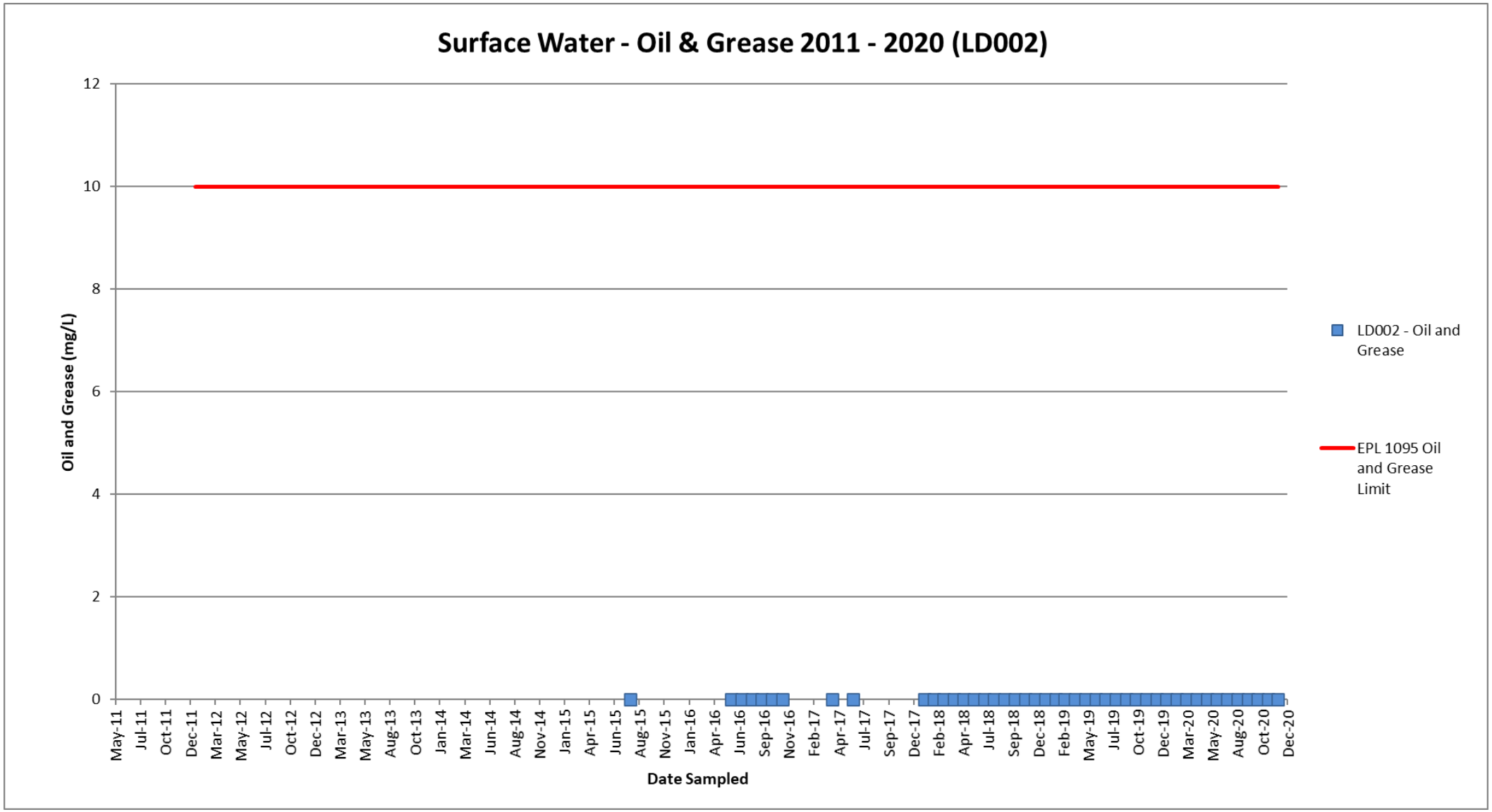
Invincible Colliery
PM_{10} Results
October 2014 to December 2020



Note: Graph includes December 2019 to January 2020 results which were influenced by extraordinary events. For comparative purposes, Annual Averages excluding these results can be found in Table 6.5 of the 2019 and 2020 Invincible Annual Reviews.


Surface Water - pH 2011 - 2020 (LD002)
pH
Date Sampled
LD002 - pH
EPL 1095 pH Upper Limit
EPL 1095 pH Lower Limit


Surface Water - TSS 2011 - 2020 (LD002)
Total Suspended Solids (mg/L)
80
70
60
50
40
30
20
10
0
May-11
Jul-11
Oct-11
Dec-11
Mar-12
May-12
Jul-12
Oct-12
Dec-12
Mar-13
May-13
Aug-13
Oct-13
Jan-14
Mar-14
Jun-14
Aug-14
Nov-14
Jan-15
Apr-15
Jun-15
Aug-15
Nov-15
Jan-16
Apr-16
Jun-16
Sep-16
Nov-16
Feb-17
Apr-17
Jul-17
Sep-17
Dec-17
Feb-18
May-18
Jul-18
Sep-18
Dec-18
Feb-19
May-19
Jul-19
Oct-19
Dec-19
Mar-20
May-20
Aug-20
Oct-20
Dec-20
Date Sampled
LD002 - TSS
EPL 1095 TSS Limit


Surface Water - Oil & Grease 2011 - 2020 (LD002)
Oil and Grease (mg/L)
0
2
4
6
8
10
12
May-11
Jul-11
Oct-11
Dec-11
Mar-12
May-12
Jul-12
Oct-12
Dec-12
Mar-13
May-13
Aug-13
Oct-13
Jan-14
Mar-14
Jun-14
Aug-14
Nov-14
Jan-15
Apr-15
Jun-15
Aug-15
Nov-15
Jan-16
Apr-16
Jun-16
Sep-16
Nov-16
Feb-17
Apr-17
Jul-17
Sep-17
Dec-17
Feb-18
Apr-18
Jul-18
Sep-18
Dec-18
Feb-19
May-19
Jul-19
Oct-19
Dec-19
Mar-20
May-20
Aug-20
Oct-20
Dec-20
Date Sampled
LD002 - Oil and Grease
EPL 1095 Oil and Grease Limit

Background Surface Water Quality Results

Note: Surface Water discharge events are represented with an asterisk.

Main Dam (LD002)			
Sampling Date	**pH**	**Oil & Grease (mg/L)**	**TSS (mg/L)**
14/01/2020	8.49	<5	<5
11/02/2020	7.18	<5	<5
10/03/2020	7.14	<5	<5
7/04/2020*	7.43	<5	8
5/05/2020*	7.63	<5	14
3/06/2020*	7.09	<5	<5
2/07/2020	7.22	<5	<5
3/08/2020*	6.08	<5	8
3/09/2020*	7.39	<5	5
1/10/2020*	8.19	<5	7
2/11/2020*	7.44	<5	5
3/12/2020*	7.35	<5	5

**Discharge event*

Environmental Dam (SW01)			
Sampling Date	**pH**	**Oil & Grease (mg/L)**	**TSS (mg/L)**
14/01/2020	Dry	Dry	Dry
11/02/2020	3.76	<5	43
10/03/2020	3.31	<5	5
7/04/2020*	3.13	<5	16
5/05/2020*	3.16	<5	11
3/06/2020*	3.11	<5	7
2/07/2020	3.04	<5	<5
3/08/2020*	3.10	<5	<5
3/09/2020*	2.80	<5	<5
1/10/2020*	3.21	<5	16
2/11/2020*	3.33	<5	6
3/12/2020*	3.06	<5	23

**Discharge event*

Silt Dam (SW02)			
Sampling Date	**pH**	**Oil & Grease (mg/L)**	**TSS (mg/L)**
14/01/2020	8.43	<5	82
11/02/2020	7.44	<5	99
10/03/2020	8.03	<5	90
7/04/2020*	7.40	<5	92
5/05/2020*	6.93	<5	51
3/06/2020*	7.15	<5	38
2/07/2020	7.10	<5	43
3/08/2020*	7.02	<5	22
3/09/2020*	7.22	<5	11
1/10/2020*	7.01	<5	32
2/11/2020*	7.12	<5	103
3/12/2020*	7.02	<5	75

**Discharge event*

Cullen Creek (BSW01 – Upstream)			
Sampling Date	**pH**	**Oil & Grease (mg/L)**	**TSS (mg/L)**
14/01/2020	7.10	<5	110
11/02/2020	6.24	<5	8
10/03/2020	6.94	<5	28
7/04/2020	6.60	<5	10
5/05/2020	6.70	<5	10
3/06/2020	6.95	<5	5
2/07/2020	6.80	<5	12
3/08/2020	6.76	<5	9
3/09/2020	6.51	<5	7
1/10/2020	7.13	<5	8
2/11/2020	6.61	<5	18
3/12/2020	7.09	<5	23

** Discharge event*

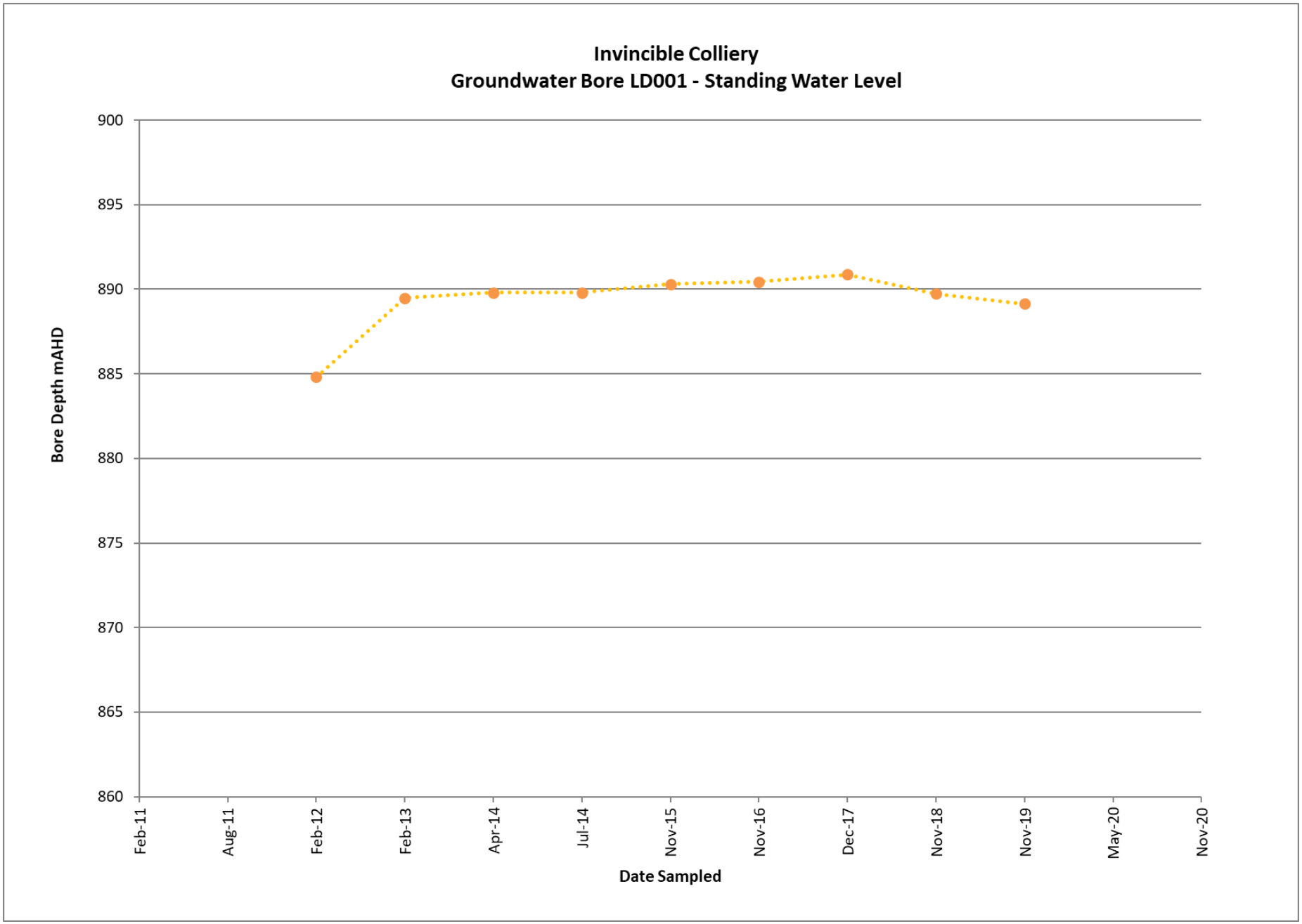
Dulhunty's Creek (BSW02 – Downstream)			
Sampling Date	**pH**	**Oil & Grease (mg/L)**	**TSS (mg/L)**
14/01/2020	8.73	<5	222
11/02/2020	4.86	<5	15
10/03/2020	6.93	<5	10
7/04/2020	7.22	<5	10
5/05/2020	7.24	<5	<5
3/06/2020	7.25	<5	<5
2/07/2020	7.52	<5	6
3/08/2020	7.34	<5	6
3/09/2020	7.43	<5	6
1/10/2020	7.90	<5	8
2/11/2020	7.42	<5	5
3/12/2020	7.46	<5	10

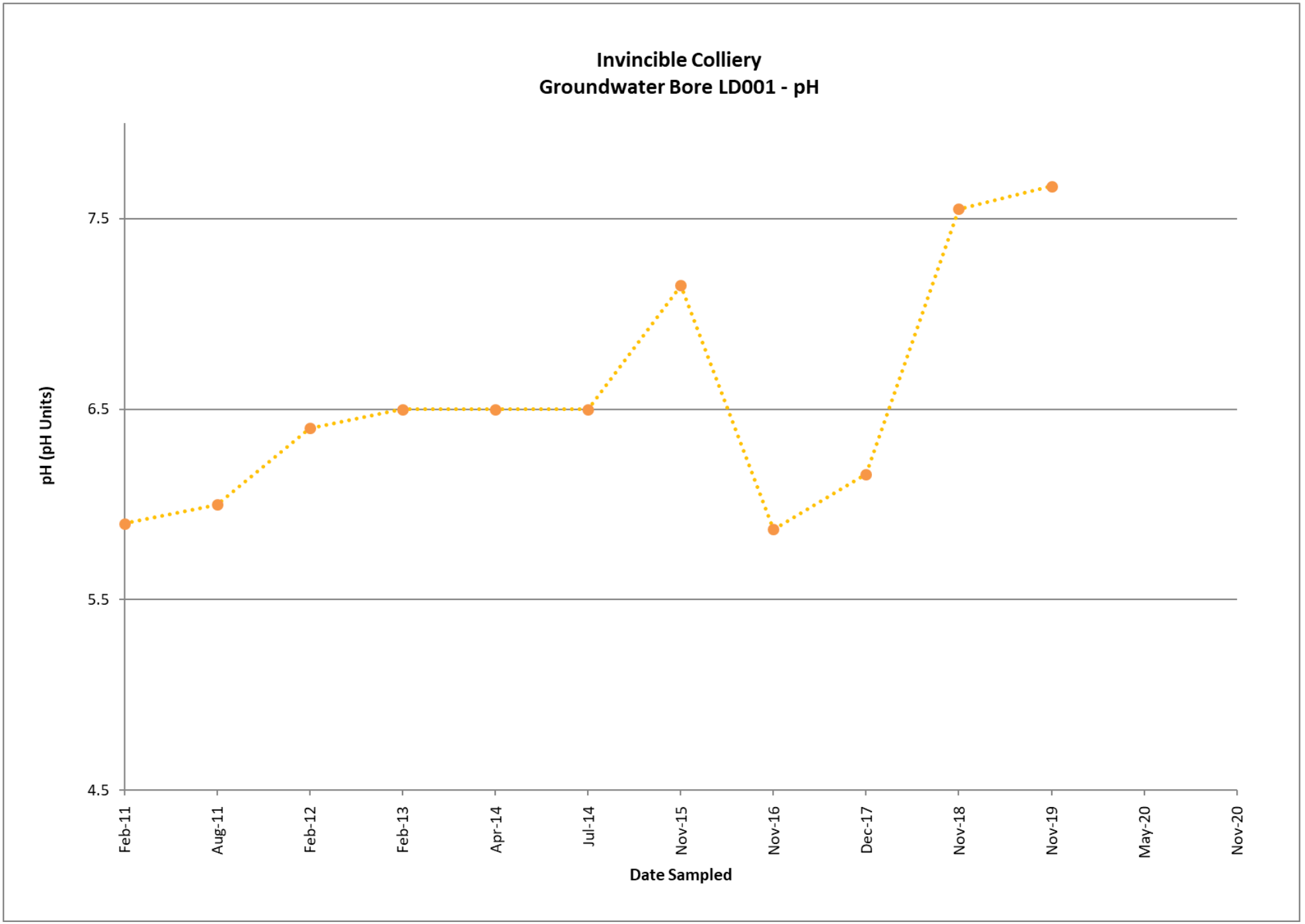
Groundwater monitoring results- LD001											
Sampling Date:	**16/02/2011**	**17/08/2011**	**2/02/2012**	**27/02/2013**	**30/04/2014**	**24/07/2014**	**10/11/2015**	**8/11/2016**	**12/12/2017**	**7/11/2018**	**5/11/2019**
AHD (RL) (m)	ND	ND	884.81	889.49	889.80	889.80	890.31	890.45	890.88	889.73	889.14
Depth to aquifer (m)	ND	ND	55.32	50.64	50.26	50.38	49.82	49.68	49.25	50.40	50.99
pH	5.90	6.00	6.40	6.50	6.50	6.50	7.15	5.87	6.16	7.55	7.67
Electrical Conductivity (µS/cm)	150	130	130	120	130	130	155	142	125	166	175
Nitrite (mg/L)	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.05	<0.01	<0.01
Total Oxidised Nitrogen (mg/L)	ND	ND	ND	ND	ND	ND	0.22	0.20	0.22	0.26	0.34
Chloride (mg/L)	6.0	5.0	5.0	5.0	5.0	5.0	5.3	6.0	6.0	5.0	9
Nitrate (mg/L)	0.01	0.06	0.26	0.24	0.24	0.24	0.22	0.20	0.22	0.26	0.34
Sulphate (mg/L)	25	15	17	11	12	14	14	13	13	12	13
Alkalinity (mg/L)	33	32	42	40	42	44	44	46	56	63	67
Calcium (mg/L)	7.8	8.3	9.9	8.2	9.2	10.0	11.0	11.0	13.0	13.0	14
Magnesium (mg/L)	4.3	6	4.7	3.6	3.8	4.3	4.0	5.0	5.0	4.0	5
Sodium (mg/L)	7.1	6.2	7.3	5.8	5.8	5.8	5.4	6.0	6.0	8.0	7
Potassium (mg/L)	6.2	6	6.3	5.7	6.8	7.2	6.7	8.0	8.0	8.0	8
Total Hardness (mg $CaCO_3$/L)	37	45	44	35	39	43	44	48	53	49	56
Dissolved Aluminium (µg/L)	<10	<10	ND	ND	<10	<10	26	<10	<10	<10	<10
Dissolved Arsenic (µg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

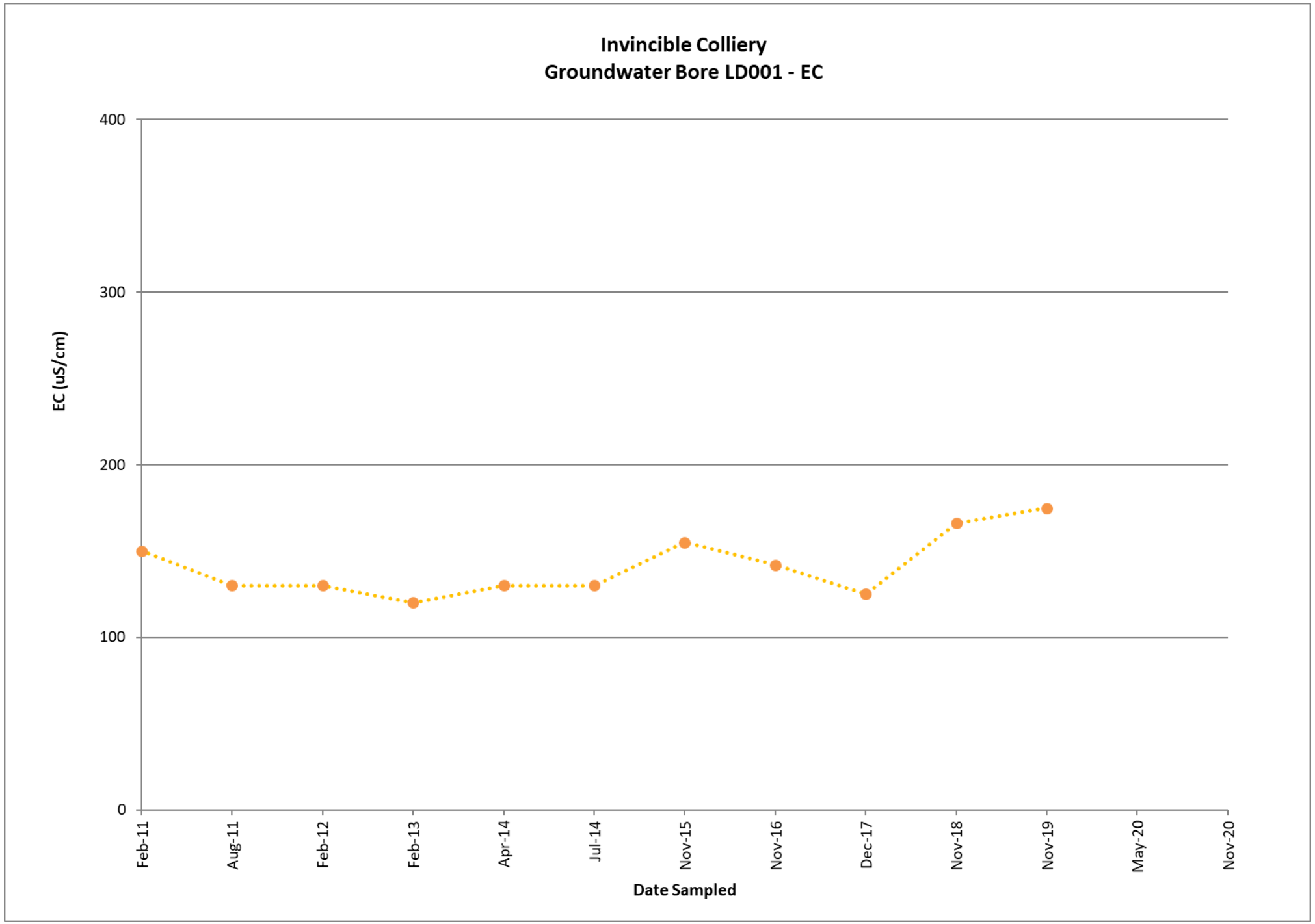
Groundwater monitoring results- LD001											
Sampling Date:	**16/02/2011**	**17/08/2011**	**2/02/2012**	**27/02/2013**	**30/04/2014**	**24/07/2014**	**10/11/2015**	**8/11/2016**	**12/12/2017**	**7/11/2018**	**5/11/2019**
Dissolved Cadmium (µg/L)	<0.1	<0.1	<0.1	<0.1	0.2	1	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Chromium (µg/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Copper (µg/L)	2	4	6	38	38	21	23	14	10	6	<1
Dissolved Iron (µg/L)	56	<10	96	<10	<10	<10	21	<50	<50	<50	<50
Dissolved Lead (ug/L)	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dissolved Manganese (ug/L)	500	510	ND	ND	<5	<5	1	2	4	<1	2
Dissolved Molybdenum (ug/L)	1	ND	ND	ND	<1	<1	<1	<1	<1	<1	<1
Dissolved Nickel (ug/L)	21	27	10	11	11	11	10	9	8	8	7
Dissolved Selenium (ug/L)	<1	ND	ND	ND	<1	<1	<1	<10	<10	<10	<10
Dissolved Zinc (ug/L)	66	79	79	52	66	65	100	122	138	150	142
Dissolved Mercury (mg/L)	ND	<0.1	ND	ND	ND	ND	<0.0001	<0.0001	<0.0001	ND	<0.0001

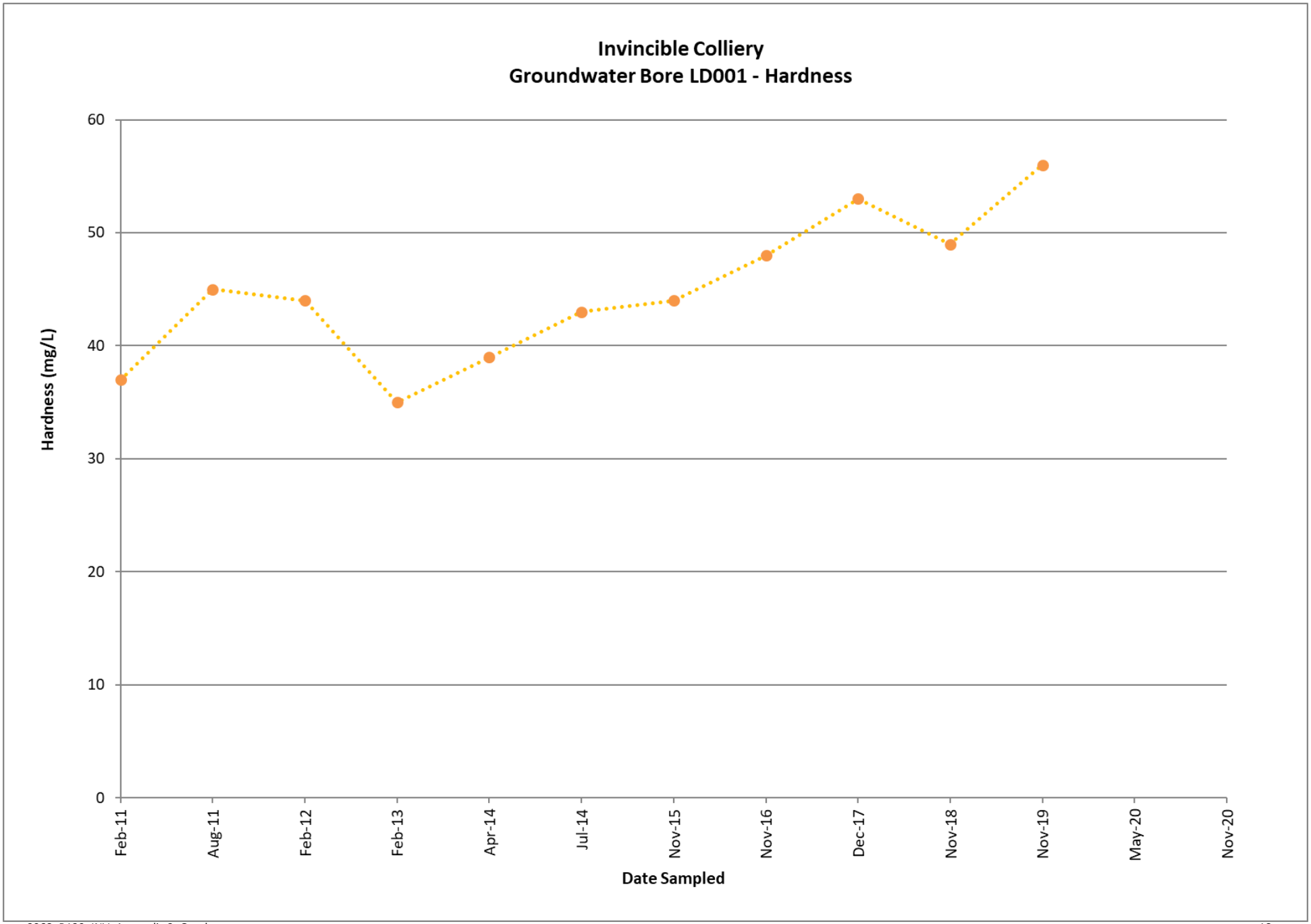
ND = No data

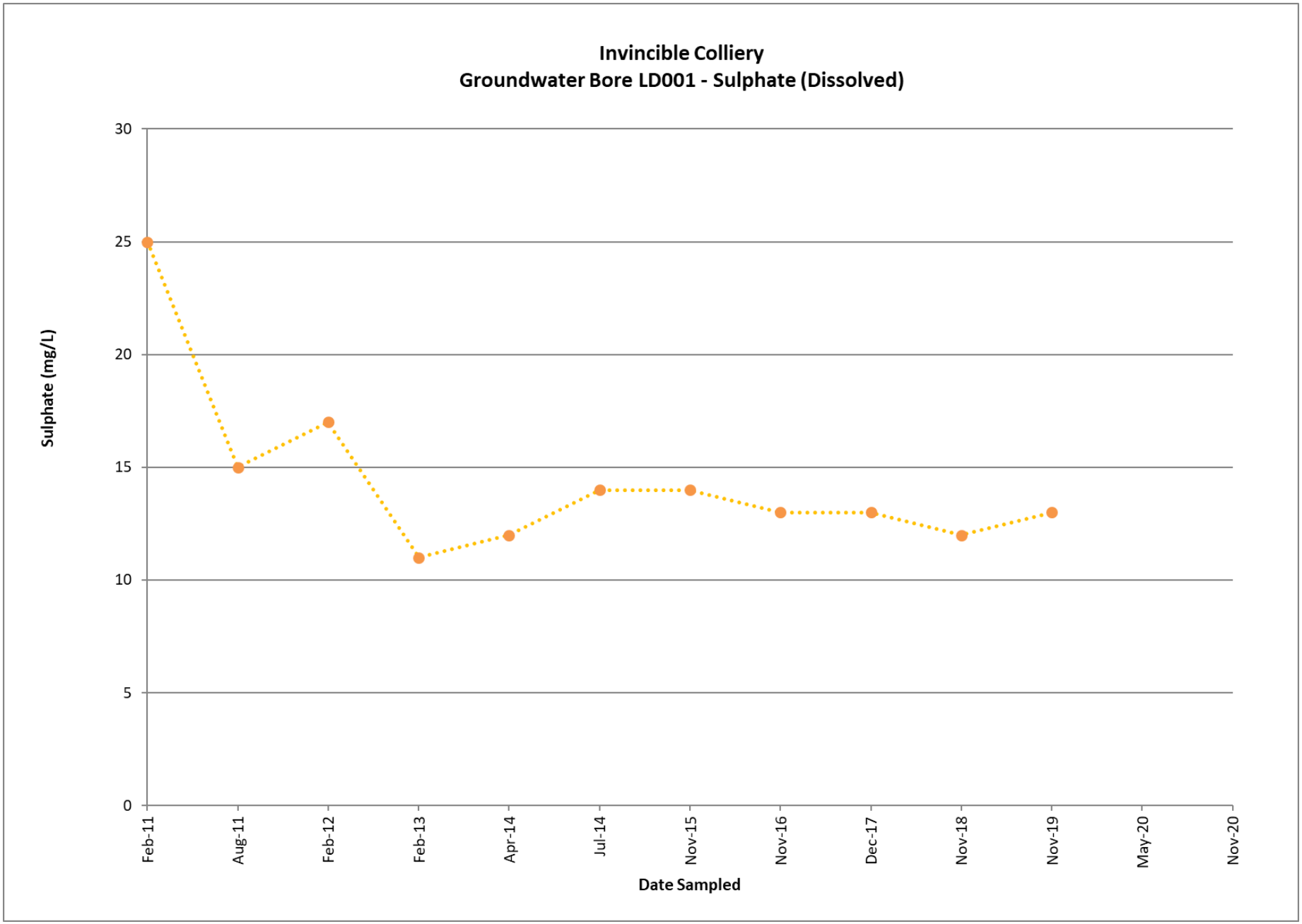
Note: No monitoring undertaken in 2020 due to inaccessibility of Ben Bullen State Forest due to bushfire damage.

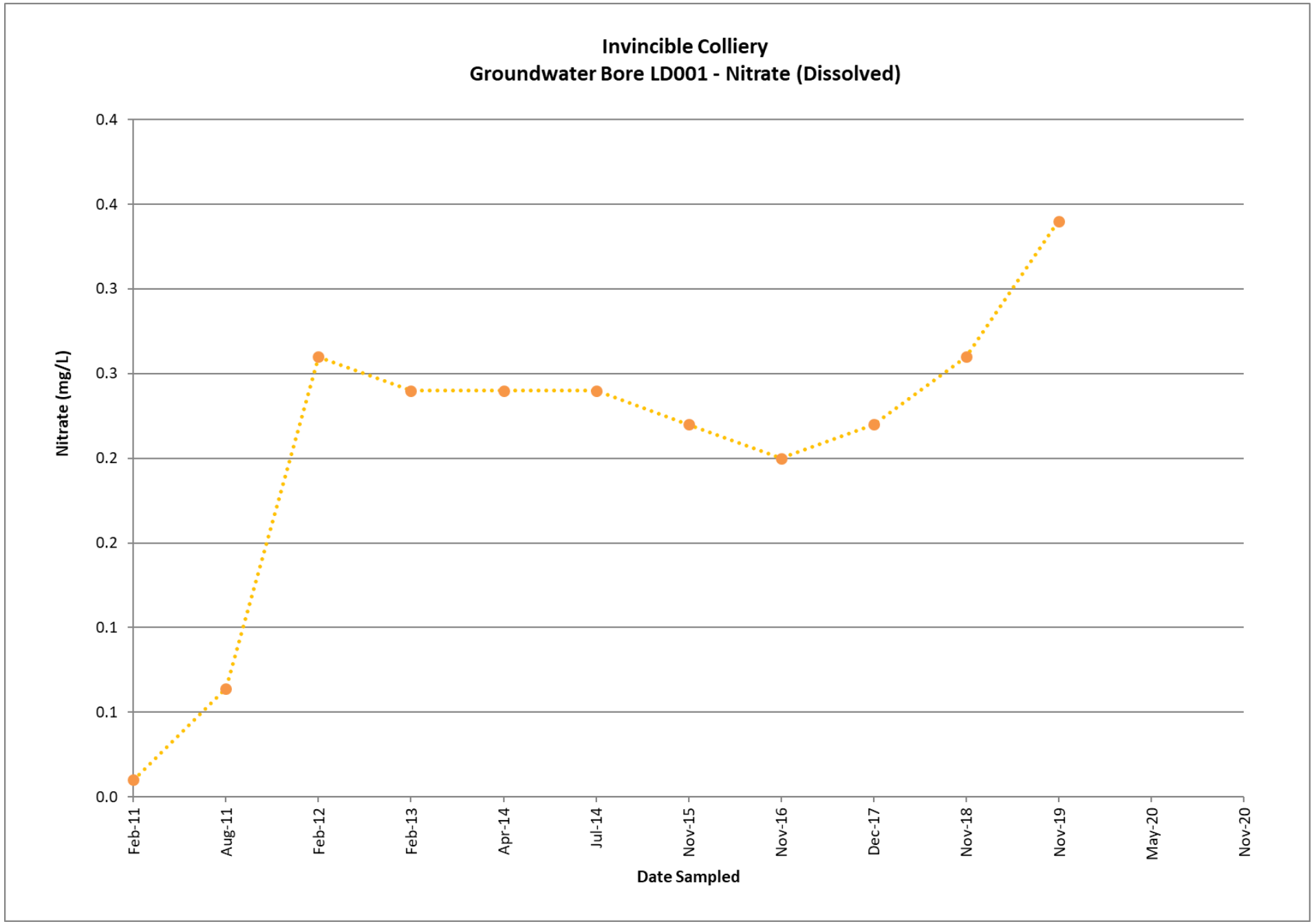

Invincible Colliery
Groundwater Bore LD001 - Standing Water Level
Bore Depth mAHD
900
895
890
885
880
875
870
865
860
Feb-11
Aug-11
Feb-12
Feb-13
Apr-14
Jul-14
Nov-15
Nov-16
Dec-17
Nov-18
Nov-19
May-20
Nov-20
Date Sampled


Invincible Colliery
Groundwater Bore LD001 - pH
pH (pH Units)
7.5
6.5
5.5
4.5
Feb-11
Aug-11
Feb-12
Feb-13
Apr-14
Jul-14
Nov-15
Nov-16
Dec-17
Nov-18
Nov-19
May-20
Nov-20
Date Sampled


Invincible Colliery
Groundwater Bore LD001 - EC
EC (uS/cm)
400
300
200
100
0
Feb-11
Aug-11
Feb-12
Feb-13
Apr-14
Jul-14
Nov-15
Nov-16
Dec-17
Nov-18
Nov-19
May-20
Nov-20
Date Sampled


Invincible Colliery
Groundwater Bore LD001 - Hardness
Hardness (mg/L)
60
50
40
30
20
10
0
Feb-11
Aug-11
Feb-12
Feb-13
Apr-14
Jul-14
Nov-15
Nov-16
Dec-17
Nov-18
Nov-19
May-20
Nov-20
Date Sampled


Invincible Colliery
Groundwater Bore LD001 - Sulphate (Dissolved)
Sulphate (mg/L)
30
25
20
15
10
5
0
Feb-11
Aug-11
Feb-12
Feb-13
Apr-14
Jul-14
Nov-15
Nov-16
Dec-17
Nov-18
Nov-19
May-20
Nov-20
Date Sampled


Invincible Colliery
Groundwater Bore LD001 - Nitrate (Dissolved)
Nitrate (mg/L)
0.4
0.4
0.3
0.3
0.2
0.2
0.1
0.1
0.0
Feb-11
Aug-11
Feb-12
Feb-13
Apr-14
Jul-14
Nov-15
Nov-16
Dec-17
Nov-18
Nov-19
May-20
Nov-20
Date Sampled

Historical Noise results

Historical Noise monitoring results for years 2011 and 2012 and are shown in below. Contribution from Invincible was inaudible for all monitoring undertaken for 2013 - 2020.

2011 Quarterly Noise Monitoring Results					
Location	**Criterion (dB)**	**Quarter 1 ($L_{Aeq\ 15\ min}$)**	**Quarter 2 ($L_{Aeq\ 15\ min}$)**	**Quarter 3 ($L_{Aeq\ 15\ min}$)**	**Quarter 4 ($L_{Aeq\ 15\ min}$)**
Cullen Bullen Central (N01)	40	IA	IA	IA	IA
Cullen Bullen West (N02)	40	IA	IA	IA	IA
Cullen Bullen South (N03)	40	IA	NM	IA	IA

IA – Noise from the mine was inaudible.
NM – Noise was audible but not measurable.

2012 Quarterly Noise Monitoring Results					
Location	**Criterion (dB)**	**Quarter 1 ($L_{Aeq\ 15\ min}$)**	**Quarter 2 ($L_{Aeq\ 15\ min}$)**	**Quarter 3 ($L_{Aeq\ 15\ min}$)**	**Quarter 4 ($L_{Aeq\ 15\ min}$)**
Cullen Bullen Central (N01)	40	IA	<30	IA	IA
Cullen Bullen West (N02)	40	IA	<30	IA	IA
Cullen Bullen South (N03)	40	IA	34	IA	IA

IA – Noise from the mine was inaudible.